MANAGEMENT RESPONSE TO
REQUEST FOR INSPECTION PANEL REVIEW OF THE
TAJIKISTAN ENERGY LOSS REDUCTION PROJECT
(IDA Credits 40930-TJ and HI7S0-TJ)

Management has reviewed the Request for Inspection of the Tajikistan: Energy Loss Reduction Project (Rogun HPP) (IDA Credits Nos. 40930-TJ and HI7S0-TJ), received by the Inspection Panel on October 8, 2010 and registered on October 22, 2010 (RQ10/08). Management has prepared the following response.

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ABBREVIATIONS AND ACRONYMS

BP	Bank Procedures
CAEWDP	Central Asia Energy-Water Development Program
CIS	Commonwealth of Independent States
ELRP	Energy Loss Reduction Project
ESIA	Environmental and Social Impact Assessment
GORT	Government of the Republic of Tajikistan
HPP	Hydropower Project
ICB	International Competitive Bidding
IPN	Inspection Panel
NGO	Nongovernmental organization
ISDS	Integrated Safeguards Data Sheet
OP	Operational Policy
TEAS	Techno-Economic Assessment Study
TOR	Terms of Reference
TWh	Terawatt hour

EXECUTIVE SUMMARY

On October 22, 2010, the Inspection Panel registered a Request for Inspection relating to the *Tajikistan Energy Loss Reduction Project (ERLP)*. The project started in 2005 and is to be restructured to include an additional component for financing Assessment Studies and technical assistance. The restructuring will be considered by the Board in December 2010. These Assessment Studies, which will examine the potential benefits and risks of the proposed Rogun Water Reservoir and Hydropower Project (proposed Rogun HPP), are the subject of the Request for Inspection. The additional component has been developed in response to a request from the Government of the Republic of Tajikistan. The aim of the Assessment Studies is to comprehensively examine the technical, economic, social and environmental viability of the proposed Rogun HPP in accordance with the Bank's policies and procedures. The estimated cost of the studies will be approximately US$10 million.

The proposed restructuring relates only to the Assessment Studies and does not contain financing for construction of the proposed Rogun HPP itself. Management has emphasized that the Bank has not committed to funding the proposed Rogun HPP. Any involvement by the Bank Group in providing financial support, directly or indirectly, for the proposed Rogun HPP will depend on a series of activities that include economic, financial, environmental and social assessments of the proposed Rogun HPP, Bank-funded studies (including analysis of project alternatives), sharing and discussion of studies with riparians, and scrutiny by the two Bank-funded independent Panels of Experts (an Engineering/Dam Safety Panel and an Environment/Social Panel). Only if these activities indicate, in the judgment of the Bank, the viability of the proposed Rogun HPP, would the Bank consider endeavoring to establish a suitable consortium to support the proposed Rogun HPP.

Strategic Context for World Bank Involvement in Assessment Studies

The proposed Rogun HPP is being considered within an environment of very difficult regional political and economic relations. A project that was conceived under the Soviet system must now be re-examined in a political dynamic of increased nationalism, resource conflicts and declining regional cooperation. Nonetheless, the proposed Rogun HPP has a potential to address many of the development needs of Tajikistan and the broader region and thus is worthy of study. As a large and complex project on a transboundary river (involving Tajikistan, Uzbekistan, Turkmenistan and Afghanistan, as well as the broader interests of Kyrgyz Republic and Kazakhstan), such study requires particular care and attention. The Bank's involvement in the Assessment Studies sustains its long term and Bank-wide engagement in energy and water in the region, and in Tajikistan's efforts to develop its energy sector. The Bank's involvement is supported by the Bank's Central Asia Energy-Water Development Program, one of the sub-regional activities of the Europe and Central Asia Strategy presented to the Board in March 2010.

The purpose of Bank involvement in the Rogun Assessment Studies is to ensure an unbiased, impartial and transparent evaluation of the benefits and risks that meets international professional standards. Two panels of independent international experts funded by the Bank will bring international scrutiny to the study by reviewing and validating the study's analysis, results and recommendations. Moreover, the Bank will support a structured program of riparian consultations, undertake Bank-funded studies to complement the Assessment Studies (including an evaluation of alternatives to the proposed Rogun HPP), and adopt additional measures related to selection and management of consultants. Management has decided to adopt this approach of expanded Bank involvement, some of which goes beyond the requirements of the Bank's operational policies, in response to the concerns raised by riparian governments and given the importance of securing internationally-recognized assessments. Management believes the Bank's support for the Assessment Studies will improve the basis for informed decision-making on the future of the proposed Rogun HPP and on associated decisions regarding possible future participation by various stakeholders. The Assessment Studies will provide the Government of Tajikistan, the World Bank, the other Central Asian countries and the international community with information about key elements associated with the proposed Rogun HPP.

The proposed Rogun HPP was initiated under the Soviet system in the 1980s to regulate energy and water for Central Asia, and was then abandoned in the early 1990s following the Soviet Union's disintegration. In the absence of maintenance and as a result of flooding, the existing structures have significantly deteriorated. Rehabilitation of existing and damaged works started in 2008 and is currently underway, financed by the Government of Tajikistan. Rehabilitation works to date have not affected water regulation in terms of diversion or storage.

Management has reached an understanding with the Government of Tajikistan that Bank support for the Assessment Studies will depend on two conditions: firstly, that there will be no river diversion (construction of the coffer dam) by Tajikistan unless the techno-economic and environmental/social studies have been completed and discussed with riparians, and the studies have been reviewed by the independent Panels of Experts to determine feasibility; and secondly, there is continued compliance with relevant Bank operational policies as applicable to the Assessment Studies. In addition, Management has reached an understanding with the Government that resettlement of communities in the proposed future reservoir area will cease until relevant studies and plans are completed as part of the Environmental and Social Impact Assessment (ESIA), in alignment with the Bank's operational policies. Resettlement in villages in the vicinity of the dam site will continue where necessary to protect them from hazardous or otherwise adverse conditions. Should such resettlement take place it would be in accordance with the applicable legal and institutional framework, as well as international good practices.

Request for Inspection

The Request for Inspection was submitted by Messrs. Boriy Botirovich Alikhanov and Saydirasul Sanginov, and Ms. Dilorom Fayezieva on their behalf and on behalf of the *Ecological Movement of Uzbekistan* which declares that it represents NGOs of Uzbekistan as downstream affected people of a project with potential transboundary impacts.

The Requesters make several claims regarding potential impacts of the proposed Rogun HPP. In addition they are of the view that the process by which the Assessment Studies are being prepared is one-sided, and that the Bank's communications with Uzbek representatives was unclear.

The core of their Request is a description of possible ecological, social and security related incidents that they allege could arise from the construction, operation and/or failure of the proposed Rogun HPP. In particular they express concerns regarding the proposed Rogun HPP's outdated Soviet design and emphasize the need to assess the design's compliance with current international standards.

Management Response to the Request for Inspection

Management asks that the Panel consider the Request ineligible for investigation because the issues raised by the Requesters focus on potential harm that could derive from the construction, operation and/or failure of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance. Management has made no decision whether to finance the proposed Rogun HPP. Hence, Management fails to understand the harm that the Requesters allege could derive from these Assessment Studies.

Management also notes that the Assessment Studies have not yet commenced and therefore substantive application of Bank policies and procedures could not have taken place. Management maintains also that the preparatory work for the Assessment Studies to date meets the requirements of the Bank's operational policies and procedures.

Management believes that an inspection at this stage of project preparation would undermine the Bank's policy by replacing the independent and integrated environmental and social assessment mandated by the Bank's operational policies with a limited review of the concerns and issues expressed by one stakeholder group. This practice could seriously undermine the Bank's ability to provide technical support and impartial advice to client countries, and act as a knowledge bank.

As regards the issue of the Requesters' prior contact with Management, Management notes that it has no records of the Requesters' attempt to raise their issues with Management. While the Requesters did meet with Management to communicate their views, this took place on the same day that their Request for Inspection was submitted. Management considers that this is not in line with the eligibility stipulations set out in the Resolution establishing the Inspection Panel.

Management believes the Requesters raise legitimate and important issues regarding the proposed Rogun HPP, which the proposed Assessment Studies are exactly designed to address. Management shares these questions and maintains that the proposed Rogun HPP has not yet been adequately reviewed and evaluated to make an informed decision on new construction. In Management's view the proposed studies will provide a sound and transparent basis for any discussion of future decisions regarding the proposed Rogun HPP. Management is aware of the region's difficult political dynamics and is committed to supporting better regional cooperation and economic integration through the Bank's Central Asia Energy-Water Development Program. It is also in this context that Management believes that conduct of the Assessment Studies is urgently needed to fill the information void that is currently fueling tensions in the region. Management underlines that the Assessment Studies will address each of the Requesters' specific concerns, and will satisfy the Requesters' own declaration of the need for further studies.

Notwithstanding Management's strong concerns regarding the eligibility of this Request for Inspection, Management welcomes the opportunity to clarify the nature and details of its involvement in the Assessment Studies and to address the issues and questions raised by the Requesters.

I. INTRODUCTION

1. On October 22, 2010, the Inspection Panel registered a Request for Inspection, IPN Request RQ 10/08 (hereafter referred to as "the Request"), concerning the Assessment Studies for the proposed Tajikistan Rogun Water Reservoir and Hydropower Project ("Rogun HPP") under the Energy Loss Reduction Project (ELRP, Credits Nos. 40930-TJ and HI7S0-TJ) financed by the International Development Association ("the Bank").

2. ***Management asks that the Panel consider the Request ineligible for investigation because the issues raised by the Requesters focus on potential harm that could derive from the construction, operation and/or failure of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance.*** Hence, Management fails to understand the harm that the Requesters allege could derive from these Assessment Studies. Management notes that at this stage the Bank is not involved in financing construction of the proposed Rogun HPP, either through the project or through other Bank engagement; nor has Management made any decision to finance the proposed Rogun HPP.

3. Management also notes that the Assessment Studies have not yet commenced and therefore substantive application of Bank policies and procedures could not have taken place. Management maintains also that the preparatory work for the Assessment Studies to date complies with the Bank's operational policies and procedures. The concerns and issues raised by the Requesters will be addressed in a comprehensive and integrated manner as part of the overall assessment process that is mandated by OP 4.01, enhanced by the application of relevant Bank policies and procedures, and which forms the basis of the Bank's environmental and social safeguard commitments. The quality and independence of the Assessment Studies will be further enhanced by expanded support from the Bank, exceeding the requirements of the operational policies.

4. ***Management believes that an inspection at this stage of preparation of the proposed Rogun HPP would undermine the Bank's policy by replacing the independent and integrated environmental and social assessment mandated by OP 4.01 with a limited review of the concerns and issues expressed by one stakeholder.*** This practice could seriously undermine the Bank's ability to provide technical support and advice to client countries, and to act as a knowledge bank.

5. ***As regards the issue of the Requesters' prior contact with Management,*** Management notes that it has no records of the Requesters' attempt to raise their issues with Management. While the Requesters did meet with Management to communicate their views, this took place on the same time day that their Request for Inspection was submitted. Management considers that this is not in line with the eligibility requirements spelled out in the Resolution establishing the Inspection Panel.

6. ***Management believes the Requesters raise legitimate and important issues regarding the proposed Rogun HPP, which the proposed Assessment Studies are exactly designed to address.*** Management shares these questions and maintains that the proposed Rogun HPP has not yet been adequately reviewed and evaluated to make an informed decision on new construction.

7. ***Management fails to understand the harm that the Requesters allege could derive from the Assessment Studies that the Bank intends to fund.*** In Management's view the proposed studies will provide a sound and transparent basis for any discussion of future decisions regarding the proposed Rogun HPP. Management is aware of the region's difficult political dynamics and is committed to supporting better regional cooperation and economic integration through the Bank's Central Asia Energy-Water Development Program. It is also in this context that Management believes that conduct of the Assessment Studies is urgently needed to fill the information void that is currently fueling tensions in the region. Management underlines that the Assessment Studies will address each of the Requesters' specific concerns, and will satisfy the Requesters' own declaration of the need for further studies.

8. ***Structure of the Text.*** The document contains the following sections: Section II outlines the Request; Section III discusses the strategic context for Bank involvement in the Assessment Studies; Section IV provides background information on the ELRP (the Project) and the specific component related to the Assessment Studies for the proposed Rogun HPP, including proposed ELRP restructuring and status of the studies; and Section V provides Management's response to the Request. Annex 1 presents the Requesters' claims, together with Management's detailed responses, in table format. The document contains the following additional annexes and maps:

- Terms of Reference for the Techno-Economic Assessment Study (TEAS)
- Terms of Reference for the Environmental and Social Impact Assessment (ESIA), including an accounting of riparian comments and responses/modifications to the draft Terms of Reference
- Vakhsh Report on Consultations on the Terms of Reference for the Assessment Studies
- Expert Opinion of the Government of Uzbekistan, and documentation of local consultations
- List of Invitees and Attendees to Dushanbe Consultations (May 2010)
- Maps of the Area for Assessment Studies.

II. THE REQUEST

9. The Request for Inspection was submitted by Messrs. Boriy Botirovich Alikhanov and Saydirasul Sanginov and Ms. Dilorom Fayezieva, on their behalf and on behalf of the Ecological Movement of Uzbekistan, representing *"more than 100 NGOs"* as downstream affected people of a transboundary Project (hereafter referred to as the "Requesters").

10. The Request contains claims that the Panel has indicated may constitute violations of various provisions of the Bank's policies and procedures, including the following:

- OP/BP 4.01, Environmental Assessment
- OP/BP 4.04. Natural Habitats
- OP/BP 4.12, Involuntary Resettlement
- OP/BP 4.37, Safety of Dams
- OP/BP 7.50, Projects on International Waterways.

11. The Requesters also make several claims regarding: (i) potential impacts of the proposed Rogun HPP; (ii) the process by which the studies are being undertaken; and (iii) Bank communications with stakeholders.

12. Attached to the Request is an Annex entitled *"Environmental Disaster in the Central Asia."* No further materials were received by Management in support of the Request.

III. STRATEGIC CONTEXT FOR WORLD BANK INVOLVEMENT

13. The Bank's engagement in the Assessment Studies for the proposed Rogun HPP is embedded in its engagement with Tajikistan, as well as its broader involvement in Central Asia.

A. THE WORLD BANK'S EUROPE AND CENTRAL ASIA STRATEGY

14. In March 2010, the World Bank's Regional Strategy for Europe and Central Asia was presented to the Board of Directors. The strategy focuses on the three pillars of competitiveness, inclusion and climate change. However, given the relatively small size of individual countries in the region and the high level of economic integration, delivering on the core strategy will also require more focus on sub-regional issues. Energy-water issues in Central Asia were highlighted as a critical example of such approaches. This element of the strategic presentation was singled out for positive endorsement by a number of Board members.

Sub-Regional Approaches: Central Asia Example

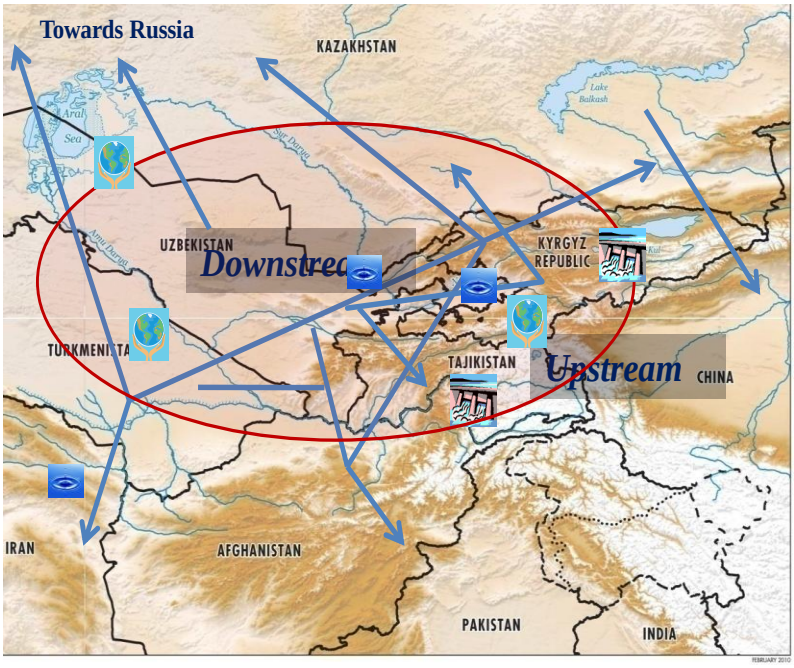
Example: **Central Asia regional water and energy nexus**

The challenge: Uneven distribution of water and energy resources; Co-dependence for energy and water security; Lack of cooperation and deterioration of institutions for cooperation

Cost of not engaging:
- Increasing power outages
- Security Threats
- Missed growth opportunities for very poor countries

Opportunities:
- Direct request from countries
- Convergence of donor interests
- Need for new mechanisms for resource management

Effective response:
- Build a platform for cooperation
- Improve water *(availability and use)* and energy *(domestic security and exports)* simultaneously
- Prioritize massive private public investments:
  - national projects
  - regional projects



Downstream: **need irrigation water in the summer**

Upstream: **release water in the winter to produce energy**

gas and hydro energy export potential

intra-regional energy trade potential

regional threats from climate change

large hydro power storage projects would require consultations with riparians

opportunities for water savings

B. THE CENTRAL ASIA ENERGY-WATER DEVELOPMENT PROGRAM

15. Central Asia is endowed with rich and varied energy resources. Hydropower resources are concentrated in the Kyrgyz Republic and Tajikistan, the upstream countries of Central Asia's Amu Darya and Syr Darya rivers. Thermal resources are concentrated in Uzbekistan, Turkmenistan and Kazakhstan. Water resources, which are increasingly under stress, also have an important geographic dimension, with downstream countries highly dependent on upstream countries for essential agricultural water. Thus, energy-water linkages are inextricable from perceptions of national security, regional stability and economic growth.

16. During the Soviet era, water and energy development was centrally managed to exploit synergies. The current political dynamic in the region is characterized instead by increasing national isolationism and troubled bilateral relations. Central Asia today lacks the systems, institutions and infrastructure to manage joint energy and water resources, resulting in a disintegration of regional cooperation on both, which weighs heavily on political relations. Building on a history of engagement in the energy and water sectors in Central Asia, the Bank has initiated a regional program to assist in the long term amelioration of these difficulties. The objective of this Central Asia Energy-Water Development Program (CAEWDP) is to enhance energy and water security through improved cooperation, with the intent of expanding economic opportunities and benefits to each country. The program addresses investments, analytics, dialogue and institutional strengthening. The CAEWDP is a long term program encompassing a broad range of energy and water issues, including fostering cooperation in future infrastructure decisions.

17. As part of the program, the Bank is partnering with ADB's Central Asia Regional Economic Cooperation (CAREC) program. Specifically, the Bank and ADB co-chair the Energy Sector Coordinating Committee which is currently implementing the Energy Action Plan approved by ministers from CAREC countries (including Tajikistan, Uzbekistan, Kyrgyz Republic and Kazakhstan) in October 2009. The Action Plan includes a component on energy-water linkages.

18. The CAEWDP supports the Bank's expanded role in the Assessment Studies. This role includes undertaking a study of possible institutional arrangements or mechanisms for managing and monitoring agreed water management regimes (i.e., reservoir operations), which may encompass an international oversight body or similar systems to ensure transparency and compliance. It will also independently verify the hydrologic data and analysis undertaken by the Bank financed and managed consultants preparing the Assessment Studies in order to enhance confidence in the studies and, more broadly, contribute to a commonly agreed information base on the hydrology of the Vakhsh and upper Amu Darya rivers.

19. In addition to consultations on the TORs for the Assessment Studies, the Bank will design and implement a program of consultations with riparian governments during the period of study. The program is aimed at information exchange and enhancing transparency, providing access to international experts, and facilitating stakeholder

review and comment on the ESIA as well as on the Bank-managed studies. These consultation activities will further ensure that the interests of stakeholders are taken into account, and help introduce mechanisms for regional dialogue and cooperation.

C. WORLD BANK ASSISTANCE IN TAJIKISTAN'S ENERGY SECTOR

20. The World Bank's current involvement in the Assessment Studies is based on a broad set of studies and discussions with the Government of the Republic of Tajikistan (GORT) over the past eight years. During a 2002 visit, then-World Bank President James Wolfensohn discussed both the Sangtuda and Rogun HPPs as potentially important energy developments for the country. He emphasized to the Tajik leadership the importance of key factors such as internal tariff reform, export options and having riparian agreements in place. Recognizing the significance of the energy sector for the development of Tajikistan, the Bank has also completed the following: a Regional Energy Exports Prospects Study; an analysis of the energy-water nexus in Central Asia; and an energy utility reform review addressing structural reforms to improve the climate to attract investment in the sector. Concurrently, the Bank has been part of growing interest regarding a Central Asia–South Asia transmission line (CASA 1000) from Tajikistan to supply summer hydropower energy to South Asia and to help mitigate the serious energy deficits there.

21. The Bank's energy assistance to Tajikistan has evolved around four key themes, as presented in the Country Partnership Strategy (April 2010):

- Improving the reliability of electricity and gas services and ameliorating winter energy shortages;
- Assessing hydropower development potential to secure the country's energy supply and gradually generate electricity export revenues;
- Evaluating regional transmission programs such as CASA 1000; and
- Encouraging effective energy and water use on a regional scale through the CAEWDP.

22. As part of its expanded program for the Assessment Studies, the Bank will undertake an assessment of alternatives for securing the energy, storage capacity and exports offered by the proposed Rogun HPP. This will help the GORT, the Bank and the international community to better understand the range of investment options for energy and water security at least cost and highest development value. The assessment will cover alternative sources such as demand side management, hydropower of alternative sizes and configurations (including reservoir and run-of-river), other renewable sources, and domestic sources of thermal energy. It will compare various development portfolios against domestic demand, export revenue potential, and water management functions, while taking into consideration economic, environmental and social criteria.

23. The alternatives study will complement current Bank scoping studies of winter energy options for Tajikistan and the Kyrgyz Republic and benefits of regional trade, as well as efforts in partnership with ADB and the CAREC Energy Sector Coordinating

Committee to better understand the infrastructure opportunities and constraints to Central Asia energy trade.

D. ASSESSMENT STUDIES FOR THE PROPOSED ROGUN HPP

24. The proposed Rogun HPP is one in a series of potential projects to take advantage of the rich hydropower resources in Tajikistan, and the need to manage water for irrigation in downstream areas through storage. It is a large, complex undertaking on a transboundary river that could have transformational impacts for Tajikistan and the broader region. Its possible benefits include:

- Important development benefits to Tajikistan (significant export revenues, increased domestic supply);
- Water management;
- Climate change mitigation and adaptation;
- Grid services to the Central Asia energy system; and
- Summer supply to energy-short South Asia (i.e., Afghanistan, Pakistan).[1]

25. At the same time, it is a divisive and contentious initiative being considered within an environment of difficult regional political and economic relations. Possible risks include: downstream water regulation (with economic and social consequences for Turkmenistan and Uzbekistan); dam safety; financeability; and regional politics and intergovernmental relations. Indeed, it epitomizes the challenges of energy and water management in post-Soviet Central Asia and the dramatically changed circumstances in the region have thrown into question its original design, purpose and viability.

26. The Bank's engagement in the Rogun Assessment Studies evolved from discussions and exploration of development opportunities for the Tajik energy sector, with an initial focus on the Sangtuda project and then evolving to the proposed Rogun HPP when Russia and Tajikistan agreed to develop Sangtuda. This evolution included numerous technical and high level discussions, involving at various times the Regional Vice President and the President of the Bank. Correspondence reflects an ongoing recognition of the importance of transparency, riparian issues and internal reforms.

27. In October 2007, the Bank agreed to the need for appropriate study of the proposed Rogun HPP, to work with the GORT "to ensure that all applicable safeguards of the Bank will be adhered to," and requested the GORT to formally inform all riparian countries about its plan to initiate the studies. The Government of Uzbekistan had previously been informed of the Bank's intentions to assist in the studies, the requirements of Bank operational policies (and in particular the policy on International

[1] Assessment studies for the CASA 1000 transmission line from Tajikistan to Pakistan are currently underway. These studies consider only existing sources of power for export and, specifically, excess summer generation associated with flows for irrigation in downstream countries. Consequently, the economic assessment of CASA 1000 is independent of the proposed Rogun HPP, though, in the future, the CASA 1000 line would support the economic viability of the proposed Rogun HPP.

Waterways), the establishment of the international Panels of Experts, and a process to ensure that the studies would be professionally done and results shared with riparians. This commitment has since been reinforced by extensive correspondence between high levels of the Government of Uzbekistan and the Bank. It has also been strengthened by the expanded role of the Bank in the Assessment Studies.

28. The purpose of Bank involvement in the Assessment Studies is to ensure a transparent, modern and unbiased evaluation of the risks and benefits that meets international standards and norms. The Assessment Studies, under the Bank's close guidance, will ensure comprehensive coverage of environmental, social, economic and engineering issues and build an objective, substantiated and updated base of knowledge. The Bank's expanded program, which goes beyond the requirements of the Bank's operational policies, will include international scrutiny through two Panels of Experts, further examination of regional issues through additional Bank-managed studies (including the study of alternatives described above), and a structured program of riparian consultations (discussed in Section B above).

29. The two international Panels of Experts will be established to provide oversight and quality assurance for both assessment studies, consistent with OPs 4.01 and 4.37: the Environment/Social Panel and the Engineering/Dam Safety Panel. To build confidence in the objectivity of the Panels' advice, members will be selected, managed and funded by the Bank.[2] Members will be internationally recognized experts in their fields with experience in similarly large and complex hydropower projects. They will be independent from any personal interests in the proposed Rogun HPP. No members will be drawn from Central Asia or other former Soviet republics.

30. The Bank's cooperation with the GORT has resulted in the following key achievements to date: (i) notification by the GORT to riparian states in December 2007, in which the initiation of the Assessment Studies was announced, noting the Bank's Operational Policy on International Waterways, and inviting states to participate in the financing of the proposed Rogun HPP; (ii) direct and comprehensive consultation by the Bank on the draft TORs with riparian governments; (iii) international-standard TORs for both the TEAS and ESIA studies, covering all critical aspects of dam design, power station design, ecological values and social and resettlement issues and incorporating concerns and issues identified during riparian consultations; (iv) International Competitive Bidding (ICB) procurement process for contracting the study consultants; (v) understanding with the GORT that there will be no river diversion (i.e., no construction of a coffer dam) by Tajikistan unless the TEAS and ESIA have been shared and discussed with riparians, and the studies are reviewed by the independent Bank-funded Panels of Experts; and (vi) Bank-funded reconnaissance on rock mechanics and construction quality monitoring to facilitate the TEAS.

31. Management recognizes that there is no single approach to analysis of the proposed Rogun HPP that will meet the expectations of every stakeholder. However, the

[2] Under normal procedures, Panels of Experts are contracted directly by the project proponent/Borrower.

Assessment Studies will provide a strong base of analysis, supported by impartial, international scrutiny. With the good faith of the parties, the Assessment Studies could also stimulate cooperation based on an understanding of potential mutual benefits. The Bank's participation in the Assessment Studies does not presume any future funding of the proposed Rogun HPP itself. However, it will help to inform decisions on the future development of the proposed Rogun HPP by the GORT, the Bank, Central Asian countries, and the international community.

IV. PROJECT BACKGROUND

A. THE ENERGY LOSS REDUCTION PROJECT (ELRP)

32. This background section briefly describes the ELRP project and its proposed restructuring to include the Assessment Studies on the proposed Rogun HPP, which are the subject of the Request for Inspection.

33. The ELRP is a key component of the Bank's engagement in the energy sector in Tajikistan and was intended to assist the Government in its efforts to reduce commercial losses in the electricity and gas systems. The Project also aimed to lay the foundation for improvement of the financial viability of the electricity and gas utilities. The ELRP was approved by the Board on June 30, 2005 and became effective on December 7, 2005. It is currently under implementation. Barki Tajik and Tajik Transgaz are the two state owned entities that are responsible for implementation of various components of the Project. The Project as originally structured is targeted for completion by June 30, 2012.

34. In response to a request from the GORT, the Bank agreed in October 2007 to assist the Government with the preparation of Assessment Studies for the proposed Rogun HPP. It is proposed to provide this assistance through the ELRP, in order to take advantage of linkages with, and savings from, other components of the Project.

35. The ELRP provides for limited financing of advisory services related to the energy sector. However, Management considered it more appropriate to fund the Assessment Studies on the technical, economic, social and environmental viability of the proposed Rogun HPP through a first order restructuring and addition of a new project development objective ("to assist in the viability assessment of the proposed Rogun HPP in Tajikistan."). Due to the technical complexity and political sensitivity of the proposed HPP, the environmental screening category for the ELRP project is proposed to be revised from Category C to Category A. The restructuring will include no commitment to fund construction. Subject to Board approval, the overall project implementation schedule will change due to inclusion of the new Assessment Studies subcomponent, and the closing date will be extended accordingly, likely to at

> ***Definition of "Project"***
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> The ***Project*** is the Energy Loss Reduction Project (ELRP) which is an approved World Bank, IDA-funded project. Subject to Board approval the ELRP will be expanded to include additional ***Assessment Studies***. The Assessment Studies examine the ***proposed Rogun HPP*** in Tajikistan. The proposed Rogun HPP is not a project under the World Bank system.

least December 31, 2012. The proposed restructuring of the ELRP will be presented to the Board for consideration by the end of 2010.

B. THE ASSESSMENT STUDIES

Purpose and Scope of Studies

36. The proposed Assessment Studies consist of: (i) a Techno-Economic Assessment Study (TEAS) covering the engineering, geologic and financial/economic aspects of the proposed Rogun HPP; and (ii) an Environmental and Social Impact Assessment (ESIA). The purpose of these studies is to assess the benefits, risks and overall viability of the proposed Rogun HPP, and to identify measures to enhance positive impacts and address potential negative impacts according to international standards and Bank policies.

37. The original design of the proposed Rogun HPP consisted of a 335 meter high dam and a large reservoir on an international waterway, which would regulate a cascade of hydropower stations downstream. It had a maximum capacity of 3,600 MW and the output of the proposed plant (13.3 TWh) would serve both domestic and export markets. The proposed Rogun HPP, initiated under the Soviet regime in 1980, was abandoned in the early 1990s.[3] The proposed Rogun HPP is located on the Vakhsh River, an international waterway as defined by the Bank policy (the Vakhsh River in Tajikistan joins the Pyanj River from Afghanistan to form the Amu Darya River that subsequently flows to Uzbekistan and Turkmenistan).

Definition of "Assessment Studies"

The Assessment Studies were initially referred to as "feasibility studies". In Western terminology, feasibility studies examine the possible technical and economic viability, and environmental and social impacts of a project. They are part of the input to decisions to develop detailed drawings, to finance and to construct. However, under the Soviet system, the definition of "feasibility studies" was frequently used to define the whole designing process including the preparation of final designs and drawings as well. Additionally, "feasibility studies" could have been translated as "feasibility design" that would mean (wrongly) the same complete designing process.

These two interpretations of "feasibility studies", which are sensitive to translation, could have created confusion as riparians feared the initiation of the studies signaled that the decision to build the proposed Rogun HPP had already been taken. This is not the case. The studies are now referred to as Assessment Studies to clarify that detailed design and bid documents are not included in the funded studies.

38. The original studies of the proposed Rogun HPP were undertaken in the Soviet era, and there is an urgent need to critically verify findings, add to the knowledge base and better define and measure both the potential positive and negative impacts through the Assessment Studies. Without such studies, outdated and increasingly misleading information and interpretations will hamper decision-making and fuel transboundary concerns.

39. Rehabilitation of existing and damaged works started in 2008 and is currently underway, financed by the GORT. Rehabilitation works to date have not affected water

[3] The abandonment of the project was due to the breakdown of the Soviet Union. The newly independent country of Tajikistan, troubled by a civil war, could not continue the project.

regulation in terms of diversion or storage.[4] While the GORT wishes to proceed with the first stage of construction of the proposed Rogun HPP as quickly as possible (a 70 m dam to generate 240 MW), the Bank has reached an understanding with the GORT that no river diversion (construction of the coffer dam) could start until the techno-economic and environmental/social studies have been completed and discussed with riparians, and the studies reviewed by the independent Bank-funded Panels of Experts to determine feasibility of construction of the dam.[5]

40. Some resettlement associated with the rehabilitation of the proposed Rogun HPP is underway. This is being undertaken by the GORT. Based on recent site visits by Bank social development specialists, the approach of the GORT shows elements of good resettlement practice, with some gaps. In the most recent visit, Management reached an understanding with the GORT that resettlement of communities in the proposed future reservoir area will cease until relevant studies and plans are completed as part of the ESIA in alignment with the Bank's operational policies. In villages in the vicinity of the dam site, most people have already been resettled and rehabilitation-related activities are already ongoing. Resettlement of the remaining 400-500 people from these villages will continue where necessary, to protect them from hazardous or otherwise adverse conditions, such as operation of quarries including use of explosives, dust, noise, vibration, and operation of heavy machinery. Should such resettlement take place it would be in accordance with the applicable legal and institutional framework, as well as international good practices (including an adequate grievance mechanism).

41. Amendments to the agreements between the GORT and the World Bank for the restructured ELRP project will reflect GORT commitments regarding resettlement, water diversion, and linkages with the Assessment Studies (i.e., paragraphs 39 and 40 above). Non-compliance would enable the Bank to exercise its remedies under the relevant legal agreement (i.e., withdraw its support for the Assessment Studies).

42. Management emphasizes that the Bank has not committed to funding the proposed Rogun HPP. Any involvement by the Bank in providing financial support, directly or indirectly, for the proposed Rogun HPP will depend on a series of activities that include economic, financial, environmental and social assessments of the proposed Rogun HPP, other Bank-managed studies (including analysis of project alternatives), sharing and discussion of studies with riparians, and scrutiny by the two Bank-funded independent Panels of Experts (the Engineering/Dam Safety Panel focused on the TEAS study and the Environment/Social Panel focused on the ESIA). Only if these activities indicate in the judgment of the Bank that the proposed Rogun HPP is viable, would the

[4] The status of the site up to 1993 was as follows: The diversion tunnels on the left bank of the Vakhsh River were completed and operational, a coffer dam in place and the river diverted around the prospective dam site, which was thus ready for placement of the rock fill. In 1993 several consecutive flood events led to heavy damage and collapse of the tunnels, blocking of the diversion flow and subsequent overtopping and destruction of the coffer dam. Today the Vakhsh flows in its original river bed.

[5] Letters from World Bank Regional Vice President Philippe le Houerou to President Rahmon of Tajikistan, President Karimov of Uzbekistan and Deputy Chairman of the Cabinet of Ministers of Turkmenistan, dated September 7, 2010.

Bank consider endeavoring to establish a suitable consortium to support the proposed Rogun HPP.

Preparation of the Assessment Studies: Terms of Reference

43. Consistent with Bank practice, the Bank has been working with the GORT and riparian governments on the preparation for the Assessment Studies. Terms of Reference (TOR) were prepared for both the TEAS and ESIA studies to ensure adequate coverage of issues and methodologies. During preparation, the Bank facilitated extensive consultations with the governments of Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan, Turkmenistan, and Afghanistan (2008-2009). Comments reflected a range of support and concern about the proposed Rogun HPP. As part of these consultations, the Government of Uzbekistan submitted its Expert Opinion (Annex 5) that described potential negative impacts to downstream populations as a consequence of the construction of the proposed Rogun HPP, and its attendant risks. Issues raised in the Uzbek Expert Opinion and by other riparian governments were considered and integrated into the TORs of both the TEAS and ESIA studies. The consultation program is documented in the Vakhsh Consultation Report (Annex 4); a detailed accounting of riparian comments and their integration into the TORs is presented in Annex 6 of the ESIA TOR (Annex 3).

44. Consultations on the assessment studies were also held with the potentially affected communities in the Tajik area of potential impact (May 2009) and Dushanbe (May 2010). Tajik and regional NGOs were invited and attended the Dushanbe meeting (see Annex 6 for a list of invitees and attendees to the Dushanbe meeting; copies of sign-up sheets of attendees to the community meetings are available on request).[6] A second set of meetings will be held in the project area and Dushanbe, currently scheduled for November and December 2010, respectively. The Bank has notified the GORT on several occasions that tendering of the ESIA study cannot proceed until adequate consultations have been completed and relevant issues are addressed in the TORs; that is, the Bank's "no objection" for contract signing is contingent on the second set of consultations being successfully carried out and the documentation finalized.

45. In order to develop the scope and design of the TORs for both the ESIA and TEAS studies, Management contracted two technical consultants in July 2010 to carry out a review of the actual situation on the site of the proposed Rogun HPP. The focus of the technical consultancies was to review current practice of quality assurance of the works, flag any imminent risks or safety aspects of the works already carried out, and provide technical information to facilitate the work of the TEAS Consultant.[7]

[6] One requester attended the consultations in Tashkent in January 2009.

[7] The technical consultancies reviewed the state of the diversion tunnels and the powerhouse cavern, and current practice of quality assurance, especially testing and record keeping routines. Advice was provided on the scope and type of documents required for the quality review that would be undertaken as one of the initial tasks of the TEAS. The rock mechanics review was important to assess the slope stability in the dam

46. The TORs for both studies were posted on the website of the Government of Tajikistan State Committee for Investments and State Property Management. They are also posted in the Bank's InfoShop in both English and Russian). The TORs for both studies are available in Annexes 2 and 3.

Preparation of the Assessment Studies: Tendering

47. The consultants for the Assessment Studies have not been contracted and the Bank will not provide a no objection on such until the ELRP restructuring has been reviewed and approved by the Board.

48. However, identification of consultants has progressed following an ICB process, undertaken according to Bank Guidelines. A public Request for Expressions of Interest for the TEAS and ESIA (2007) resulted in a short-list of ten firms of international reputation. Three proposals were received for the TEAS and reviewed independently by the Bank; negotiations were initiated with the highest ranked bidder in September 2010, with Bank presence. Only one proposal was received for the ESIA study. The proposal evaluation raised concerns as to whether the methodology, team and work plan were adequate to ensure a full and robust assessment of the environmental and social aspects of the proposed Rogun HPP within the budget. The Bank and GORT agreed to rebid the ESIA study with the original, competitively selected short-listed firms. The TOR were revised, with a higher budget and more focused scope,[8] but retaining the original environmental and riparian analysis. New proposals are due December 10, 2010. The revised TOR for the ESIA (Annex 3) is currently being posted on the GORT's website, will be posted in the InfoShop to replace the original version (which is currently posted). All subsequent discussion of the ESIA TORs refers to the revised version in Annex 3.

The World Bank's Enhanced Role in the Assessment Process

49. Notwithstanding consultations on the Terms of Reference and other discussions, stakeholders have repeated their concerns about the credibility and transparency of the assessments, and the rigor of international scrutiny. To build confidence and enhance riparian involvement, and in recognition of the seriousness and complexity of transboundary issues, the Bank is expanding its role beyond the requirements of its operational policies. It is adopting a five-point program covering international expertise, riparian consultation, additional, Bank-managed studies and greater oversight of the studies being contracted through the IDA grant and credit to the GORT. The five point program sustains the previous high level of engagement of the Bank in Central Asia energy-water issues. It will afford the Bank a high level of control over the assessment

abutment areas, flag any imminent risks and critical safety aspects, and provide technical information to facilitate the TEAS Consultant's familiarization with the geotechnical situation.

[8] The revisions included eliminating aspects which will be accomplished under separate, parallel assignments (e.g., the Strategic Environmental Assessment), which overlap with the TEAS (e.g., geological investigations of the reservoir area), or which could logically be postponed until later project phases should a decision to proceed emerge (e.g., full Resettlement Action Plans for reservoir filling).

process. Each of the five points of the program is summarized in Table 1; details of individual components are described in the previous section.

Table 1. World Bank Five Point Program for Proposed Rogun HPP Assessment Studies	
• **Consultant (Assessment) studies**	The Bank will oversee consultant studies financed under an IDA grant and credit to the GORT, including selection of consultants, contract negotiations, and review of all interim and draft reports. The Bank will also affect direct payment to the consultants. All short-listed consultants have been selected through ICB and are experienced in similar projects.
• **Regional studies**	The Bank will undertake certain studies independently of the GORT, funded through Bank-managed trust funds. These studies will focus on: (a) alternatives to Rogun to meet both domestic energy needs and export opportunities; (b) possible mechanisms to manage reservoir operations with transboundary impacts; and (c) verification of the hydrologic data and analysis.
• **Panels of Experts**	The Bank will select, manage and fund two international Panels of Experts that will participate in the studies and provide independent advice, guidance and quality assurance. Panel members will be well-known in their fields of expertise and will be drawn from outside the former Soviet republics to ensure independence. The Engineering/Dam Safety Panel will focus on the TEAS while the Environment/Social Panel will focus on the ESIA; however, the Panels shall coordinate and ensure necessary linkages between the two studies. (Note: These Panels are usually convened by the Borrower.)
• **Riparian involvement**	The Bank will facilitate a structured process for riparian involvement in the Assessment Studies, to include information exchange and access to independent experts. The specific program will be determined with input from riparians.
• **Commitments**	The GORT has committed to fully comply with all Bank operational policies and to align construction with study results; specifically as it concerns construction of the coffer dam. The Bank's involvement is contingent on ongoing GORT commitment to the operational policies and ensuring no river diversion prior to completion of the appropriate assessments.

V. MANAGEMENT'S RESPONSE

50. The Requesters' claims, accompanied by Management's detailed responses, are provided in Annex 1.

51. ***Management asks that the Panel consider the request ineligible for investigation because the issues raised by the Requesters focus on potential harm that could derive from the construction, operation and/or failure of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance.*** Hence, Management fails to understand the harm that the Requesters allege could derive from these Assessment Studies. Management notes that at this stage the Bank is not involved in financing construction of the proposed Rogun HPP, either through the project or through other Bank engagement; nor has Management made any decision to finance the proposed Rogun HPP.

52. Management also notes that the Assessment Studies have not yet commenced and therefore substantive application of Bank policies and procedures could not have taken place. Management maintains also that the preparatory work for the Assessment Studies to date meets the requirements of the Bank's operational policies and procedures. The concerns and issues raised by the Requesters will be addressed in a comprehensive and integrated manner as part of the overall assessment process that is mandated by OP 4.01, enhanced by the application of relevant Bank policies and procedures, and which forms the basis of the Bank's environmental and social safeguard commitments. The quality and independence of the Assessment Studies will be further enhanced by expanded support from the Bank, exceeding the requirements of the operational policies.

53. ***Management believes that an inspection at this stage of preparation for the proposed Rogun HPP would undermine the Bank's policy by replacing the independent and integrated environmental and social assessment mandated by OP 4.01 with a limited review of the concerns and issues expressed by one stakeholder group.*** This practice could seriously undermine the Bank's ability to provide technical support and impartial advice to client countries, and to act as a knowledge bank.

54. ***As regards the issue of the Requesters' prior contact with Management,*** Management notes that it has no records of the Requesters' attempt to raise their issues with Management. While the Requesters did meet with Management to communicate their views, this took place on the same time day that their Request for Inspection was submitted. Management considers that this is not in line with the eligibility requirements spelled out in the Resolution establishing the Inspection Panel.

55. ***Management appreciates the Requesters' concerns and valid questions regarding the proposed Rogun HPP and maintains that these can only be addressed and answered through a set of comprehensive studies which Management intends to finance.*** Management recognizes that many questions about the proposed Rogun HPP remain unanswered, and that these questions and uncertainties must be addressed before any decision about the HPP can be reasonably entertained. Answers to these questions require both technical and environmental studies that reflect modern international

standards of good practice in impact assessment, engineering, and quality assurance. Attention to international scrutiny and consultation with potentially affected stakeholders is also necessary. The Bank is currently supporting the GORT in developing this body of credible and objective knowledge through the TEAS and the ESIA.

56. ***Management fails to understand the harm that the Requesters allege could derive from the Assessment Studies that the Bank intends to fund.*** In Management's view the proposed studies will provide a sound and transparent basis for any discussion of future decisions regarding the proposed Rogun HPP. Management is aware of the region's difficult political dynamics and is committed to support better regional cooperation and economic integration through the Bank's Central Asia Energy-Water Development Program. It is also in this context that Management believes that conduct of the Assessment Studies is urgently needed to fill the information void that is currently fueling tensions in the region. Management underlines that the Assessment Studies will address each of the Requesters' specific concerns, and will satisfy the Requesters' own declaration of the need for further studies.

57. As Management noted earlier, the Assessment Studies have not yet commenced and the project restructuring has not yet been considered by the Board. Hence, only preparatory work for the studies has begun. Concerning this work, Management believes that the Bank has made every effort to apply its policies and procedures and to pursue concretely its mission statement. In Management's view, the Bank has followed the guidelines, policies and procedures applicable to the project component that is the subject of the Request. Moreover, the Bank has taken steps to address issues arising from the regional sensitivities that surround the proposed Rogun HPP and has actively involved the riparians and considered their views and concerns as appropriate. As a result, Management believes that the Requesters' rights or interests have not been adversely affected by a failure of the Bank to implement its policies and procedures.

58. Management's response to the concerns raised by the Requesters is focused on the following themes:

A. Management's consideration of the eligibility of the Request

B. Management's clarifications of the specific issues raised by the Requesters.

59. Each of these themes, which encompass several specific issues, is addressed below. Responses to each individual issue are presented in detail in Annex 1.

A. MANAGEMENT'S CONSIDERATION OF THE REQUEST'S ELIGIBILITY

60. **Management submits that the Request for Inspection does not meet eligibility criteria stipulated in the Resolution establishing the Inspection Panel.**

61. The relevant eligibility consideration is that, in the opinion of the Requesters, a serious violation by the Bank of its operational policies and procedures has occurred, and has or is likely to have a material effect. For the reasons set out below, Management does not believe that this consideration has been or can be satisfied. The Request for

Inspection does not meet the criteria for eligibility because there is no basis to support a recommendation to investigate. Management is being placed in the untenable position of being required to demonstrate its compliance with Bank policies and procedures in circumstances where this is not possible.

62. Management notes that the Assessment Studies have not yet commenced and therefore substantive application of Bank policies and procedures could not have taken place. The concerns and issues being raised by the Requesters will be addressed in a comprehensive and integrated manner as part of the overall assessment process, which is mandated by OP 4.01, enhanced by the application of the other relevant policies and procedures, and which forms the basis of the Bank's environmental and social safeguard commitments. Through this process, environmental and social risks will be identified, mitigation measures considered, and the concerns and issues of stakeholders will be taken into account. The Assessment Studies, which will commence once the restructuring is approved and will be carried out by independent international experts with dedicated resources, are the appropriate forum for raising the issues and concerns of the Requesters.

63. Management submits that the Assessment Studies proposed under the restructured Project should be viewed as tools to assist the GORT, the Bank, Central Asian countries and the international community in the decision-making process with regard to the proposed Rogun HPP. This approach fulfills the spirit and letter of the applicable Bank policies. Studies, by their very nature, cannot result in harm. There is a logical distinction to be made between the assessments and recommendations of an independent consultant funded by a Bank-financed project – which are intended to inform the decision-making process – and the Government's decision to accept and implement such assessments and recommendations. If the restructuring of the Project is approved, the Bank will be involved in the former, but not in the latter. Management does not have responsibility over the decision of the Government regarding applicable standards, and how such standards will be applied to the ultimate infrastructure project. This is not the remit of the technical assistance component of the restructured Project which the Bank proposes to finance. Management, therefore, cannot see how its proposal to assist in the financing of the Assessment Studies has violated Bank policy and procedures, leading to actual or potential harm as required by the Inspection Panel Resolution.

Eligibility Criteria

64. With respect to the Request, the Resolution (and its subsequent Clarifications) contains the following relevant considerations regarding eligibility:

a. The affected party **must demonstrate** that its rights or interests have been or are likely to be directly affected as a result of the Bank's **failure to follow its operational policies and procedures** with respect to the design, appraisal

and/or implementation of a project financed by the Bank provided in all cases that such failure has had, or threatens to have, **a material adverse effect.**[9]

b. The alleged violation of the Bank's policies and procedures is of a serious character.[10]

c. The subject matter of the request has been dealt with by the Management and it has failed to demonstrate that it has followed, or is taking adequate steps to follow, the Bank's policies and procedures.[11]

d. The Panel will not hear "complaints with respect to actions which are the responsibility of other parties, such as a borrower, or potential borrower, and which do not involve any action or omission on the part of the Bank".[12]

65. The 1999 Clarification of the Board's Second Review of the Inspection Panel (1999 Clarification) provides further clarification on the issue of eligibility. On the basis of a recommendation from the Panel, the Board has the authority to authorize an investigation without (i) making a judgment on the merits of the claimant's request; and (ii) without discussion, except that the Board is obliged to consider the technical eligibility criteria set out in Para 9 of the 1999 Clarification. The Board has to be satisfied that the request does assert in substance that a serious violation by the Bank of its operational policies and procedures has or is likely to have a material adverse effect on the requester.[13]

66. The Board must also consider whether the request does assert that its subject matter has been brought to Management's attention and that, in the requester's view, Management has failed to respond, adequately demonstrating that it has followed or is taking steps to follow the Bank's policies and procedures.[14]

67. While the Panel is required to determine the eligibility of a request for inspection independently of any views that may be expressed by Management, in deciding whether

[9] Para 12 of the Resolution sets out the basis for a requester's claim, requiring that: "The affected party must demonstrate that its rights or interests have been or are likely to be directly affected by an action or omission of the Bank as a result of a failure of the Bank to follow its operational policies and procedures with respect to the design, appraisal and/or implementation of a project financed by the Bank….provided in all cases that such failure has had, or threatens to have, a material adverse effect". For the purposes of the Resolution, "operational policies and procedures" consist of the Bank's Operational Policies, Bank Procedures and Operational Directives, and similar documents issued before these series were started, and does not include Guidelines and Best Practices and similar documents or statements.

[10] Para 13 of the Resolution requires the Panel to satisfy itself of this criteria before a request for inspection is heard.

[11] Para 13 of the Resolution requires the Panel to satisfy itself of this criteria before a request for inspection is heard.

[12] Para 14(a) of the Resolution.

[13] 1999 Clarification, para 9.b.

[14] 1999 Clarification, para 9.c.

to recommend that an investigation be carried out, the Panel is obliged to satisfy itself that "all the eligibility criteria provided for in the Resolution have been met."[15]

68. Even if the Board's intention is to defer actual examination of the merits raised in a Request for Inspection to a subsequent investigation phase, it is necessary for both the Panel and the Board to deem that the assertion laid out in the Request complies with the eligibility requirements of the Resolution and the Clarifications. Without this determination, the Request should not be considered admissible.

Application of Bank Policies and Procedures

69. The Board Resolution which established the Inspection Panel divides the Inspection Panel process in two distinct phases, both of which involve the Board. The first stage of the process, prior to authorizing an inspection, relates to determining whether the Request for Inspection is eligible: in this regard, the Panel is required to assess whether the claim meets the specified eligibility criteria. As discussed above, a key aspect of eligibility, on which both the Panel and Board must be satisfied, is that the Request relates to an alleged violation by the Bank of its policies and procedures, and such alleged violation is of a serious character.

70. Management therefore has difficulties identifying any basis on which the Requesters could assert a failure by the Bank to follow its operational policies and procedures. Management also notes that Bank policies and procedures provide for, and facilitate, various processes to assess and evaluate a proposed project, and to incorporate the views of stakeholders into the project planning process. Stakeholders have a variety of avenues through which to express their views and concerns, and have the ability to raise these views and concerns with Management.

74. Policies and procedures must be allowed to run their course. A stakeholder should not be allowed to bypass this process by submitting a claim to the Inspection Panel, in preference to utilizing the avenues provided through the policies and procedures, including raising issues with Management. If the Bank is not being given an adequate opportunity to apply and implement its policies and procedures, it is not appropriate for the valuable time and resources of the Board, Panel and Management to be used for claims that do not meet the intent or requirements of the Resolution. This is precisely the case of the claim in question.

Requesters' Contact with Bank Management

71. **Management has no records indicating that the Requesters have raised the subject matter of their Request with Bank Management.** The Request states that representatives of Uzbekistan have complained several times to Bank staff, including verbally and in writing in July and August 2010, and that they received an obscure and not clear verbal response. The Bank has no record of any written contact with the Requesters during the period specified.

[15] 1999 Clarification, paras 6 and 7.

72. Management is aware that one of the signatories of the Request was present at a meeting between the Government of Uzbekistan and the Bank in Tashkent on August 4, 2010 and the NGO's pamphlet was shown. One of the Requesters was present at Bank-led consultations on the proposed Rogun HPP and TORs on January 20, 2009 in Tashkent, Uzbekistan. However, during that meeting he did not speak. The Bank has no record of written contact by NGOs within Uzbekistan.

73. Management is aware of only one occasion in which the Requesters communicated directly with Bank staff regarding the concerns raised in the Request. This contact occurred on October 8, 2010, the date on which, according to the Notification from the Inspection Panel, the Request for Inspection was received by the Panel.

74. The Annual Meetings of the IMF and the World Bank Group took place in Washington DC on October 8-10, 2010. On October 8, Bank Staff met with the Requesters – at the Bank's initiative – to discuss their concerns, and how the Bank was proposing to address these. During this meeting, the Requesters indicated that they had already been in contact with the Inspection Panel to discuss a Request for Inspection, but did not inform the Bank staff that a Request had been or would be filed that day. In the meeting the Bank staff expressed full understanding of the concerns presented by the Requesters and the importance of addressing these concerns. Bank staff made it clear that the purpose of the Assessment Studies was to assess the potential impacts and the overall feasibility of the proposed Rogun HPP, and that such studies would be conducted in an independent and comprehensive manner, with the application of relevant Bank policies. With regard to the Requesters' concerns relating to the independence of the Assessment Studies, the Bank staff explained the enhanced role of the Bank, intended specifically to address their concern for the benefit of stakeholders. Bank staff also made it clear that the Bank had made no decision regarding any further involvement with the proposed Rogun HPP, and would not do so until the Assessment Studies had been completed and shared and discussed with the riparians. The Requesters asked the Bank staff at the meeting for assurance that their concerns and their information pamphlets would be passed on to the Regional Management of the Bank, which was duly done.

Conduct of the Assessment Studies

75. Following the restructuring of the ELRP Project, the Bank is proposing to provide support to the GORT to carry out the two Assessment Studies discussed above, the purpose of which is to enable the Government, financiers and stakeholders to make an informed decision regarding further development of the proposed Rogun HPP, based on independent review and assessment by specialized consultants firms. The Project intends to apply funds for "*the conduct of the Rogun HPP feasibility assessment studies and related review panels of experts that are necessary to fulfill the Bank's Safeguards policies*". The Integrated Safeguards Data Sheet (ISDS) states that no investments or physical activities are planned; the main focus of the Bank's assistance will be "*the preparation of TOR specifically for extensive environmental and social studies, as well as engineering, dam safely and hydrological assessments and models, which will be relevant for the future dialog with riparian states*". The intention is that the Bank will "*provide guidance and technical inputs to these studies to ensure that the resulting documents are*

operationally to address environmental and social issues prior to commencement of civil works".

Incorporation of the Requirements of Bank Policies and Procedures into Terms of Reference

76. The process for gathering information and conducting the initial studies with the aim of achieving a comprehensive assessment of the issues is set out in a number of Bank policies and procedures. At this preliminary stage of consideration, which to date has related only to the preparation of the TORs for the conduct of the Assessment Studies, the relevant policies are OP 4.01 on Environmental Assessment and OP 4.37 on Safety of Dams. The relevance of OP 7.50, Projects on International Waterways, is discussed below. To the extent that involuntary resettlement issues arise, OP 4.12 on Involuntary Resettlement will also be relevant.

77. A review of the TORs clearly indicates that they reflect the requirements of the relevant Bank policies and procedures, specifically OP 4.01 and OP 4.37. At a broad level, OP 4.01 requires an environmental assessment to be conducted, "*to identify and assess the potential environmental impacts of the proposed project, evaluate alternatives and design appropriate mitigation, management and monitoring measures"* (OP 4.01, Annex A, para 2). It is intended that the Assessment Studies reflect and take into account all relevant safeguard policies: this is specified in both the ISDS and the TORs for the studies. The scope of the studies will be subject to further revision as the process develops, additional consultation is undertaken, further information is gathered and the views of experts and stakeholders are incorporated.

78. Both TORs also reflect the requirements set out in OP 4.01 and OP 4.37, to establish independent panels. OP 4.01 requires that for Category A projects that are highly risky or contentious or involve serious multidimensional environmental concerns, the borrower will normally engage a panel of independent internationally recognized environmental experts to advise on all aspects of the environmental assessment. Where resettlement issues arise, OP 4.12 states that a resettlement panel may form part of the panel established under OP 4.01. OP 4.37 requires that, for large dams, a panel of independent experts carry out reviews of the investigation, design, and construction of the dam. It requires that the members of the panel have expertise in the various technical fields relevant to the safety aspects of the dam in question, and the panel should review and advise the borrower on matters relevant to dam safety and other critical aspects of the dam; its appurtenant structures; the catchment area; the area surrounding the reservoir; and downstream areas. As specified in OP 4.37, the panel's remit is usually expanded to include other areas, which depend on the characteristic of the dam under review.

Operational Policy on International Waterways

79. The Notice of Registration states that the Request may constitute non-compliance by the Bank with OP 7.50, Projects on International Waterways, although the Request does not appear to contain any claims to this effect. OP 7.50 applies to the proposed Rogun HPP because it involves the use of an international waterway as defined in the

Bank policy: the proposed Rogun HPP is located on the Vakhsh River in Tajikistan which joins the Pyanj River (from Afghanistan) to form the Amu Darya River that subsequently flows to Uzbekistan and Turkmenistan. Riparian notification of a proposed project is required for such projects, including if the activity involves detailed design and engineering studies or construction of same. The policy exempts from this notification requirement, *inter alia*, water resource surveys and feasibility studies on or involving international waterways, although the policy does require that terms of reference for the activities include an examination of any potential riparian issues. This requirement is met through multiple elements in the TORs for both the TEAS and ESIA, which were modified based on consultation with riparian governments.

80. Notwithstanding the above:

- In December 2007, the GORT notified the Government of Uzbekistan and other riparians of its intention to further examine development of the proposed Rogun HPP, inviting riparian governments to join a consortium for its development and advising of the Bank's commitment to support the GORT in carrying out initial studies; and

- In April 2008, the Government of Uzbekistan officially objected to the Bank financing what it referred to as a "detailed feasibility study" until an independent assessment of consequences and issues could be completed. The Government of Uzbekistan then prepared an Experts Opinion that was considered during subsequent consultations and integrated into the TORs for the studies.

No Basis for Recommending an Investigation

81. Management submits that there is no basis for recommending an investigation at this point. Management fails to see how it would be possible for the Panel to recommend and the Board to conclude that the *alleged violation of the Bank's policies and procedures is of a serious character* if the studies designed to evaluate the issues and identify environmental and social risks and propose mitigation have not yet commenced. In Management's view, the allegations of policy violation that may lead to harm as required under the Board Resolution cannot be verified by objective independent evidence, which is in fact the aim of the proposed studies.

82. The work to date has been limited to assisting the GORT in preparing the two TORs and bidding/contracting for selection of the consultants for the TEAS and ESIA. In addition, the Bank is establishing the two Panels of Experts. The Assessment Studies, which have been proposed with the specific intent of identifying environmental and social issues and proposing mitigation measures, cannot logically be in violation of any Bank policies and procedures, since the process provides the opportunity for potential issues and concerns to be addressed during the assessment stage. The assessment process will provide an opportunity to identify further issues and concerns, and it is likely that other Bank policies and procedures will be deemed relevant.

83. Therefore, Management reiterates its views that the Request for Inspection is not eligible. Indeed, Management would argue that an inspection at this stage of project preparation would have the effect of **undermining the very policy which the Requesters claim has been violated**, by replacing the independent and integrated environmental and social assessment mandated by OP 4.01, with a limited review of the concerns and issues expressed by one stakeholder group. The appropriate form for expressing and addressing such concerns and issues must be the fora established by OP 4.01, OP 4.37 and OP 7.50, and any other policies that are deemed relevant. Management is committed to ensuring that the Requesters' issues and concerns, and those of other relevant stakeholders, are taken into account in a timely and appropriate manner. Management respectfully requests that the proper conduct of its policies and procedures be allowed to take place in accordance with due process, as prescribed in the Bank's applicable policies and procedures.

84. Finally, Management takes issues with, and views with extreme concern, any suggestion that Bank support for assessments or studies could make it liable to claims regarding actions or omissions under a future project concerning which it has made no decision regarding financial commitment. Such early assessment or studies are an important part of the Bank's role in increasing transparency and capacity in the decision-making process, ensuring the collection and dissemination of information, consideration of stakeholder concerns and issues and the incorporation of international technical expertise into project design. Management views as entirely inappropriate any attempt to allege that a violation of Bank policy and procedures has taken place, when the Bank is proposing to finance the very policy tools that are designed **to avoid harm**.

85. On the basis of the foregoing, Management concludes that the Request for Inspection is ineligible under the Resolution on several grounds, and requests the Panel not to recommend an investigation.

B. MANAGEMENT'S CLARIFICATIONS OF THE SPECIFIC ISSUES RAISED BY THE REQUESTERS

86. Notwithstanding its strong concerns regarding the eligibility of this Request for inspection, Management welcomes the opportunity to clarify the nature and details of its involvement in the Assessment Studies and to address the issues and questions raised by the Requesters.

87. **The Requesters do raise legitimate and important issues, which the Assessment Studies are exactly designed to address.**

88. The Bank shares the technical questions raised by the Requesters on the proposed Rogun HPP, including in regard to the potential impact of the proposed Rogun HPP on populations downstream. The Bank maintains that the proposed Rogun HPP has not yet been adequately reviewed and evaluated to make an informed decision on new construction or financial mobilization. The proposed TEAS and ESIA will provide a credible assessment of the proposed Rogun HPP that meets international standards for design, construction, economic viability, and environmental and social impact. These

studies will fill the existing gap in knowledge to ascertain potential harm or benefit of the proposed Rogun HPP and help to answer the issues raised by the Requesters.

89. The TORs for the studies set out the requirements for analysis, data collection and risk assessment. The scope of work for each of the Assessment Studies was developed by technical specialists in environmental assessment, resettlement and social impact, dam engineering, hydropower operations and construction, and water resources management. The TORs were informed by site visits and discussions with the GORT, and consultations with riparian governments, NGOs, local communities and other stakeholders, as noted above. They were reviewed and approved by Bank safeguard staff, including the Bank's resettlement and lead dam specialists. Management believes that the TORs fully reflect international standards for such assessments. The Assessment Studies will be contracted to internationally recognized firms through ICB. The two Bank-managed international Panels of Experts will provide independent oversight and quality assurance for both studies, ensuring modern standards and norms are adhered to.

90. Annex 1 responds to each issue raised by the Requesters and provides specific references to the relevant paragraphs/sections of the TORs. The following paragraphs summarize the clarifications.

Technical and Engineering Issues

91. The Requesters identify numerous issues related to the technical integrity of the proposed Rogun HPP.[16] None of those issues can be answered on the basis of the available information. Hence, the overall objective of the TEAS – to examine the technical, engineering and economic aspects of the proposed Rogun HPP – encompasses the range of issues raised by the Requesters. The scope of work includes (but is not limited to) geological stability, assessment of the existing Rogun HPP works, project definition and sizing, and assessment of the selected option.

92. The TORs for the TEAS clearly address engineering integrity and potential riparian impacts:

- ***Seismicity:*** *The Requesters claim the proposed Rogun HPP, located in a seismically active zone, will cause new earthquakes, with attendant risk to populations downstream.* The TEAS contains detailed requirements for assessment of seismicity at the site, determination of seismic design parameters and assessing the design relative to these parameters. The TEAS also requires assessment and mitigation of risks associated with a number of factors, including induced seismicity.
- ***Dam failure:*** *The Requesters identify the risk of dam failure to the cascade of hydropower plants on the Vakhsh River, and the consequent risk to settlements in Tajikistan and downstream countries.* The TORs for the TEAS pay particular attention to the risks associated with dam safety and dam operation and

[16] Items 2,3,4,6,7,8,9 in Annex 1.

maintenance. They require attention to other hydropower projects in the Vakhsh cascade, an instrumentation plan to monitor dam behaviors and an Emergency Preparedness Plan, the costs of which would be appropriately incorporated into the economic and financial analysis of the proposed HPP.

- ***Salt dome:*** *The Requesters identify a thick layer of rock salt in the geological structure of the base of the dam as a threat to the integrity of the dam base and the construction of the complex.* The initial phase of the TEAS requires investigation of the heterogeneous bedrock at the dam site, including the wedge of salt fed by the Gaudark salt formation along the Ionaksh fault. This issue will be a particular focus of the Engineering/Dam Safety Panel of Experts.
- ***Existing works*****:** *The Requesters question the integrity of construction undertaken in the late 1980s and early 1990s and the destruction of said works by subsequent mud streams.* Phase I of the TEAS covers an assessment of the existing legacy and rehabilitated works to establish their adequacy for the development of the proposed Rogun HPP.
- ***Engineering standards:*** *The Requesters express concern that the engineering designs and equipment do not meet modern, international norms and standards.* The selected consultant is a recognized member of the international community of hydropower experts and will review the designs against international norms and criteria. In addition, the Panel of Experts will contribute leading edge knowledge and ensure adherence to modern methodologies and norms.

Environmental Issues

93. Environmental standards for impact assessment have changed dramatically over the past two decades. The issues raised by the Requesters reflect current concerns with ecological protection and water management, with particular emphasis on the exacerbation of water scarcity during filling and operations and associated impacts on human lives, as well as biodiversity.[17]

94. Management reiterates that studies are needed to develop the data and analysis necessary to answer the claims and concerns raised by the Requesters as listed below. The ESIA will address the environmental, socio-economic and cultural situation at the proposed Rogun HPP site and identify potential impacts, including the cumulative impact of the entire Vakhsh river cascade on the relevant areas of Tajikistan and the riparian states.

- ***Standards for ecological and environmental impact assessment:*** *The Requesters claim the design of the proposed Rogun HPP is based on the same standards as other CIS hydro-constructions that do not address ecological or environmental considerations.* The purpose of the ESIA is to specifically identify and measure the potential environmental and social impacts. The TORs specify that the assessment shall be in accordance with international good practice and Bank

[17] Annex 1, Items 5,9,10,11,12,13b.

safeguard polices. In addition, the ESIA Panel of Experts will contribute leading edge knowledge and ensure adherence to modern methodologies and norms.

- ***Water scarcity:*** *The Requesters claim that the proposed Rogun HPP will have serious negative impacts on the availability of water during reservoir filling and during operations.* The TEAS will examine several scenarios for reservoir filling and operations in order to assess this concern. The ESIA requires assessment of the impacts of these scenarios on downstream interests including (but not limited to) flows into the Aral Sea, environmental flow requirements, irrigation-based agricultural systems and drinking water. The TEAS and ESIA will examine the potential implications of climate change on water demand and Rogun operations. The studies will also consider impacts on groundwater as appropriate.
- ***Cultivated area and land productivity:*** *The Requesters claim the proposed Rogun HPP will compromise incomes, living standards and survival ability of large populations in Uzbekistan and Turkmenistan.* The ESIA will examine irrigated lands and agricultural activity. The reservoir filling and operational scenarios noted above will also be assessed for impacts on agricultural outputs, which will be incorporated into the economic analysis of the proposed HPP.
- ***Drinking water:*** *The Requesters claim construction of the proposed Rogun HPP will lead to a dramatic deterioration of the potable water supply downstream of the project.* The ESIA will examine water use by communities and industries to assess whether and/or to what degree the proposed Rogun HPP would affect current availability and quality of water. A specific section of the TORs focuses on impacts on riparian interests.
- ***Biodiversity:*** *The Requesters claim the proposed Rogun HPP will have catastrophic consequences for biodiversity, including deterioration of the gene pool and reduction of flora and fauna.* A major component of the ESIA study is to assess the impact of the proposed HPP on flora and fauna. This encompasses a biodiversity inventory for the entire affected project area, identification of "hot spots" of the downstream area where hydrological changes are expected to have the most impact, and assessment of possible measures for the protection of key species or ecological communities.

Communications with riparians

95. The Bank has had extensive correspondence, meetings and discussions with members of the Government of Uzbekistan on the Assessment Studies for the proposed Rogun HPP, starting in August 2007 when the Bank accepted the invitation of the GORT. Numerous other meetings and written correspondence, including between Presidents, have occurred since then, as illustrated in the table of correspondence (see Table 2).

96. The Bank has recognized the concerns of the Government of Uzbekistan since its formal objection in 2008, and has made every effort to address those concerns through both the TORs for the studies, the design of the approach to the studies, and the Bank's expanded role. Of particular note were consultations undertaken for the draft TORs for the studies, during which the Government of Uzbekistan presented its technical Expert

Opinion (see Annex 5) on the proposed Rogun HPP. The riparians' views and concerns, including those expressed in the Expert Opinion, were taken into account in the TORs for the Assessment Studies. In August 2009, the Bank discussed the establishment of a Bank-managed regional Panel of Experts, supplementing the study panels to be established as part of the Assessment Studies under Bank policies, and in September 2009 Bank staff met with the Government of Uzbekistan to review modifications to the TORs. In May 2010, the Regional Vice President (ECA) met with the President of Uzbekistan to hear Uzbek views and concerns and in August 2010, senior Bank Management discussed the expanded Bank approach to the Assessment Studies with the Deputy Prime Minister, with particular reference to the requests of the Government of Uzbekistan.

Table 2: Correspondence between World Bank and Government of Uzbekistan (Oct 2007 – present)

Date	From	To
Oct 3,2007	Central Asia Country Director, World Bank	Deputy Prime Minister, GOU
April 1, 2008	President, Republic of Uzbekistan	President, World Bank
April 3, 2008	Central Asia Country Director, World Bank	Deputy Prime Minister, GOU
April 16, 2008	Central Asia Country Director, World Bank	Deputy Prime Minister, GOU
April 25, 2008	President, World Bank	President, Republic of Uzbekistan
May 29, 2008	Central Asia Country Director, World Bank	Deputy Prime Minister, GOU
Nov 10, 2008	Deputy Prime Minister, GOU	Central Asia Country Director, World Bank
Jan 8, 2009	Uzbekistan Country Manager, World Bank	Deputy Prime Minister, GOU
Jan 30, 2009	President, Republic of Uzbekistan	President, IFC
March 3, 2009	President, Republic of Uzbekistan	President, World Bank
March 30, 2009	President, IFC	President, Republic of Uzbekistan
March 3, 2009	President, Republic of Uzbekistan	President, World Bank
April 15, 2009	President, World Bank	President, Republic of Uzbekistan
Sept 11, 2009	Sector Manager, Energy, World Bank	First Deputy Minister, Ministry of Economy
Dec 2, 2009	Ministry of Foreign Affairs (MFA)	World Bank
Dec 22, 2009	Uzbekistan Country Manager, World Bank	Minister, MFA
Dec 31, 2009	MFA	World Bank
March 12, 2010	Prime Minister, Republic of Uzbekistan	Europe and Central Asia (ECA) Regional Vice President, World Bank
March 22, 2010	Europe and Central Asia (ECA) Regional Vice President, World Bank	Deputy Prime Minister, GOU
April 7, 2010	Deputy Prime Minister, GOU	Europe and Central Asia (ECA) Regional Vice President, World Bank
April 15, 2010	Central Asia Country Director, World Bank	Deputy Prime Minister, GOU
April 29, 2010	Uzbekistan Country Manager, World Bank	Deputy Prime Minister, GOU
May 10, 2010	Deputy Prime Minister, GOU	President, World Bank
May 11. 2010	Minister of Economy, GOU	ECA Regional Vice President, World Bank
May 26, 2010	ECA Regional Vice President, World Bank	Deputy Prime Minister, GOU
July 16, 2010	Uzbekistan Acting Country Manager, World Bank	Deputy Prime Minister, GOU
Aug 5, 2010	President, Republic of Uzbekistan	President, World Bank
Aug 19, 2010	President, World Bank	President, Republic of Uzbekistan
Sept 7, 2010	ECA Regional Vice President, World Bank	President, Republic of Uzbekistan
Oct 4, 2010	Deputy Prime Minister, GOU	ECA Regional Vice President, World Bank
Oct 21, 2010	ECA Regional Vice President, World Bank	Deputy Prime Minister, GOU
Nov 5, 2010	Deputy Prime Minister, GOU	ECA Regional Vice President, World Bank

97. Recently, the Bank formally invited the Government of Uzbekistan to nominate a senior official to lead Uzbekistan's contribution to the Bank-led program of consultations for the Assessment Studies. The Government has not nominated a representative and

continues to express concern about the process for the Assessment Studies and lack of consensus decision-making by Tajikistan, Uzbekistan and Turkmenistan on all aspects of the studies. In recent correspondence, the Government of Uzbekistan continues to question the independence and objectivity of the proposed assessment, and hence its participation.

98. The Bank is continuing its dialogue with the Government of Uzbekistan and the other riparian countries.

Tender Procedures

99. The Requesters claim the Bank is making a one-sided evaluation of the tender procedures for the environmental assessment. Uzbek Government representatives have consistently questioned the independence of a study financed through an IDA grant and credit provided to the GORT. The Bank is fully cognizant of the difficult transboundary energy-water issues in Central Asia and takes very seriously the concerns of riparians. With this concern in mind, the Bank has taken exceptional steps to ensure the integrity and fairness of the assessments. With the application of these measures, Management believes the studies will present an unbiased set of findings and recommendations.

ANNEX 1

ISSUE CLARIFICATION BY MANAGEMENT

No.	Issue	Clarification	OP/ BP
	Projects On International Waterways		
1.	We, Ecological Movement of Uzbekistan, represent more than 100 of NGO's of Uzbekistan. We have suffered, or are likely to suffer, harm as a result of the World Bank's failures or omissions in the "CONSTRUCTION OF "ROGUN" HYDROELECTRIC POWER STATION WITH THE 340 METERS HIGH DAM" by the government of the Republic of Tajikistan in one of the main currents of transboundary river of Amudarya which belongs to the basin of the Aral sea. Construction of hydroelectric power station similar to "Rogun" hydroelectric power station will lead to aggravation of the present unfavorable environmental conditions in the region and appearance of numerous social, ecological and humanitarian disasters. Here are some of them:	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun Water Reservoir and Hydropower Project (proposed Rogun HPP) itself, but not from the Assessment Studies that the Bank intends to finance. The potential impacts of the proposed Rogun HPP require further investigation. At this time no studies and assessments exist which provide an up-to-date, objective and analytically sound response to this claim. The purpose and scope of the Assessment Studies is to produce technical, economic, environmental and social studies based on a sufficient pool of existing and newly gathered data to allow an assessment of the proposed Rogun HPP benefits, costs and risks. Management has made it explicit that its support for the Assessment Studies on the proposed Rogun HPP does not commit any later financial support for the possible construction of the proposed Rogun HPP. The Request does not state how the Bank has failed to comply with its policy obligations .OP 7.50 applies to the proposed Rogun HPP because it involves the use of an international waterway as defined in the Bank policy: the proposed Rogun HPP is located on the Vakhsh River in Tajikistan which joins the Pyanj River (from Afghanistan) to form the Amu Darya River that subsequently flows to Turkmenistan and Uzbekistan. Riparian notification of a proposed project is required for such projects, including if the activity only involves detailed design and engineering studies of the same. The policy exempts from this notification requirement, *inter alia*, water resource surveys and feasibility studies on or involving international waterways. These studies constitute feasibility assessments, not detailed design and engineering studies. Nonetheless, in December 2007, the GORT notified the Government of Uzbekistan and other riparians of its intention to further examine development of the proposed Rogun HPP, inviting riparian governments to join a consortium for its development and advising of the Bank's commitment to support the GORT in carrying out initial studies. The policy does require that terms of reference for the activities include an examination of any potential riparian issues. This requirement is met through multiple elements	7.50

No.	Issue	Clarification	OP/ BP
		in the TORs for both the TEAS and ESIA. Paragraph 43 of the ESIA Terms of Reference[1] specifies that: "*The ESIA will examine issues related to water regulation and impacts on existing flow regimes both at the project site and downstream through riparian countries. Such impacts will include both ecological and social/economic (e.g., agriculture).*" Items below detail the paragraphs/sections of the TORs for the TEAS and ESIA that relate to each topic raised by the Requesters. The TORs are included in Annexes 2 and 3). These activities demonstrate that the Bank has complied with the requirements of OP 7.50 in the preparation of the Assessment Studies.	
	Environmental Assessment, Safety of Dams, Natural Habitats, Involuntary Resettlement		
2.	As the hydro-electric power station is being constructed in the zone of Ilyak-Vakhs crust fracture with the category seismic danger reaching magnitude 9 by Richter scale, construction of a massive dam in the seismic active zone can provoke new earthquakes and will create immense danger for life of hundreds thousand people.	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance. This issue will be studied in the TEAS and reviewed by an independent international Engineering/Dam Safety Panel. The TORs for the Rogun TEAS contain detailed requirements for (i) assessing the seismicity of the proposed site, (ii) determining appropriate seismic design parameters, and (iii) assessing the design of the project for these parameters. Section 6.6 of the TORs requires the Consultant to "undertake, inter alia: detailed seismological investigations, evaluation of available studies for Sangtuda, Nurek and other HPPs in the region; description of seismicity of the region; evaluation of the seismic hazard [methodologies, zone of influence, seismic sources (faults, etc.), estimation of the maximum credible earthquake (MCE), operating basis design earthquake (OBE), and acceleration of the design earthquake, reservoir triggered seismicity, etc.], and present results and conclusions." This Section also stipulates that "The project shall be designed on the basis of the results of seismic studies." Section 7.23 of the TORs requires the Consultant to: "identify risks associated with the developing of the Project, construction and operation and maintenance of Rogun HPP and of the combined operation and maintenance of Rogun with other HPPs in the Vakhsh River. The identification of risks shall include, among others: topography, hydrology, geology/geotechnical (including potential for induced landslides), seismic	4.37

[1] All paragraph and section numbers for the ESIA TORs refer to the revised TORs dated October 2010.

No.	Issue	Clarification	OP/ BP
		(including induced seismicity), material investigations, power and energy/plant performance, construction costs, construction schedule, construction and installed capacity in stages, economic and financial aspects. Particular attention should be paid to the risks associated with dam safety and dam operation and maintenance procedures to avoid major disasters leading to the flooding of downstream areas." The Engineering/Dam Safety Panel will also review in detail aspects associated with the assessment of the impact of seismicity on the proposed Rogun HPP.	
3.	In case of dam failure after completion of construction of Rogun hydroelectric power station in the designed parameters, the wave 245280 meters high (depending on the water reservoir filling) in the area of Nurek hydroelectric power station (the start-point) and 6 -7 meters high in the Republic of Karakalpakstan (the end-point) will destroy the whole cascades of 6 hydroelectric power stations and over 700 settlements in the territory of Tajikistan, Afghanistan, Uzbekistan, Turkmenistan populated with 5 million people, including 3 million living in Uzbekistan. The area of 1.3 -1.5 million hectares of land will be flooded.	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance. This issue will be studied in the TEAS and reviewed by an independent international Engineering/Dam Safety Panel. The TORs for the TEAS (Section 7.23) require an identification of the *"risks associated with the developing of the Project, construction and operation and maintenance of Rogun HPP and of the combined operation and maintenance of Rogun with other HPPs in the Vaksh River"*. This Section of the TORs also stipulates that: "*Particular attention should be paid to the risks associated with dam safety and dam operation and maintenance procedures to avoid major disasters leading to the flooding of downstream areas. For this purpose the Consultant shall, among other things, prepare:* • *Instrumentation Plan to monitor the behavior of the dam through its life time and a plan for such monitoring as envisaged in Annex A to BP 4.37 of the World Bank entitled 'Dam Safety Reports: contents and timing'* • *An Emergency Preparedness Plan to cover the contingency of dam failure as envisaged in the above mentioned Annex A to protect the people, property, animals, heritage sites, national treasures etc in the downstream areas in the Amu Darya basin. This should also include an early warning system and communication plans."*	4.374.01
4.	There is the thick layer of rock salt in the geological structure of the basis of the dam which is in the zone of active movement of filtration stream. When the level of water in the reservoir rises and the filtration stream starts moving, subsurface erosion in the basis of the dam will develop. The speed of washout under certain conditions can reach the values threatening the integrity of the base and the constructions of the hydro-electric complex.	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance. This issue will be studied in the TEAS and reviewed by the independent international Engineering/Dam Safety Panel. There is a specific phase (Phase 0) of the Rogun TEAS for the "Geological and Geotechnical Investigation of the	4.37, 4.01

No.	Issue	Clarification	OP/ BP
		Salt Dome in the Dam Foundation and Reservoir." The specific provisions in Section 4.1 of the TORs for the TEAS related to this aspect include the following: *"The Consultant shall pay special attention and investigate thoroughly the heterogeneous bedrock at the dam site composed of sedimentary systems including a wedge of salt fed by the Gaudark salt formation along the Ionaksh fault, including the crossing in the reservoir, and area which will therefore be submerged."* *"The assessment shall recommend possible treatment options, residual risks during Rogun's operation and how to manage them, and based on it, the Consultant shall recommend the most appropriate course of action to the Client."* *"The Consultant shall present a complete report on said assessment as soon as it is completed."* This is one of the main aspects to be reviewed by the Panel of Experts and a decision point for continued exploration of the proposed Rogun HPP design.	
5.	Designing the huge hydroelectric power station was conducted by the same standards as other large hydro-constructions within the CIS which do not include ecological examination and environmental impact assessment.	This is a valid issue and will be examined in the ESIA and by an independent international Environment/Social Panel. Ecological and environmental impacts are, with social and resettlement issues, the focus of the ESIA study. The study will provide the types of assessments referred to by the Requesters. Modern approaches as desired by the Requesters are embedded in the study's structure. The ESIA will replace existing reviews of the proposed Rogun HPP by updating, expanding and upgrading the project's database, and introducing sound environmental and social practice, founded on quality checked data. Consultants are required to go beyond existing studies with field work by international experts and use recognized methodologies for impact assessment. The study's conclusions and recommendations will meet modern international standards and the Bank's operational policies. Paragraph 19 of the TORs for the ESIA specifically states: *"The Consultant shall assess the environmental and social impacts in accordance with Tajik environmental laws and regulations, with international good practice, as well as the World Bank Safeguard Policies (available on the World Bank's external web site in English, Russian and Farsi languages). These may be supplemented by similar policies and practices required by other International Financing Institutions (IFIs) and Export Credit Agencies (ECAs) and under the Equator Principles for private sector investors."*	4.01
6.	Construction of the hydro-electric complex in the late 1980s and early 1990s was conducted with considerable deviations from the design. The building suspension in 1992 was done practically without any	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance.	4.37

No.	Issue	Clarification	OP/ BP
	conservation. The tunnels and other constructions have already been seriously destroyed by powerful mud stream. By the time of making decision on continuation of the construction many building fragments of the dam have been damaged.	This issue will be examined in the TEAS and by an independent international Engineering/Dam Safety Panel. Phase I of the Rogun TEAS covers an assessment of existing works at the proposed Rogun HPP to establish their adequacy for the development of the project. This task will include both review of existing documentation (including assessments undertaken since the Soviet reports) and site visits to inspect the works. The specific instructions to Consultants can be found in Section 5 of the TORs. In order to develop the scope and design of the TORs for both the ESIA and TEAS studies, Management contracted two technical consultants in July 2010 to undertake a review of the actual situation on the site of the proposed Rogun HPP. The focus of the technical consultancies was to review current practice of quality assurance of the works implemented to date, flag any imminent risks or safety aspects of the works already carried out, and provide technical information to facilitate the TEAS Consultant's familiarization with the geotechnical situation	
7.	Experts consider that the turbine-generator installation design was made 25 years ago, and today the careful examination is needed to know whether it meets the modern technical norms, requirements, national and international standards.	This issue will be examined in the TEAS and by an independent international Engineering/Dam Safety Panel. Assessment of designs for components of the proposed Rogun HPP is to be undertaken in Phase III of the Rogun TEAS according to modern, internationally accepted design criteria. In accordance with Section 7.12 of the TORs, this includes "*Mechanical equipment such as turbines, governors, cooling system ventilation, drainage, cranes, etc"* and *"Electrical equipment such as generators, transformers, switch gear, auxiliary power supply, power cables, control cables, communication, protection and control equipment, switchyard, control room, etc.*" The Engineering/Dam Safety Panel will review the studies, providing independent evaluation of the quality, and ensuring international standards are met.	4.37
8.	Filling the reservoir with water to the designed capacity (13 billion cubic meters) will take 7-8 years that will lead to a number of negative consequences. Transition to energy generation by Rogun water reservoir after achieving the design parameters, will be followed by deficiency of water in the vegetation period increase by 22,2 % in average, and in the years of water shortage almost twice as high in comparison with the present conditions.	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance. This issue will be examined in the TEAS and ESIA and by both the Engineering/Dam Safety and Environment/Social Panels of Experts. The filling and operation of the reservoir of the proposed Rogun HPP are key issues to be carefully investigated during both the ESIA and TEAS. The importance of reservoir filling to downstream interests was repeatedly raised during the consultations with the riparian countries and was addressed in the TORs. The impact on downstream ecosystems and related economic activities, especially agriculture, will be	4.014.04

No.	Issue	Clarification	OP/ BP
		examined under a range of dam designs and operational regimes of the proposed HPP. The TEAS requires that reservoir filling be examined and a number of scenarios modeled for both reservoir filling and operations (Section 6.11 of the TEAS), with the consultants required to: *"Carry out reservoir operation simulation using the latest reliable hydrological data available for the longest period of months.* *The reservoir operation studies shall be based on Nukus Declaration (September 5, 1995). The Consultant will provide simulation of analysis of possible operating regimes of Rogun Reservoir over 50-60 years. These scenarios will be described in terms of economic, financial, environmental and social impacts.* *The Consultant shall prepare a phased reservoir filling schedule in accordance with the construction stages. These scenarios should be assessed in terms of economic, financial, environmental and social impacts."* These simulations and scenarios will be used in the ESIA to assess downstream impacts. Box 7 after paragraph 47 in the TORs specifies: *"The Consultant will assess the impacts of the construction and operation of Rogun HPP on the downstream countries. The specific assessment should be done in concert with the consultants conducting the Techno-Economic Assessment Study (TEAS), who would be responsible for proposing any technical and economic solutions."* Box 7 (in particular bullets c to f) further specifies the topics to be addressed, including: flows into the Aral Sea; environmental and social impacts of various reservoir filling and operations modes; mitigation measures for adverse impacts; and environmental flow requirements. This analysis is supported by Box 6 which addresses: water quality, flooding, sedimentation and erosion, cultural resources, potential for incidence of water borne and water related diseases, fisheries, and downstream irrigation-based agricultural systems and drinking water supply, both during reservoir filling phase and routine operation. In addition, Box 8 of the ESIA and Section 6.9 of the TEAS TORs require the Consultant to study the potential climate change induced impacts, especially changes in the basin hydrology, and their effects on the project's environmental performance, as well as identification of potential changes in demand for water and electricity: "*Review the data on the past climate change in each of the countries in the region and all available future climate change forecasts and assess their impact (a) on the water demand in each country and (b) on the design and operation of Rogun."*	
9.	Reduction of the cultivated area and a decrease in land productivity will affect income, living standards and survival ability of over 12 million people of Uzbekistan and 6 million people of Turkmenistan.	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance.	4.01 4.12

No.	Issue	Clarification	OP/ BP
		This issue will be examined in the ESIA and TEAS and by both the Engineering/Dam Safety and the Environment/Social Panels of Experts. The impact on downstream ecosystems and related economic activities, especially agriculture, will be examined under a range of dam designs and operational regimes of the proposed HPP. As part of the analysis noted above in both the TEAS and ESIA, Box 7 of the TORs for the ESIA requires the consultant to: "*Compile data relating to the area of lands irrigated by Amu Darya waters Tajikistan, Uzbekistan, Turkmenistan and Kazakhstan since independence regarding, crops grown, water usage per hectare, yields, agronomic and irrigation practices."* In addition, Section 7.19 of the TORs for the TEAS requires that the macro-economic impact analysis examine: *"employment generation, regional development, betterment of people directly affected, etc. both in Tajikistan and riparian countries, taking into consideration impacts on ecosystem services where possible (drawing from the ESIA)."*	
10.	Construction of Rogun water-reservoir and its operation in energy-generating mode will lead to dramatic deterioration of potable water supply for about 18 million people living in downstream areas of the river.	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance. This issue will be examined in the TEAS and ESIA and by both the Engineering/Dam Safety and the Environment/Social Panels of Experts. The impact on downstream ecosystems and related economic activities will be examined under a range of dam designs and the operational regimes of the proposed HPP. As part of the analysis noted above in both the TEAS and ESIA, Box 7 of the TORs for the ESIA requires the consultant to: *"Compile data on number of communities using Amu Darya for domestic and industrial water supply and the related water demand and whether the proposed operating regime of Rogun/Nurek could in any way improve or worsen their current situation."* The ESIA will also include a study of the reservoir water quality, and the analysis of downstream hydrological impacts will include potential effects on groundwater resources in the river bed of Vakhsh River, which could have a detrimental effect on drinking water supply. Box 6 after paragraph 46 of the ESIA TOR requires investigation of, among other issues: ecological effects of flooding and construction activities, including risks to habitats and topographical impacts that would induce landslides or flooding; effect on the hydrology and on the water quality of the river/reservoir; impact of the changed river flow regime, including impact due to river impounding upstream of the dam, and changes in volume, pattern and quality of water downstream of the dam; determination of ecological flow between dam and	4.01

No.	Issue	Clarification	OP/ BP
		tailrace discharge; effect on lives of river and aquatic animals and potential for maintaining them; impact on drinking water supply systems; potential for incidence of water borne and water related diseases; impact on fisheries, agriculture and other sources of income; Impact on downstream irrigation-based agricultural systems and drinking water supply, both during reservoir filling phase and routine operation. In addition, Section 7.19 of the TORs for the TEAS requires that the macro-economic impact analysis examine: *"employment generation, regional development, betterment of people directly affected, etc. both in Tajikistan and riparian countries, taking into consideration impacts on ecosystem services where possible (drawing from the ESIA)."*	
11.	Deterioration of the gene pool, conditions for flora and fauna, disappearance of large areas of riparian (tugay) forests, sharp reduction of biodiversity will become the most catastrophic consequences of infringement of the balance of water use in the region due to the construction of Rogun hydroelectric power station.	Management notes that this issue raised by the Requesters actually refers to potential harm that could derive from the construction and operation of the proposed Rogun HPP itself, but not from the Assessment Studies that the Bank intends to finance. This issue will be examined in the ESIA and by an independent international Environment/Social Panel. The TORs, as set out in Paragraph 45, Box 5, require the Consultant to *"produce a biodiversity inventory for the entire affected project area, including reservoir and dam sites, appurtenant structures, temporary works, areas of indirect impacts and potential reservoir influence (e.g., by microclimate change).*" The TORs state further that the "*surveys should address terrestrial and aquatic compartments, the latter selected key areas and 'hot spots' of the downstream area where hydrological changes are expected to have most impact. Biodiversity data should be geo-referenced and maps be prepared for the entire relevant investigation area."* The consultant is also to "*assess feasibility and options for protection or rescue/recovery of any rare/endangered species or ecological communities which may be identified through the biodiversity inventory."*	4.014.04
12.	In our opinion, the World Bank is making a one-sided evaluation of the tender procedures for environmental assessment of construction of hydroelectric power station, and do not take into account the interests of all parties, including those countries which are located in the downstream of Amudarya river. Moreover, the draft design of the power station was developed 40 years ago, which completely did not take into account ecological aspects of this project.	**Consultations:** The Bank led a comprehensive program of consultations with riparian governments (Afghanistan, Kazakhstan, Republic of Kyrgyz, Turkmenistan and Uzbekistan), which is documented in the Vakhsh Report (Annex 4). The comments were integrated into the TORs for both the TEAS and ESIA. Each comment, along with how it was considered in revisions to the TORs is documented in Annex 6 of the ESIA TORs (Annex 3 of this Response). Consultations on the proposed Rogun HPP were also held in the potentially affected communities (May 2009) and in Dushanbe (May 2010). A range of Tajik and regional NGOs were invited and attended the meetings (see Annex 6 for a list of invitees and attendees to the Dushanbe meeting; scanned copies of the sign-in sheets	4.01

No.	Issue	Clarification	OP/ BP
		for the community meetings are available upon request). A second set of meetings will be held in November and December 2010. The Bank has notified the GORT on several occasions that tendering of the ESIA study cannot proceed until adequate consultation has been completed and necessary issues addressed in the contracted TORs. Following the first set of consultations, the TORs for both the TEAS and ESIA studies were disclosed on both the GORT website and in the Bank's InfoShop. **Ecological aspects:** The Assessment Studies will replace previous Soviet designs. The studies will ensure modern standards and norms for both technical design and ecological aspects. The TORs for both studies clearly reflect the care and attention to ensuring international good practice. Coverage of ecological aspects is comprehensive in terms of impact assessment, consideration of riparian issues, and Environmental Management Plans. The Bank-managed Environment/Social Panel provides a further check on the coverage and treatment of ecological aspects. **Ongoing involvement of riparians:** OP 4.01 requires consultation on the TORs and on the draft report of the ESIA. As noted above, the Bank is meeting the first of these conditions (including consultation with riparian governments). The draft ESIA report will be shared and discussed when completed. In addition, and beyond safeguard requirements, the Bank has committed to facilitating a program of consultation with riparian governments to support information exchange and transparency, to take into account the interests and knowledge of stakeholders and to provide access to international experts. **Contracting study consultants:** Both the ESIA and TEAS Studies are being procured according to ICB and the Bank's procurement policies. To date, Requests for Expressions of Interest were posted on UNDP Online with responses from 14 firms, from which a short list was selected and approved by the Bank; three proposals were received for the TEAS and one for the ESIA study. The Bank carried out an independent technical evaluation of the proposals as part of its review of Barki Tajik's Bid Evaluation Reports. Negotiations are underway with the selected TEAS consultant, with the Bank participating as observer. Based on the review of the single proposal received for the ESIA study, the Bank and GORT agreed to re-bid the study with the original, competitively selected short listed firms using revised TORs and budget. Proposals are due December 10, 2010. The Uzbek Government representatives have consistently questioned the independence of a study financed through a credit provided to the GORT. The Bank is fully cognizant of the difficult transboundary energy-water issues in Central Asia and takes very seriously the concerns of riparians. With this concern in mind, the Bank has taken exceptional steps to ensure the integrity and fairness of the assessments, exceeding Bank operational policies. With the application of the	

No.	Issue	Clarification	OP/ BP
		measures, Management believes the studies will present an unbiased set of findings and recommendations.	
13.	Representatives of Uzbekistan have complained several times to World Bank staff. The last verbally complains and in writing complains to World Bank were made on July and August 2010. We have received an obscure and not clear verbal response from World Bank. We are not satisfied with a response from World Bank.	Management notes that it has no records of the Requesters' attempt to raise their issues with Management. While the Requesters did meet with Management to communicate their views, this took place on the same time day that their Request for Inspection was submitted. Senior Management met with the Government of Uzbekistan regarding the Bank's expanded program of engagement in August 2010, at which one of the Requesters was present. However, the Requester did not speak at that meeting. Management considers that this is not in line with the eligibility requirements spelled out in the Resolution establishing the Inspection Panel. The Bank has no record of written communication with NGOs in Uzbekistan. Management wishes to point out that it has been in constant and close contact with the Government of Uzbekistan at the highest levels regarding the Assessment Studies. Uzbek authorities have on numerous occasions expressed their concerns. Considerable correspondence has been exchanged between the Bank and the Government of Uzbekistan, and their concerns have been incorporated in both the study TORs and the Bank's expanded role in overseeing the study process.	

WORLD BANK

MANAGEMENT RESPONSE TO

REQUEST FOR INSPECTION PANEL REVIEW OF THE

TAJIKISTAN ENERGY LOSS REDUCTION PROJECT

(IDA Credits 40930-TJ and HI7S0-TJ)

Annex 2

Terms of Reference for the Techno-Economic Resettlement Study (TEAS)

for Rogun Hydroelectric Power Plant Construction Project

November 22, 2010

Section 5. Terms of Reference

TEAS for Rogun Hydroelectric Power Plant Construction Project

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1. INTRODUCTION

1.1 Background

The Government of Tajikistan (GORT) plans to re-start of the construction of the 3600 MW Rogun hydroelectric project (HEP) (which was partially constructed during the Soviet rule and has made no further progress since the early 1990s for want of funds to complete the construction); and intends to mobilize the needed financing for completing the construction of this project through an international consortium.

For the completion of the construction of the Rogun Hydrolectric Project (HEP) GORT intends to secure consulting services for the assessment of this project from technical, economic, financial, environmental and social perspective. GoRT has received funding from the World Bank for an Energy Loss Reduction Project, and GoRT intends to apply part of the proceeds of this funding towards the preparation of the Assessment Study consisting of: (a) Techno-Economic Assessment Study (TEAS); and (b) separately, but in parallel, an Environmental and Social Assessment (ESIA).

GoRT and Barki Tajik (the national electricity utility and the contracting party) are now inviting detailed proposals from shortlisted consulting firms to undertake the consulting assignments for TEAS for Rogun HEP.

The work on TEAS would include an assessment of all the previous work done to date on the Rogun HEP; and an assessment of the entire Vaksh River development master plan. In respect of Rogun HEP the TEAS would evaluate (bearing in mind that this is a case of completing a partially constructed project and not a case of green field project) different options for dam type, dam height, construction phasing, reservoir operations, as well as issues of dam safety. Importantly, TEAS would analyze and recommend the possible trade-offs between techno-economic issues and the safeguards issues of dam safety, environmental, social, resettlement and impacts on other riparian states..

The ESIA which would be conducted in parallel by another Consultant would comply with World Bank and other IFI requirements, and would be guided by the policies of the World Bank, in addition to those of Tajikistan. Under the guidance of the World Bank, clarifications may be provided as necessary to address minor differences between the policies of the World Bank and those of other participating IFIs. Assessments would include compliance requirements of the applicable World Bank Safeguard Policies including, but not limited to, environmental assessment, involuntary resettlement, physical cultural property and dam safety.

In addition, TEAS and ESIA would receive information upon coordination with the Government subject to confidentiality of proprietary financial data, and provide information to, an independent assessment of the potential **regional impacts**[1] of Construction of Rogun HEP on the other riparian states of Amu Darya basin that the World Bank plans to undertake in parallel.

1.2 Overall Guidelines for Project Development

Key Principles for Project Development

[1] Such as, for example, the impacts (during the construction and operating phases of Rogun HEP) on irrigation, agriculture, drinking and industrial water supplies, sanitary flows, sedimentation, flooding etc in the downstream countries, as well as impact on the agreed flow of water to Aral Sea and impacts on the downstream countries relating to the safety of the dam.

The construction of Rogun HPP was begun in 1980 during the Soviet Union era as per the original designs prepared by Tashkent HydroProject. According to this design, Rogun HPP would have a reservoir with multi-year regulation mode with a dam height of 335 m, located on the Vaksh River upstream of the existing Nurek HPP cascade, to be realized in two stages. The reservoir would have a total storage volume of 13 km^3; a live storage of 8.6 km^3, and would likely extend upstream over a distance of about 70 km. The installed capacity is proposed to be 6x600 MW (totaling 3,600 MW) and the annual power generation would be 13,300 GWh. Despite significant storage, Rogun HPP was expected to produce electricity in Tajikistan and develop irrigation in the region. Construction works were started during 1980-ies of the past century, but stalled about 15 years ago for lack of funds. Currently most of the site preparation works about 70% of the underground works (access tunnels, penstocks, diversion and outlet tunnels, chambers for turbines/generators and transformers) have been completed.

The majority of the electricity to be produced by Rogun HPP is expected to be exported. Currently, the main export market identified is that of Pakistan, and the intention of Pakistan to import electricity from Rogun HPP has been explored in bilateral (Pakistan Tajikistan Joint Economic Commission) and multilateral (Central Asia South Asia Regional Electricity Market or CASAREM) forums. Other possible markets would also be considered as part of the Assessment.

In view of the size of investments needed, Rogun HPP would need significant private/foreign investment and but also requires the Government to play a key role, in view of the existing assets and the necessity to take responsibility for environmental, social, resettlement and riparian issues, and also for establishing the export markets (which are to be underpinned by inter-governmental agreements). The Government intends to establish an International Consortium of investors and financiers for the development of Rogun HPP.

Process

The development of Rogun HPP is a high priority task for the Government, which has established a high level inter-ministerial committee to oversee this task. This high level steering committee is chaired by the First Deputy Prime Minister and comprises the Presidential Administration, State Investment Committee and the Ministers of Energy and Industry; Justice; Economy and Trade; Finance;; Agriculture and Water Resources; and Ecology; with Barki Tajik performing the role of Secretariat of the Steering Committee.

The Assessment Study would comprise two distinct parts – (1) Technical-Economic and (2) Environmental and Social. There will be two separate consulting services contracts for these two parts, with the work to be carried out in parallel and in an interactive manner. Barki Tajik would be responsible for the process of bidding and selection of the Consultant (following the World Bank Guidelines for Consultant selection), but the tender committee would [either] be the Inter-Ministerial Steering Committee mentioned above [or] a committee appointed by the Inter-Ministerial Committee.

The Assessment Study would be reviewed in parallel by International Independent Panels of Experts (PoE), one each for (a) techno-economic/dam safety and (b) environmental/social aspects. The costs of these PoE would also be met from the funding provided by the World Bank under the on-going Energy Loss Reduction Project.

The Assessment Study work would include assessment of all the previous work done to date. The most relevant studies that need to be reviewed are: Rogun HPP Technical Project, 1978, by Hydroproject Tashkent, and the 1993 supplementary studies done by the same organization, as well as technical projects/studies (documents) done in 2008-2009 by design institutes “Hydroproject” and “Moshydrostal” .These studies would be given to the consulting firm(s) that would carry out the Study, in English and in Russian.

1.3 The Rogun Hydro Power Project

According to the original design Rogun HPP would have a reservoir with a rockfill/earthfill dam with a height of 335 m. MW (totaling 3.6 GW). The estimated average annual energy would be 13,300 GWh.

The selected dam location is a narrow gorge with steep flanks. The geology is characterized by highly heterogeneous sedimentary layers (in terms of strength and permeability) including haline, soluble strata, which necessitate careful investigation and analysis. The facility's design life is estimated to be 150-200 years.

Construction works were started around 1980 and were stopped in 1992. Since then, GoRT has allocated a minimum budget to continue works on a low key and maintenance basis. Currently most of the site preparation works as well as an estimated 70% of the underground works (access tunnels, penstocks, diversion and outlet tunnels, chambers for turbines / generators and transformers) have been completed.

The location of Rogun HPP is presented in Appendix 1 and its salient characteristics as of 1992 are presented in Appendix 2.

2. OBJECTIVE OF THE CONSULTANT'S SERVICES

The overall objective is to prepare and submit to the Government of Tajikistan and Barki Tajik a Techno Economic Assessment Study of the proposed Rogun Hydropower Power Plant.

3. OVERSIGHT OF THE CONSULTANT'S SERVICES AND RELATED STUDIES

The Government of Tajikistan/Barki Tajik will appoint its own Project Manager/Coordinator and support staff to administer the Contract.

The Consultant's work shall be undertaken in accordance with the World Bank's Safeguards Policies, including Operational Policy OP 4.37, Dam Safety. An Engineering Panel of Experts will oversee the engineering and dam safety aspects during the execution of the services. Another Panel of Experts will oversee the environmental and social impact assessments which will be carried out by another consultant under separate contract with the Government of Tajikistan and Barki Tajik.

4. SCOPE OF WORK OF THE CONSULTANT

These ToRs describe the services/tasks to be performed by the Consultant for the Government of Tajikistan and Barki Tajik in respect of the TEAS

All services of the Consultants described herein shall be performed in close cooperation with the Government of Tajikistan and Barki Tajik and agencies and authorities designated by the Government/Barki Tajik. The Consultant shall keep in mind that the services and tasks described herein can not be considered as the complete and comprehensive description of the Consultant's services and duties. It is rather the Consultant's responsibility to critically verify the scope of the services indicated herein, and to propose modifications in his proposal wherever he deems it necessary according to his own professional judgment and the knowledge that he will acquire during the preparation of his proposal. It is understood that the Consultant shall perform all the services/work as necessary to fulfill the objectives of the Consultancy Contract..

During the Consultant's assignment, other consultants and advisers may provide services to the Government of Tajikistan and Barki Tajik. The Consultant shall have to coordinate his activities with those of the said parties.

The Consultant is expected to execute as much work as possible in Tajikistan, and shall have staff with knowledge of Tajik and Russian, in addition to English, which is the main working language.

The Consultant shall carry out the work in four inter-related Phases:

Phase 0 (Zero)	Geological and Geotechnical Investigation of the Salt Dome in the Dam Foundation and Reservoir
Phase I	Assessment of the Existing Rogun HPP Works
Phase II	Rogun HPP Project Definition Options
Phase III	Assessment Report of the Selected Option

The Consultant shall be responsible for carrying out all the necessary field work and investigations to compile information and data required for the work. This includes the preparation of tender documents for field investigations (for instance: topography and mapping; geological, geotechnical and geophysical field investigations; hydraulic model testing; etc.), the tendering process, where necessary, for such investigations, and the award and management of said contracts in agreement with the Government of Tajikistan and Barki Tajik. The contracts shall stipulate that the Consultant shall be responsible for their correct performance. These investigations shall be defined and completed as soon as possible to have the information available when required at the time of the services. The consultant should include in their financial proposal the cost of such investigation, as a separate item clearly defined and based on best possible estimates, whith a specific breakdown of Consultant costs for preparing bid documents and supervision. These sub-contracting costs shall not be used in the evaluation of financial proposals; the cost of preparing bid documents and engineering services to supervise will be considered in the evaluation. The scope of the investigations and the related costs will be agreed during negotiations and any subsequent changes must be determined in consultation with the Government of Tajikistan and the World Bank, and authorized in writing as such.

All the reports shall be prepared in English and Russian.

4.1 PHASE 0 (ZERO): GEOLOGICAL AND GEOTECHNICAL INVESTIGATIONS OF THE SALT DOME IN THE DAM FOUNDATION AND RESERVOIR

The Consultant shall pay special attention and investigate thoroughly the heterogeneous bedrock at the dam site composed of sedimentary systems including a wedge of salt fed by the Gaudark salt formation along the Ionaksh fault, including the crossing in the reservoir, and area which will therefore be submerged.

The Consultant shall perform under this Phase 0 a risk assessment pertaining to the salt dome's influence on dam safety. The assessment shall be based on existing documentation and visual surveys. The Consultant may recommend additional investigations as appropriate.

The assessment shall recommend possible treatment options, residual risks during Rogun's operation and how to manage them, and based on it, the Consultant shall recommend the most appropriate course of action to the Client.

The Consultant shall present a complete report on said assessment as soon as it is completed.

The Consultant shall not proceed to commence the Phase 1 work unless the Client authorizes him to do so in writing, after a careful review and acceptance of the above report in consultation with the Engineering Panel of Experts.

5. PHASE I. ASSESSMENT OF THE EXISTING ROGUN HPP WORKS

The Consultant shall carry out an assessment of the existing works at Rogun HPP to establish the adequacy of the selected site for the development of the Project. Phase I and Phase II shall be carried out in parallel. The Consultant shall carry out the following tasks, but is not limited to them:

5.1 Document/Data Collection on Rogun HPP

The Consultant shall collect, review and analyze available documents/records on the existing Rogun HPP documents and works, such as:

- Topographic surveys and mapping
- Meteorology
- Hydrology
- Sediments
- Hydraulics
- Reservoir simulation studies (power, energy, irrigation, flood mitigation)
- Envisaged Reservoir operating regime
- Geological reports
- Geotechnical investigations and reports, foundation investigations
- Seismic reports
- Electrical and mechanical equipment
- Engineering design criteria used (civil, electrical, mechanical, etc.)
- Engineering design of the Project components
- Bidding documents and construction and equipment supply contracts
- Construction drawings of the executed works
- Construction records and reports
- Structural and hydraulic model tests reports
- Infrastructure
- Transmission
- Estimated investment made at current price level in the existing works
- Existing documents on water sharing within Nukus Declaration (September 5, 1995)

5.2 Rogun HPP Site Inspection

The Consultant shall conduct a project area and site inspection to assess the condition of the existing works, which shall include, but not be limited to the following:

- Access road to the Project Site
- Permanent and temporary roads, tunnels and bridges
- Accommodation for construction workers
- Upstream and downstream cofferdams
- River diversion works during construction
- Reservoir area conditions including slope stability
- Pertinent geological features

- Dam foundation and abutments, spillway, intake, diversion works, powerhouse, substation sites, etc.
- Dam integrity and dimensions and elevations
- Intake and lower outlets dimensions
- Head race pressure tunnel
- Concrete integrity, extent of deterioration (detailed structural inspection of structures, confirm concrete strength and integrity, confirm concrete contact with other materials [foundation, abutments, reinforcement steel], and collect other information related to the structural soundness of all works
- Access tunnels to underground power house
- Underground power house and partial concreting
- SF6 insulated switchgear – 500 kV

5.3 Assessment of Current Conditions of the Rogun HPP Site and Works

Assessment of the value of the infrastructure already constructed at the Rogun HEP would be part the Feasibility Study from the points of view of its usefulness and value. Assessment and especially valuation of this infrastructure is to be done in a clear and professional manner and the methodology for such assessment would be agreed with the Government and the World Bank at the time of the Inception Report review of the Consultants' work.

The Consultant shall prepare a report that shall cover the results of the assessment of the Project, inter alia:

- An executive summary in Russian and in English
- Analysis and results of the documentation reviewed as stated under paragraph 5.1
- Analysis and results of the site inspection including conditions of the structures and other project components as indicated under paragraph 5.2.
- Identification of potential problems and weaknesses, evidence of defects, indications of deterioration
- Recommendation of appropriate measures to correct unsafe conditions and bringing the existing works to specifications
- Adequacy of the works and Site for the development of the Project including for the proposed dam.
- Detailed estimate of the investment made (sunk cost at current price level) in the Project on the basis of the agreed methodology.
- Location map and layout and drawings of the existing works

6. PHASE II. ROGUN HPP PROJECT DEFINITION OPTIONS

The objective of Phase I is to review the Rogun HPP as proposed originally, compare it with alternative options, and as a result of the substantiated technical economic comparison, select and recommend the option for which a detailed Assessment shall be carried out in Phase II

Work on Phase I and Phase II shall start simultaneously and run in parallel until one option is selected.

For Phase II, the depth of the investigations, designs and estimates shall be limited to the degree of accuracy required for a clear delineation among the project alternatives considered, enabling the Consultant to make a substantiated recommendation as to the selected scheme.

The Consultant shall carry out the following work, but is not limited to:

6.1 Review and Analysis of the Vaksh River Masterplan

The TEAS should look at the entire Vaksh River development master plan, including the Sangtuda 1, Sangtuda 2, and Shurob HPPs.

The TEAS shall provide a description of the Vaksh river valley, its hydroelectric potential; the Vaksh river development master plan; rationale and justification for the master plan; and progress achieved to date in the development of the master plan;

The TEAS shall assess whether it would be optimal to build the first stage Rogun HPP; then in parallel construct the Shurob run-of-river project, and then pursue the construction of Rogun Stage 2.

6.2 Selection of Dam Site and Dam Type and Height

Considering that this is a case of completing the construction of a partially constructed project, change in the dam site/type and the power house site shall be considered only when the existing criteria site/type, height etc) is proved clearly unsafe or otherwise technically unsuitable.

The original design of Rogun HPP adopted a rockfill/earthfill dam. The Consultant shall evaluate the existing design of the dam and its site, and compare it with other dam types feasible for the site, and select the appropriate dam type and height and its characteristics on the basis of a technical and economic evaluation. The construction of Rogun dam and of the installed capacity in two or more stages shall be analyzed. The spillway capacity must be available at all times to discharge the design/probable maximum flood during the construction stages.

6.3 Assessment of selected Powerhouse Site and Other Components

Since the Rogun HPP power house cavern has been completed earlier, the Consultant shall evaluate the site, on the basis of a technical and economic evaluation, taking into consideration uncompleted construction of site objects. Related project waterways shall also be evaluated.

Considering that this is a case of completing the construction of a partially constructed project, consultant will further confirm that the existing construction is safe and technically suitable.

6.4 Topographical Surveys and Preparation of Maps

Review of existing documentation to be provided by the Government/Barki Tajik.

Prepare topographical maps on GIS platform at the appropriate scales and contour curves for the project area as follows:

> Entire reservoir area (reservoir and capacity data/curves versus elevation; e.g. horizontal scale 1:10,000 with 5 m contour levels)
>
> Selected dam site and power house site (river cross sections, etc.; e.g. horizontal scale 1:1,000 and 1 m contour levels)

As far as possible, satellite remote sensing (SRS) shall be linked to the GIS models. The remote sensing based information shall be integrated appropriately in the on-site topographic surveys and investigations.

The Consultant shall submit all maps prepared and procured by him in hard and soft copies (5 copies of each).

All the scope of work, including calculations, shall be presented in the report on topography and maps.

6.5 Geological, Geophysical and Geotechnical Investigations

Review of existing documentation to be provided by the Government/Barki Tajik, among other things, to assess the completeness, adequacy, and usability and quality of investigations carried out in the past against good international practice.

Establish the engineering geological conditions of the project area and component (reservoir, dam, waterways, powerhouse, etc.) sites.

Compilation of geological maps and reports of the project area and sites

A regional geological assessment shall be carried out based on the available data, maps, and aerial surveys. Regional geological maps, regional geological cross sections and seismic-tectonic maps shall be prepared.

Geological, geophysical, and geotechnical investigations shall be integrated to the topographic maps.

A regional geological assessment shall be carried out based on the available data, maps, and aerial surveys. Regional geological maps, regional geological cross sections and seismic-tectonic maps shall be prepared.

The geophysical investigations shall be performed for selected lines/profiles.

The geotechnical investigations shall include boring in soil, drilling/coring in rock, trenches, sampling, in-situ tests, galleries on the dam abutments, site tests, laboratory test and reports, and shall establish the soil and rock strata along with their properties.

The assessment shall be performed for the project components such as:

- Reservoir (including reservoir tightness, losses if any, and slope stability etc.)
- Dam
- Spillway and energy dissipation area
- Intake area
- River diversion works during construction
- Headrace tunnel
- Surge chamber
- Penstocks
- Power house site (caverns)
- Substation
- Sources of construction materials
- Infrastructure to the site

Identify and comment on potential or possible specials problems or risks such as: (a) halite and gypsum bearing strata in the dam foundation area dissolving and causing preferential seepage flow; (b) cracks at the clay core-foundation rock contact, which could initiate erosion of core material (Teton Dam Effect); and (c) flow through zones of high permeability such as fractured sandstone or faults.

Sampling and field-testing shall take place during the investigation program. Selected samples of soil and cores recovered through drilling of boreholes shall be sent to the laboratory for tests to find out/confirm the quality and suitability of the rock for foundation of the civil works structures and soil as construction material.

Assemble the classified drill cores and other samples in a safe place/warehouse.

All the scope of work, including analysis, findings and calculations, carried out shall be presented in the geological, geophysical, and geotechnical report.

6.6 Seismic Studies

Review of existing documentation to be provided by the Government/Barki Tajik.

The Consultant shall undertake, inter alia: detailed seismological investigations, evaluation of available studies for Sangtuda, Nurek and other HPPs in the region; description of seismicity of the region; evaluation of the seismic hazard [methodologies, zone of influence, seismic sources (faults, etc.), estimation of the maximum credible earthquake (MCE), operating basis design earthquake (OBE), and acceleration of the design earthquake, reservoir triggered seismicity, etc.), and present results and conclusions. The project shall be designed on the basis of the results of seismic studies.

Review the existing seismic network in the region/zone/project area and propose means to improve it to closely monitor the seismic activity in the region/zone/project area.

All the scope of work, including analysis, findings and calculations, carried out shall be presented in the seismic studies report.

6.7 Construction Materials Survey

Review of existing documentation to be provided by the Government/Barki Tajik

Survey shall be carried out of the proposed site area for identification of suitable location for construction materials. This shall cover investigations of locations of potential quarries for sand, soils, dam core materials, rock and aggregates, etc. and preparation of maps identifying the borrow areas; estimation of quantities; collection of samples from borrow areas; testing of samples of the materials at the various locations, preparation of location maps, road maps, etc. showing transport routes up to the borrowing areas and their relation to the construction site(s).

In addition, the source (national and international) of supply of other materials such as cement, steel, lumber, etc. shall be identified.

All the scope of work, including findings, analysis and calculations, carried out shall be presented in the report on construction materials.

6.8 Meteorological and Hydrological Studies

Review of existing documentation to be provided by the Government/Barki Tajik.

Carry out the necessary meteorological and hydrological studies and investigations necessary to define the project.

The following parameters shall be collected from the respective agencies:

- Temperature
- Rainfall /Snow fall / Glacier melt

- Discharge
- Water quality
- Humidity
- Sedimentation
- Evaporation, etc.

The following shall be performed, inter alia:

- Preparation of maps showing the location of the stations along with the available and collected data.

- Evaluation of existing meteorological and hydrologic measuring stations/network in the river basin and, if necessary, actions to improve them, including new installations.

- Evaluation of the condition of the existing gauging station at the Project site, and determine if it needs recalibration or if a new station should be installed and calibrated for daily measurement of the river flow at the Project site.

- Collection and organization of available meteorological and hydrological data in the catchment area upstream of the Project site

- Assessment of data quality.

- Analysis of precipitation, snow melt, evaporation, river flows, sediment discharges and volumes, etc.

- Compilation of historical updated data of river flows at sites: daily, weekly, monthly and annual. Representative period of dry, medium and high flow conditions shall be selected for analysis of hydraulic conditions.

- Studies for validation of hydrological data, compilation and processing including extension and generation of data, and preparation of hydrological inputs for reservoir simulation studies shall be performed. Consider stochastic methods.

- Assessment of historic flows at identified locations.

- Studies of construction diversion flow, flows for various return periods, accompanied by the respective hydrographs.

- Estimate of floods with different return periods and of the probable maximum flood (PMF) accompanied by their respective hydrographs, data and methodology used.

- Studies of sediment discharge and volume.

- Overview of water use along the Amu Darya, including in riparian countries.

All the items covered by the above scope of work, including findings, analysis and calculations, shall be presented in the report on meteorology and hydrology.

6.9 Climate Change Impact Assessment

The Consultant shall review the trends in annual and seasonal water flow in the Vaksh River during the past several decades, forecast changes in water flows as a result of climate change and global warming and take these into account while finalizing the design of Rogun HPP and its operating regime.

The Consultant should assess the possible positive aspects of Rogun HPP in the context of climate change - flood control in the event of higher flows due to climate change, avoided carbon emission of Rogun HPP relative to similar-sized fossil fuel generation; the beneficial impact it would have on the glaciers and other sources of water into Vaksh etc.

The Consultant should review the available global and regional climate models and studies carried out with relevance for the Central Asian countries (Tajikistan, Kyrgyz Republic, Uzbekistan and Turkmenistan), assess the likelihood of variability in the flow regime, optimize the equipment design and flow regime for the most likely flow ranges and carry out sensitivity studies in relation to the variations on either side.

The lines on which this aspect of the work may be handled are given in Box 1 below[2].

[2] For further details see *Addressing Climate Change Driven Increased Hydrological variability in Environmental Assessments of Hydropower projects- A Scoping Study* , Vattenfall Power Consultants AB, Sweden, July 2007

Box 1: Approach to encompass Climate Change aspects in Hydro Projects Design

The Vattenfall report provides the following guidelines:

- Do baseline planning assessments based on available solid information. Conduct standard trend analysis for exiting hydrological records. This is empirical evidence and does not have a dependency on modeling.
- Obtain detailed scenario projections for the particular region from global climate models or regional models if available.
- Generate runoff scenarios with deterministic hydrological models, which can account for non-linear dynamic responses. Focus on quantity (annual volumes), seasonal distribution and variability as the main outputs. Also assess potential changes in environmental flow requirements.
- If the outputs of climate models are insufficient (or even as a control measure), revert to the use of statistical models. The scaling of the key variables such as total precipitation should be proportionate to the changes predicted by the GCMs.
- **Either** calibrate a statistical model to observed rainfall sequences and then change the key parameters such as the mean and coefficient of variability, to generate optional scenarios of possible rainfall sequences, as input to deterministic models **Or** calibrate a statistical model directly on the observed runoff records and change key variables to generate possible resulting runoff scenarios.
- Use the outputs from the above in simulation models and apply probabilistic techniques for assessing the impacts of the various flow scenarios on water resource systems and hydropower schemes It is important to include the other and competing water uses in such simulations This will then allow an assessment of the impacts on the hydropower Plant and reservoir operating rules and hence on the potential for water yield and hydropower generation
- Carry out the economic and financial analyses.
- Adopt an adaptive management approach with regular monitoring, evaluation and reviews, with possible redesign of the management program as necessary. This needs to be based on a solid set of indicators
- Design changes may be needed for spillway capacities, outlet structures etc
- Sediment transport, domestic and agricultural water withdrawals, and environmental flow needs may all be affected by major changes in hydrological regime and need to be kept in view

Vattenfall (2007) *Addressing Climate Change-Driven Increased Hydrological Variability in Environmental Assessments for Hydropower Projects – a Scoping Study.* Prepared for the World Bank.

6.10 Hydraulic Studies

The following shall be performed, inter alia:

Review of existing documentation to be provided by the Government/Barki Tajik.

Flood routing of the probable maximum flood through the reservoir to establish the discharge capacity of the spillway, operating rule of the reservoir, and water levels downstream of the dam/spillway

The Consultant shall provide the model, methodology, criteria and calibration used in the flood routing. The spillway capacity must be available at all time to discharge the design/probable maximum flood during lower and final stage of the dam.

Backwater studies to determine maximum water level at full reservoir level and its location, and maximum distance from the axis of the dam.

Reservoir sedimentation studies including methodologies, sediment characteristics, sediment volume, sediment accumulation profile in the reservoir, profile/elevation of sediment at the upstream face of the dam, determination of reduction of the dead and useful reservoir/live storage/volume as a function of time (years, e.g. 50 years) after commencing the operation of the reservoir, reservoir area and volume curves versus water reservoir elevation. The Consultant shall assess possible sediment reduction by various methods of reservoir flushing.

The reservoir area/elevation and volume/elevation should be presented on the basis of these studies

All the scope of work, including findings, analysis and calculations, carried out shall be presented in the report on hydraulics of the Project.

6.11 Reservoir Operation Simulation Studies

For each project alternative including stages of Project implementation, the Consultant shall, inter alia:

Carry out reservoir operation simulation using the latest reliable hydrological data available for the longest period of months.

Estimate the operating reservoir levels (minimum, normal and maximum). Use latest tail water rating curve available, and if not, develop the rating curve.

Run Rogun reservoir simulation and multi reservoir simulation of Rogun with other HPPs combined. The Rogun Project development may improve operations of downstream HPPs. The Consultant shall assess and describe the impacts of Rogun on said HPPs. The simulation should consider the dam construction and installed capacity in stages.

The reservoir operation and simulation studies for the power and energy analysis shall be presented in a report along with the model/methodology, criteria and data used and the analysis of the results.

The reservoir operation studies shall be based on Nukus Declaration (September 5, 1995). The Consultant will provide simulation of analysis of possible operating regimes of Roghun Reservoir over 50-60 years. These scenarios will be described in terms of economic, financial, environmental and social impacts.

The Consultant shall prepare a phasedreservoir filling schedule in accordance with the construction stages. These scenarios should be assessed in terms of economic, financial, environmental and social impacts.

The Consultant shall review, in the light of international experience, possible institutional arrangements (e.g., a reservoir management commission with multi-country representation) for monitoring reservoir operation and regimes for ensuring compliance with the prescribed operating regime. The options should be described in terms of strengths and weaknesses. The Consultants shall identify preferred institutional arrangements both in respect of initial filling schedule and in respect of the regular operation of Rogun HEP.

6.12 Power and Energy Analysis

Since all power in excess of the power demand in Tajikistan is destined for exports (mainly to South Asia) the objective function of the energy analysis is to optimize energy output consistent with the reservoir operation regime discussed earlier in section 6.11

As part of the reservoir simulation study and based on the long term load forecast (power and energy) as well as detailed information of other generation sources in Tajikistan (with costs, capacities, capabilities and restrictions) and sources of power imports and power exports (costs and availabilities) as provided by the Government/Barki Tajik, the Consultant shall identify the place and role of Rogun HPP (base load, peak load, etc) within the electric power system of Tajikistan and between Tajikistan and present and foreseen electric power interconnections to export markets.. The power and energy analysis should consider the dam construction and installed capacity in stages.

The Consultant shall discuss several export scenarios with the Government/Barki Tajik, and provide technical, economic, financial, and operational analysis of the scenarios involving exports to such markets as with Afghanistan and Pakistan.

The Consultant shall simulate the energy generation for all Project options, and shall determine firm and secondary energy for the full potential of a given site.

The Consultant shall optimize the power/capacity and number and size of generating units to be installed in Rogun whether it is in one stage or by stages.

The power and energy studies shall be presented in a report along with the model/methodology, criteria and data used, and the analysis of the results.

6.13 Engineering Design

Review of existing documentation to be provided by the Government/Barki Tajik.

The Consultant shall carry out design at the project definition level. It shall prepare design criteria and memoranda and lay out drawings.

The determination of alternative layout and design shall go hand in hand, and shall include various dam types and height/reservoir capacity and mode of operation of the power plant with respect to base load and peaking, reservoir and flow management, environmental mitigation and volume in the reservoir to absorb floods, and the construction of Rogun dam and installed capacity in stages.

Based on the results of the technical designs and the various cost elements derived, an optimization of the layout and of its various components shall be carried out.

Project definition design shall be carried out and drawings prepared based on field investigations and optimization performed. The optimization shall include, among others, the reservoir size, the dam height, development stages, the spillway design capacity and size, the waterways (intake type and size, headrace pressure tunnel length and cross-sectional area, surge chamber, pressure shaft, penstocks, valves, major mechanical (turbine capacity and number of turbines), electrical equipment (generators, transformers), gross and net operating heads, power house cavern, tailrace, etc.

The design and drawings shall cover all major components of the dam, spillway, intake, bottom outlets, tunnels, penstocks, river diversion during construction, power station, installed capacity and number and size of generating units, hydraulic, electrical and mechanical equipment, etc.

The layouts and design shall include, but will not be limited to the following:

River diversion works (cofferdams, diversion tunnel, etc.)

Dam, spillway (cranes, gates, etc.), including optimization of the spillway (number of bays, type and size of gate, etc.)

Waterways:

Intake with trash racks, stop logs, gates, hoists, sediment traps,
Facilities for ecological discharge from the reservoir
Head race pressure tunnel, rock and sand traps
Penstocks
Surge chamber and pressure shaft
Valves, etc.
Tailrace: draft tubes, gates surge arrangements, tailrace tunnel, gates, cranes, etc.

Power House

Civil works
Mechanical equipment such as turbines, governors, cooling system ventilation, drainage, cranes, etc.
Electrical equipment such as generators, transformers, switch gear, auxiliary power supply, power cables, control cables, communication, protection and control equipment, switchyard, control room, etc.

Stability Analysis

The structural analysis is intended to determine the integrity of the dam and structures under standard loadings and other loadings. These include dead load, maximum reservoir water level, downstream water levels, internal pressures, foundation uplift, backfill/sedimentation, earthquakes, etc.

For type of dam considered/selected, the corresponding stability analysis shall be performed.

The engineering design shall be presented in a report, including findings, design memoranda, calculations, analysis, and optimization of the Project components

6.14 Infrastructure

Review of existing documentation to be provided by the Government/Barki Tajik

Analyze access to project site by roads, offices, workshop, housing facilities, electric power, recreation areas and provisional installations such as construction camps, contractor's plants, borrow areas, etc., and establish the infrastructure that will have to be implemented for the Project.

6.15 Transmission System Associated with Rogun HPP and Export of Electricity

Review of existing documentation to be provided by the Government/Barki Tajik.

The Consultant shall evaluate the alternatives for linking Rogun HPP to the national grid and to neighboring countries such as Kyrgyzstan, Afghanistan, and Pakistan. To make his own assessment of the Tajikistan transmission system's capacity and ability to transport Rogun power to major Tajik consumption centers and neighboring countries, the Consultants shall utilize system expansion plans and feasibility studies for system expansion and rehabilitation, as provided by the Government/Barki Tajik Similarly, the Consultant shall make his own assessment of the transmission system's capacity and ability to export Rogun power to said countries on the basis of system expansion plans and feasibility studies provided by the Government/Barki Tajik. These alternatives should be considered in conjunction with the CASA 1000 HVDC transmission line project to access the power markets of Afghanistan and Pakistan and its expansion plans.

The Consultant shall prepare the corresponding transmission plans on a least cost basis to evacuate electricity produced from Rogun HEP into the domestic market as well as to the export markets.
The transmission system findings and studies should be submitted in a report.

6.16 Cost Estimate of each Rogun HPP Alternative

The Consultant shall prepare a project definition stage cost estimate separate for each alternative option for the Rogun HPP with break down in local and foreign currency. The cost estimate should be prepared on the basis of prevailing market prices. The reference price level and exchange rate(s) should be provided. The civil works prices should be derived specifically for the project taking into account construction methodology and cost for construction equipment, local labor, materials, etc. For all equipment, the prices should be based on collected information from potential suppliers. An estimate for engineering, supervision, administration, legal costs, land acquisition, resettlement, environmental, etc. shall be included along with the basis for their estimate. The criteria for estimating physical contingencies for the various project components and the price escalation during construction shall be provided. It shall cover also, among others, hydraulic and structural model tests; topography and mapping; geological, geotechnical and geophysical field investigations, etc. Financing charges during construction shall be included along with the criteria used in their calculation.

The sunk cost estimate of existing works should be shown separately.

If the dam and installed capacity are to be built in stages, the estimate for each stage should be presented.

The Consultant shall estimate the annual operation and maintenance costs of each alternative.

The cost estimate of the various alternatives and of the selected one shall be presented in a separate report.

6.17 Implementation Schedule

The Consultant shall prepare an implementation schedule for each alternative of Rogun HPP so that a cash flow can be developed for consideration in the economic and financial analysis. This schedule shall define, among others, the preconstruction activities, including access and transportation route and method, contract packaging, location of borrow areas for construction materials, construction methodologies, construction equipment, construction labor force requirements, construction camp and site infrastructure, and office facilities, environmental requirements and population resettlement activities. The critical activities and the critical path of activities in the schedule shall be illustrated in the schedule.

The implementation schedule for each dam stage and installed capacity phase should be presented.

The implementation schedules shall be presented in a separate report accompanied by the necessary explanation, analysis, recommendation, etc.

6.18 Economic Analysis

The Consultant shall prepare: (a) a national electricity demand and supply analyses using an appropriate, internationally recognized methodology acceptable to GoRT and the World Bank, and this methodology should be agreed at the Inception Report stage; (b) a least cost generation expansion program to meet the domestic demand and (c) the Average Incremental Costs of the electricity produced at Rogun HPP in comparison with other generation alternatives, including small hydro. Please see Attachment 3 for details of parts (a) and (b) of this subtask.

The Consultant shall carry out the economic analysis for each Rogun alternative taking into account the national demand and planned exports and the costs and benefits identified. Indicators such as Net Present Value (NPV), Benefit Cost (B/C) Ratio, and Economic Internal Rate of Return (EIRR) shall be calculated. Sensitivity analysis shall be applied on important parameters in order to check in order to check their impact on the viability.

The analysis shall be based on domestic and export energy prices (plus sensitivities) to be agreed with the Government/Barki Tajik.

The economic impact on downstream HPPs such as Nurek from having an upstream Rogun reservoir should be included in the economic analysis. The impact should also be analyzed and presented separately, considering the option that the ownership of Rogun and other Vaksh River HPPs may be different.

The Consultant shall provide the model applied in the analysis including description of the methodology and criteria used. The cash flow estimate based on the relevant alternative implementation schedule shall be used in this analysis.

The complete economic analysis shall be presented in a separate report.

6.19 Financial Analysis

The Consultant shall carry out the financial analysis of Rogun taking into account the national demand and planned exports and the costs and benefits identified. In general, the financial analysis should evaluate the commercial merits of the alternative under alternative power market conditions such as only the national market, a combination of the national market and export, ownership models, financial packages, fiscal regime.

The complete financial analysis shall be presented in a separate report including the model applied in the analysis including description of the methodology and criteria used. The cash flow estimate based on the relevant alternative implementation schedule shall be used in this analysis.

6.20 Risks Evaluation/Assessment and their Mitigation

The Consultant shall identify risks associated with the construction and operation and maintenance of each Rogun alternative and of the combined operation and maintenance of Rogun with other HPPs in the Vaksh River. The identification of risks shall include, among others: topography, hydrology, geology/geotechnical, seismic, material investigations, power and energy/plant performance, construction costs, construction schedule, dam construction and installed capacity in stages, economic and financial aspects.

The Consultant shall prepare the outlines of an Instrumentation Plan to monitor the behavior of the Dam through its life time and an Emergency Preparedness Plan for the contingency of dam failure.

The risk simulations methods shall be presented.

The means/actions/measures to minimize the impact of each risk shall be presented.

6.21 Project Definition Report

(A) The consultant shall prepare and submit the report which shall present the substantiated recommendation of the project configuration for which the feasibility study should be carried out based on the alternatives assessed with regard to dam height, dam type, reservoir operations regime and reservoir filling.

(B) The report shall comprise as a minimum:

An executive summary in Russian and in English

Separate reports for:

Methodology adopted

Infrastructure (roads, office building, accommodation, electricity, water, etc.) of the Project

Confirmation of Dam Site

Selection of Dam Type and Height and Construction by Stages

Confirmation of Powerhouse Site (caverns)

Confirmation of installed power capacity

Description of each Rogun HPP Alternative

Topography and mapping

Geological, Geophysical, Geotechnical

Seismicity and Seismic Studies

Construction Materials

Meteorological and Hydrological Studies

Climate change aspects

Hydraulic Studies

Reservoir Simulation and Power and Energy Studies

Reservoir operating regime

Legal Framework analysis underpinning the operation of this multi-year regulatory reservoir in the Amu Darya Basin (taking into consideration such treaties and regulatory documents as have been approved by the Government of Tajikistan).

Engineering Design and Optimization

Cost Estimate and Financial Requirements

Implementation Schedule

Initial reservoir filling schedule

Transmission studies

Economic Analysis

Financial Analysis

Risks Evaluation/Assessment and their Mitigation

Instrumentation Plan for monitoring the behavior of the Dam and an Emergency Preparedness Plan for the contingency of dam failure as envisaged in Annex A to BP 4.37 of the World Bank

Actions to be taken

Comments to the Terms of Reference for the Feasibility Study

Required maps, drawings, figures, tables, etc. to illustrate the technical solutions

7. PHASE III. ASSESSMENT OF THE SELECTED ROGUN SCHEME

After the approval by Government/Barki Tajik of the Project Definition report (prepared in Phase II), the Consultant shall, during Phase III, prepare a complete bankable Assessment Report for the option selected in Phase II that can be presented to potential investors, developers, donors and lenders for the financing and implementation of Rogun HPP. The scope of work for Phase III will be confirmed after the results of Phase 0, I and II and by agreement with the Government of Tajikistan and the World Bank. The bidder is advised to provide the costs for phase 3 separately in the relevant sections of the financial proposal.

The Consultant shall:

- include in the report all data and information compiled under Phase II, Project Definition for the selected alternative
- complement as necessary the scope of work of the tasks listed under Phase II, to gather all required information and data for the Phase III report
- carry out all studies, field investigations, and other activities as required at detailed assessment level.

- perform the design, layout and optimization of each Project component

7.1 Infrastructure

The Consultant shall establish the plan to implement the required infrastructure necessary to support transport and construction activities of the Project such as: access roads to the Project site, accommodation, offices, warehouse, work shops, security, medical and educational facilities, and laboratories at the Project site.

7.2 Topographical Surveys and Preparation of Maps

The Consultant shall update all topographic surveys and maps prepared and procured by him in hard and soft copies.

The final topographic surveys and maps and studies shall be presented in a topographic report.

7.3 Geological, Geophysical and Geotechnical Investigations

The Consultant shall update all information and perform the necessary additional studies and investigations for the feasibility of the selected Project, in accordance with the scope of work for the Phase II, and other as required.

The assessment shall be carried out for the project components such as:

Reservoir (including reservoir tightness, losses if any, slope stability etc.)
Dam
Spillway and energy dissipation area
Intake area
River diversion works during construction
Headrace tunnel
Surge chamber
Power house (caverns)
Substation
Sources of construction materials
Infrastructure to the site

Major faults and features of the faults crossing the Rogun Site as well as of other geological features should be identified and analyzed.

Consultant shall prepare a Geotechnical Baseline Report (GBR) based on international guidelines[3] that presents the complete findings, analysis, investigations of the geological, geophysical and geotechnical aspects of the selected project.

[3] The GBR aims to establish a contractual understanding of the subsurface site conditions, referred to as a baseline. Risks associated with conditions consistent with or less adverse than the baseline are allocated to the contractor and those significantly more adverse than the baseline are accepted by the owner. The more clearly defined the anticipated conditions, the more easily the encountered conditions can be evaluated. Therefore, the baseline statements shall be described using quantitative terms that can be measured and verified during construction. Where the baseline has been set determines risk allocation and has a great influence on

7.4 Seismic Studies and Design

The seismic studies resulting from Phase II, Project Definition/Prefeasibility shall be revised and updated as required. The design of the works shall be performed on the basis of these results. Please refer to paragraph 6.4.

An updated report shall be presented with the complete information/data, analysis, findings, and conclusions.

7.5 Construction Materials Survey

Conduct additional surveys as required, and present an updated report on construction materials survey following the scope of work for the Phase II, Project Definition/Prefeasibility.

7.6 Meteorological and Hydrological Studies

Carry out complementary meteorological and hydrological studies and investigations necessary for the feasibility study following the corresponding scope of work under Phase II, and revise and update them, and present the report.

7.7 Hydraulic Studies

Carry out complementary studies and investigations necessary for the feasibility study following the corresponding scope of work under Phase II, and revise and update them, and present the report. The updated calculations shall be used to dimension and optimize the hydraulic structures such as cofferdams, dam, spillway, bottom outlets, river diversion during construction, waterways, etc.

7.8 Hydraulic Model Tests

The Consultant will propose to carry out hydraulic model tests for the performance of the spillway and the energy dissipation arrangements downstream of the dam. The model studies shall be carried out in a well recognized and reputed laboratory. The efficiency and features of the spillway and spillway channel over the entire range of discharges/flood flows shall be established.

Other model studies may be carried out; for example: operation and efficiency and features of the bottom outlet, intake, etc.

The activities connected with the model studies and the presentation of the corresponding reports shall take into account the period of preparation and presentation date of the bidding documents that include said components.

7.9 Structural Model Tests

The Consultant may propose to carry out these tests for the dam. The activities connected with the tests, and the presentation of the corresponding reports shall take into account the period of preparation and presentation date of the bidding documents that include the dam.

7.10 Reservoir Operation Simulation Studies

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risk acceptance, bid prices, quantity of change orders and the final cost of the project. For example "ASCE 2007, Geotechnical Baseline Report for Construction – *Suggested Guidelines"*

The Consultant shall prepare these studies specifically for the project subject of the feasibility study. It shall follow the scope of work applied in Phase II and improvements thereof. The studies shall be done for Rogun alone and Rogun combined with other HPPs in the Vaksh River such as Nurek. A Rogun project development may improve operations of Nurek and other downstream HPPs. The Consultant shall assess and describe the impacts (positive and negative, if any) from Rogun on other HPPs. The simulation should consider the dam construction and installed capacity in stages.

The Rogun reservoir operation and simulation studies for the power and energy analysis shall be presented in a report along with the model/methodology, criteria and data used, analysis of the results, conclusions and recommendations.

The Consultant shall prepare an initial reservoir filling schedule spread over several years in such a manner that the downstream riparian states are not adversely affected.

7.11 Power and Energy Analysis

The Consultant shall develop the Long-Term demand and supply forecasts on the basis of agreed methodology with and without the project (refinement of work done in 6.18 Economic Analysis Phase III, Project Definition).

The Consultant shall revise and update the studies carried out in the Project Definition phase including optimization of installed capacity, unit type, size and number; confirmation of the mode of operation of the power plant (base load/peak load) within the electric power system; and calculation of the annual firm and secondary energies.

The Consultant shall optimize the power/capacity and number and size of generating units to be installed in Rogun whether it is in one stage or by stages.

The power and energy studies shall be presented in a report along with the model/methodology, criteria and data used, and the analysis of the results.

7.12 Engineering Design

The Consultant shall carry our design at the level of feasibility level. It shall prepare design criteria and memoranda and layout drawings.

The design shall be carried out and drawings prepared based on field investigations and optimization of the various components of the Project. The staged construction should be considered in the design.

The optimization shall include, inter alia, the reservoir size and operating water elevations, the dam height and type, the spillway design capacity and size, the waterways (intake type and size, headrace pressure tunnel length and cross-sectional area, surge chamber, pressure shaft, penstocks, valves, major mechanical (turbine capacity and number), electrical equipment (generators, transformers), operating head, power house, tailrace, etc.

The design and drawings shall cover all major components of the dam including instrumentation, spillway, intake, bottom outlets, river diversion during construction, power station, installed capacity and number and size of generating units, electrical and mechanical equipment, and transmission.

The layouts, design and drawings shall include, but will not be limited to the following:

- Infrastructure
  Finalize the design for works needed for access to project site by roads, offices, workshop, housing facilities, electric power, recreation areas and provisional installations such as construction camps, contractor's plants, borrow areas, etc.

- River diversion works (cofferdams, diversion tunnel, etc.)
  Dam, spillway (cranes, gates, etc) The spillway capacity must be available at all time to discharge the design/probable maximum flood during lower and final stages of the dam.

- Waterways:
  Intake with trash racks, stop logs, gates, hoists, sediment traps
  Facilities for ecological discharge from the reservoir
  Head race pressure tunnel, rock and sand traps
  Surge chamber and pressure shaft
  Penstocks
  Valves, etc.
  Tailrace: draft tubes, gates, surge arrangements, tailrace tunnel, gates, cranes, etc.

- Power House (cavern)
  Civil works
  Mechanical equipment such as turbines, governors, cooling system ventilation, drainage, cranes, etc
  Electrical equipment such as generators, transformers, switch gear, auxiliary power supply, power cables, control cables, communication, protection and control equipment, switchyard, control room, etc.

- Stability Analysis

The Consultant shall carry out a dam stability analysis of the selected dam type, location and height in accordance with a Method to be proposed by him and agreed with the Client at the Inception Stage.

The structural analysis is intended to determine the integrity of the dam and structures under standard loadings and other loadings. These include dead load, maximum reservoir water level, downstream water levels, internal pressures, foundation uplift, backfill/sedimentation, earthquakes, etc.

The engineering design shall be presented in a report, including findings, design memoranda, calculations, analysis, optimization, and drawings of the Project components.

7.13 Transmission System Associated with Rogun and Export of Electricity

The Consultant shall perform all the necessary studies and investigations related to the feasibility of the Rogun transmission system to the national grid and proposed interconnections with other countries. Please refer to paragraph 6.13. The corresponding report shall be presented.

7.14 Drawings

Drawings shall be elaborated so that they can be readily converted into bidding documents drawings at the time of design for bidding documents. A volume containing the drawings shall be presented.

7.15 Quantity Estimate

The Consultant shall prepare a detailed quantity estimate of the civil works and equipment of the various components of the Project, taking into account that they may be used in bidding documents. If the Project is to be built by stages, the quantity estimate should be presented for each stage.

The corresponding report shall be presented accompanied by explanations and sources of the estimate and drawings used.

7.16 Cost Estimate

The Consultant shall prepare a feasibility cost estimate for the Rogun HEP with a break down in local and foreign currency. The cost estimate should be prepared on the basis of prevailing market prices. The reference price level and exchange rate(s) should be provided. The civil works prices should be derived specifically for the project taking into account construction methodology and cost of construction equipment, local labor, materials, insurance, etc. For equipment, the prices should be based on collected information from potential suppliers. An estimate for engineering, supervision, administration, legal costs, land acquisition, resettlement including compensation for loss property and loss income, construction of social infrastucture, environmental, etc. shall be included along with the basis for their estimate. The criteria for estimating physical contingencies for the various project components and the price escalation during construction shall be provided. It shall cover also, among others, hydraulic and other model tests. Financing charges during construction shall be included along with the criteria used in their calculation.

If the dam and installed capacity are to be built in stages, the estimate for each stage should be presented.

The cost estimate for civil works and equipment shall be prepared following the format to be used for the bidding documents.

The Consultant shall estimate the annual operation and maintenance costs of Rogun HPP

The cost estimate shall be presented in a separate report, providing methodology, criteria, analysis, etc. accompanied by tables and graphs.

7.17 Procurement Planning

Prepare a procurement strategy for Rogun HPP to define the contract lots/packages for the civil works and for the electrical and mechanical equipment accompanied by the justification thereof. Pre-qualification shall be taken into account for major contracts for civil works and electrical and mechanical equipment. Procurement planning should be done for each stage as required.

A separate report shall be presented for procurement planning, furnishing criteria, analysis of options, justification of the selected option, etc.

7.18 Implementation Schedule

Prepare an implementation schedule for Rogun HPP based on the lots/packages resulting from the procurement strategy so that a cash flow can be developed for consideration in the economic and financial analysis. This schedule shall define the preconstruction activities, including access and transportation route and method, location of borrow areas for construction materials, construction methodologies, construction equipment, construction labor force requirements, construction camp and site infrastructure, and office facilities, environmental requirements and population resettlement activities. The critical activities and the critical path of activities in the schedule shall be illustrated in the schedule.

If the dam and installed capacity are to be built in stages, the schedule for each stage should be presented.

The construction process for each stage should be described.

Prepare an implementation schedule for the associated transmission system to the national grid. On the basis of information from system expansion plans and feasibility studies for system expansion and rehabilitation agreed with the Government/Barki Tajik, (see paragraph 7.13.)

The schedules shall be presented in a CPM – Gantt charts accompanied by the corresponding explanations and criteria used in their preparation.

7.19 Economic Analysis

The economic analysis for the selected Project should be carried out in detail from three perspectives: macro economic impact; sectoral analysis; and project analysis.

Macro Economic Impact. This should analyze the:

(a) revenues that would accrue to the Government through: (i) value added taxes; (ii) other taxes and levies as contributions to specific funds (e.g. Social Fund); (iii) corporate taxes; (iv) municipal taxes; (v) custom duties and excise levies on equipment and services imported/purchased; (iv) guarantee/on-lending margins charged by the Government;

(b) impact on Government overall debt and debt service position; and

(c) employment generation, regional development, betterment of people directly affected, etc. both in Tajikistan and riparian countries, taking into consideration impacts on ecosystem services where possible (drawing from the ESIA).

Sectoral/Market Analysis. Economic aspects of the targeted markets: demand projections for the target country for the length of the project period (minimum 30 years); supply options the target country has in terms of its own or alternative options to meet the projected electricity demand; the competitiveness of the Project vis-à-vis the target country's marginal cost of generation; the share of the Project in meeting the power capacity demand and share of the Project in meeting electricity demand; and

Project Level Analysis. The economic analysis of Rogun taking into account the national demand and planned exports and the costs and benefits identified. Indicators such as Net Present Value (NPV), Benefit Cost (B/C) Ratio, and Economic Internal Rate of Return (EIRR) shall be calculated. Sensitivity analysis shall be applied on important parameters in order to check their impact on the viability of the Project. The analysis shall be based on an energy price and sensitivities to be agreed with the Government/Barki Tajik.

The Consultant shall provide the model applied in the analysis including description of the methodology and criteria used. The cash flow estimate based on implementation schedule shall be used in this analysis.

7.20 Financial Analysis

The Consultant shall carry out the financial analysis of Rogun based on national demand and planned exports and the costs and benefits identified. In general, the financial analysis should evaluate the commercial merits of the Project under several power market scenarios such as only the national market, a combination of the national market and export, ownership models, financial packages, fiscal regime. Scenarios with varying financial schemes should include financing by the Government/Barki Tajik, by

private investors, international financing institutions, commercial lending, carbon credit financing, and others.

Financial projections of Rogun shall be prepared including the period of implementation of the project and up to five years after its commissioning. The projection shall include sources and applications of funds.

The Consultant shall provide the model applied in the analysis including description of the methodology and criteria used. The cash flow estimate based on the implementation schedule shall be used in this analysis.

7.21 Export Market Analysis

Rogun power and energy is planned to be exported to other countries for reasons related to the Rogun HEP production characteristics.

The Consultant shall study the electricity balances of neighboring countries or countries in other regions. The Consultant shall also assess the electricity markets of these countries to verify the practicality of the export objective of the project.

The Consultant shall also carefully review the impact on, and implications to, the operation of the Central Asian Power System of such export orientation of the project.

7.22 Rogun Project Financing

The Legal and Financial Advisors to the Government would be considering several financing models for the Rogun HPP investment. Funding sources may include Government of Tajikistan, international financial institutions, commercial banks, private sector investors, and others. Various mechanisms may be employed to mitigate risks and reduce financing costs. They will be providing an overview of the various financial options available to Tajikistan and provide guidance as to their attractiveness, advantages and drawbacks.

The Legal and Financial Advisors to the Government would develop and present a road map for the steps the Government (or its agent) needs to take to mobilize financing for Rogun. This would include the specific steps to engage the potential financiers and developers of the Project as well as the approach to negotiate and obtain reliable power purchasing arrangements/agreements that would satisfy the needs of the Government, the investors/developers and the lenders to secure a cash flow from Rogun.

The Consultant shall furnish a detailed cost estimate and all the relevant technical data to enable the Legal and Financial Advisors to carry out the above mentioned tasks properly. The Consultant shall work interactively with such Advisors and provide his professional judgment on the proposed options from the technical point of view.

7.23 Risks Evaluation/Assessment and Mitigation

The Consultant shall identify risks associated with the developing of the Project, construction and operation and maintenance of Rogun HPP and of the combined operation and maintenance of Rogun with other HPPs in the Vaksh River. The identification of risks shall include, among others: topography, hydrology, geology/geotechnical (including potential for induced landslides), seismic (including induced seismicity), material investigations, power and energy/plant performance, construction costs, construction schedule, construction and installed capacity in stages, economic and financial aspects. Particular attention should be paid to the risks associated with dam safety and dam operation and maintenance procedures to avoid major disasters leading to the flooding of downstream areas. For this purpose the Consultant shall, among other things, prepare:

- Instrumentation Plan to monitor the behavior of the dam through its life time and a plan for such monitoring as envisaged in Annex A to BP 4.37 of the World Bank entitled "Dam Safety Reports: contents and timing"

- An Emergency Preparedness Plan to cover the contingency of dam failure as envisaged in the above mentioned Annex A to protect the people, property, animals, heritage sites, national treasures etc in the downstream areas in the Amu Darya basin. This should also include an early warning system and communication plans.

Consultant shall prepare a Risk Register differentiating among:
- Risks associated with design assumptions and approach;
- Risks associated with proposed construction methodology/ sequencing;
- Risks associated with construction activities;

For each set of risks, the Register shall assess and quantity:
- Events associated with the specific hazard;
- Assessment of probability of occurrence;
- Potential consequences;
- Preventive and/ or mitigation measures;
- Contractual entity who, in the Consultant's opinion, is best placed to take responsibility for costs and delays associated with the specific risk.

The risk simulations methods shall be presented.

7.24 Assessment Report

The report shall be prepared to comprise as a minimum the following on the basis of the Terms of Reference and the work carried out:

Executive Summary

Introduction

Interrelation of the proposed project with existing and future projects

Methodology adopted

Individual reports as follows:

Infrastructure

Confirmation of selected Dam Site,

Selection of Dam Type and Height and Construction Stages

Confirmation of Powerhouse Site

Topography and mapping

Geological, Geophysical, Geotechnical

Seismicity and Seismic Studies

Construction Materials

Meteorological and Hydrological Studies

Climate Change Impact and Mitigation

Hydraulic Studies

Hydraulic Model Studies

Structural Model Studies

Reservoir Simulation and Power and Energy Studies

A legal framework analysis for the operation of this multi-year regulatory storage in the Amu Darya basin

Engineering Design and Optimization

Cost Estimate and Financial Requirements

Implementation Schedule

Initial reservoir filling schedule

Reservoir operating regime and institutional arrangements for ensuring adherence to the prescribed regime

Procurement Planning

Economic Analysis

Financial Analysis

Export Market Analysis

Project Financing

Risks Evaluation/Assessment and their Mitigation

An Instrumentation Plan to monitor the behavior of the dam through its life time and a plan for such monitoring as envisaged in Annex A to BP 4.37 of the World Bank entitled “Dam Safety Reports: contents and timing”

An Emergency Preparedness Plan to cover the contingency of dam failure as envisaged in the above mentioned Annex A.

Actions to be taken

Required maps, drawings, figures, tables, etc., to illustrate the technical solutions

8. PHASE IV: PREPARATION OF DOCUMENTS

A fourth phase of the project may be exercised subject to the findings of the assessments, the opinions of the Panels of Experts, and funding. The specific tasks for this phase will be determined after completion of Phase III and the ESIA. Phase IV is also subject to World Bank funding and no objections on contract extension. The Consultant is not required to provide methodology nor cost estimate for Phase IV in their proposal.

9. OUTPUTS AND DELIVERABLES

a) Stage 1 Assessment

The present terms of reference have been prepared for assisting GoT in developing the hydropower potential of the Rogun site in an optimal manner. In order to achieve that goal, the Consultant will have to take into account the following stage 1 option:

Before raising the dam to the final design height, a Stage 1 project is planned by the GoT coincident with the completion of technical, environmental and social studies, riparian consultation and financial arrangements for the final project design. This Stage 1 would comprise raising the embankment dam to level 1,060 m above sea level (70 m dam height), with operating water level at 1,055 m above sea level; it would entail the completion of intake structure and hydro-tunnels, as well as the installation of the first two 600 MW units with replaceable runners . The operation of this stage would be quasi run of the river with a reservoir capacity of well below 250 Mill m^3. The units would yield a maximum capacity of 120 MW each due to the low water head.
The Consultants will assess the feasibility of the proposed use of the 600 MW units with temporary runners during Stage I of the project, operating to a maximum capacity of 120 MW a much lower head (about 70 m), and then replacing the temporary runners with the permanent runners for operation with a much greater head (325 m) during Stage II of the project. Implications on civil works modification, equipment efficiency, and increased erosion effects should be examined up-front before proceeding to further detailed analysis, if warranted. Should the priority analysis reveal that the idea is worth more detailed studies, the Consultants will cover technical and cost implications of proposal, including the changes to be made in the units and the associated civil works for Stage II.

The Stage 1 option should be designed in such a way to allow future rising of the dam, and adaptation of associated works (river diversion, foundation construction, vertical waterways layout, extraction of the ground, etc.), to develop the site further.

The Consultant will have to undertake tasks described under phases 0, I, and II as related to the above described option. In particular:

1. Review and Analysis of Vakhsh River Master Plan
2 Topographic Surveys and Preparation of Maps
3 Geological, Geophysical and Geotechnical Investigations
4 Seismic Studies
5 Construction Materials Survey
6 Meteorological and Hydrological Studies

7 Climate Change Impact Assessment
8 Hydraulic Studies
9 Power and Energy Analysis
10 Engineering Design
11 Infrastructure
12 Transmission System Associated with Rogun HPP and Export of Electricity
13 Cost Estimate of the Mini Rogun alternative
14 Implementation Schedule
15 Economic Analysis
16 Financial Analysis
17 Risks Evaluation/Assessment and Mitigation
18 Project Definition Report

The Stage 1 assessment shall be developed in parallel to Phases 0, I, and II of the overall assignment. Deliverables shall be as follows:

- Preliminary Report: 6 months after Effective Dated of the Contract;
- Final report: 8 months after Effective Dated of the Contract.

The Consultant will propose a methodology for developing the studies with the inclusion of the Stage 1 option and reflect the associated costs in its financial proposal.

b) Complete Assessment

Best efforts should be made by the Consultants to complete all the work and provide all the reports envisaged for Phase 0 to the Client within 20 (twenty) weeks from the Effective Date of Contract.

Phase I work should be completed and all the reports envisaged for this Phase submitted to the Client within 12 (Twelve) weeks from the date on which the Client authorizes the Consultant to proceed to Phase I.

Phase II work should be completed and all the reports envisaged for this phase including the final Project Definition Report shall be submitted to the Client within 24 (twenty four) weeks from the date on which Phase I commenced.

Phase III work should be completed and all relevant reports including the final Assessment Report should be submitted to the Client within 40 weeks from the date on which phase I commenced.

The Consultant shall prepare and present the draft reports mentioned in Deliverables (c) and other documentation to the Government/Barki Tajik for comments and approvals. In general the Government/Barki Tajik will review them and convey its comments to the Consultant within thirty (30) days from the date it receives the reports/documents.

The Consultant shall present the final versions to the Government/Barki Tajik within thirty (30) days from the date it receives the comments.

Reports not commented by the Government/Barki Tajik within thirty (30) days after its receipt by them shall be deemed to have been approved by the Government/Barki Tajik

Deliverables

(a) Ten (10) copies of the Inception Report that shall be presented within five (5) weeks from the Effective date of Contract. The Inception Report shall provide the work plan and schedule and the annotated content of the reports for Phase I, Phase II, and Phase III.

(b) Five (5) copies of the monthly progress reports. These reports shall be provided within seven (7) days after the end of the month covered in the report. These reports shall summarize, inter alia, the Consultant's activities, highlight important aspects and actions, address specific difficulties encountered or to be expected and their solutions, progress achieved and comparison with the contractual schedule, and expenditures on various activities as per the Contract.

(c) All draft reports and final reports for Phases 0, I, II and III shall be provided to the Client in 10 copies each in the time frame indicated above.

All the reports and documents for Phase 0, Phase I, Phase II, and Phase III shall annex the engineering design memoranda, engineering calculations, economic and financial calculations, drawings, etc. In addition to the hard copies, the complete reports and annexes shall be furnished in CD in MSWord, MSExcel, and the drawings in AutoCAD, or similar versions.

c) Summery of Deliverables:

Deliverable	Schedule	No. of copies
Inception Report	5 weeks from effective date of contract	10
Phase 0 Reports	20 weeks from effective date of contract	10
Stage 1 preliminary report	24 weeks (6 months) from effective date of contract	10
Stage 1 final report	32 weeks (8 months) from effective date of contract	10
Phase I reports	12 weeks after authorization tp proceed with Phase I	10
Phase II reports including Project Definition Report	24 weeks after authorization tp proceed with Phase I	10
Phase III reports	40 weeks after authorization tp proceed with Phase I	10
Monthly progress reports	7 days after end of reporting month	5

d) All reports and deliverables should be provided in English and Russian with, (approximately) equal number of each within the required numbers noted above.

10. CONDUCT OF THE WORK

The Consultant shall provide overall management on all aspects of the work/services. The Consultant shall nominate a Project Manager and a Deputy Manager (during all times of unavailability of the former) to liaise with the designated representative of the Government/Barki Tajik. All contractual matters shall be channeled through these persons.

The Consultant shall also provide the necessary level of independent quality assurance and control of the work.

The Consultant staff shall work closely with the Government/Barki Tajik staff assigned to the work, and shall coordinate as needed with other consultants working in other aspects of the Project and with the Engineering/Dams Safety Panel of Experts

The Consultant shall be fluent in English and have staff with knowledge of Tajik or Russian, or both.

The standards for design and construction and for materials and equipment shall be those of recognized agencies in Tajikistan and of those of recognized international agencies.

The Consultant shall implement his internal quality control and assurance procedures during the execution of the Contract, and shall demonstrate that they are being applied to his work.

The Consultant shall provide all facilities, including office equipment (computers and software, etc.) and vehicles required for the work.

Additional investigations works and above those included in the Contract for essential project investigations such as but not limited to topographic surveys and mapping; geological, geotechnical and geophysical; hydraulic and structural model testing and studies; shall be undertaken through the Contract with prior consent of the Client.

The Consultant shall fully cooperate with the consultants contracted to carry out the Environmental and Social Impact Assessments (ESIA) and work with them in an interactive manner.

The Consultant shall coordinate with the ESIA consultant during all relevant phases of the services to ensure that both consultant teams have all necessary information from each other to facilitate the high quality execution of both assignments. The Consultant shall assist and supplement the Government/Barki Tajik and the ESIA consultant as necessary for their consultation with stakeholders.

The Consultant shall provide information to and meet as necessary with the consultant for the Environmental and Social Impact Assessment.

11. PARTICIPATION OF THE GOVERNMENT/BARKI TAJIK

The Government of Tajikistan will appoint a Project Manager/Coordinator during the preparation of proposals by the Consultants, and during the performance of the Consultant's services.

The Government of Tajikistan/Barki Tajik will provide for examination of the firms during the preparation of their proposals available documentation related to the Rogun HPP such as:

(a) Rogun HPP Technical, 1980, by Hydroproject Tashkent, Uzbekistan, Technical projects/documents designed in 2008-2009 by design institutes Hydroproject Moscow, Moshydrostal
(b) Existing documentation on, inter alia: topography and maps, hydrology, hydraulics, geological, geotechnical, seismic, engineering design and drawings, etc.
(c) Existing transmission system information and long-term transmission expansion plan.
(d) Soviet Government Protocol 566 of 1987.

In addition Government of Tajikistan will:

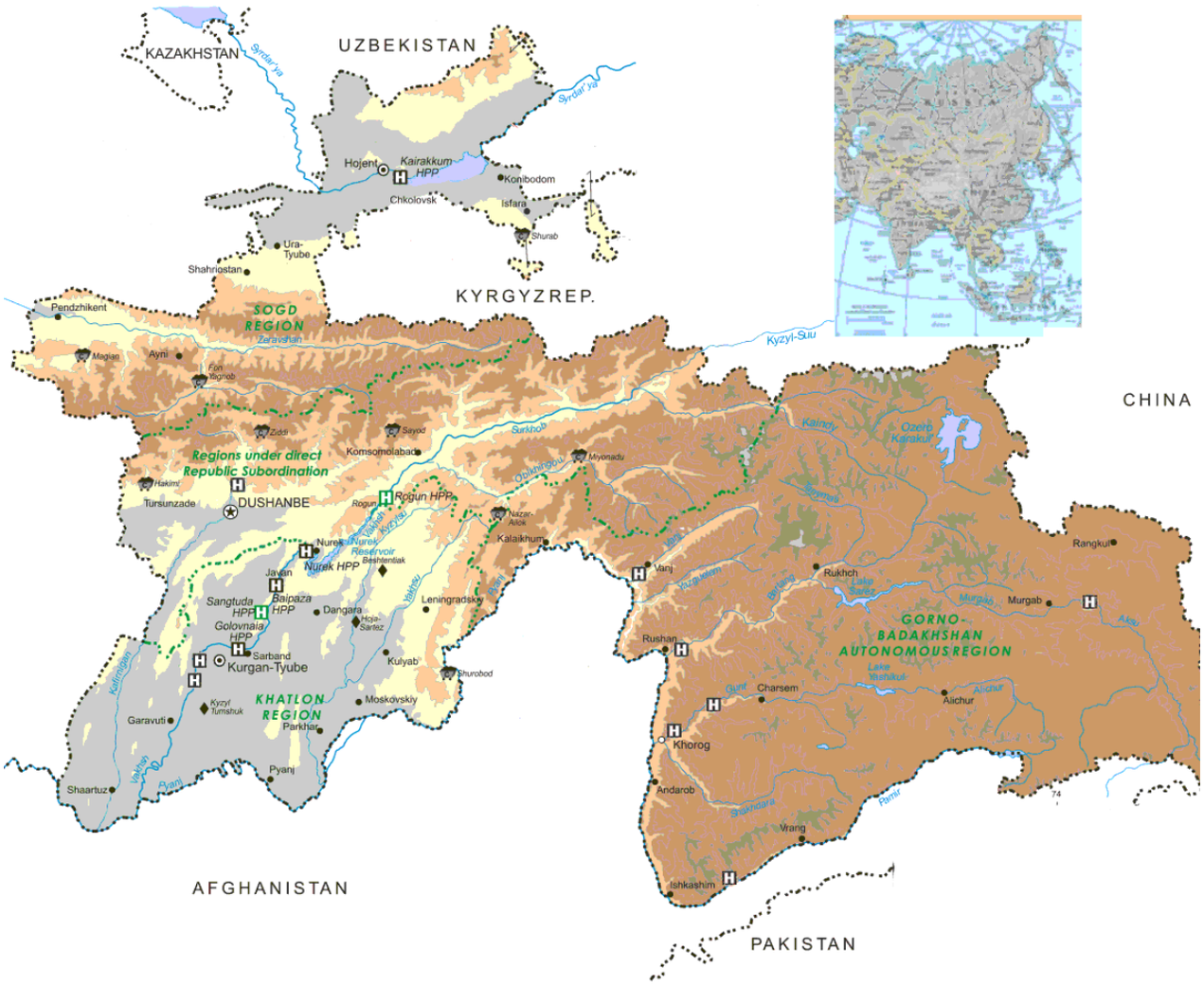
(a) Ensure access to the Rogun HPP Site, to the Nurek HPP and to other HPP sites in the Vaksh River as necessary;
(b) Arrangements for meetings between the Consultant and other agencies in Tajikistan and in relevant countries (such as for energy export and interconnection);

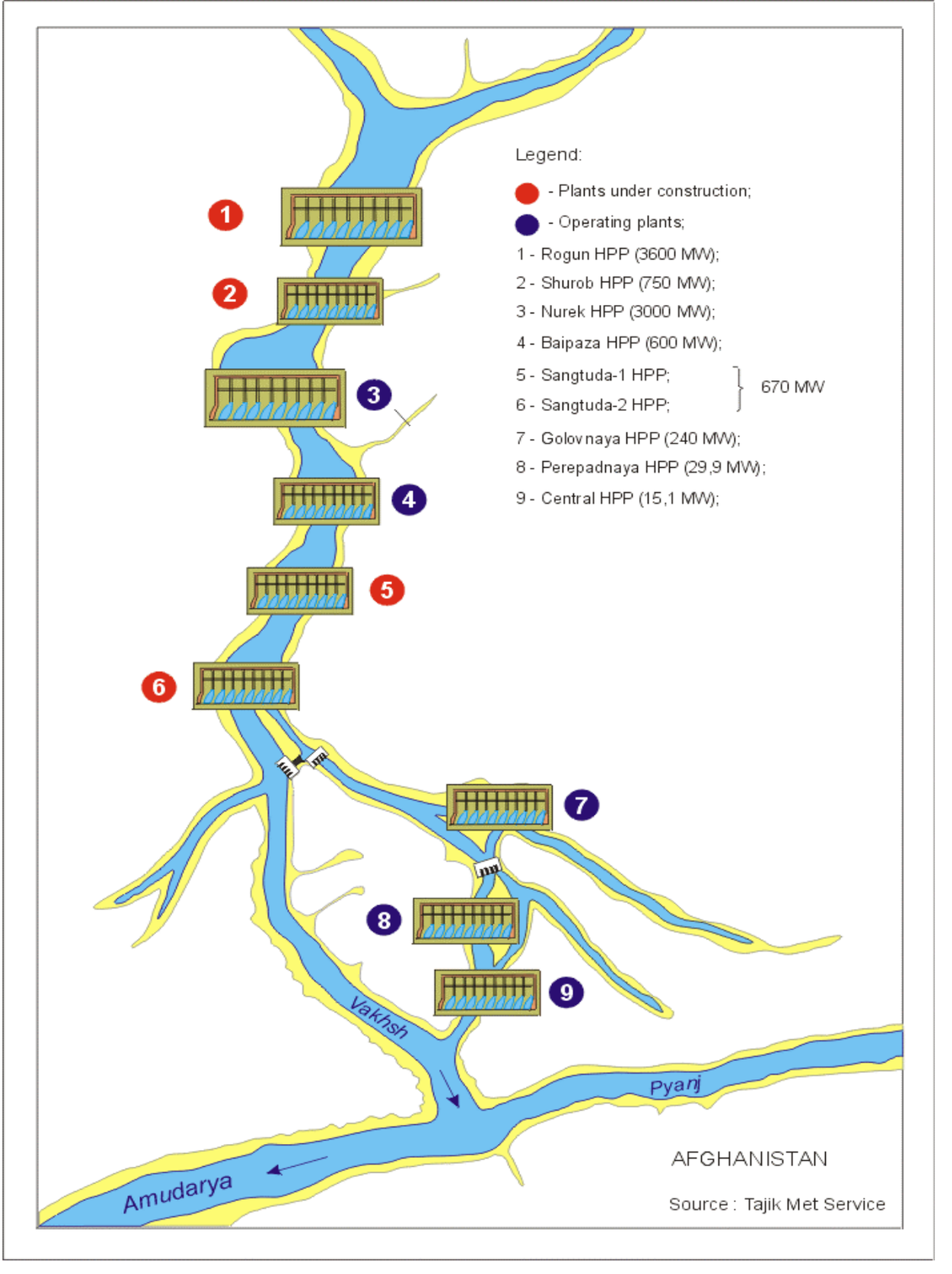
(c) Arrangements for topographic surveys; geological, geophysical and geotechnical investigations; structural and hydraulic model studies

The Government/Barki Tajik will provide above documents to the contracted Consultant for the performance of his services. For whatever services the Government/Barki Tajik cannot provide, the Consultant shall make his own arrangements in coordination with the Government/Barki Tajik.

Appendix 1

LOCATION MAP OF ROGUN HPP




Legend:
- Plants under construction;
- Operating plants;
1 - Rogun HPP (3600 MW);
2 - Shurob HPP (750 MW);
3 - Nurek HPP (3000 MW);
4 - Baipaza HPP (600 MW);
5 - Sangtuda-1 HPP;
6 - Sangtuda-2 HPP;
670 MW
7 - Golovnaya HPP (240 MW);
8 - Perepadnaya HPP (29,9 MW);
9 - Central HPP (15,1 MW);
Vakhsh
Pyanj
Amudarya
AFGHANISTAN
Source : Tajik Met Service

Appendix 2
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SALIENT FEATURES OF THE ROGUN HPP AS CONSIDERED IN 1992

Access to Project Area	Various roads
Vaksh River Flows	
Average annual flow	635 m³/sec
Maximum measured flow	3730 m³/sec
Maximum estimated discharge	5710 m³/sec
Construction Diversion Tunnel	
Length	1483+1479 (2962) m
Cross section	203 (107) m^2
Rated discharge	_____ m³/sec
Rockfill/eartfill Dam	
• Construction height	335 m
• Elevation of dam crest	1291,5 m (amsl)
• Crest length	612 m
• Thickness of dam	
(at dam base)	1500 m
(at dam crest)	20 m
Spillway	
• ___ bays with ___ gates)	__ m x __ m each
• total rated discharge capacity	3760 m³/sec
Bottom outlets	
• at ___ m elevation-	14 x 17 m diameter each
Reservoir (at normal water elevation	
• Total volume	13500 million m³
• Useful volume	10300 million m³
• Area	16750 hectares

Appendix 2
Page 2 of 2

Waterways

- Water intakes ___ m x ___ m each
  Total rated discharge 1644 m³/sec

- Headrace pressure tunnel
  - length 180 m
  - diameter 7,5 m
  - rated discharge 274 m³/sec

- Penstocks
  - length ____ m
  - diameter 7-5,7 m

Underground Power House

- Building (length x width x height in meters) B x H x 27 x 67,75 x 205,5
  Installed power capacity (MW) 3,600 MW (six units each 600 MW; Francis turbines)
- Estimated average annual generation 13,41 GWh
- Head (gross)
  - Maximum 320 m
  - Minimum 200 m
  - Nominal rated 245 m
- Nominal rated flow per turbine 274 m³/sec
- Discharge conduit into tailrace – three m
- Cavern for tailrace gates (L x W x Height) ___ m x __ m x __ m)
- Tailrace tunnel 512 m
- Access tunnel to power house ____ m long

500 kV Switchyard On the ____ bank of the river

Appendix 3

Details of Tasks 6.18 for Preparation of Load Forecasts and Least Cost Generation Plan

Electricity Market Survey and Load Forecasts

The purpose of this sub-task of the Study is to arrive at the economic justification of the Rogun HPP. The Consultant shall:

- conduct a power market survey for the whole country and prepare demand projections from 2010-2040 with sufficient detail as required by the following stages of the Study.

- propose the methodology he intends to use for this part of the Study in his proposal. It should include at least sectoral and global methods. Sectoral methods (or end-use analysis methods) should be based in detailed analysis by class of consumers, aggregated for small consumers and specific for large consumers. Global methods (econometric modeling methods) should be based on econometric correlation with sectoral and global economic growth.

- review existing historical data on electricity sales and consumption by location, by consumer category (small, medium, large), sectors (industrial, transport, residential, commercial, agricultural, government, public lighting and water supply), and specific end-uses (lighting, heating, air-conditioning, power, electrochemical operations);

- review the transmission and distribution losses and theft and collusion;

- review the economic and demographic data.

- conduct interviews with the entities responsible for medium and large agricultural communes, mines, manufacturing, industrial, and commercial operations to determine current demand and supply, service reliability, short term and long term requirements for power;

- identify data inconsistencies, gaps and problems in interpreting and utilizing data and should complete and bring data to consistency;

- collect data concerning the macroeconomic variables such as population, gross national product, per capita income and agricultural, industrial and commercial activities and study the relationship between these variables and the use of power to determine power coefficients which shall be applied to projections of the macro-economic variables;

- identify the scope of reducing demand for electricity through technical tools (improvements in the supply system such as transmission, distribution networks; and consumers end – better building construction standards) as well as through economic tools (appropriate pricing);

- Identify the scope for demand management through such mechanisms as CFLs, and Energy Loss Reduction Project.
- prepare the electricity load forecasts using a specifically developed electricity load forecasting model which would include inter alia: (i) the historical trends and growth rates by customer categories and geographical areas, (ii) the effect of modernization and increase in living standards of the population and (iii) the effect of large consumers such as industries and tourism on past and present electric power usage; (iv) the impact of improved efficiency and reliability; (v) the impact of price elasticity (changes in consumption due to tariff increases) and income elasticity (changes in consumption of due to increases in incomes); etc.

- A scenario based approach should be adopted and at a minimum base case, high growth and low growth scenarios should be presented.

- The Consultant should also assess and take into account appropriately the export demand in summer and winter in the prospective export markets.

The results of the Load Forecasting Phase shall be presented and analyzed for the system as a whole; as well as demand by large power consumers (e.g, TALCO Aluminum smelter, who would buy power directly from the generation company); as well as the export demand and translated into annual and seasonal load duration curves, and typical daily load curves.

Generation Expansion Plan

The purpose of the Generation Expansion Plan subtask is to identify and economically rank the available generation expansion options to meet the incremental electricity demand (including export demand) that would remain unmet after impact of efforts to reduce the demand for energy and electricity consumption has been factored and to verify whether Rogun remains as part of the recommended least cost power development plan. The methodology and computer programs to be used for this purpose will be agreed with the Government/Barki Tajik and the World Bank during the Inception mission.

The Consultant shall:

- consider generation expansion options including: rehabilitation of Nurek generation station, Rogun and other hydro sites; GoRT plans for coal based power generation, Small to medium hydro sites; combined cycle gas turbines based on imported natural gas; and Imports of electricity from neighboring countries.
- study the existing system conditions, how the demand is being met in each sub-system, the present sources of energy and their relative economy, and the means available for transmission.

- make an inventory of all the existing generation power facilities indicating their age, location, type, efficiency, heat rate, water requirements, operating costs, maintenance costs, etc., and recommend retirement dates for the existing units.

- propose several logical and technically feasible sequences of development of generating plants; each sequence meeting the prospective demand for power and energy. These sequences, including hydro developments and thermal options shall all provide the power system with the similar degree of reliability. Sequences with and without Rogun should be considered.

- recommend the desirable degree of reliability (measured by the Loss of Load Probability or LOLP), on the basis of the country's economic development and the cost of outages to the economy.

- Carry out sensitivity analysis to determine the consequences of this parameter (LOLP) on the selection of the alternatives and on the total cost of the program.

- Present the cost estimates as well as their annual phasing for each of the plants in the base case of the expansion option as well as for the alternative case(s).

- The environmental and social analysis of the generation options and considered alternative generation addition sequences would be carried out by the consultants for the ESIA study and the two sets of consultants work interactively.

In considering the listed plants above as expansion candidates, the Consultant is not expected to carry out any feasibility studies to establish the costs of developing the site. Rather, the Consultant would rely on the studies done to date for the cost information, but update such costs to reflect current world market prices.

Appendix 4.

Information on available Feasibility Studies, Technical Project and Project Revision for Rogun HPP.

There are the following materials available in the OJSC "Rogun HPP":

1. Technical Project of Rogun HPP 1978 (Annex 1);
2. The conception of completion Rogun HPP 2009 (Annex 2), "Gydroproekt" Moscow;
3. Bank Feasibility Study of Rogun HPP, Lamaer LTD 2006.

Note:
On the issue of the runner and the total weight of hydro turbine:

1. Replaceable runner – D =4835 mm, weight - 70 tons, P=200 Mwt ;
2. Permanent runner – D = 6000 mm, weight – 100 tons P=615 Mwt;
3. Total weight of turbine – 1580 tons

			Annex 1
16	15	Technical project of production and organization of underground works (for underground complex). Explanatory note. Antifiltration barriers in the dam site and the upper cofferdam.	# 561 TP – 3 IV – 1310
17	16	Technical project of production and organization of underground works (for underground complex). Explanatory note. Motor transport tunnels to be used during the construction and exploitation period.	# 561 TP – 3 IV – 2631
18	17	Technical project of production and organization of underground works (for underground complex). Explanatory note. Actions on the protection of salt layer from washing.	# 561 TP – 3 IV – 2906
19	18	Technical project. Preliminary strengthening of rocks/layers during driving of the right – bank motor transport tunnels. Estimation.	# 561 TP – 3 IV – 9848
20	19	Technical project. Preliminary strengthening of rocks/layers during driving the channel rise of hydraulic and saline screen. Estimate	# 561 TP – 3 IV – 9849
21	20	Technical project. Preliminary strengthening of rocks/layers. Catalogue of unit costs.	# 561 TP – 3 IV – 9850
22	21	Technical project. Carrying out 35 kV power line from the flooding area and the external power supply of collective farms and settlements of the population under resettlement. Project note and drawing.	Volume II. PL – 35 – 110 kV
23	22	Technical project for the carrying out the connection line from the reservoir area and the construction of connection line from the district centre “Childara” and Gharm to the new built settlements and collective farms.	Volume III. Power supply
24	23	Technical working project. Carrying out the power line of 35 kV from the flooding area. Volume IV – Estimate documentation. Book 1 – summary estimates and estimation of supplemental construction works.	
25	24	Technical working project. Motor road Dushanbe – Khorog. On the site of the terminal station Nurekgesstroi – Karabulok settlement Volume 1 – general part. Book III – summary explanatory note, documents for agreements and lists.	
26	25	Technical project. Settlement of constructors of Rogun HPP. Rogun settlement. Housing. Book 1 – explanatory note.	
		Technical project – main	
		Part I. Environmental conditions.	
27	28	Book 1. Hydrological conditions. Climate. River operation regime in project conditions.	1174 – T13
	29	Book 2. Topographical geodesic study.	1174 – T14
28		**Part II. Economy. Water industry. Hydro system parameters. Water reservoir. Using the natural resources and protection**	

		of environment.	
29	33	Book 3. Water reservoir and the tailrace area.	1174 – T18, P – 18
		Part III. Main hydro system building.	
30	35	Book 1. Main starting position of the Project. Selection of dam site and the scheme of HPP. Assembly of hydro system.	1174 – T20, P – 20
31	36	Hydro system building	P – 21 – 1
32	38	Chapter 2. Activities for the protection of salt layer from washing.	1174 – T21 – 2
33	39	Chapter 3. Spillways. Pressure station unit	1174 – T21 – 3, P – 21 – 3
34	40	Chapter 4. Mud dam on Obi-Shur range.	1174 – T21 – 4, P – 21 – 4
35	42	Chapter 1. Water power and mechanical equipment.	1174 – T22 – 2
36	43	Chapter 2. Electro technical equipment	1174 – T22 – 2, P – 22 – 2
37	44	Book 4. Sanitary engineering	1174 – T23, P – 23
38	45	Book 5. Fire safety and safeguard activities.	1174 – T24 – P – 24
39	47	Book 7. Special activities	1174 – 34 – T26
40	48	Book 8. Operational activities of hydro system	1174 – T27
41	49	Book 9. Field studies	1174 – T28
42	50	Book 10. Settlements	1174 – T29, P – 29
		Part IV. Organization for construction and estimation	
43	51	Book 1. Organization for construction	1174 – T30, P – 30
44	52	Book 2. Production basis. Technological and constructional part.	1174 – T31, P – 31
45	53	Book 3. Work production	1174 – T32, P – 32
46	54	Book 4. Summary expenditure and estimation	1174 – T33
47	55	Book 5. Object and local estimations. Part “A” chapters 1-VII, X, XI, XII	1174 – T34
48	56	Book 6. Object and local estimations. Part “A” chapters VIII and IX	1174 – T35
49	58	Book 8. Catalogue of single district of single valuation, attached to the conditions of constructions on the salary.	1174 – T37
50	59	Book 9. Catalogue of single district of single valuation, attached to the conditions of constructions on the salary and local constructional materials	1174 – T38
51	60	Book 10. Calculation prices for the local materials, collective	1174 – T39
52	61	Book 11. Catalogue of estimate prices for the local constructional material.	1174 – T40
		Annex	
53	66	Phased review materials of the project	1174 – T45
54	70	Project testing for novelty	1174 – T49
55		**Annex to the note # 1174 – T18 of technical project “Water reservoir”**	
56	71	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume II, Parts III, IV. Chapter I, book – 8 – Plan and grade	1174 – T18 – 2.8

		line on Tavildara – Gharm area	
57	72	Evacuation of motor way to the direction Kulyab –Shugnov – Tavildara – Gharm – Komsomolobod. Volume IV, Parts XI – estimate documentation. Chapter I – summary estimation.	1174 – T18 – 2 A
58	73	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod. Volume IV, Book 18 – 3 – DRP in Siafark. Drawings	1174 – T18 – 2.18.3
59	74	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume IV, Book – 18 – 7 – Linear Master House (LMH) in Kurboztanak village. Drawings	1174 – T18 – 2.18.7
60	75	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 18 – 9 – LMH in Degrez village. Drawings	1174 – T18 – 2.18.9
61	76	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 18 – 15 LMH in Zilalak village. drawings	1174 – T18 – 2.18.11
62	77	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 18 – 15 – LMH in Kalachai Poyon village	1174 – T18 – 2.18.15
63	78	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume IV, book 20 – 1 – Road Maintenance settlement (RMS) in Sangikar. Drawings	1174 – T18 – 2.20.1
64	79	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 20 – 3 – LMH in Shul village. Drawings	1174 – T18 – 2.20.3
65	80	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume IV, 20 – 5 – LMH in Shul village. Drawings	1174 – T18 – 2.20.5
66	81	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume II, LMH	1174 – T18 – 2.27.20
67	82	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume VI, book 27 – 6/1.10 – LMH Degrez village	1174 – T18 – 2.27.21
68	83	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume VI, book 27 – 8/1.10 – LMH in Degrez village	1174 – T18 – 2.27.3
69	84	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the flooding area with reservoir. For the construction of Road Operational Department	1174 – T18 – 2.27.7

		in Butaikabad village. Volume VI – estimate documentation. Chapter I – estimation. Book 27 – 3/17 – land improvement of the enterprise.	
70	85	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the flooding area with reservoir. For the construction of Road Operational Department in Butaikabad village. Volume VI – estimate documentation. Chapter I – estimation. Book 27 – 3/19[a] – ATS estimation.	1174 – T18 – 2.27.8
71.	86.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Childara settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-5/4,5,6 – Transformer substation. External electric lighting networks. Installation of radio and communication.	1174-T18/2.28.15
72.	87.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Childara settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-5/17 – Area improvement of the enterprise.	1174-T18-2.28.23
73.	88.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-4/1.9 – LMH in the Ezgand settlement.	1174-T18-2.28.4
74.	89.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Chil-Dara settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-5/3,7,8 – Car parking building. Entrance-lodge. Auto washing dock.	1174-T18-2.28.6
75.	90.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Childara settlement. Volume – cost estimate documentation. Chapter – cost estimation. Book 28-5/24 – Water field well in the Childara settlement.	1174-T18-2.28.7
76.	91.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in Dashtimur settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-6/4,5,6 – Transformer substation. External electric lighting networks. Installation of radio and communication.	1174-T18-2.28.9
77.	92.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in Sangikar settlement. Volume VI – cost estimate documentation. Part II – cost estimation. Book 28-6/4,5,6 – Biological waste water treatment plant.	1174-T18-2.29.15

78.	93.	Kulyab-Shughnon -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 29-6/22 – Water field well in the site of Sangikar settlement.	1174-T18-2.29.16
79.	94.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 29-2 – Bridges.	1174-T18-2.29.2
80.	95.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in the Sangikar settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 29-6/10 – Boiler house with two vessels "Universal" – 6m.	1174-T18-2.29.5
81.	96.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in the Sangikar settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-6/17 - Area improvement of the enterprise.	1174-T18-2.29.6
82.	97.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of Roghun HPP zone. Volume VI – cost estimate documentation. Chapter I – cost estimation. Book 29-7/1,9 - LMH in the Tagob settlement.	1174-T18-2.29.8
83.	98.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Kulyab – Tavildara (motor way) site. Volume IV – cost estimate documentation. Chapter II – quotation catalogue. Book 30-1.	1174-T18-2.30.1
84.	99.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Gharm – Komsomolobod site. Volume IV – cost estimate documentation. Chapter II – quotation catalogue. Book 32.	1174-T18-2.32
85.	100.	Integrated project on lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 1. Explanatory note.	1174-T18-4.1
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87.	102.	Project of lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 4. Objective and local cost estimations. Objects of communal construction and improvement of "Miyonadu" collective farm. Central messuage.	1174-T18-4.7
88.	103.	Hydro geological conclusion about conditions of water supply of	1174-T18-4.13a

		the designed Tavildara settlement, “Roghun” collective farm of Komsomolobod district.	
89.	104.	Development of central messauge of “Miyonadu” collective farm with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 5 – construction organization.	1174-T18-4.15
90.	105.	Integrated project on lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 8.	1174-T18-4.18
91.	105a.	Project of lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 7. Amendment on cost of local and carriage materials.	
92.	106.	Air Line – 35 kV retrieving out of dam zone flooding area, including external power supply of settlements and collective farms for moving population. Volume I – Substation 35-110 kV. Part 11 – Registered specification on substations. Book 7 – registered specification compilation on substation 35/10 kV “Tavildara”.	1174-T18-6.11.7
93.	107.	Air line – 35 kV retrieving out of dam zone flooding area, including external power supply of settlements and collective farms for moving population. Volume II – Air Line – 35 110 kV. Part 1 – General explanatory note.	1174-T18-6.12
94.	108.	Air line – 35 kV retrieving out of dam zone flooding area. Volume IV. Book 2 – Objective cost estimations No. 16, 17, 18 on substation construction 110/35/10 kV “Tegermi” and “Childara” and on РПБ at substation “Childora”.	1174-T18-6.26
95.	109.	Air line – 35 kV retrieving out of dam zone flooding area. Volume IV. Book 3 – Objective cost estimations No. 12, 13, 14, 15 on substation construction 35/10 kV “Kizrok”, “Miyonadu” “Chorsadi” and “Khufak”.	1174-T18-6.27
96.	110.	Air line – 35 kV retrieving out of dam zone flooding area, including external power supply of settlements and collective farms for moving population. Volume IV– Objective cost estimation No. 19 on reconstruction of substation 35/10 kV “Tavildara”.	1174-T18-6.28
97.	111.	Air line – 35 kV retrieving out of dam zone flooding area. Volume IV – Objective cost estimation No. 30 on Air Line construction – 10 kV and Transformer Substation for settlements in the newly developed zones.	1174-T18-6.32
98.	111a.	Communication Line retrieving out of dam zone and construction of communication line from district/center Childara and Gharm to newly organized settlements and collective farms. Volume V – Cost estimate part. Chapter 4 – Local cost estimates on assemblage works on station facility (structures).	1174-T18-5.9
99.	112	Irrigation of new lands in return of flooding area. Part II –	1174-T18-7.2

		Natural conditions. Book 3 – Engineering geological and hydrological justification.	
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102.	119.	Cost estimation on construction College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement.	
103.	120.	Technical and economic valuation of College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement.	
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107.	124.	College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement. Water pipe and sewerage system. Volume IV. Chapter B. Secret language 945.	

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	Project number	Name	Copies
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2	1861 -1 book 2	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Organization of construction. Explanatory note.	4
3	1861 – 1 Album 1	Album of drawings	4
		II Phase	
4	1861 – 2 – VII	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Organization of construction.	4
5	1861 – 2 – II – 2	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume II. Environmental conditions. Book 2. Hydrometereological conditions. 53 pages.	4
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20	1861 – 2 – VII – A	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Organization of construction.	4
		III Phase	
21	1861 – 2 – 1	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. General note.	4
22	1861 – 2 – 10	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Estimate cost of the construction.	4

Annex 3.

Information of "Lomayer" documentation located in Open Stock Company "RoghunGESstroy"

1. Detailed evaluation of existing facility and equipment. Part 3 from 8.

   (book 1 from 5)
   (book 2 from 5)
   (book 3 from 5)
   (book 4 from 5)
   (book 5 from 5)

2. Detailed evaluation of existing facility and equipment. Part 2 from 8.

   (book 1)
   (book 2)
   (book 6 from 8)
   (book 7 from 8)
   (book 8 from 8)

3. Detailed evaluation of existing facility and equipment. Part 4 from 8.

   (book 1 from 10)
   (book 2 from 10)
   (book 3 from 10)
   (book 4 from 10)
   (book 5 from 10)
   (book 6 from 10)
   (book 7 from 10)
   (book 8 from 10)
   (book 9 from 10)
   (book 10 from 10)

4. Volume 2 "Basic Report"

5. Volume 3F "Project parameters".

Информация по имеющимся технико-экономическим обоснованиям, техническом проекте, проектным доработкам Рогунской ГЭС.

В ОАО «Рогунская» ГЭС по указанным материалам имеется:
1. Технический проект Рогунской ГЭС 1978. (Приложение 1);
2. Концепция достройки Рогунской ГЭС 2009 г. (Приложение 2);
3. Банковское ТЭО Рогунской ГЭС, Ламайер ЛТД 2006 г.

По вопросу рабочего колеса и общего веса турбины:
1. Временное рабочее колесо –D = 4835 мм, вес = 70 тн, P= 200 Мвт;
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17.	16.	Технический проект производства и организации работ по подземному комплексу. Пояснительная записка. Автотранспортные туннели строительного и эксплуатационного периода.	**№561ТП—3-VII-2631**
IS.	17.	Технический проект производства и организации работ по подземному комплексу. Пояснительная записка. Мероприятия но защите пласта соли от размыва.	**№ 561ТП—3-VIII2906**
19.	18.	Технический проект. Предварительное закрепление пород при проходке правобережных транспортных туннелей. Смета	**№561 ЦС-3- VII - 9848**
20.	19.	Технический проект. Предварительное закрепление пород при проходке русловой штольни гидравлической и солевой завес. Смета.	**№561 ЦС-3-VIII-9849**
21.	20.	Технический проект. Предварительное закрепление пород. Каталог единичных расценок.	**№561 ЦС-3-VII-9850.**
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23.	22.	Технический проект на вынос линий связи из зоны водохранилища и строительство линий связи от р/ц Чильдора и Гарм к вновь организуемым поселкам и совхозам.	**Том III. Электро-питание.**
24.	23.	Техно-рабочий проект. Вынос ВЛ-35кВ из зоны затопления. Том IV-Сметная документация. Книга I -сводная смета и сметы на сопутствующие работы стр-ва.	
25.	24.	Техно-рабочий проект. Автомобильная дорога Душанбе-Хорог, на участке перевалочная база Нурекгэсстроя - пос.Карабулак. Том I -общий раздел. Книга III — Сводная пояснительная записка. доку менты согласований и ведомости.	
26.	25.	Технический проект. Поселки строителей Рогунекой ГЭС. Поселок Рогун. Застройки. Книга I - Пояснительная записка.	
		Технический проект - основной	
		Часть I. Природные условия	
27.	28.	Книга I. Гидрологические условия. Климат. Режим реки в проектных условиях	**1174-Т13**
	29.	Книга 2. Топографо-геодезическое обоснование	**1174-Т14**

28.		**Часть II. Экономика. Водное хозяйство. Параметры гидроузла.** **Водохранилище. Использование природных ресурсов и охрана**	
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37.	44.	Книга 4. Сантехника	**П74-Т23, П-23**
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43.	51.	Книга 1. Организация строительства	**1174-Т30, П-30**
44.	52.	Книга 2. Производственные базы. Технологическая и строительная часть	**П74-Т31, П-31**
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46.	54.	Книга 4. Сводка затрат и сводные сметы	**1174-Т33**
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48.	56.	Книга 6. Объектные и локальные сметы. Раздел «А», главы VIII и IX	**1174-Т35**
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50.	59.	Книга 9. Каталог единых районных единичных расценок, привязанных к условиям строительства по заработной плате и местным строительным материалам	**1174-Т38**
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52.	61.	Книга 11. Каталог сметных цен местных строительных материалов	**1174-Т40**
		Приложения	
53.	66.	5. Материалы поэтапного рассмотрения проекта	**1174-Т45**
54.	70.	9. Проверка проекта на патентную чистоту	**1174-Т49**
55.		**Приложения к записке № 1174-Т18 технического проекта «Водохранилище»**	
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57.	72.	Вынос автодороги по направлению Куляб - Шугноу - Тавпль-Дара -Гарм - Комсомол-абад. Том IV, части XI - Сметная документация. Раздел 1 - Сводная смета.	**1174-T18-2A**
58.	**73.**	Вынос автодороги по направлению Куляб - Ховалинг - Шугноу - Тавиль Дара - Гарм - Комсомолабад из зоны водохранилища. Том IV. книга 18-3 - ДРП в Сиафарке.	**1174-T18-2.18.3**
59.	74.	Вынос автодороги по направлению Куляб-Ховалинг-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. Том IV, книга 18-7 - ДЛМ в к-к Курбозтанак. Чертежи.	**1174-T18-2.18.7**
60.	75.	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны водохранилища. Том V, книга 18-9 -ДЛМ в кишлаке Дегрез. Чертежи.	**1174-T18-2.18.9**
61.	76.	Вынос автомобильной дороги по направлению Куляб—Ховалинг-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны водохранилища. Том V, книга 18-11 -ДЛМ в кишлаке Зилалак. Чертежи.	**1174-T18-2.18.11**
62.	77.	Вынос автомобильной дороги по направлению Куляб-Ховалинг- Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны водохранилища. Том V. книга 18-15 -ДЛМ в кишлаке Калачаи Пойон. Чертежи.	**1174-T18-2.18.15**
63.	**78.**	Вынос автомобильной дороги по направлению Куляб-Шутноу-Тавиль-Дара-Гарм- Ховалинг-Комсомолабад из зоны водохранилища. Том IV, книга 20-1 -ДРП в Сангикар. Чертежи.	**1174-T18-2.20.1**
64.	79.	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шутноу-Тавнль-Дара -Гарм-Комсомолабад из зоны водохранилища. Том V. книга 20-3 ДЛМ в кишлаке Ш\ле. Чертежи.	**1174-T18-2.20.3**
65.	80.	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны водохранилища. Том IV, книга 20-5 -ДЛМ в кишлаке Шуль. Чертежи.	**1174-T18-2.20.5**
66.	81.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том VI, книга 27-6/1.10- Дом линейного мастера в кишлаке Дегрез.	**1174-T18-2.27.20**
67.	82.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм— Комсомолабад из зоны водохранилища. Том VI, книга 27-8/1.10 -Дом линейного мастера в кишлаке Дегрез.	**1174-T18-2.27.21**
68.	83.	Автодорожный туннель под перевалом Хорсанг. Объектная смета на сооружение автодорожного туннеля. (Вариант 1).	**1174-T18-2.27.3**

69.	**84.**	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы ДЭУ в кишлаке Бутайкабад. Том VI - Сметная документация. Раздел I - Сметы. Книга 27-3. 17 - Благоустройство территории предприятия.	**1174-Т18-2.27.7**
70.	**85.**	Вынос автомобильной дороги по направлению Куляб—Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы ДЭУ в к-ке Бутайкабад. Том VI -Сметная документация. Раздел 1- Книга 27-3. 19[a]-Сметы АТС.	**1174Т18-2.27.8**
71.	86.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы в кишлаке Чиль-Дора. Том VI -Сметная документация. Раздел II - Сметы. Книга 28-5.4. 5. 6 - Трансформаторная подстанция. Наружные сети электроосвещения.	**1174-Т18/2.28.15**
72.	87.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы ДЭУ в кишлаке Чиль-Дора. Том VI - Сметная документация. Раздел II - Сметы. Книга 28-5/17 - Благоустройство территории предприятия.	**1174-Т18-2.28.23**
73.	88.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара—Гарм— Комсомолабад из зоны водохранилища. Том VI - сметная документация. Раздел I - сметы. Книга 28-4 1) - Дом линейного мастера в кишлаке Езганд.	**1174-Т18-2.28.4**
74.	89.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. На строительство базы ДЭУ в к-ке Чиль-Дара. Том VI - сметная документация. Раздел II -сметы. Книга 28-5/3, 7, 8 - Здание стоянки машин. Проходная будка. Моечная эстакада.	**1174-Т18-2.28.6**
75.	90.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. На строительство базы ДЭУ в к-ке Чиль-Дара. Том Раздел -сметы. Книга 28-5/24 -Водозаборная скважина в п.Чильдара.	**1174-Т18-2.28.7**
76.	91.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Даштимур. Том VI - сметная документация. Раздел — сметы. Книга 28-6/4, 5,6 - Трансформаторная подстанция. Наружные сети электроосвещения. Радиофикация и связь.	**1174-Т18-2.28.9**
77.	**92.**	Вынос автомобильной дороги по направлению Куляб—Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Сангикар. Том VI. Часть I - сметная документация. Раздел -сметы. Книга 28-6/18 — Станция биологической очистки сточных вод.	**1174-Т18-2.29.15**

78.	93.	Вынос автомобильной дороги по направлению Куляб—Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. На строительство ДРП. Том VI - сметная документация. Раздел II - сметы. Книга 29-6/22 - Водозаборная скважина на участке в кишлаке Сангикар.	**1174-Т18-2.29.16**
79.	94.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том VI - сметная документация. Раздел II - сметы. Книга 29-2 - Мосты.	**1174-Т18-2.29.2**
80.	**95.**	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Сангикар. Том VI - сметная документация. Книга 29-6/10 -Котельная с двумя котлами «Универсал» - 6м.	**1174-Т18-2.29.5**
81.	96.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Сангикар. Том VI - сметная документация. Раздел - сметы. Книга 28-6/47 - Благоустройство территории предприятия.	**1174-Т18-2.29.6**
82.	**97.**	Вынос автомобильной дороги по направлению Куляб—Шугноу-Тавиль-Дара—Гарм— Ком-сомолабад из зоны Рогу некой ГЭС. Том VI - сметная документация. Раздел I - сметы. Книга 29-7/1,9 - Дом линейного мастера в кишлаке Такоба.	**1174-Т18-2.29.8**
83.	**98.**	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу Тавиль-Дара—Гарм—Комсомолабад из зоны водохранилища. Участок Куляб - Тавиль-Дара (а/дорога). Том IV- сметная документация. Раздел II — Каталог единичных расценок. Книга 30-1.	**1174-Т18-2.30Л**
84.	**99.**	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Участок* Гарм - Комсомолабад. Том IV-сметная документация. Раздел II-Каталог единичных расценок. Книга 32.	**1174-Т18-2.32**
85.	**100.**	Комплексный проект по планировке и застройке сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 1. Пояснительная записка.	**1174-Т18-4.1**
86.	**101.**	Проект планировки и застройки сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 3. Сводка сводных смет и сводные сметы.	**1174-Т18-4.3**
87.	**102.**	Проект планировки и застройки сельских населенных пунктов с производственными зонами совхозов и колхозов для населения. переселяемого из зоны затопления водохранилищем. Книга 4. Объектные и локальные сметы. Объекты коммунального строительства и благоустройство с-за «Миенаду». Центральная усадьба.	**1174-Т18-4.7**

88.	**103.**	Гидрогеологическое заключение об условиях водоснабжения проектируемого поселка Тавильдара с-за «Рогун» Комсомолабадского района.	**1174-Т18-4.13а**
89.	**104.**	Застройка центральной усадьбы совхоза «Миенаду» с производственной зоной для населения, переселяемого из зоны затопления. Книга 5 -организация строительства.	**1174-Т18-4.15**
90.	**105.**	Комплексный проект по планировке и застройке сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 8.	**1174-Т18-4Л8**
91.	**105а.**	Проект планировки и застройки сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 7. Поправка на стоимость местных и привозных материалов.	
92.	**106.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем, включая внешнее электроснабжение поселков и совхозов для переселяемого населения. Том I - Подстанции 35-1 10 кВ. Часть 11- Заказные спецификации по подстанциям. Книга 7 - сборник заказных спецификаций по и/ст 35/10 кВ «Тавиль-Дара».	**1174-Т18-6.П.7**
93.	**107.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем и внешнее эл.снабжение поселков и совхозов для переселяемого населения. Том II - ВЛ-35-110 кВ. Часть I- Общая пояснительная записка.	**1174-Т18-6.12**
94.	**108.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем. Том IV. Книга 2 -Объектные сметы № 16. 17. 18 на стр-во п/ст 1 10/35/10 кВ «Тегерми» и «Чильдора» и на РПБ при п/ст «Чильдора».	**1174-Т18-6.26**
95.	**109.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем. Том IV. Книга 3 - Объектные сметы № 12. 13. 14. 15 на стр-во п/ст 35/10 кВ «Кизрок», «Миенаду», «Чореады», «Хуфак».	**1I74-Т18-6.27**
96.	**110.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем, включая внешнее электроснабжение поселков и совхозов для переселяемого населения. Том IV, Книга 4 - (Объектная смета № 19 на реконструкцию п/ст 35/10 кВ «Тавиль-Дара».	**1174-Т18-6.28**
97.	**111.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем. Том IV - Сметная документация. Книга 8 - Объектная смета № 30 на строительство ВЛ-110 кВ и ТП для поселков вновь осваиваемой зоны.	**1174-Т18-6.32**
98.	**111а.**	Вынос линий связи из зоны водохранилища и строительство линий связи от р. центра Чнльдора и Гарм к вновь организуемым поселкам и совхозам. Том V- Сметная часть. Раздел 4-Локальные сметы на монтажные работы по станционным сооружениям.	**1174-Т-18-5.9**
99.	**112.**	Орошение новых земель взамен затапливаемых водохранилищем. Часть II- Природные условия. Книга 3 — Инженерно-геологическое и гидрологическое обоснование.	**1174-Т18-7.2**

100.	**116.**	Орошение новых земель взамен затапливаемых водохранилищем. Часть **III.** Книга I - Схемы орошаемых участков.	
101.	**118.**	Профессионально-техническое училище на 720 учащихся строителей-гидротехников в поселке Оби-Гарм. Проект организации строительства.	
102.	**119.**	Смета на строительство ПТУ на 720 учащихся строителей-гидротехников в поселке Оби-Гарм.	
103.	**120.**	Технико-экономическая оценка ПТУ на 720 учащихся строителей-гидротехников в поселке Оби-Гарм.	
104.	**121.**	ПТУ на 720 учащихся строителей-гидротехников в поселке Оби-Гарм. Учебно-производственные мастерские. Том IV. Раздел Б. Шифр 945.	
105.	**122.**	ПТУ на 720 учащихся строителей-гидротехников в поселке Оби-Гарм. Учебно-производственные мастерские. Отопление и вентиляция. Том VI. Раздел Б. Шифр 945.	
106.	**123.**	ПТУ иа 720 учащихся строителей-гидротехников в поселке Оби-Гарм. Том IV. Раздел В. Шифр 945.	
107.	**124.**	ПТУ на 720 учащихся строителей-гидротехников в поселке Оби-Гарм. Водопровод и канализация. Том IV. Раздел В. Шифр 945.	

		Приложение 2	
	номер проекта	наименование	экз.
		1 этап	
1	1861-1-кн.I	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Организация строительства. Краткая записка	4
2	1861-1-кн.2	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Организация строительства. Пояснительная	4
3	1861-1-Альбом 1	Альбом чертежей	4
		II этап	
4	1861-2-VII	Рогунская ГЭС на р. Вахш, Концепция достройки станции. Организация строительства.	4
5	1861-2-II-2	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том II. Природные условия. Книга 2. гидромететорологические условия. 53 стр.	4
6	1861-2-III	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том III. Водное хозяйство. 85 стр.	4
7	1861-2-IV	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Электроэнергетики Таджикистан. 48 стр.	4
8	1861-2-V-1	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том V. Книга 1. "Плотина гидроузла" 128 стр.	4
9	1861-2-VI-2	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том VI. Технологическое оборудование Книга 1. Электротехническое оборудование и схема выдачи мощности.	4
10	1861-VI-3	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Механическое оборудование и стальные конструкции. 24 стр.	4
11	1861-2-VI-4	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том VI. Технологическое оборудование. Инженерные системы станции. Теплоснабжение. Отопление, вентиляция и кондиционирование воздуха. Системы водоснабжения и канализации. Средства связи. 33 стр.	4
12	1861-2-VIII	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том VIII. Мероприятия по подготовке зоны водохранилища. 148 стр.	4
13	1861-2-Т.5	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Основные сооружения гидроузла. 182 стр.	4
14	1861-2-Альбом 2	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Альбом чертежей.	4
IS	1861-2-II-1	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том II. Природные условия. Книга 1. Гидрологические и инженерно-геодезические изыскания. 17 стр.	4

16	1861-2-II-3	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том II. Природные условия. Книга 3. Инженерно-геологические условия. 92 стр.	4
17	1861-V-3	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Том V. Основные сооружения гидроузла. Книга 3. программа комплексного мониторинга Рогунсой ГЭС. 59 стр..	4
18	1861-VI-1	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Технологическое оборудование. Основное и вспомогательное гидросиловое оборудование. 75 стр.	4
19	1861-2-Альбом 1	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Альбом чертежей.	4
20	1861-2-VII-A	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Организация строительства.	4
		III этап	
21	1861-2-10	Рогунская ГЭС на р. Вахш. Концепция достройки станции. Общая записка	4
22	1861-2-10 1	Рогунская ГЭС на р, Вахш. Концепция достройки станции. Стоимость строительства.	4

Приложения 3

Информация по имеющейся документации «Ломайер»
находящейся в АООТ «РогунГЭСстрой»

1. Детальная оценка имеющихся сооружений и оборудования Часть 3 из 8
   (книга 1 из 5)
   (книга 2 из 5)
   (книга 3 из 5)
   (книга 4 из 5)
   (книга 5 из 5)
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5. Том 3Т «Проектные параметры».

WORLD BANK

MANAGEMENT RESPONSE TO

REQUEST FOR INSPECTION PANEL REVIEW OF THE

TAJIKISTAN ENERGY LOSS REDUCTION PROJECT

(IDA Credits 40930-TJ and HI7S0-TJ)

Annex 3

Terms of Reference for the Preparation of an Environmental and Social Impact Assessment (ESIA)

November 22, 2010

Section 5. Terms of Reference

for the Preparation of an Environmental and Social Impact Assessment (ESIA)

1. PROJECT DESCRIPTION

1. The prospective site of Rogun hydro power plant (HPP) is located about 110 km (by road on M41) ENE of Dushanbe, the capital of Tajikistan. Construction at an existing site was started during Soviet times, thus the proposed location is defined by already existing built assets (esp. underground works) and auxiliary infrastructure, such as office buildings, construction camps and access roads, some of which have deteriorated since construction was halted in the early 1990s.

2. The World Bank has accepted the request of the Government of Republic of Tajikistan (the Government) to finance an assessment of the Completion of the Rogun Hydroelectric Project (HPP), which the Government considers as an important element of the country's economic development strategy.

3. The Assessment would comprise two complementary parts – (i) Technical-Economic and (ii) Environmental-Social including riparian issues and cross border impacts. Consulting services will be rendered by two separate firms for these two parts, while the work is to be carried out in parallel and in an interactive manner.
The two sets of Assessment studies would be professionally reviewed on a running basis by two International Independent Panels of Experts (PoE), one for techno-economic and dam safety, the other for environmental/social aspects.

4. The work would include assessment of all the previous work done to date. The most relevant reports/documents that need to be reviewed are: Rogun HEP Technical Project, 1980, by Hydroproject Tashkent, technical projects/documents done in 2008-2009 by design institutes Hydroproject and Moshydrostal.

5. The Government confirms its commitment to comply with the applicable World Bank Safeguards policies in the development of Rogun HPP and the Assessment studies; Social and Environmental Studies would cover these policies comprehensively. Environmental and Social Assessment including involuntary resettlement and land acquisition; riparian issues and dam safety are some of the most intensive assessments that would be undertaken. It is recognized that the Assessment studies would analyze and recommend the possible trade-offs between techno-economic issues and the safeguards:

dam safety,

environmental,

social,

resettlement

riparian issues.

There will be an intensive information flow between the techno-economic Study and the Environmental and Social Studies. In addition a Strategic Environmental Assessment (SEA) will be conducted in a separate assignment to investigate power production scenarios and establish the relative economic, environmental and social performance of identified scenarios, tradeoffs and linkages to other energy sector projects both in country and region.

6. The Assessment studies would consider the design and potential impacts of the Rogun HEP within the context of the entire Vaksh River Development Master Plan (Annex 5), including the Sangtuda 1&2 and Shurob HEPPs. One of the important options that would be assessed is whether it would be optimal to adopt the following sequence: (a) to build the first starting complex of Rogun HEP, (b) then in parallel start construction of the Shurob run-of the river project which is to be located downstream between Rogun and Nurek, and (c) the second stage Rogun HEP to the full originally envisaged height of the dam 335 m. using the cash flows from (a) and (b) above.

2. HISTORY AND STATUS OF PROJECT

7. The original planning, design and construction of Rogun HPP was initiated in the 70ies of the past century. The civil war in 1992 disrupted further development.

8. According to the current *conceptual* design Rogun would be a reservoir type HEPP with a dam height of about 335 m. The reservoir would have a total storage volume of 13.3 km^3 and an active storage volume of about 8.6 km^3. It will extend upstream over a distance of about 70 km. The installed capacity will be 6x600 MW (totaling 3.6 GW).

9. The selected dam location is in a narrow gorge with steep flanks, which would allow minimal material demand for dam construction. The site geology is complex, being characterized by highly heterogeneous sedimentary layers (in terms of strength and permeability) including haline, soluble strata that necessitate careful investigation and analysis. The facility's design life is estimated to be 150-200 years.

10. Construction works were started in the early 1980s but had substantively stopped by 1992, but beginning 2006 there are significant resources allocated from the State Budget to continue with the restoration works as this project. Currently most of the site preparation works as well as about 70% of the underground works (access tunnels, penstocks, diversion and outlet tunnels, chambers for turbines / generators and transformers) have been completed.

11. A key safeguards issue is the resettlement of 63 villages with at least 30,000 residents from the reservoir area. Resettlement commenced at the end of the 1980s and part of the reservoir area's residents have already moved to new housing provided by the project developer in the cities of Rogun, Obigarm and other parts of Tajikistan. Known physical cultural resources include sacred sites, graveyards and burial sites. While no sites of major archeological and historical importance have been reported it should be anticipated that the project area contains some sites to be identified, documented and secured on the

basis of a field survey by qualified specialists. Resettlement needs to be viewed from a comprehensive livelihoods restoration and development perspective.

12. Environmental due diligence during project preparation has started with several volumes of environmental studies in the original first design commenced at the end of the 80s of the past century. They focused on the HPP's environmental impact on the downstream river system, local flora and fauna, local microclimate, population, and the environmental quality of the reservoir area. Planning for involuntary resettlement was prepared and resettlement partially implemented at the end of the 80s of the past century.

3. OBJECTIVE OF THE CONSULTANT'S SERVICES

13. The Consultants shall prepare and present to the Borrower / Project Sponsor an Environmental and Social Impact Assessment (ESIA) including all necessary additional documentation which may be required to satisfy specific World Bank safeguard policies which may be triggered by the planned project activities. Under the ESIA process a socio-economic monitoring framework, resettlement policy framework (RPF) to cover the entire project area (including resettlement audit) and resettlement action plan (RAPs)[1] for the initially affected villages would be prepared to manage involuntary resettlement, land acquisition and losses of property and livelihoods, as well as an environmental management plan (EMP) covering both local and riparian impacts and risks.

14. The ESIA and related environmental management plan (EMP), resettlement policy framework (RPF), as well as the resettlement action plans (RAPs) shall be prepared in a level of detail specific enough for incorporation into a tender package for potential construction works, to allow these activities to be adequately priced and become part of the successful bidder's works contract. The ultimate aim is to foster on the ground implementation of effective measures during the project execution and operational phases.

15. The Consultant shall be independent, hired on a competitive basis and will not be connected to the Designer of the project, or the Contractor, or any other entity assuming a role which a role which might cause a conflict of interest situation.

4. SCOPE OF WORK OF THE CONSULTANT

4.1 General:

16. The Consultants services will relate to the Rogun HPP project, as a very large scale reservoir type HPP with a significant amount of related safeguards work to be accomplished; the Environmental and Social Impact assessment (ESIA) will address the environmental, socio-economic and cultural situation at the project site, identify potential impacts, including the cumulative impact of the entire Vakhsh river cascade on the relevant areas of Tajikistan and all the riparian states.

[1] The primary RAP will be prepared for the planned Stage 1 of Rogun HPP, which would include a dam height of crest at 1,060 m asl and a correspondingly much smaller reservoir thereby affecting only a small number of the total villages. Should the full project be decided feasible and implementation proceed, a full RAP covering the entire project area impacted by a 335 m high dam would be produced under a separate consultancy)

17. The Consultant will design appropriate measures to avoid, mitigate, offset or compensate such impacts where possible and provide instruments for their implementation in form of environmental and social management and monitoring plans. This study includes all necessary assessments relating to potentially triggered safeguard policies.

18. The Consultant shall be responsible for carrying out all necessary preparatory studies, field work, research and investigations (including the generation of new field data, as deemed necessary or appropriate) to compile the information required for the work. This includes the preparation of designs and tender documents for investigation services and the award of subcontracts and the monitoring of performance and outcome of sub-contracted activities, if any.

4.2 Environmental and Social Assessment

19. The Consultant shall assess the environmental and social impacts in accordance with Tajik environmental laws and regulations, with international good practice, as well as the World Bank Safeguard Policies (available on the World Bank's external web site in English, Russian and Farsi languages). These may be supplemented by similar policies and practices required by other International Financing Institutions (IFIs) and Export Credit Agencies (ECAs) and under the Equator Principles for private sector investors. Annex 1 provides an overview over the World Bank's safeguard policies and the commonly required related documents.

20. During the initial phase of the environmental and social assessment the Consultant will – in consultation with Client and World Bank - confirm which Safeguard Policies are triggered and include the appropriate documentation into the deliverables.

4.2.1 Strategic Environmental Assessment (SEA)

21. In the initial stages of the environmental assessment process a strategic environmental assessment (SEA) will be prepared under a separate consultancies, which will include strategic environmental considerations for potential alternative power production scenarios. This SEA will contribute to shaping Tajikistan's overall energy development outcomes by integrating environmental and social considerations in the country's energy policy and sector growth. It will also analyze relevant components within the Tajik energy sector in their relationship with transnational energy trading and development schemes. It will build upon the World Bank's Country Environmental Analysis (CEA) Similar studies by Asian Development Bank (ADB) and OECD should also be considered.

22. Specifically the SEA will analyze, from the environmental and social points of view, Tajikistan's energy policy, the current planning for energy sector, the role of the Vaksh River Development Master Plan and currently developed transmission projects in the energy policy and long term planning, and the government's schemes on energy sources other than hydropower (e.g. coal fired TPP, renewable energy) and energy conservation. The SEA will obtain the results of the load forecast scenarios, export demand data and the related least cost generation development alternatives produced by the Consultants and carefully analyze related economic, environmental, social implications of the existing

and proposed generation alternatives and their interactions with other sectors such as transport, infrastructure or mining, as well as the Central Asia energy sector. Strategic issues relevant to the Vakhsh cascade will be carried over from the SEA to the ESIA.

23. The Consultant will review the SEA once it is available as draft document and peruse its main findings for the further development of the ESIA. In this context the Consultant will also familiarize himself with a planned major transmission line project (CASA 1000) which would entail the creation of several major energy transmission corridors designed to export (hydropower) energy produced in Tajikistan to neighboring and regional countries, among them Afghanistan and Pakistan. This project is being prepared with IFI financing as well, notably IsDB and WBG and the Consultant will be aware of the activities and outputs of these studies and, whenever warranted useful, refer to results and findings in the Rogun Environmental and Social Impact Assessment (ESIA) and notably the Strategic Environmental Assessment (SEA).

24. Studies and investigations including preliminary environmental and social assessments as well as a techno-economic feasibility study of the CASA 1000 line were concluded, some time back. Update of these assessments are under way.

4.2.2 Initial Environmental Screening and Social Screening

25. The purpose of an initial screening of the current environmental and social situation is to gain an overall understanding of the local baseline situation and riparian issues, and the project's current and potential future social and environmental impacts and provide an overview of the range and depth of issues to be subsequently studied in detail under the main ESIA. This overview will set the focus for further studies, data collection or other resources that will be required for the conduct of the ESIA.

26. The proposed project is based on the completion of a dam at the Rogun site and the already existing, about 70% complete underground works. Thus the Consultant will have to review the previous studies carried out at different project phases during the original assessment/design, and investigate /summarize what in terms of environmental /social due diligence has been done in the past, present situation and which future actions are planned. The approach to ESIA of Rogun HEP will therefore be dependent on the present physical conditions and state of past studies/assessments.

27. The Consultant will list, rank and explain the major identified environmental and social issues for the project, assess if they have been dealt with adequately in the past project phases (both process-wise and from actual, practical handling on site) and which issues might constitute risks for the further course of the project.

28. The Consultant shall carry out an integrated, initial environmental and social impact assessment in accordance with Tajik requirements and the operational policies of the World Bank[2]. The Consultant will initiate this initial assessment at the start of the

[2] See Operational Policy 4.01, Environmental Assessment and the Environmental Assessment Sourcebook, Volume II, Sectoral Guidelines, Environmental Department, World Bank, and Technical Paper No. 140, dealing with dams and reservoirs.

engineering studies and work parallel to the Techno-Economic Assessment Study (TEAS) Consultant. The screening report will be submitted during Phase 2 of the TEAS, taking into account the assessment of the existing situation at Roghun (as produced in Phase 1 of the TEAS) and providing input to the project definition of Phase 2.

29. The initial task of the initial assessment and screening is a review of the existing documentation that is relevant to environmental impact of the proposed Rogun HEPP, and to identify where there are (i) gaps, (ii) deficient or contradictory issues, or (iii) issues to be updated. Also, the Tajik legal and institutional framework on land acquisition, compensation and resettlement will be reviewed and compared with World Bank safeguard requirements, and gaps and deviations will be identified. In doing so, not only relevant official law but also good practice related to resettlement will be assessed for incorporation into any future investment project.

30. A preliminary stakeholder analysis will be conducted, indicating possible specialized interests and conflicts. The consultant will meet with representatives of the key stakeholders to review the findings of the preliminary assessment and receive feedback on any issues they feel are missing. Based on this stakeholder assessment, the Consultant will recommend the main channels and issues that are needed to engage in effective communication with these groups.

31. The report prepared during this initial assessment will

- Review and recognize past environmental/social performance and liabilities/risks (see section above)
- Elaborate a preliminary inventory of environmental and social impacts of the existing engineering project and alternatives (if more than one), regarding to dam height, dam type, reservoir operations regime and reservoir filling, and include any identified related structures or investments, such as access and construction roads and infrastructure, housing, storage facilities, accessory construction and transmission lines.

32. A field based audit of the impacts and consequences of the construction activities already carried out during the Soviet period and continued by the Tajik Government up to present (i.e. ongoing resettlement), is to be carried out and the findings systematically recorded. This audit will examine the current resettlement program, document its policy guidelines, entitlement matrix and other provisions (see text on resettlement audit in later section).

33. In this initial phase all possible safeguards related impacts shall be identified and quantified as far as possible, albeit for some costs in terms of order of magnitude, for inclusion in the project cost estimate. The long term and irreversible impacts and those which cannot be mitigated shall be identified and analyzed as a priority.

34. The environmental screening will encompass direct and indirect impacts of the project. The scope of the screening will extend beyond the project site to upstream and downstream impacts. Impacts of changes in water regulation will be screened for both ecological and ecosystem services impacts (including social impacts as noted below).

35. The social screening will review land policy, land cadastre and other official documents, verify the population census, take stock of the land use in a screening manner (yielding main types and percentages on a community scale), discuss with local authorities and community leaders the likely scale of resettlement and socioeconomic impacts for both communities to be resettled and other communities potentially impacted by the project including host communities in areas to which resettled populations might move. Also, Tajik law on permitting and the role of the Ministry of Energy and Industries / Environment as well as on land acquisition and resettlement will be reviewed and compared with World Bank safeguard requirements. Any significant deviations and gaps should be identified. The reality of and experience with resettlement in Tajikistan should also be assessed, so any good practice not mentioned in the law might be actively utilized and poor practice identified and avoided in the project.

36. The IESS will also take into account the already completed and ongoing resettlement activities under the auspices of the Government of Tajikistan. This will include a detailed review of the legal background, existing procedures and instruments, the current status, ongoing activities and existing planning for the further course of the project.

37. Attention will be given by the Consultant to physical cultural property issues, such as any cultural, religious, historical or archaeological sites, including sacred sites, graveyards and burial places, that might be flooded or affected by the construction of the dam, reservoir impoundment, quarries, construction camps and access / haulage roads. A field based survey will be conducted by qualified cultural resources staff to identify potential impacts and mitigation measures. Provisions will be made for the use of chance find procedures if unanticipated archeological, historical and sacred sites or materials are encountered during further construction.

38. The social screening should be done to provide an understanding of the socio-economic profile of the affected communities to enable the project to design activities to meet their development needs and mitigate against potential negative impacts. See Annex 4 for detailed guidance on issues to be considered when conducting social analysis for this project.

39. During the social screening, consultation with the Project-Affected People (PAPs) should focus on basic information about the project. Details on such topics as resettlement packages would be deferred until the policies and procedures for resettlement are defined. The consultants should clearly tell PAPs that they are just conducting studies and that issues raised during interviews and group discussions cannot be viewed as agreed policies or decisions in the project. Key among other information that should be disseminated at this stage is the nature and scope of the current studies and the possible future project, cutoff dates (after agreement on the same with project authorities) and grievance mechanisms to be used during the project. The opportunities for further feedback and participation in conjunction with preparation of the RAP will also be communicated. An outreach strategy for the resettlement plan is to be prepared as part of the RAP.

40. The preliminary assessment shall be completed and the report shall be prepared and submitted at the conclusion of the pre-feasibility phase. Terms of Reference for the

follow-on EIA, RPF and RAPs will be reviewed and can be adjusted depending on the outcomes of this phase.

4.2.3 Environmental and Social Impact Assessment (ESIA)

41. The ESIA will be developed for Rogun HEPP and shall contain a detailed identification of the base-line situation, of expected impacts of the proposed project, and provide an Environmental Management Plan (a proposal for content and structure of the EMP can be found in Annex C to the World Bank's Operations Policy 4.01, Environmental Assessment, available on the World Bank's external web site, and a summary further below in this section). The EMP shall include both a Mitigation Plan and a Monitoring Plan (see Annex 2).

42. Activities for both environmental and social aspects shall run in parallel and be synchronized with progress of the techno-economic study, with particular reference to integration of water management and environmental/social measures that may affect design and/or project economics.

43. The ESIA will build on results from the screening environmental and social assessments, but the level of detail shall be higher. The ESIA addresses the physical, biological and meteorological consequences of the flooding of the reservoir area as well as the impact on population centers and cultural properties. This includes the impact on the topography that might induce natural disasters, including landslides or flooding. It will address the impact of any transmission system expansion or rehabilitation, e. g. transmission lines connecting Rogun HEPP to the CASA 1000 project, as well as the impact of construction activities and waste / spoils disposal. The ESIA will examine issues related to water regulation and impacts on existing flow regimes both at the project site and downstream through riparian countries. Such impacts will include both ecological and social/economic (e.g., agriculture).

44. A detailed risk analysis will be conducted in close cooperation with the TEAS and should include geological and seismic hazards, especially a detailed analysis for induced seismicity, which in studies performed during Soviet period, have been found to be a potentially significant risk. If issues of relevance are identified, they shall be communicated to the TEAS Consultant to be included into the technical risk management plan.[3] The context of landslides in the reservoir area and induced seismicity should also be explored under this topic.

45. Boxes 1 to 5 summarize key environmental topics for the assessment as identified by previous studies, during joint field missions by representatives from the Government, Barki Tojik and World Bank specialists, and known to be general issues of concern

[3] For risk analysis covered in the technical studies, the Consultant shall receive the relevant information from the TEAS consultants commissioned for these studies. In the TOR for the technical studies (TEAS TOR) this topic is be explicitly stated, that risks associated with the construction of Rogun HPP, risks associated with the operation of Rogun and the combined operation of Rogun and other HPPs of the cascade must be identified. For each risk its impact must be assessed and means to mitigate it or eliminate it designed.

within large hydropower projects. These topics will be updated based on the Consultants' screening and SEA:

Boxes 1-5: Key environmental tasks and actions identified for Rogun HEPP:

Box 1: Review of existing data / studies

- Needs to be a major compilation and inventory campaign
- Work with Bark Tajik to view archives and draw list of existing studies and data pools
- Copy and physically assemble all materials at a place freely accessible to all authorized project participants
- Organize staff to manage and supervise data pool
- Review data using sufficient number of Russian speaking, qualified engineers and specialists, translate key technical and safeguards documents into English language
- Identify data gaps and areas not covered by appropriate studies, using good international practice and World Bank requirements as benchmarks
- Review existing studies and materials (including but not limited documents in Annex 7 of these ToRs), and follow up with study authors, as appropriate.
- Elaborate a comprehensive data review report, which contains
    - List / inventory of available information
    - Contents and abstracts of all key reports in Russian and English languages; list of documents available in English in full version
    - Identification of major data gaps and proposed action to close them, including time and cost estimates

Box 2: Review of geological conditions at dam site and reservoir area

- Review investigation history, including campaigns, types, volume, quality of site investigations (SI); assess completeness, quality, availability and usability of generated data
- Review geological / geotechnical reports and resulting models against adequacy in context of good international practice
- Identify and comment on special problems such as: Landslides/ rockfalls along reservoir slopes, that can cause hazards to settlements and infrastructure, or can create natural dams and generate flood waves or peak floods when such dams break.
- Review existing geotechnical hazard maps for the reservoir area and assess their accuracy and actuality by sufficient field checks, assess adequacy for project purposes and identify gaps and measures to close them.
- Review issue of seismic dam engineering and induced seismicity from Rogun reservoir, provide recommendations for further investigations, if deemed necessary
- Identify major gaps in geological / geotechnical model and propose the necessary actions to close them.
- Review and discuss any proposed supplementary site investigation program with project proponents, engineering Consultants and POE

Note: All geological, geotechnical, geochemical and seismic investigations and technical reviews will be done by the TEAS Consultants. The results obtained from them need to be reviewed by the ESIA consultants from the environmental, social and safety points of view in an interactive manner.

Box 3: Workplace health and safety, hazards to site personnel and population

- Review current conditions of existing built assets, especially underground works regarding structural stability, potential spalling and rock fall risks, unsecured shafts and caverns
- Review current site conditions regarding safety of electrical installations, lighting, signposting, emergency equipment and communication systems, fire safety, first aid equipment and rescue services.
- Review status of use of personal protection equipment for surface and underground works
- Review current site health and safety management procedures and staffing
- Draw up recommendations to improve H&S conditions on construction site, elaborate comprehensive H&S plan
- Develop site inspection, monitoring and enforcement procedures for H&S measures

Box 4: Site preparation, cleanup and waste management

- Currently the construction site is characterized by certain quantities of left over scrap metal, derelict machinery, construction materials and waste
- Conduct site survey to prepare an inventory of above materials, including quantities, assessment of properties such as environmental hazards, usability for new construction works, recyclability, waste categories and disposal pathways and costs
- Elaborate site cleanup and waste management plan, which at later project preparation / implementation stages can be expanded as component of the EMP

Box 5: Land management: soil conservation, erosion control, hazard management and biodiversity

- Due to the combination of past construction activities, the sudden drastic reduction of the level of construction works and the 15+ year period of limited activity, the project area has been visibly impacted by strong erosion, slope instability, mass movements such as landslides and rock falls, and a deteriorated vegetation cover aggravating and accelerating soil depletion
- Conduct construction site mapping to identify and localize areas impacted by erosion, mass movements and instabilities; classify according to hazard / risk levels for existing built assets and future project components
- Produce hazard related maps for dam area and planned site installations such as roads, camps, storage areas, machinery pads, workshops etc., which indicate high risk areas and can be used as planning tool for remediation and mitigation works
- The maps should be compatible in format and contents with geotechnical hazard maps to be prepared for the entire reservoir area
- Produce a biodiversity inventory for the entire affected project area, including reservoir and dam sites, appurtenant structures, temporary works, areas of indirect impacts and potential reservoir influence (e.g. by microclimate change).
- The surveys should address terrestrial and aquatic compartments, the latter selected key areas and “hot spots” of the downstream area where hydrological changes are expected to have most impact.
- Biodiversity data should be geo-referenced and maps be prepared for the entire relevant investigation area.
- The Consultant should assess feasibility and options for protection or rescue/recovery of any rare/endangered species or ecological communities which may be identified through the biodiversity inventory, and the cost of such actions.
- Total biomass in the reservoir area should be estimated and an assessment made whether it will be necessary to remove vegetation prior to filling the reservoir (if so, at which cost)

46. Box 6 summarizes the general environmental issues commonly associated with HPPs, all of which will apply to Rogun in varying degrees. These issues will have to be considered with respect to the relevant areas in Tajikistan as well as in all countries forming part of the Amu Darya basin.

Box 6: List of potential adverse environmental

Description of the potential impact of the hydropower plant needs to consider the whole range of reservoir and river basin management issues, including water flow-through, including but not limited to:

- key environmental performance indices, eg.: surface area vs. megawatt production capacity (ha/MW), water retention time (days), biomass flooded (m^3), length of river impounded / left dry, useful reservoir life (years), persons requiring resettlement vs. megawatt production capacity (no. persons/MW), area of critical natural habitats affected (ha)
- ecological effects of flooding and construction activities, including risks to habitats and topographical impacts that would induce landslides or flooding
- effect on the hydrology and on the water quality of the river/reservoir
- impact of the changed river flow regime, including impact due to river impounding upstream of the dam, and changes in volume, pattern and quality of water downstream of the dam
- determination of ecological flow between dam and tailrace discharge
- effect of river animal and aquatic lives and potential for maintaining them
- likelihood of reservoir stratification, biomass flooding potential
- foliage and vegetation in area to be flooded and removal requirements before flooding
- impact on drinking water supply systems
- sedimentation of the reservoir
- potential for reservoir landslides and soil erosion
- possible loss of cultural property (including archaeological and historical sites), including a site survey and provision for chance finds
- potential impact from short-term or long-term migration to the project area or such induced activities as logging
- potential for incidence of water borne and water related diseases
- impact on fisheries, agriculture and other sources of income
- Impact on downstream irrigation-based agricultural systems and drinking water supply, both during reservoir filling phase and routine operation

47. Box 7 identifies the key elements of the impact assessment on riparian countries of the construction and operation of Rogun HPP. (see Box 7).

Box 7: Impact Assessment on Riparian countries of Rogun HPP

After the collapse of the Soviet Union in 1990-91, the newly independent Republics continued to hold the flow targets prescribed in Soviet Union Decree 1110 as agreed and valid. By an agreement dated February 18, 1992, the five Central Asian Riparians (CARs) agreed to maintain and adhere to the division of trans-boundary water resources as set out in Protocol # 566 (Amu Darya basin). Later on in 1995, heads of the States of Central Asia signed the effective Nukus Declaration which is the basic document regulating water sharing issues and is the basis for assessment of riparian impacts.

The consultant will assess the impacts of the construction and operation of Rogun HPP on the downstream countries. The specific assessment should be done in concert with the consultants conducting the Techno-Economic Assessment Study (TEAS), who would be responsible for proposing any technical and economic solutions.

The consultant should:

a) Compile data relating to the area of lands irrigated by Amu Darya waters Tajikistan, Uzbekistan, Turkmenistan and Kazakhstan since independence regarding, crops grown, water usage per hectare, yields, agronomic and irrigation practices.
b) Compile data on number of communities using Amu Darya for domestic and industrial water supply and the related water demand and whether the proposed operating regime of Rogun/Nurek could in any way improve or worsen their current situation

Box 7: (continued)

c) Review the flows into Aral Sea since independence and broadly identify the key causes for Aral Sea's decline and the inability to achieve the targets specified in Soviet Decree 1110 for Aral Sea restoration.
d) Analyze the impact of the proposed Rogun operating regime and check whether it is directly or indirectly relevant to the issue of Aral Sea restoration. If yes, indicate how change to the operating regime can help
e) Analyze whether Rogun HPP by its construction and operation has the potential to stop the flow of Amu Darya water to downstream countries – either wholly or partly; or during the vegetation season; or has the potential to change the seasonality of Amu Darya flow to downstream countries.
f) Analyze environmental and social impacts of various reservoir simulations, including those undertaken in the TEAS, for both reservoir filling and operation
g) If the potential exists, working closely with the TEAS consultants, identify the mitigation measures – technical, operational, financial institutional, legal – that could be implemented to ensure no significant harm is caused to the riparian countries.
h) Review the environmental flow needs in Amu Darya River and verify whether the minimum needs are met under the present arrangements and whether Rogun could in any way improve this on account of its high storage capacity.

Note:

The Memorandum of Understanding on Energy Development for Sustainable Growth between the Government of Tajikistan and the World Bank regarding cooperation agreed between the Government of Tajikistan and the World Bank, (Item 2) includes:

- Initiating and advancing the technical-economic, the environmental and social impact assessments for the Rogun Hydropower Project (HPP) with due regard to international standards of environmental and social standards, as well as compliance with applicable operational policies of the World Bank, including dam safety, environmental impact assessment, resettlement, and issues related to downstream countries.

48. The World Bank has organized independent and objective consultations with all affected riparian countries. A detailed record of the issues raised by the riparians is included as in Annex 6.

49. Box 8 addresses the recommended investigations relating to implications of climate change scenarios on the project as well as the project's potential impacts on downstream ecosystems and the socio-economic framework.

50. Also the ESIA should address issues connected to climate change and climate variations, investigating matters such as glacial melting, changes in flow regime (volumes, seasonal variation), sediment transport and re-sedimentation. Potential scenarios and their impact on operation should be outlined and considered (see Box 8).

Box 8: Hydrology and Climate Change Impacts

The impacts of Rogun HEP construction and operation should be seen within the context of global climate change, which might significantly affect the physical environment of the project. The Consultant should describe and whenever possible quantify processes and factors such as:

- temperature impact change on water balance models of mountainous regions, on glacial melting, water generation from fossil ice vs. annual replenishment by precipitation, water storage in glacial systems, timescale of balance of deposition and depletion
- changes in amount, type and seasonal/annual distribution of precipitation in the project area and the upstream / downstream watershed of Rogun HPP
- changes in reservoir temperature and resulting stratification / mixing behavior due to change of average ambient temperature as well as water temperature of Vaksh river and other direct inflows, impacts on reservoir water chemistry, fauna and flora
- changes of upstream / downstream hydrological parameters, notably flow rates and sedimentary load and their seasonal / annual distribution. They might be controlled by underlying phenomena such as glacial melting and subsequent release of water / sediment trapped in ice, glacial retreat and exposition of additional areas to erosion, changes in vegetation and resulting impact on erosion / sediment generation and microclimate
- changes in seasonal / annual demand patterns for water and electricity: shifts in peak demands for energy (heating / cooling) and water (agriculture, irrigation) in the annual cycle, and interaction of these changes with operational requirements and hydrological parameters, such as seasonal flow rates;
- Review the data on the past climate change in each of the countries in the region and all available future climate change forecasts and assess their impact (a) on the water demand in each country and (b) on the design and operation of Rogun;
- Review the Carbon dioxide emission data in all the five countries and analyze the extent to which Rogun could help to reduce them and outline possible carbon financing mechanisms.

The Consultant is not expected to deliver detailed, quantitative studies on the listed topics, but will analyze them in a comprehensive, qualitative manner, procure quantitative data where available (e.g. from existing global climate models - GCMs) and supplement own best estimates whenever reasonably possible. The Consultant will analyze existing conflicts due to competition among different water uses and develop scenarios how such conflicts would be affected by likely climate change scenarios.

The Consultant will not be required to conduct own basic research, but use available scientific and technical publications and reports.

51. A proposed structure for the ESIA is outlined below:

- **Executive Summary and Conclusions**
- **Policy, Legal and Administrative Framework** - Discuss the policy, legal and administrative framework and requirements (e.g. Government of Tajikistan, World Bank, relevant international environmental agreements, etc).
- **Project Description** – describe the proposed project and include the following information as relevant: location; general layout; size, capacity, etc; pre-construction activities; project / construction history, construction activities; schedule, staffing and support; facilities and services; operations; required off-site investments; and life span. Note: this is not an exhaustive list.
- **Baseline Data** – assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area including the physical, biological, cultural property and socio-economic conditions. Any changes anticipated before the project commences should also be identified.
- **Environmental Impacts** – determine and quantify where possible the significant positive and negative impacts, direct and indirect impacts, and immediate and long term impacts associated with the project. Impacts will include both local and downstream, including impacts on riparians countries. Identify those that are unavoidable or irreversible. Identify mitigation measures and explore opportunities for environmental enhancement. Characterize the extent and quality of available data (see Boxes 1-7 for identified and general issues associated with Rogun HPP, which need to be checked / addressed by the Consultant).
- **Analysis of Alternatives** – Making use of the outputs from the TEAS and the SEA, systematically compare feasible alternatives to: (a) the proposed project as an investment to provide energy and water regulation, (b) the project with the already-built assets, (c) technology, design, construction techniques, (d) sites for access roads, construction camps, quarry sites and other associated works (e) phasing and operation. As for Rogun the location is predetermined by existing works, variations in dam height / resulting reservoir size, as well as the 'without project' scenario should be assessed. The comparative analysis should address (and quantify where possible): the environmental impacts; the feasibility of impact mitigation; capital and recurrent costs; the suitability of options under local conditions; related institutional, training and monitoring requirements. State the basis for selecting the proposed design, including the minimization of risk.
- **Environmental Management Plan** –The objective of the Environmental Management Plan (EMP) is to provide a practical tool to mitigate negative impacts and enhance positive impacts resulting from the investment project. The EMP includes both a Mitigation Plan and Monitoring Plan. Sample tables for format, structure and content are provided in Annex 2. The EMP is a key outcome of the Environmental Impact Assessment and the backbone for environmental safeguards implementation and management during physical project implementation. It generally covers the following information:

(a) Introduction/Responsible Party: Link to the specific project and identify the authors who prepared the EMP along with the date of preparation.

(b) Project Description: brief summary description of the project, including nature of the investment, location of the project, baseline situation/geographic description, and any characteristics of the area that are of particular interest (e.g. near a protected area, area of cultural or historical interest). Also this should include a description of the socio-economic conditions in the area and illustrative maps and drawings.

(c) Project Impact: Identify the expected short-term and long-term impacts of the project during the design, construction, and operation phases. If these can be quantified, this should be included.

(d) Mitigation Plan: Include a description of the steps to be taken to mitigate the major potential impacts on land, water, air, ecosystem services and other aspects of the environment during the construction and operation phases. The mitigation plan should be keyed to the impacts identified in the previous section. Particular attention should be paid to the specification of emission limits, environmental norms, water management and regulation, and design standards with specific reference to Tajik laws and any other relevant guidelines such as the World Bank Group Environmental, Health and Safety Guidelines (EHS), in particular the General EHS Guideline, (2007), or other relevant international norms.

The Mitigation Plan should parallel the risk from impacts identified in (c) above. For example, to minimize the emission of greenhouse gases from flooding, contractors should remove foliage in the flood plain in advance of the flooding stage.

(e) Monitoring Plan: Include a description of the key parameters to be monitored (including monitoring locations, schedules and responsible entities) to ensure that the construction and operation of the project is in conformance with Tajik law, other relevant norms and standards, operating commitments and transboundary agreements. Again, the Monitoring Plan should parallel the structure and issues included in the Environmental Management and Mitigation Plan. If permits or construction or monitoring contracts cover such details, these can be referenced as attachments. The development of this plan will require consultation with responsible agencies for EMP monitoring such as the Ministry of Environment.

(f) Institutional Arrangements: There should be a narrative discussion that provide a brief presentation on how the monitoring data is going to be used for sound environmental performance and water management - who collects the data, who analyzes it, who prepares reports, who are the reports sent to and how often, what is done by the responsible authorities after they receive the information; how decisions are taken, responses generated and enforced, regarding non-compliance with the EMP. Particular discussion needs to be given to the role of the Ministry of Environment and other ministries and agencies that may play a monitoring role, as well as transboundary organizations such as the ICWC.

(g) Training requirements and costs: Training opportunities should be organized for technical and management staff from relevant Tajik authorities and institutions (environmental, land management, geological / geophysical / meteorological / hydrological surveys and institutes), to create / raise awareness of international best practice in safeguards issues, close technical knowledge gaps and enhance staff skills and experience. The Consultant should develop specific plans and schedules stating the groups / persons to be trained, contents, timeframe, venues, trainers and the cost such as venues, travel, per diem, fees / remuneration for lecturers / trainers.

- **Instrumentation and Monitoring Plan**: Drawing upon the work of the TEAS Consultants this consultancy will update and supplement be the plan for monitoring and recording of the behavior of the Rogun dam and related hydro-meteorological, structural and seismic factors with environmentally relevant data such as water quality, and downstream discharge and availability and ensure that the quality and frequency of data recording corresponds to the requirements of ensuring good environmental performance of the HPP and avoiding of any negative downstream impacts, especially in transboundary context.
- **Emergency Preparedness Plan**, including the protection of people, property and heritage and national treasures (located downstream in the riparian states) in the event of Rogun dam failure, as well as a coordinated early warning system and a communication plan. This plan shall be prepared as envisaged in Annex A to BP 4.37 (Dam Safety) of the Operational Policies of the World Bank. Execution of part of these services in phases II and III assigned to the consultant for TEAS under another task and consultant has to perform these services, taking into account the data obtained from TEAS.

- **Appendices**

(a) Consultations with affected groups and non-governmental organizations. The following should be included: (i) date(s) of consultation(s); (ii) location of consultation(s); (iii) names and addresses of attendees (as appropriate); (iv) meeting program/schedule: (v) what is to be presented and by whom; (vi) summary Meeting Minutes (Comments, questions and responses by presenters); (vii) agreed actions. Since the investment project would be a Category A, specific public consultations are to include (i) an initial consultation in relation to the planned work and then (ii) a second consultation in terms of the findings.

(b) Sample contract terms and positions for the bill of quantities (BoQ) for contractors to mitigate short-term impacts from construction and decommissioning plan for significantly sized temporary works, such as access and haulage roads, borrow areas, quarries, and construction camps.

4.3 Information Disclosure and Consultations of the Public

52. A public consultation and disclosure campaign as required by OP 4.01 and OP4.12 will be prepared, organized and carried out. For a project of Rogun's size and complexity at least 2 rounds of consultations will have to be carried out: One round before

commissioning of the ESIA, on the TOR and the planned safeguards approach. These will be carried out independently by a third party and are not part of these TOR. The second round (or series) will be held on draft environmental and social documents to integrate stakeholder concerns into the final versions and especially the derivative environmental and social management plans.

53. The Consultant will assemble appropriate materials, (maps, graphs, drawings, simulations, models, key environmental figures) disclose them in a manner acceptable to Bank policies (timely prior to consultation, in a form and language that are understandable, in locations accessible with reasonable effort to the groups being consulted) and organize venues which will enable the affected population to participate without excessive undue efforts. Suggested venues would be near the construction site and in the reservoir area, ensuring accessibility to all affected people, i.e., with a spacing allowing for a travel distance of not more than 20 km for any participants. The initial consultations on the ESIA TOR will be organized in the same manner as described above after publication on appropriate websites (Barki Tojik, Ministry for Energy) and invitation of affected local population, relevant NGOs and other appropriate parties.

54. The materials and information to be disclosed will have to cover the following aspects of the project: (i) General project design and layout, emphasizing areas directly impacted by permanent or temporary works and structures, access and service roads, and areas indirectly impacted by construction or operation (noise, dust, borrow pits, landscape aesthetics etc.), areas impacted by reservoir filling and downstream hydrological changes; (ii) summary of all major direct and indirect environmental and socio-economic impacts generally associated with large scale hydropower, (iii) overview of relevant World Bank environmental and social safeguards policies applicable to the project (OP4.01, OP4.12) and the approaches and instruments for mitigation of environmental and social impacts, which are commonly applied in hydropower projects; (iv) overview of TOR for the ESIA and RAP for the project.

55. The Consultant will ensure the presence, at the consultations, of competent technical staff highly familiar with the project. Discussions will be conducted in language(s) understandable to all affected stakeholders. With assistance of the project proponent materials, will be prepared clearly describing the project in a manner understandable for non-specialists and conduct the presentation(s). These can be maps, pictures, plans, diagrams and other information materials which are understandable to a non-technical audience, yet truly and fully characterize the project, the expected impacts and planned mitigation measures. The Consultant will provide documentation of the following:

- Manner in which notification of the consultation was announced: media(s) used, date(s), description or copy of the announcement
- Date(s) consultation(s) was (were) held
- Location(s) consultation(s) was (were) held
- Who was invited (Name, Organization or Occupation, Telephone/Fax/e-mail number/address (home and/or office)
- Who attended (Name, Organization or Occupation, Telephone/Fax/e-mail number/address (home and/or office)
- Meeting Program/Schedule (What is to be presented and by whom)

- Summary Meeting Minutes (Comments, Questions and Response by Presenters)
- List of decisions reached, and any actions agreed upon with schedules, deadlines and responsibilities.

4.4 Monitoring and Evaluation Framework for Socio-economic Impacts, Resettlement Policy Framework (RPF), Resettlement Audit and Resettlement Action Plan (RAP)

The resettlement assessment and action plans will proceed in two parts: (i) scope of work detailed below; and (ii) completion of full Resettlement Action Plan for remaining people potentially affected by the full project. This ToRs calls for the specification of methodology, work and budget for the first part only. The second part may be exercised subject to the findings of the assessments, the opinions of the Panels of Experts, and funding. The specific tasks for this phase will be determined after completion of Phase III of the TEAS and the ESIA. Part 2 is also subject to World Bank funding and no objections on contract extension. The Consultant is not required to provide methodology nor cost estimate for Part 2 in their proposal.

Monitoring and Evaluation Framework for Socio-economic Impacts:

56. The socio-economic studies described in the social screening section, and detailed in Annex 4 will inform the development of a socio-economic baseline which will serve as a framework to evaluate and analyze project impacts (negative impacts and benefits) on the wide range of stakeholders (beyond just those directly resettled by the project). The detailed profile of the groups impacted by the project, their livelihoods, social networks, communication channels, institutional and political set up as described in the section on social screening will be summarized and presented as a baseline profile of the communities affected by the project.

57. Based on the above, a monitoring and evaluation framework will be developed. This will include a set of clear, measurable indicators to analyze the impact that the project will have on the communities. The indicators will differ over the project cycle (short and long term) as well as for different groups (impacts on resettlers different from hosts etc.). The framework will also indicate the time-frame where the indicator is relevant, the methodology to collect information for the indicator, the primary informants and the relative weight of the indicator. This framework will have a heavy focus on qualitative methods and indicators to contextualize quantitative data, thereby reflecting the mix of methods recommended for use in the collection of baseline data (see above). There should be clarity on the institutional responsibilities for M & E with a balanced use of Government and civil society represented in the responsibility matrix.

58. The Consultants should also refer to the *Social Assessment Policies and Guidelines* (GP 10.05) and the *Social Analysis Sourcebook* (2003) of the World Bank for methodological guidance and social assessment tools.

Resettlement Policy Framework

59. The World Bank's Policy on Involuntary Resettlement (OP 4.12) requires that either a Resettlement Policy Framework (RPF) or a Resettlement Action Plan (RAP) be prepared when project activities displace people from land or productive resources, and which result in the loss of shelter, the loss of assets or access to assets, and the loss of income sources or means of livelihood whether or not the affected persons must move to another location. The objectives of the policy are to avoid or minimize adverse impacts, to give displaced people opportunities to participate in the design and implementation of resettlement programs, and to assist displaced people in their efforts to improve their livelihoods and standards of living, or at least to restore these to pre-project levels. Key elements and structure of a RPF and RAP are detailed in Annex A of the World Bank's Operational Policy OP 4.12.

60. A RPF will be developed to cover the whole submergence area, and including households who may resettle as well as those who may not resettle but are affected through loss of access to resources or services. The aim of the RPF is to serve as a framework detailing the following areas:

i. Legal Framework**.** Identification of the principles and guidelines which will be used to acquire lands or other assets from private ownership, as well as to resume public lands from authorized and unauthorized private uses. A review of current policies and procedures in Tajikistan relating to land acquisition and the World Bank's resettlement policy to identify any gap between local laws and the Bank's policy, and the mechanisms to bridge such gaps.

ii. Potential Impacts. Identification of project activities that will result in resettlement, the zone of impact of these activities, and alternatives considered to avoid or minimize resettlement. Impacts on communities both upstream and downstream of the reservoir should be identified. As part of defining the project impacts, it is essential that the Consultant work with the project authorities to agree on a cut-off date for resettlement eligibility and communicate this to the PAPs in writing. In addition, a specific emphasis should be placed on impacts on those people who are currently being resettled, and those who were displaced from the project area when initial construction of Rogun hydro-electric power plant commenced in the 80s of the past century and who have relocated back to the project site.

iii. Profile of Communities to be Resettled and Compensated. This section will refer to the socio-economic baseline studies to detail the following:

- Current occupants of the project affected area to establish a basis for designing the resettlement program;
- Characteristics of displaced households, including a baseline information of livelihoods such as relevant production levels and income derived from both formal and informal economic activities and standards of living of the affected population;
- The magnitude of the expected loss - total or partial – of assets, and the extent of displacement, physical or economic. Types of losses can include, but are not limited to the following: agricultural land, residential land, houses,

structures, standing crops and trees, income, cultural and religious property (e.g. grave/sacred shrine), other productive assets, community buildings and structures. Information on vulnerable groups, for whom special provisions may need to be made;

- Information on land tenure rights and systems, including an inventory of common property natural resources from which people derive their livelihood, and non-title based usufruct systems including fishing, grazing, or use of forest areas;
- Identification of categories of loss of access to resources (e.g. grazing land) or services (hospital) including where the physical asset may not be affected, but there is cut-off or loss of access to the asset as a result of project works.
- Information on further livelihood of population by categories to be resettled to the new living places in order to identify employment and training/retraining for diverse types of professions.

iv. Valuation of Compensation**.** The methodology to be used in valuing losses to determine their replacement value and a description of the proposed types and levels of compensation.

v. Entitlement Matrix and Compensation Measures**.** Definition of affected persons and criteria for determining their eligibility for compensation and resettlement assistance. An *entitlement matrix* defining compensation packages and other resettlement measures that will assist each category of eligible persons. Resettlement measures should be prepared in consultation with affected population and should be framed within the overall approach of livelihood restoration and development. A sample entitlement matrix is provided in Annex 3.[4]

vi. Compensation Procedures. This covers how compensation and resettlement measures will be implemented. It includes details of information flows, money and in kind transfers to people, paperwork and sign off for package approval for each PAP, how transportation will take place etc. An important part is agreement on a cut off date which is to be communicated to the PAPs in writing.

vii. Resettlement Sites. Relocation sites considered and explanation of those selected, detailing:

- Process of involving affected populations in identifying potential housing sites, assessing advantages and disadvantages and selecting sites;

[4] Based on the profile of affected people and the valuation of compensation, the entitlement matrix will define and identify each category of affected persons, each type of recognized asset or access to asset loss, and specify the compensation rate or other resettlement measure to mitigate against that loss. Compensation may include a range of measures. Direct measures could be replacement of the asset in kind, cash based on calculation of market replacement value, providing access to an alternative school while indirect measures could include training for job opportunities in new site, providing access to micro-credit for community development initiatives, provision of cash lump sum against intangible impacts such as disturbance and trauma etc. The aim of the entitlement matrix is to ensure that the formula ensures that a compensation package can be easily and transparently designed for every PAP that assures livelihood restoration and development opportunities.

- Mechanisms for procuring, developing and allotting resettlement sites, including awarding of title or use rights to allotted lands;
- Measures for studying lands fertility to identify profitable cultivation of agriculture and creation of SMEs on agro-processing.
- Consultations with host communities about the new settlers. Have they participated in the identification of potential impacts on their communities and defining appropriate mitigation measures? Do the host communities have a share of the resettlement benefits (e.g. education, water, health, and any community development funds or programs)?

viii. Livelihood Restoration/Rehabilitation. Strategies for livelihood restoration and improvement should address the following questions:

- Are the compensation entitlements sufficient to restore livelihoods and income streams for each category of impact? Are additional rehabilitation measures necessary to promote longer term social and economic uplift of the project area and to respond to the development framework within which resettlement should take place?
- Does income restoration require change in livelihoods, development of alternative farmlands or other activities, that require a substantial amount of training and include such training in the compensation package.
- Are there any social or community development programs operating in the project area? Are there any opportunities for the project to support new programs or expand existing programs to support the development needs of the affected and host communities. It is also expected that there will be analysis of the potential for development and investment to benefit communities who will live around the newly formed reservoir (e.g. tourism, fishing, etc.)

ix. Participation and Consultation. A consultation strategy building on the stakeholder analysis, which describes :

- Process of promoting meaningful consultation of the affected people and stakeholders in the preparation and implementation of resettlement activities, including facilitating the participation of vulnerable groups and women.
- Process of involving the affected population and other stakeholders in project monitoring.
- Plan for disseminating information about the RAP, grievance channels, ongoing project activities, and other issues such as an awareness program for contractors and local communities on HIV/AIDS transmission

x. Grievance Procedures. Identification of affordable and accessible procedures for settlement of disputes related to the planning and implementation of resettlement activities. Establish a procedure for recording grievances and response times for resolution of problems. Identify agencies responsible for implementing these procedures.

xi. Institutional Arrangements. Organizational framework for implementing resettlement activities, describing:

- Agencies responsible for implementing all aspects of resettlement program. This includes implementing compensation procedures (including the delivery of each item/activity in the entitlement matrix), implementation of other resettlement measures (e.g. payment of allowances, training, development programs, service provision, income restoration etc.), communicating and informing PAPs etc. and coordination of activities for implementation of the RAP;
- Coordination arrangements, if resettlement activities involve different government agencies and jurisdictions;
- Identify clearly the various rolez of project authority, Government agencies, civil society, private sector and community representatives and organizations as appropriate.
- Assess the institutional capacity for and commitment to resettlement, identify gaps and recommend measures to ensure delivery of the program.

xii. Costs and Budget. Aside from the compensation calculation tables and the entitlement matrix which will have detailed costs to estimate losses, this section will project the costing of resettlement program, taking into account a range of potential compensation packages for different categories of affected people. It will also estimate costs for identified additional resettlement measures such as training and associated development programs in the new area and around the reservoir.

xiii. Monitoring and Evaluation. Framework defining the arrangements for evaluating impacts and measuring outcomes, including:

- Performance monitoring indicators derived from the socioeconomic baseline to measure inputs, outputs, and outcomes for resettlement activities;
- Frequency of reporting and integrating feedback from monitoring activities into project implementation.
- Institutional responsibilities ensuring adequate role and representation of civil society, private sector and community groups.

61. Sample table of contents for both RPF and RAP are provided in Annex 3.

Resettlement Audit

62. Following on the resettlement audit done in the initial social screening, the Consultancy will identify gaps in the current program and recommend retroactive measures to make it consistent with the RPF, pilot RAPs and World Bank OP 4.12. These measures should be detailed showing cost implications, institutional responsibilities and a potential time-line for implementation.

63. Legacy Issues: The Consultancy will also look at past resettlement done under Soviet times when this project was initiated. It will describe policy guidelines,

entitlement matrix and other provisions. It will identify gaps in the program and reflect on the financial and social implications of undertaking possible retroactive measures for this legacy resettlement.

Resettlement Action Plans:

64. Consistent with the laws and policies in Tajikistan as well as the World Bank's policy on Involuntary Resettlement, the RAP will be developed based on up-to-date information about the number and characteristics of affected people, the impacts on the displaced populations and other adversely affected groups, resettlement alternatives and appropriate mitigation measures as well as legal issues involved in resettlement. The RAP will build upon the social screening socio-economic baseline and the RPF.

65. The RAP builds on the legal policies, entitlement matrix, compensation procedures, institutional arrangements and M & E framework detailed in the RPF. It covers all the areas discussed in the RPF but goes further to detail on some additional areas. The RAP serves as a detailed plan that lays out all the activities to be done to implement the resettlement program, breaking this up per household as appropriate. Areas of additional detail are:

- Household level resettlement packages taking into account the profile of the household, existence of vulnerable persons, household asset base, eligibility for any additional development measures, potential to restore livelihood in new site etc.

- Implementation Schedule. An implementation schedule covering all resettlement activities from project preparation through implementation, including a description of the linkage between resettlement implementation and the initiation of civil works.
- Tables showing itemized cost estimates for all resettlement activities, including planning and implementation, management and administration, monitoring and evaluation, and contingencies.
- Detail and be specific on all areas covered in the RPF such as institutional responsibilities, compensation procedures, monitoring arrangements etc. Where the RPF has not specified the appropriate office, or the detailed procedure, the RAP must provide the details.

- Scope of RAP in this Consultancy: For the purposes of this Consultancy it is expected that detailed RAPs will be prepared for villages to be submerged within Phase 1 of the project. However, the initial screening should recommend the detailed scope of the exact number of villages to be covered in the Phase 1 RAP.

4.5 Panels of Experts

66. As customary for projects of this size and complexity two Panels of Experts (PoE) will be established by the project owner for dam safety and for environmental and social safeguards aspects. The PoEs will be comprised of impartial, international and national experts and act as reviewers and advisors.

67. The Consultant will be expected to coordinate and liaise with the PoEs and provide the experts with findings and documentation from the assignment on request.

4.6 Links to Safeguards Information

68. The following links provide additional information on the World Bank Group's safeguards policies and environmental and social tools, instruments and practices:

- World Bank Safeguards Website
  www.worldbank.org/safeguards
- Strategic Environmental Assessment (SEA) Tool Kit Website
  www.worldbank.org/seatoolkit
- IFC's Sustainability Policy Framework
  www.ifc.org

5. SCHEDULE OF REPORTS

69. The ESIA will be following the sequencing of the Techno Economic Assessment Study (TEAS), which will be phased as follows:

Phase 0	Assessment of the Salt-Dome issue
Phase I	Assessment of the Existing Rogun HPP Works
Phase II	Rogun HPP Project Definition Options
Phase III	Detailed Assessment of the of the Selected Option

70. The individual reports (including draft documents) to be produced under this assignment are listed in Table 1 below, and the timeframe for their delivery indicated. The Consultant should include in its proposal a list of data required from, and data to be supplied to the TEAS consultants, with approximate timing

71. Parallel to the ESIA a Dam Safety Report (DSR) will be elaborated by the Panel of Experts (PoE). The Consultant will be aware of its progress and the activities of the PoE and draw upon / integrate relevant findings.

72. For the whole duration of the assignment the Consultant shall provide monthly reports, enabling the Client to assess the progress in relation to the overall tasks as well as indicating any unforeseen problems, obstacles or findings requiring the Client's attention.

Table 1: Overview of report schedule

Timeframe (weeks from the date of commencement of services)	**Deliverable**	**Other Studies**
8	Inception report and Environmental/Social Screening report	Techno-Economic Assessment (TEAS): Draft stage 1 and Phase II reports (approx. 11 weeks)
16	Draft Environmental and Social Assessment (ESIA) report for Stage 1 (crest at 1,060 m asl) Inception report for Stage 2 ESIA	
20	Final ESIA report for Stage 1 (crest at 1,060 m asl)	TEAS: Final Stage 1 and Phase II reports (approx. 22 weeks) Consideration of extension of ESIA to full Resettlement Action Plans (RAPs) for Stage 2 (full dam)
34	Draft ESIA report for Stage 2 (full dam) including Environmental Management Plan and MP	
38	Final draft ESIA report for Stage 2 (full dam) Disclosure to stakeholders for comments	
47	Disclosure period ends, public consultations held, comments received	
52	Finalization of Stage 2 (full dam) ESIA report, EMP and MP	
67		TEAS: Draft Phase III report RAPs: Draft RAPs for Stage 2 (full dam)
75		TEAS: Final Phase III report RAPs: Final RAPs for Stage 2 (full dam)

6. OUTPUTS AND DELIVERABLES

73. The **inception reports and short monthly progress reports** shall be prepared in English and Russian with the Executive Summary in English, Russian and Tajik. The draft and final reports will be prepared in both English and Russian, with the Executive Summaries also in Tajik language. Local disclosure of the final reports in Russian is required, including public notice and specification of availability of the reports at the Ministry of Energy and Industries or other suitable, publicly accessible locations, especially in the proposed project area. Wide-ranging channels of communication,

identified as part of the Outreach Strategy, will be used to disseminate such key elements of the RAP as compensation/rehabilitation measures, entitlement policies, and grievance redress mechanisms.

74. The Consultant shall prepare and present the reports and other documentation to the project sponsors for comments and approvals. In general the project sponsors will review it and convey its comments to the Consultants within ten (10) working days from the date it receives the reports and documentation. The Consultant shall present the final version to the Ministry within ten (10) working days from the date it receives the comments. The foreseen schedule is specified in the Table in Section 5 above.

75. The **Initial Environmental and Social Screening reporting** shall include:

a) Ten (10) copies of the Inception Report which shall provide a work plan and schedule and the annotated content of the reports.

b) Twenty (20) copies of the final reports and fifty (50) copies of the Executive Summary, which shall have incorporated the comments provided by the Ministry of Energy and Industries. The final reports shall be presented within two (2) weeks from the date of receiving comments from the Ministry. The final reports shall be supplied as hard copies and on CDs in Microsoft Word, Microsoft Excel, and the drawings in AutoCAD, or similar software.

76. The **Environmental & Social Impact Assessments for both project stages (asl 1060m and 335m dam crest), the EMP, MP, Monitoring Framework for socio-economic impacts, RPF, RAPs and Resettlement Audit** shall be submitted in the following manner:

c) Twenty (20) copies of an inception report that shall be presented within one (1) month from the date of commencement of the task. The Inception Report shall provide the work plan and schedule and the annotated content of the reports.

d) Ten (10) copies of the monthly progress reports. These reports shall be provided within five (5) working days after the end of the month covered in the report. These reports shall briefly summarize, inter alia, the Consultant's activities, highlight important aspects and actions, address specific difficulties encountered or to be expected and their solutions, progress achieved and comparison with the contractual schedule, and expenditures on various activities as per the Contract. They may include all simultaneous environmental and social activities carried out under the assignment.

e) **Stage 1 Assessment:** The present terms of reference have been prepared for assisting GOT in developing the hydropower potential of the Rogun site in an optimal manner. In order to achieve that goal, the Consultant will have to take into account the following Stage 1 option:

   Before raising the dam to the final design height, an intermittent stage is planned by the GoT coincident with the completion of technical, environmental and social studies, riparian consultation and financial arrangements for the final, full project design. This stage 1 would comprise raising the embankment dam to level

1,060 m above sea level, with operating water level at 1,055 m above sea level; it would entail the completion of intake structure and hydro-tunnels, as well as the installation of the first two of six 600MW units with replaceable runners. The operation of this stage would be quasi run of the river with a reservoir capacity of well below 250 Mill m^3. The units would yield a maximum capacity of 120 MW each due to the low water head.

The Consultant will thus organize studies and works in a way to advance a compressed and downscaled study for this Stage 1 project before proceeding to the study for the full size Rogun HEP. In accordance with the ToR for the full size Rogun study, this optional assessment will comprise:

(i) environmental and social screening,

(ii) environmental and social impact assessment

(iii) environmental management plan (EMP)

(iv) instrumentation and monitoring plan

(v) disclosure of project information, consultation with public and affected stakeholders

(vi) monitoring Framework for socio-ecnomic impacts

(vii) resettlement policy framework (RPF)

(viii) resettlement action plan (RAP)

(ix) resettlement audit

The strategic environmental assessment (SEA) envisaged for the full size Rogun HEP is anticipated to start parallel to the Stage 1 assessment. The main outputs for Stage 1will be an ESIA report, an EMP, and a RAP which will have to be produced within the timeframe allocated to the phases of the ToR dedicated to (A) Data Collection and Desk Study and (B) Audit and Initial Screening Phase.

Twenty (20) copies of the Stage 1 draft assessment shall be presented and twenty (20) copies of the final reports have incorporating comments provided by the project sponsors, and fifty (50) copies of the Executive Summary shall be provided. The final reports shall be presented within ten (10) working days from the date of receiving comments from the project sponsor.

f) Complete Assessment: The draft assessment report for the full Rogun project (high dam) shall be presented within nine (9) months from the date of commencement of the work, including twenty (20) copies of the draft report and fifty (50) copies of the Executive Summary.

g) **Twenty (20) copies of the final reports** that shall have *incorporated the comments* provided by the project sponsors and received during consultations with the public, and fifty (50) copies of the Executive Summary respectively shall be presented within ten (10) working days from the date of receiving the last comments. The final reports shall be furnished in hard copies and electronically as Microsoft Office documents (2003 upwards), and the drawings in .dwg or .dxf formats compatible with AutoCAD (2004 and younger) or similar software. The due date for the delivery of the final reports shall be 12 months after commencement of the work.

77. All reports and deliverables should be available in both Russian and English, in equal numbers (i.e. half of required number in each language).

7. DISCLOSURE AND CONSULTATION

78. In addition to searching information from and providing information to Project-Affected People and other stakeholders, as described in previous sections, the Consultant shall consult these groups, as well as the riparian countries to Vakhsh and Amu Darya river basins with respect to the findings of the environmental and social studies work. Such consultations shall take place at appropriate milestones, and notably towards the end of the Preliminary Environmental and Social Screening, as well as during the development of and finalizing of the ESIA, Monitoring framework for socio-economic impacts, Resettlement Audit, RPF and RAP. The consultations shall be comprehensive, wide-ranging, open, and meaningful.

8. CONDUCT OF STUDY PROGRAM

79. The Consultant shall provide overall management of all the aspects of the work/services. The Consultant shall nominate a Project Manager and a Deputy Manager (during all times of unavailability of the former) to liaise with the Client's designated representative. All contractual matters shall be channeled through these persons. The Consultant shall also provide the necessary level of independent quality assurance and control of the work.

80. The Consultant staff shall work closely with the Client's staff assigned to the work, and shall coordinate with Consultants for the Technical Studies and other consultants working with other relevant aspects of the Project, including the Panels of Experts to be established for dam safety and environmental / social issues in the project. The Consultant shall liaise and undertake meetings with the Consultant for the Technical Studies during all relevant phases of the work to ensure that both Consultant teams share all necessary information with each other to facilitate the high quality execution of both the technical and environmental/social assignments.

81. The Consultant shall be fluent in English and have staff with good knowledge of technical Russian.

82. The Consultant shall implement his internal quality control and assurance procedures during the execution of the Contract, and shall demonstrate that they are being applied to his work.

83. The Consultant shall implement an effective capacity development program which integrates seconded personnel of the Borrower / Project Sponsor into the work. The Consultant shall be prepared to accommodate in his site office(s) a team of professionals seconded by the Borrower / Project Sponsor, and thereby to train them while on the job.

84. The Consultant shall provide all necessary work office equipment (computers and software, office machinery etc.) and the means of transport required for the work.

85. The Consultant shall provide and quality-assure translation services from English into Russian / Tajik and vice versa.

86. The Consultant shall be given office space in Dushanbe and at Rogun free of charge by the Government. The understanding shall be, that the bulk of the Consultant's staff would be located at the site and most work would be accomplished with close proximity to field conditions and affected stakeholders.

9. SERVICES PROVIDED BY CLIENT / PROJECT SPONSORS

87. The Services to be provided by the Borrower / Project Sponsor to the Consultant shall encompass the following:

- Provision of all available relevant environmental and technical documentation related to the Project will be provided free of charge for the Consultant;
- Facilitation of access to the existing HPPs along Vakhsh River, esp. Rogun and Sangtuda 1 sites, the other prospective project sites and all related transmission and infrastructure corridors / alignments as necessary;
- Access to land cadastre and other government sources of data;
- Provision of Office space as required; suitably furnished with heating, lighting, electricity, international telephone and internet connections; the Consultant shall, however, include all communication costs into the project's budget;
- Cooperation with and assistance to the Consultant of staff of the responsible line Ministry and of other agencies as required at the expense of the Ministry and agencies;
- Assistance with liaison between the Consultant and Government agencies in Tajikistan at national and local levels;
- Facilitation with other government agencies in charge of issues relevant to land acquisition and resettlement, including utility agencies;

For whatever services the Ministry of Energy and Industries cannot provide, the Consultant shall make own arrangements

ANNEX 1

Documents and Deliverables Generally Required Under the World Bank's Safeguard Policies.

Policy No.	Topic	Documents / deliverables required during		
		preparation	implementation	operation
OP 4.01	Environmental Assessment (EA)	EA process, including EIA, EMP, MP	EMP / MP	(EMP) / MP
OP 4.04	Natural Habitats	included in EA under OP 4.01	compensation plan, included in EMP + MP, OP 4.01	included in EMP + MP, OP 4.01
OP 4.09	Pest Management	included in EA under OP 4.01	Pest Management Plan (PMP)	(reference in ISR/ICR)
OP 4.10	Indigenous Peoples	social assessment, IPP	IPP / RAP	(reference in ISR/ICR)
OP 4.11	Physical Cultural Resources	included in EA under OP 4.01	PCR management plan (part of EA)	(reference in ISR/ICR)
OP 4.12	Involuntary Resettlement	RPF, RAP (and other instruments)	RAP (and other instruments)	(reference in ISR/ICR)
OP 4.36	Forest	included in EA under OP 4.01	Included in EMP + MP, OP 4.01	included in EMP + MP, OP 4.01
OP 4.37	Safety of Dams	dam safety report (DSR), TOR for PoE	DSR & emergency preparedness plan (ERP)	DSR & emergency preparedness plan[5], dam instrumentation & monitoring plan
OP 17.50	Disclosure	SIR	SCR, disclosure of ESIA & EMP	contd. information & consultation
OP/BP 7.50	International Waterways	notification of riparian states		
OP/BP 7.60	Disputed Areas	legal / political negotiations		

Fields hatched in grey: no specific documents required from Consultant at preparation stage

Acronyms:

DSR	dam safety report	EA	environmental assessment process
EIA	category A environmental impact assessment report	EMP	environmental management plan
ERP	emergency response plan	ESIA	environmental / social impact assessment
ICR	implementation completion report	IPP	indigenous peoples plan
ISR	implementation status report	MP	monitoring plan
PCR	physical cultural resources	PoE	Panel of Experts
RAP	resettlement action plan	RPF	resettlement policy framework
SCR	stakeholder consultation report	SIR	stakeholder identification report

[5] This is commonly not released to the Public.

ANNEX 2

ENVIRONMENTAL MANAGEMENT PLAN: FORMAT FOR SUMMARY TABLES/APPENDICES

A. MITIGATION PLAN

Phase	Issue	Mitigating Measure	Cost of Mitigation (if Substantial)	Responsibility*
I. Implementation / Construction	•			
II. Operation	•			

B. MONITORING PLAN

[Parameters in Monitoring Plan should be matched to issues in Mitigation Plan]

Phase	**What** *parameter is to be monitored?*	**Where** *is the parameter to be monitored?*	**How** *is the parameter to be monitored/ type of monitoring equipment?*	**When** *is the parameter to be monitored- frequency of measurement or continuous?*	**Monitoring Cost** *What is the cost of equipment or contractor charges to perform monitoring*	**Responsibility**
I. Construction	• • • • • • • •					
II. Operation	• • • • • • • •					

C. INSTITUTIONAL STRENGTHENING

1. Equipment Purchases

List items in tabular form showing:

Type of equipment	
• Number of units	
• Local or international purchase	
• Total cost	

2. Training

List in tabular form showing:

Type of Training	
• Number of students [also indicate current and future organization unit or current and future title/job description]	
• Duration of training	
• Start/ends dates for each student	
• Venue [domestic or abroad]	
• Institute/Provider	
• Total costs	

3. Consultant Services/Special Studies

Provide description of:

• Type of Services	
• Summary TOR [attach full TOR]	
• Justification	
• Local or international purchase	
• Cost	

D. SCHEDULE

Present (preferably in Chart Form) Start Dates and Finish Dates for:

- Mitigation Activities
- Monitoring Activities
- Training Activities

This information should be keyed to the overall project schedule (as defined in the Project Implementation Plan)

E. INSTITUTIONAL ARRANGEMENTS

Provide a narrative discussion supported by organizational charts detailing:

- Responsibilities for mitigation and monitoring
- Environmental information flow (reporting—from who and to who and how often)
- Decision making chain of command for environmental management (to take action, to authorize expenditures, to shut down, etc.)

In short, how is all the monitoring data going to be used to maintain sound environmental performance—who collects the data, who analyzes it, who prepares reports, who are the reports sent to and how often, and who does that person send it to, or what does he/she do with the information—who has the authority to spend, shutdown, change operations etc.

F. CONSULTATION WITH LOCAL NGOs AND PROJECT-AFFECTED GROUPS

(may be presented as an appendix)

Provide documentation of the following:

- Date(s) consultation(s) was (were) held
- Location(s) consultation(s) was (were) held
- Who was invited
  Name, Organization or Occupation, Telephone/Fax/e-mail number/address (home and/or office)
- Who attended
  Name, Organization or Occupation, Telephone/Fax/e-mail number/address (home and/or office)
- Meeting Program/Schedule
- What is to be presented and by whom
- Summary Meeting Minutes
  (Comments, Questions and Response by Presenters**)**

ANNEX 3

RESETTLEMENT POLICY FRAMEWORK and RESETTLEMENT ACTION PLAN: SAMPLE TABLE OF CONTENTS

(The Consultant should add, delete, or amend it as necessary)

1. Project description

2. Baseline socioeconomic information of the project areas.

3. Avoidance or reduction of displacement

4. Identification of Project-Affected People, including vulnerable groups

5. Identification of the exact number of households (including quantities of families) that are planned to be resettled including vulnerable groups

. Consultation and participation

6. Land acquisition/ resettlement mechanisms

7. Entitlement Matrix

8. “Green light conditions” of resettlement

9. Coordination with civil works

10. Institutional arrangement

11. Training

12. Monitoring and reporting

13. Grievance procedures and communication strategy

14. Complete estimation of property and income of families to be resettled with further compensation

14. Budget and funding

15. Contingencies and flexibility

Sample Entitlement Matrix:

CATEGORY OF PAP	TYPE OF LOSS	ENTITLEMENTS				
		Compensation for Loss of Structures	Compensation for Loss of Assets	Compensation for Loss of Income	Moving Allowance	Other Assistance
Property Owners	Loss of land	---	Land replacement at new site, plus land clearing by project	Crops at market cost in scarce season	None	Food from WFP during construction of new site
	Loss of structure Residential or business	Compensation at full replacement value not depreciated	Fences (wire or wood) at $ 3/meter Hand-dug wells at $200	For lost rental income Lump sum cash payment of 6 months rent per tenant	Moving to be done free by project	Disturbance Allowance of $100
Residential Tenant: Business Tenant	Loss of rental accommodation	No loss of structure, no entitlement to housing at new site	Replacement cost for non-movables if installation was agreed with owner	No loss of income	Free moving if notification before deadline	6 months rent equivalent for disturbance
	Loss of premises	No loss	Replacement cost for facilities that cannot be moved	For loss of business income, payment of half of turnover for 6 months	Free moving if notification before deadline	
Encroachers (using land)	Loss of land	---	Relocation to resettlement site of choice, with payment of rental fee for land. For crops, fences and wells, as above for owners	---	---	Food from WFP during construction of new site
Squatters (living on site)	Loss of shelter	Compensation at full replacement value for structure, relocation to resettlement site, with payment of site rent	None	Payments in lieu of wages while rebuilding		Disturbance Allowance of $100

ANNEX 4

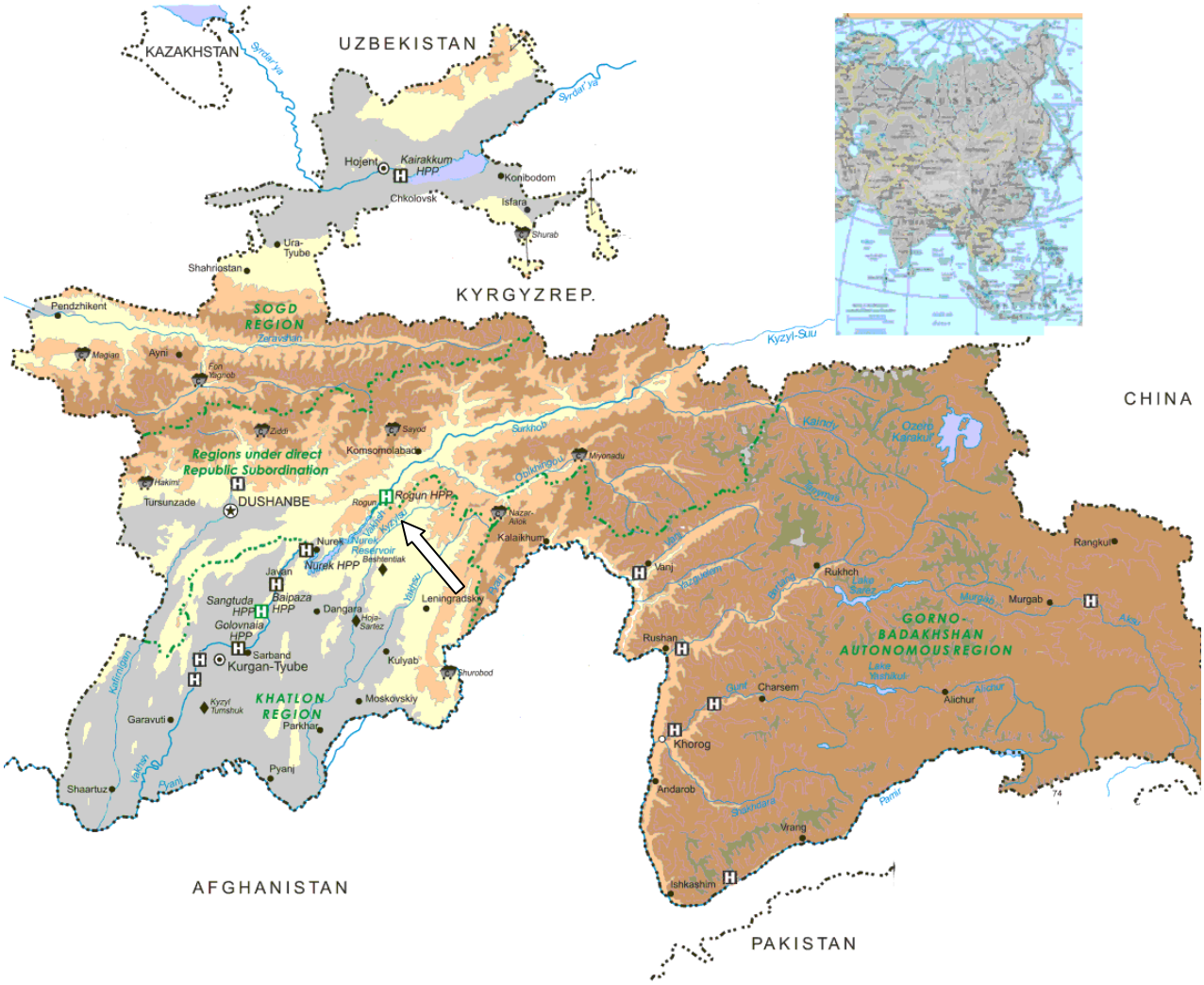
GUIDANCE ON ADDITIONAL ISSUES TO BE CONSIDERED DURING SOCIAL SCREENING OF PROJECT AFFECTED COMMUNITIES

- Profile and map the general population of the basin area, identify categories of project-affected people;
- Assess existing communication channels between official authorities and local population, including grievance channels and develop an effective communication strategy and mechanisms;
- Define the process on the basis of which the riparian countries are informed
- Identify temporary and permanent land acquisition requirements and the scale of displacement resulting from the project;
- Prepare a socio-economic baseline that is representative for the range of affected communities, using a mix of quantitative and qualitative techniques. The aim of this study is not so much to cover every household through lengthy statistical questionnaires but rather to use a range of tools to get analytical depth on understanding the impact of the project on aspects of their lives. Questionnaires should be limited to relevant issues linked to potential project impacts. The quantitative data should be adequately contextualized with qualitative methods such as focus group discussions, personal interviews and it is highly recommended that it include some in depth case histories using 3-4 day participant observation techniques to represent the range of affected households.
- The analysis should cover the livelihood profiles, land ownership, tenure and access patterns, household structure and social/kinship networks. The analysis should look at both formal and informal sources of livelihoods, access to resources (private and common property) and support structures.
- The socio-economic analysis should identify categories of vulnerable groups specific to the impacts from this project, describe the activities that will negatively affect them and justify why they should be recognized as eligible for special measures under the project.
- The socio-economic analysis will also review access to services in the dam area as well as the proposed new sites.
- Study the proposed new resettlement sites, available resources (land, employment, informal income sources etc.) and impact on kinship support structures. Identify areas where communities may need additional support to re-build their livelihoods.
- Specifically issues related to potential conflict areas with host communities should be studied.
- Review information sharing, feedback and greviance channels in place for affected communities to communicate with local and project authorities and the role for civil society (link to Stakeholder Analysis)

- Institutional set up, leadership structures (traditional and state recognized) and social stratification within the communities.
- Impacts on the downstream communities as a result of changes in the flow of the river. Specific attention to the impacts on the use of riverine resources (e.g. cultivation on banks, fishing, foraging for wild grasses, food, cultural sites etc.)
- Any additional issues to be discussed that the project needs to identify to ensure that resettlement takes place within a livelihoods and development framework.
- Recommend the detailed scope that the RAP (within this consultancy) should cover taking into account the proposed schedule of works and the Government's resettlement schedule. The RAP should cover atleast all villages scheduled to be affected in Phase 1 of the project.
- Assess the impact of changes in river flow regimes on communities, both directly impacted by the project and those who live upstream/downstream of the reservoir, in terms of socio-economic activities, fishery resources, land use, drinking water, etc.;
- Assess the impact of population influx during and after construction, especially on local communities;
- Assess the capacity of governmental and non-governmental services that are locally available to carry out awareness campaign relating to the risk of HIV transmission and other diseases that may result from the inflow of migrant workers;
- Assess job loss and job creation during and after construction, including indirect economic activities (e.g. transport, tourism, etc.);
- Assess availability and cost of alternative land to be provided to the displaced population, locally or otherwise, and assessment of utilities and other critical services provided in such alternative lands;
- Consider impact of any resettlement on neighboring villages, directly or indirectly (e.g. cut off from school, market);
- Examine the integration of the infrastructural development of the area into the construction requirements for the Project (e.g. roads and bridges, housing, schools, medical services and disease control programs);
- Identify issues relating to the minimization of short-term impact during construction to be addressed in future construction contracts;
- Assess other social and cultural impacts resulting from the Project, including family and community as well as cultural property issues;
- Carry out environmental screenings and produce EIAs/EMPs for resettlement areas, where development of infrastructure and residential construction of substantial scale is to be expected.

ANNEX 5

A: MAP OF ENERGY PRODUCTION AND POTENTIAL IN TAJIKISTAN
B: SCHEMATIC SKETCH OF VAKHSH RIVER MASTERPLAN
(INCL. ALL PLANNED AND EXISTING HPP FACILITIES)



ANNEX 6

Riparian Stakeholder Consultations (October 2008- April 2009): Comments and Responses

Para/ Bullet	Issue/Concern	Modification of Original Draft Terms of Reference	Coverage in Final Terms of Reference (ToR)
Government of Uzbekistan Expert Opinion: Rogun Hydro-electric Power Station Across the Vakhsh River and its Construction Risks (November 2008)			
1.	Engineering design documents for the construction of Rogun are being developed in violation of the international rules (norms).	The term "feasibility" has been replaced with "assessment" to properly reflect the stage of project study and align English and Russian terminology. References to possible future steps such as preparation of bid documents etc have been removed from the TORs. World Bank President Zoellick's letter dated April 15, 2009 underscores that the World Bank has only agreed to assist in the conduct of the two assessment studies. Reference to a fourth phase has been added to the ToR to enable continuation of studies and next stage preparation. However, this fourth phase will not proceed as it is subject to additional funding from the World Bank, and will depend on the results from the assessments.	Engineering designs are not being prepared now. The studies are at the review and assessment level of detail (as designed earlier and partly implemented), covering technical, economic, financial, environmental and social aspects. For completeness, a fourth phase is identified in the ToR but is subject to funding and the results of the assessments themselves.
	The Tajik Party is implementing engineering design and construction of the Rogun HPS without any information exchange or consultations with the transboundary states	Several consultations have taken place since release of the original draft Terms of Reference, including World Bank led consultations in Turkmenistan, Republic of Krygyz, Kazakhstan, Afghanistan and Tajikistan (Sept-Oct 2008), receipt of the Expert Opinion from Government of Uzbekistan (Nov 2008), consultations in Uzbekistan (Jan 2009), letters between the Government of Uzbekistan and the World Bank Group (August 14, 2007, November 10, 2998, April 18, 2008, April 25, 2008, March 3, 2009, March 30, 2009, April 15, 2009). The ToR require panels of experts that are selected as objective technical experts. The members of the Panel,, selected by the World Bank, would be recognized international	These studies will encompass consultation with stakeholders, as per the World Bank's Safeguards Policies and will provide comprehensive information as requested to enable a meaningful consultation with the riparian states (see also letter from Lars Thunnel to President Azimov dated March 30, 2009). Specifically, paragraph 41 of the ESIA ToR requires at least two rounds of consultation as well as public disclosure of documents according to World Bank policies (See section 4.3 paragraphs 60-64 of the ESIA ToR). The ToR specify the need for panels of experts and indicate the consultants are to work closely with those panels. Paragraph 74 of the ESIA ToR and Section 3of the TEAS ToR elaborate that the consultants will be aware of the progress and the activities

		professionals from outside the countries of the former Soviet Union. The Terms of Reference will be prepared by the World Bank based on operational policies, and riparian input on trans-boundary issues, taking into account Nukus Declaration.. They will be shared with key stakeholders. The Panel will review the technical rigor and results of the assessment studies, participate in decisions related to study progress and report their views to interested partners. There will be no separate panel of experts contracted by the Government of Tajikistan. The World Bank may also access independent experts as counsel on cross-border impacts. All reports by environmental and social consultants and panel are public and subject to stakeholder review, scrutiny and comment.	of the panels and draw upon / integrate relevant findings. The panels will oversee execution of the consultants' services. The members of the Panel,, selected by the World Bank, would be recognized international professionals from outside the countries of the former Soviet Union. The Terms of Reference will be prepared by the World Bank based on operational policies, and riparian input on trans-boundary issues, taking into account Nukus Declaration. They will be shared with key stakeholders. The Panel will review the technical rigor and results of the assessment studies, participate in decisions related to study progress and report their views to interested partners. There will be no separate panel of experts contracted by the Government of Tajikistan. The World Bank may also, separately, access independent experts as counsel on cross-border impacts All reports by environmental and social consultants and panel are public and subject to stakeholder review, scrutiny and comment.
2. and 3.	If Rogun is built and operated following a power regime then the number of years with intermittent water availability would vary from 12 -23 within a 50-year period, with a worst case scenario of 28-39 years, to the great disadvantage of vital interests of downstream countries	Reference to both local and riparian impacts has been specified in the objectives of the ESIA (Paragraph 16). An additional set of tasks has been specified in the ESIA ToR dealing explicitly with impact assessment in riparian countries (Box 7). The section refers to the Nukus Declaration and also requires assessment of water use, impact of flow regimes on environmental, social and economic interests downstream, and links the ESIA to reservoir simulations undertaken in the TEAS, with particular reference to project costs and design. The impact on river flow regime in Box 6 has been detailed in terms of changes in water quantity, pattern and quality downstream. A paragraph on water regulation both upstream and downstream has been added to the description of the initial environmental and social screening (paragraph 25). The ToR have been revised to explore a range of possible	The ESIA ToR explicitly includes riparian and cross-border impacts in the scope of assessment (paragraph 16). Downstream water regimes and riparian impacts are captured in several places, especially in the ESIA ToRs (e.g., paragraphs 16, 25, 34, 43, 46, 51, 78) The reservoir simulation study (paragraph 6.11) will explore operating regimes. Emerging opportunities for increased mutual benefits (see note below) and possible of risks of alternative reservoir operating regimes will be assessed in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Paragraph 6.11 of the TEAS ToRs also instructs the consultant to prepare an initial reservoir filling schedule as well as simulating reservoir operations for the next 50-60 years.

		reservoir operations to identify opportunities for increased mutual benefits and to articulate risks, in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Additional references have been made throughout the ESIA ToR to emphasize the inclusion of riparian interests and cross-border impacts of the project.	
4.	Present seismic and tectonic conditions shows that the area for construction of the Rogun HPS had been picked very unfavourably, raising risks of increased seismic activity and new earthquakes, washouts and dam failure, and salt formation	Reference to the "favourable" site has been removed. Reference to safety has been added in paragraph 6.3, with specific instructions that it should be thoroughly investigated. The first phase of the TEAS is the geological and Geotechnical Investigation of the Salt Dome in the Dam foundation and Reservoir. It has been added that the consultant shall not proceed to the next phase of assessment unless the client authorizes after careful review and acceptance of the salt dome report, in consultation with the Panel of Experts	Section 4.1 (Phase 0) of the TOR for TEAS specifies a review of the salt dome question (including influence on dam safety) and section 6.3 addresses the safety of the underground power house cavern. Sections 6.5, 6.6 and 7.12 focus on geological and seismic aspects of dam safety. Paragraph 44 and Box 2 of the TORs for ESIA also examine these issues.
5.	Dam failure in case of earthquake would result in formation of an outburst wave with a flow of 2.35 to 1.56 mlm m3, and flooding in an area of 69 thousand km2 populated by approximately 5 million people	Provisions for an instrumentation plan for monitoring the behavior of the dam through its lifetime and an emergency preparedness plan have been added to the risk evaluation (paragraph 6.20) and assessment report (paragraph 7.23 and 7.24). The environmental and social aspects of dam monitoring and emergency preparedness, with particular reference to the transboundary context are captured paragraph 51 of the ESIA ToR.	Paragraph 6.6 of the TEAS requires seismic studies including evaluation of seismic hazard, operating basis design earthquake, and review and improvement of existing seismic monitoring network in the region. Both the TEAS (paragraph 7.23) and ESIA (two bullet points below paragraph 51 (g)) require the preparation of a dam monitoring plan and emergency preparedness plan and communication plan as outlined in the World Bank safeguard guidelines.
6.	The Rogun HPs area is known for active manifestation of recent physical-and-geological processes, with dangers of landslides	Linkages between the TEAS and ESIA studies have been specified to ensure consistency.	Paragraph 6.5 of TEAS covers these aspects within a comprehensive geological, geophysical and geotechnical investigation. Related environmental and social risks are covered in 44 of the TORs of ESIA
7.	Capacity of the Tajik Civil Defense and Emergency Service staff, equipment technology and training are not adequate to ensure safety and rapid elimination of disasters with the Rogun HPS area	See comments for point 5 above	This issue is covered under the Emergency Preparedness Plan in section 7.23 in the TEAS. Also reinforced in the TORs of ESIA under paragraph 51
8..	Unscheduled intensive winter discharges would result in land degradation in the lower reaches of the river	Reference to both local and riparian impacts has been specified in the objectives of the ESIA (Paragraph 13).	Section 6.11 of TEAS addresses operations and flow management in addition to the requirement for hydrologic modeling.. See also paragraphs 46 and 47 and Boxes 6 and 7 in

9.	Reduced water flow in summer will cause accumulation of salts within the irrigated area	An additional set of tasks has been specified in the ESIA ToR dealing explicitly with impact assessment in riparian countries (Box 7). The section refers requires assessment of water use, impact of flow regimes on environmental, social and economic interests downstream, and links the ESIA to reservoir simulations undertaken in the TEAS, with particular reference to project costs and design. The impact on river flow regime in Box 6 has been detailed in terms of changes in water quantity, pattern and quality downstream. A paragraph on water regulation both upstream and downstream has been added to the description of the initial environmental and social screening (paragraph 34). The ToR have been revised to explore a range of reservoir operations to identify opportunities for increased mutual benefits and to articulate risks, in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Additional references have been made throughout the ESIA ToR to emphasize the inclusion of riparian interests and cross-border impacts of the project.	the TORs for ESIA. These paragraphs: • Require examination of a range of reservoir operations and associated flow regimes in terms of environmental, social, economic and financial impacts in Tajikistan and riparian countries • Include a review and evaluation of alternative institutional arrangements to monitor and enforce operating regimes • Require assessment of an environmental flow The studies will also explore possible exports to Afghanistan and Pakistan, which could provide a financial incentive for summer generation.
10.	Reduced runoff and decreased water discharge to the Aral Sea would cause further desertification and change in temperature regime. Climatic conditions would become inappropriate for living, but also detrimental for flora and fauna		
11, 12 and 13.	Estimates of losses and damages if water flow is reduced (e.g., US$4.1 billion per year from land degradation, US$146.5 million from loss of flora and fauna)		
14.	Instead of Rogun consider alternatives such as small hydropower projects, with small daily storages.	Small hydropower has been specified as one resource to be considered in the generation expansion plan.	Evaluation of the alternatives from the power point of view is provided for in the generation expansion plan in Annex 3 of the TEAS and separate study on alternatives to Rogun to be managed by the World Bank. Note that some small hydro is already being pursued in Tajikistan.
	The ESA should cover not only the project area but all the affected countries Reputed UN agencies (UNDP, UNEP, ICARDA, IPCC, and IUCN should be involved in this exercise.	See comments for points 8-13 above Involvement of other UN agencies is outside the scope of the consultants work, although documents are available to UN agencies for review and comment. However, the World Bank will convene Panels of Experts to provide independent international input.	The geographic scope for the ESIA covers the relevant areas in Tajikistan and the relevant areas in all riparian states (see for example paragraph 46 and 47 Box 6 and Box 7 of the TORs of ESIA).
Points from the Minutes of Consultations with Uzbek Authorities (January 2009)			

1	UZ is concerned about quality assurance of TEAS and ESIA, needs guarantees that the Panels of Experts (PoE) will be truly independent,	The ToR require panels of experts that are selected as objective technical experts. The members of the Panel, selected by the World Bank, would be recognized international professionals from outside the countries of the former Soviet Union The Terms of Reference will be prepared by the World Bank based on operational policies, and riparian input on trans-boundary issues, taking into account Nukus Declaration. They will be shared with key stakeholders. The Panel will review the technical rigor and results of the assessment studies, participate in decisions related to study progress and report their views to interested partners. There will be no separate panel of experts contracted by the Government of Tajikistan. The World Bank may also access independent experts as counsel on cross-border impacts. All reports by consultants and the environmental and social panel are public and subject to stakeholder review, scrutiny and comment.	The ToR specify the need for panels of experts and indicate the consultants are to work closely with those panels. The ToRs for both the ESIA TEAS elaborate that the consultants will be aware of the progress and the activities of the panels and draw upon / integrate relevant findings. The panels will oversee execution of the consultants' services. The members of the Panel, selected by the World Bank, would be recognized international professionals from outside the countries of the former Soviet Union. The Terms of Reference will be prepared by the World Bank based on operational policies, and riparian input on trans-boundary issues, taking into account Nukus Declaration. They will be shared with key stakeholders. The Panel will review the technical rigor and results of the assessment studies, participate in decisions related to study progress and report their views to interested partners. There will be no separate panel of experts contracted by the Government of Tajikistan. The World Bank may also, separately, access independent experts as counsel on cross-border impacts. All reports by consultants and the environmental and social panel are public and subject to stakeholder review, scrutiny and comment.
2	UZ is concerned about outdated information sources, specifically seismic and geotechnical data,	Additional cautions have been added.	Use of best available data and ensuring its quality is the professional responsibility of the consultants. The Dam safety POE will be alert to this issue and provide oversight.
3	UZ expresses the strong wish that its experts should have access to the Rogun site (inaccessible for the past 18 years)		Access is the prerogative of the Government of Tajikistan and is outside the scope of the consultant's authority.
4	UZ underlines that potential impacts of energy exports to Pakistan on the Central Asia energy system should be assessed		Paragraph 7.21 of the TEAS and the World Bank managed study of alternatives to Rogun will analyze this issue.
5	UZ has little trust in the long term reliability of any arrangement to jointly operate Roghun HPP (such as international commission, PPP/consortium), citing	The World Bank will undertake an independent study of the various institutional options and their strengths, weaknesses and implementation. Determining the appropriate system is outside the scope of the ToRs; however, the information	The World Bank will undertake an independent review, in light of international experience, of possible institutional arrangements (e.g., a reservoir management commission with multi-country representation) for monitoring reservoir

	operation of Toktogul, Nurek and Kairakum, all of which allegedly deviated significantly from operational modes agreed when they were once commissioned	developed by the consultants would support consultation among riparians.	operations and regimes for ensuring compliance with prescribed operations. A permanent international commission to monitor the releases and a sanction regime linked to the escrowed export revenue are likely to be credible mechanisms.
6.	UZ suggested that the PoE might be hired directly by the Bank, preferably not by the same department which is preparing / supervising the project (ECSSD) but by a Bank section which has no "personal, political or commercial stakes" in the project.	See point 1 above	See point 1 above
7	The TORs contain words and expressions indicating possible bias of the WB towards Rogun	With apologies, terminology has been modified and such words and expressions removed to ensure a neutral stance.	
	General		Section 6.9 of the TEAS and Box 8 of the ESIA deal with climate change aspects in detail.
Points from Turkmenistan Consultations(Sept-October 2008)			
1.	Though Rogun was originally designed to operate in an irrigation mode with multi-year water regulation as the primary objective, it might be operated in the "power mode" resulting in adverse changes to the water flow.	Reference to both local and riparian impacts has been specified in the objectives of the ESIA (Paragraph 16). An additional set of tasks has been specified in the ESIA ToR dealing explicitly with impact assessment in riparian countries (Box 7). The section requires assessment of water use, impact of flow regimes on environmental, social and economic interests downstream, and links the ESIA to reservoir simulations undertaken in the TEAS. The impact on river flow regime in Box 6 has been detailed in terms of changes in water quantity, pattern and quality downstream. A paragraph on water regulation both upstream and downstream has been added to the description of the initial environmental and social screening (paragraph 25). The ToR (paragraph 6.11 of the TEAS) have been revised to explore additional reservoir operations to identify opportunities for increased mutual benefits and to articulate risks, in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS).	The ESIA ToR explicitly includes riparian and cross-border impacts in the scope of assessment (paragraph 16). Downstream water regimes and riparian impacts are captured in several places, especially in the ESIA ToRs (e.g., paragraphs 16, 25, 34, 43, 46, 51, 78) The reservoir simulation study will explore a range of operating regimes. Emerging opportunities for increased mutual benefits (see note below) and possible of risks of alternative reservoir operating regimes will be assessed in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Paragraph 6.11 of the TEAS ToRs also instructs the consultant to prepare an initial reservoir filling schedule considering effects on the downstream riparian states as well as simulating reservoir operations for the next 50-60 years.

		Additional references have been made throughout the ESIA ToR to emphasize the inclusion of riparian interests and cross-border impacts of the project.	
2.	TM needs guarantees (a) that there would be no reduction in the present level of flows as well as in the present flow regime (based on the 1992 Agreement), and (b) that there would be no violation of the ecological safety in the downstream countries.	The World Bank will undertake an independent study of the various institutional options and their strengths, weaknesses and implementation. It is outside the scope of these studies to establish a guarantee. However, the review and analysis of alternative institutions will provide support for deliberations among riparians and indicate their assessment of the preferred option.	World Bank will take an independent "review, in light of international experience of possible institutional arrangements (e.g., a reservoir management commission with multi-country representation) of monitoring reservoir operations regimes for ensuring compliance" with prescribed operations. A permanent international commission to monitor the releases and a sanction regime linked to the escrowed export revenue are likely to be credible mechanisms.
3.	TM needs detailed information on the ecological, financial and social impact of Rogun HEP and the associated risks to the downstream population.	See point 1 above	Collectively the TEAS and the ESIA are aimed at creating such detailed information. The geographic boundaries include impacts downstream of Rogun, extending to all riparian countries. See for example, Boxes 6 and 7 in the ESIA.
Points from Consultations with Kyrgyz, Tajikistan, Kazakhstan, and Afghanistan(Sept –Oct 2008)			
	No significant point calling for revision of the TORs was made.		

ANNEX 7

Information on available Feasibility Studies, Technical Project and Project Revision for Rogun HPP.

There are the following materials available in the OJSC "Rogun HPP":

1. Technical Project of Rogun HPP 1978 (Annex 1);
2. The conception of completion Rogun HPP 2009 (Annex 2), "Gydroproekt" Moscow;
3. Bank Feasibility Study of Rogun HPP, Lamayer LTD 2006.

Note:
On the issue of the runner and the total weight of hydro turbine:

1. Replaceable runner – D =4835 mm, weight - 70 tons, P=200 Mwt ;
2. Permanent runner – D = 6000 mm, weight – 100 tons P=615 Mwt;
3. Total weight of turbine – 1580 tons

			Annex 1
16	15	Technical project of production and organization of underground works (for underground complex). Explanatory note. Antifiltration barriers in the dam site and the upper cofferdam.	# 561 TP – 3 IV – 1310
17	16	Technical project of production and organization of underground works (for underground complex). Explanatory note. Motor transport tunnels to be used during the construction and exploitation period.	# 561 TP – 3 IV – 2631
18	17	Technical project of production and organization of underground works (for underground complex). Explanatory note. Actions on the protection of salt layer from washing.	# 561 TP – 3 IV – 2906
19	18	Technical project. Preliminary strengthening of rocks/layers during driving of the right – bank motor transport tunnels. Estimation.	# 561 TP – 3 IV – 9848
20	19	Technical project. Preliminary strengthening of rocks/layers during driving the channel rise of hydraulic and saline screen. Estimate	# 561 TP – 3 IV – 9849
21	20	Technical project. Preliminary strengthening of rocks/layers. Catalogue of unit costs.	# 561 TP – 3 IV – 9850
22	21	Technical project. Carrying out 35 kV power line from the flooding area and the external power supply of collective farms and settlements of the population under resettlement. Project note and drawing.	Volume II. PL – 35 – 110 kV
23	22	Technical project for the carrying out the connection line from the reservoir area and the construction of connection line from the district centre “Childara” and Gharm to the new built settlements and collective farms.	Volume III. Power supply

24	23	Technical working project. Carrying out the power line of 35 kV from the flooding area. Volume IV – Estimate documentation. Book 1 – summary estimates and estimation of supplemental construction works.	
25	24	Technical working project. Motor road Dushanbe – Khorog. On the site of the terminal station Nurekgesstroi – Karabulok settlement Volume 1 – general part. Book III – summary explanatory note, documents for agreements and lists.	
26	25	Technical project. Settlement of constructors of Rogun HPP. Rogun settlement. Housing. Book 1 – explanatory note.	
		Technical project – main	
		Part I. Environmental conditions.	
27	28	Book 1. Hydrological conditions. Climate. River operation regime in project conditions.	1174 – T13
	29	Book 2. Topographical geodesic study.	1174 – T14
28		**Part II. Economy. Water industry. Hydro system parameters. Water reservoir. Using the natural resources and protection of environment.**	
29	33	Book 3. Water reservoir and the tailrace area.	1174 – T18, P – 18
		Part III. Main hydro system building.	
30	35	Book 1. Main starting position of the Project. Selection of dam site and the scheme of HPP. Assembly of hydro system.	1174 – T20, P – 20
31	36	Hydro system building	P – 21 – 1
32	38	Chapter 2. Activities for the protection of salt layer from washing.	1174 – T21 – 2
33	39	Chapter 3. Spillways. Pressure station unit	1174 – T21 – 3, P – 21 – 3
34	40	Chapter 4. Mud dam on Obi-Shur range.	1174 – T21 – 4, P – 21 – 4

35	42	Chapter 1. Water power and mechanical equipment.	1174 – T22 – 2
36	43	Chapter 2. Electro technical equipment	1174 – T22 – 2, P – 22 – 2
37	44	Book 4. Sanitary engineering	1174 – T23, P – 23
38	45	Book 5. Fire safety and safeguard activities.	1174 – T24 – P – 24
39	47	Book 7. Special activities	1174 – 34 – T26
40	48	Book 8. Operational activities of hydro system	1174 – T27
41	49	Book 9. Field studies	1174 – T28
42	50	Book 10. Settlements	1174 – T29, P – 29
		Part IV. Organization for construction and estimation	
43	51	Book 1. Organization for construction	1174 – T30, P – 30
44	52	Book 2. Production basis. Technological and constructional part.	1174 – T31, P – 31
45	53	Book 3. Work production	1174 – T32, P – 32
46	54	Book 4. Summary expenditure and estimation	1174 – T33
47	55	Book 5. Object and local estimations. Part “A” chapters 1-VII, X, XI, XII	1174 – T34
48	56	Book 6. Object and local estimations. Part “A” chapters VIII and IX	1174 – T35
49	58	Book 8. Catalogue of single district of single valuation, attached to the conditions of constructions on the salary.	1174 – T37
50	59	Book 9. Catalogue of single district of single valuation, attached to the conditions of constructions on the salary and local constructional materials	1174 – T38
51	60	Book 10. Calculation prices for the local materials, collective	1174 – T39
52	61	Book 11. Catalogue of estimate prices for the local constructional material.	1174 – T40
		Annex	
53	66	Phased review materials of the project	1174 – T45
54	70	Project testing for novelty	1174 – T49

55		**Annex to the note # 1174 – T18 of technical project "Water reservoir"**	
56	71	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume II, Parts III, IV. Chapter I, book – 8 – Plan and grade line on Tavildara – Gharm area	1174 – T18 – 2.8
57	72	Evacuation of motor way to the direction Kulyab –Shugnov – Tavildara – Gharm – Komsomolobod. Volume IV, Parts XI – estimate documentation. Chapter I – summary estimation.	1174 – T18 – 2 A
58	73	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod. Volume IV, Book 18 – 3 – DRP in Siafark. Drawings	1174 – T18 – 2.18.3
59	74	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume IV, Book – 18 – 7 – Linear Master House (LMH) in Kurboztanak village. Drawings	1174 – T18 – 2.18.7
60	75	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 18 – 9 – LMH in Degrez village. Drawings	1174 – T18 – 2.18.9
61	76	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 18 – 15 LMH in Zilalak village. drawings	1174 – T18 – 2.18.11
62	77	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 18 – 15 – LMH in Kalachai Poyon village	1174 – T18 – 2.18.15
63	78	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the	1174 – T18 – 2.20.1

		reservoir area. Volume IV, book 20 – 1 – Road Maintenance settlement (RMS) in Sangikar. Drawings	
64	79	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume V, book 20 – 3 – LMH in Shul village. Drawings	1174 – T18 – 2.20.3
65	80	Evacuation of motor way to the direction Kulyab – Khovaling – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume IV, 20 – 5 – LMH in Shul village. Drawings	1174 – T18 – 2.20.5
66	81	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume II, LMH	1174 – T18 – 2.27.20
67	82	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume VI, book 27 – 6/1.10 – LMH Degrez village	1174 – T18 – 2.27.21
68	83	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the reservoir area. Volume VI, book 27 – 8/1.10 – LMH in Degrez village	1174 – T18 – 2.27.3
69	84	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the flooding area with reservoir. For the construction of Road Operational Department in Butaikabad village. Volume VI – estimate documentation. Chapter I – estimation. Book 27 – 3/17 – land improvement of the enterprise.	1174 – T18 – 2.27.7
70	85	Evacuation of motor way to the direction Kulyab – Shugnov – Tavildara – Gharm – Komsomolobod from the flooding area with reservoir. For the construction of Road Operational Department in Butaikabad village. Volume VI – estimate documentation. Chapter I – estimation. Book 27 – 3/19[a] – ATS estimation.	1174 – T18 – 2.27.8

71.	86.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Childara settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-5/4,5,6 – Transformer substation. External electric lighting networks. Installation of radio and communication.	1174-T18/2.28.15
72.	87.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Childara settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-5/17 – Area improvement of the enterprise.	1174-T18-2.28.23
73.	88.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-4/1.9 – LMH in the Ezgand settlement.	1174-T18-2.28.4
74.	89.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Chil-Dara settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-5/3,7,8 – Car parking building. Entrance-lodge. Auto washing dock.	1174-T18-2.28.6
75.	90.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of Road Operational Department in Childara settlement. Volume – cost estimate documentation. Chapter – cost estimation. Book 28-5/24 – Water field well in the Childara settlement.	1174-T18-2.28.7
76.	91.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in Dashtimur settlement. Volume VI – cost	1174-T18-2.28.9

		estimate documentation. Chapter II – cost estimation. Book 28-6/4,5,6 – Transformer substation. External electric lighting networks. Installation of radio and communication.	
77.	92.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in Sangikar settlement. Volume VI – cost estimate documentation. Part II – cost estimation. Book 28-6/4,5,6 – Biological waste water treatment plant.	1174-T18-2.29.15
78.	93.	Kulyab-Shughnon -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 29-6/22 – Water field well in the site of Sangikar settlement.	1174-T18-2.29.16
79.	94.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 29-2 – Bridges.	1174-T18-2.29.2
80.	95.	Kulyab-Shughnow -Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in the Sangikar settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 29-6/10 – Boiler house with two vessels “Universal” – 6m.	1174-T18-2.29.5
81.	96.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. For the construction of RMS in the Sangikar settlement. Volume VI – cost estimate documentation. Chapter II – cost estimation. Book 28-6/17 - Area improvement of the enterprise.	1174-T18-2.29.6
82.	97.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of Roghun HPP zone. Volume VI – cost estimate	1174-T18-2.29.8

		documentation. Chapter I – cost estimation. Book 29-7/1,9 - LMH in the Tagob settlement.	
83.	98.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Kulyab – Tavildara (motor way) site. Volume IV – cost estimate documentation. Chapter II – quotation catalogue. Book 30-1.	1174-T18-2.30.1
84.	99.	Kulyab-Shughnow-Tavildara-Gharm-Komsomolobod motor way retrieving out of dam zone flooding area. Gharm – Komsomolobod site. Volume IV – cost estimate documentation. Chapter II – quotation catalogue. Book 32.	1174-T18-2.32
85.	100.	Integrated project on lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 1. Explanatory note.	1174-T18-4.1
86.	101.	Project of lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 3. Consolidated cost estimation brief and consolidated cost estimations.	1174-T18-4.3
87.	102.	Project of lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 4. Objective and local cost estimations. Objects of communal construction and improvement of “Miyonadu” collective farm. Central messuage.	1174-T18-4.7
88.	103.	Hydro geological conclusion about conditions of water supply of the designed Tavildara settlement, “Roghun” collective farm of Komsomolobod district.	1174-T18-4.13a
89.	104.	Development of central messauge of “Miyonadu” collective farm with industrial zones of state farms and collective farms for	1174-T18-4.15

		population, moved out of dam zone flooding area. Book 5 – construction organization.	
90.	105.	Integrated project on lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 8.	1174-T18-4.18
91.	105a.	Project of lay-out and development of rural population aggregate with industrial zones of state farms and collective farms for population, moved out of dam zone flooding area. Book 7. Amendment on cost of local and carriage materials.	
92.	106.	Air Line – 35 kV retrieving out of dam zone flooding area, including external power supply of settlements and collective farms for moving population. Volume I – Substation 35-110 kV. Part 11 – Registered specification on substations. Book 7 – registered specification compilation on substation 35/10 kV “Tavildara”.	1174-T18-6.11.7
93.	107.	Air line – 35 kV retrieving out of dam zone flooding area, including external power supply of settlements and collective farms for moving population. Volume II – Air Line – 35 110 kV. Part 1 – General explanatory note.	1174-T18-6.12
94.	108.	Air line – 35 kV retrieving out of dam zone flooding area. Volume IV. Book 2 – Objective cost estimations No. 16, 17, 18 on substation construction 110/35/10 kV “Tegermi” and “Childara” and on РПБ at substation “Childora”.	1174-T18-6.26
95.	109.	Air line – 35 kV retrieving out of dam zone flooding area. Volume IV. Book 3 – Objective cost estimations No. 12, 13, 14, 15 on substation construction 35/10 kV “Kizrok”, “Miyonadu” “Chorsadi” and “Khufak”.	1174-T18-6.27
96.	110.	Air line – 35 kV retrieving out of dam zone flooding area, including external power supply of settlements and collective	1174-T18-6.28

		farms for moving population. Volume IV– Objective cost estimation No. 19 on reconstruction of substation 35/10 kV “Tavildara”.	
97.	111.	Air line – 35 kV retrieving out of dam zone flooding area. Volume IV – Objective cost estimation No. 30 on Air Line construction – 10 kV and Transformer Substation for settlements in the newly developed zones.	1174-T18-6.32
98.	111a.	Communication Line retrieving out of dam zone and construction of communication line from district/center Childara and Gharm to newly organized settlements and collective farms. Volume V – Cost estimate part. Chapter 4 – Local cost estimates on assemblage works on station facility (structures).	1174-T18-5.9
99.	112	Irrigation of new lands in return of flooding area. Part II – Natural conditions. Book 3 – Engineering geological and hydrological justification.	1174-T18-7.2
100.	116.	Irrigation of new lands in return of flooding area. Part III, book 1 – Chart of irrigated lands.	
101.	118.	Vocational school for 720 learning builders – hydraulic engineer in the Obi Gharm settlement. Construction organization project.	
102.	119.	Cost estimation on construction College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement.	
103.	120.	Technical and economic valuation of College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement.	
104.	121.	College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement. Field (educational productive) working shops. Volume IV. Chapter B. Secret language 945.	
105.	122.	College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement. Field (educational productive) working shops. Heating and ventilation. Volume VI. Chapter B. Secret language 945.	

106.	123.	College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement. Volume IV. Chapter B. Secret language 945.	
107.	124.	College for 720 learning builders – hydraulic engineer in the Obi Gharm settlement. Water pipe and sewerage system. Volume IV. Chapter B. Secret language 945.	

			Annex – 2
	Project number	Name	Copies
		I Phase	
1	1861-1 book 1	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Organization of construction. Brief note.	4
2	1861 -1 book 2	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Organization of construction. Explanatory note.	4
3	1861 – 1 Album 1	Album of drawings	4
		II Phase	
4	1861 – 2 – VII	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Organization of construction.	4
5	1861 – 2 – II – 2	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume II. Environmental conditions. Book 2. Hydrometereological conditions. 53 pages.	4
6	1861 – 2 – II	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume III. Water industry 85 p.	4
7	1861 – 2 – VI	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Electrical power engineering of Tajikistan. 48 p.	4
8	1861 – 2 – V – 1	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume V. Hydro engineering complex (power dam). 128 p.	4
9	1861 – 2 – VI – 2	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume VI. Technological	4

		equipments. Book 1. Electro technical equipment and power distribution. 148 p.	
10	1861 – VI – 3	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Mechanical equipment and steel constructions. 24 p.	4
11	1861 – 2 – VI – 4	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume VI. Technological equipment. Engineering system of the power plant. Heating supply. Heating, ventilation and air conditioning. The system of water supply and sewerage. Communications. 33 p.	4
12	1861 – 2 – VIII	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume VIII. Activities on preparation of reservoir zone. 148 p	4
13	1861 – 2 – T.5	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Main building of hydro system. 182 p.	4
14	1861 – 2 – Album 2	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Album of drawings	4
15	1861 – 2 – II – 1	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume II. Environmental conditions. Book 1. Hydrological and engineering geodesic studies. 17 p.	4
16	1861 – 2 – II – 3	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume II. Environmental conditions. Book 3. Engineering geological conditions. 92 p.	4
17	1861 – V – 3	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Volume V. Main building of hydro system. Book 3. The program of complex monitoring of Rogun HPP. 59 p.	4

18	1861 – VI – 1	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Technological equipment. Main and auxiliary water power equipment. 75 p.	4
19	1861 – 2 – Album 1	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Album of drawings	4
20	1861 – 2 – VII – A	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Organization of construction.	4
		III Phase	
21	1861 – 2 – 1	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. General note.	4
22	1861 – 2 – 10	Rogun HPP on Vakhsh river. The conception of the power plant construction completion. Estimate cost of the construction.	4

Annex 3.

Information of "Lamayer" documentation located in Open Stock Company "RoghunGESstroy"

1. Detailed evaluation of existing facility and equipment. Part 3 from 8.

   (book 1 from 5)
   (book 2 from 5)
   (book 3 from 5)
   (book 4 from 5)
   (book 5 from 5)

2. Detailed evaluation of existing facility and equipment. Part 2 from 8.

   (book 1)
   (book 2)
   (book 6 from 8)
   (book 7 from 8)
   (book 8 from 8)

3. Detailed evaluation of existing facility and equipment. Part 4 from 8.
   (book 1 from 10)
   (book 2 from 10)
   (book 3 from 10)
   (book 4 from 10)
   (book 5 from 10)

(book 6 from 10)
(book 7 from 10)
(book 8 from 10)
(book 9 from 10)
(book 10 from 10)

4. Volume 2 “Basic Report”

5. Volume 3F “Project parameters”.

Информация по имеющимся технико-экономическим обоснованиям, техническом проекте, проектным доработкам Рогунской ГЭС.

В ОАО «Рогунская» ГЭС по указанным материалам имеется:
1. Технический проект Рогунской ГЭС 1978. (Приложение 1);
2. Концепция достройки Рогунской ГЭС 2009 г. (Приложение 2);
3. Банковское ТЭО Рогунской ГЭС, Ламайер ЛТД 2006 г.

По вопросу рабочего колеса и общего веса турбины:

i. Временное рабочее колесо –D = 4835 мм, вес = 70 тн, P= 200 Мвт;
2. Постоянное рабочее колесо – D = 6000 мм, вес = 100 тн, P=615 Мвт.
3. Общий вес турбины- 1580 тн.

			Приложение 1
16.	15.	Технический проект производства и организации работ по подземному комплексу. Пояснительная записка. Противофильтрационные сооружения в основании плотины и верховая перемычка.	**№561ТП—3-IV-1310**
17.	16.	Технический проект производства и организации работ по подземному комплексу. Пояснительная записка. Автотранспортные туннели строительного и эксплуатационного периода.	**№561ТП—3-VII-2631**
IS.	17.	Технический проект производства и организации работ по подземному комплексу. Пояснительная записка. Мероприятия но защите пласта соли от размыва.	**№ 561ТП—3-VIII2906**
19.	18.	Технический проект. Предварительное закрепление пород при проходке правобережных транспортных туннелей. Смета	**№561 ЦС-3- VII - 9848**
20.	19.	Технический проект. Предварительное закрепление пород при проходке русловой штольни гидравлической и солевой завес. Смета.	**№561 ЦС-3-VIII-9849**
21.	20.	Технический проект. Предварительное закрепление пород. Каталог единичных расценок.	**№561 ЦС-3-VII-9850.**
22.	21.	Технический проект. Вынос ВЛ-35 кВ из зоны затопления водохранилищем и внешнее электроснабжение совхозов п поселков переселяемого населения. П/запиека и чертежи.	**Том II. ВЛ-35-110 кВ**
23.	22.	Технический проект на вынос линий связи из зоны водохранилища и строительство линий связи от р/ц Чильдора и Гарм к вновь организуемым поселкам и совхозам.	**Том III. Электро-питание.**

24.	23.	Техно-рабочий проект. Вынос ВЛ-35кВ из зоны затопления. Том IV-Сметная документация. Книга I -сводная смета и сметы на сопутствующие работы стр-ва.	
25.	24.	Техно-рабочий проект. Автомобильная дорога Душанбе-Хорог, на участке перевалочная база Нурекгэсстроя - пос.Карабулак. Том I -общий раздел. Книга III — Сводная пояснительная записка. доку менты согласований и ведомости.	
26.	25.	Технический проект. Поселки строителей Рогунекой ГЭС. Поселок Рогун. Застройки. Книга I - Пояснительная записка.	
		Технический проект - основной	
		Часть I. Природные условия	
27.	28.	Книга I. Гидрологические условия. Климат. Режим реки в проектных условиях	**1174-Т13**
	29.	Книга 2. Топографо-геодезическое обоснование	**1174-Т14**
28.		**Часть II. Экономика. Водное хозяйство. Параметры гидроузла.** **Водохранилище. Использование природных ресурсов и охрана**	
29.	***ii.***	Книга 3. Водохранилище и зона нижнего бьефа	**1174-Т18, П-18**
		Часть Ш. Основные сооружения гидроузла	
30.	**35.**	Книга 1. Основные исходные положения проекта. Выбор створа и схемы ГЭС. Компоновка гидроузла.	**1174-Т20, П-20**
31.	36.	Сооружения гидроузла	**П-21-1**
32.	38.	Раздел 2. Мероприятия по защите пласта соли от размыва.	**1174-Т21-2**

33.	39.	Раздел 3. Водосбросные сооружения. Напорно-станционный узел.	**1174-Т21-3, П-21-3**
34.	**40.**	Раздел 4. Селезащитные сооружения на сае Оби-Шур	**1174-Т21-4, П-21-4**
35.	42.	Раздел 1. Гидросиловое и механическое оборудование	**1174-Т22-2**
36.	43.	Раздел 2. Электротехническое оборудование	**1174-Т22-2, П-22-2**
37.	44.	Книга 4. Сантехника	**П74-Т23, П-23**
38.	45.	Книга 5. Противопожарные и охранные мероприятия	**1174-Т24, П-24**
39.	47.	Книга 7. Специальные мероприятия	**1174-34-Т26**
40.	48.	Книга 8. Организация эксплуатации гидроузла	**1174-Т27**
41.	49.	Книга 9. Натурные наблюдения	**1174-Т28**
42.	50.	Книга 10. Поселки	**1174-Т29, П-29**
		Часть IV. Организация строительства и сметы	
43.	51.	Книга 1. Организация строительства	**1174-Т30, П-30**
44.	52.	Книга 2. Производственные базы. Технологическая и строительная часть	**П74-Т31, П-31**
45.	53.	Книга 3. Производство работ	**П74-Т32, П-32**
46.	54.	Книга 4. Сводка затрат и сводные сметы	**1174-Т33**

47.	55.	Книга 5. Объектные и локальные сметы. Раздел «А» по главам I-VII, X, XI, XII	**1174-T34**
48.	56.	Книга 6. Объектные и локальные сметы. Раздел «А», главы VIII и IX	**1174-T35**
49.	58.	Книга 8. Каталог единых районных единичных расценок, привязанных к условиям строительства по заработной плате	**1174-T37**
50.	59.	Книга 9. Каталог единых районных единичных расценок, привязанных к условиям строительства по заработной плате и местным строительным материалам	**1174-T38**
51.	60.	Книга 10. Калькуляция стоимости местных материалов, сборных бетонных и железо- бетонных изделий и энергоресурсов (вода, воздух, пар, электроэнергия)	**1174-T39**
52.	61.	Книга 11. Каталог сметных цен местных строительных материалов	**1174-T40**
		Приложения	
53.	66.	5. Материалы поэтапного рассмотрения проекта	**1174-T45**
54.	70.	9. Проверка проекта на патентную чистоту	**1174-T49**
55.		**Приложения к записке № 1174-T18 технического проекта «Водохранилище»**	
56.	71.	Вынос автодороги по направлению Куляб - Ховалинг - Шугноу - Тавиль Дара - Гарм - Комсомолабад из зоны водохранилища. Том II. части III, IV. Раздел I. книга 8 - План и продольный профиль на участке Тавиль-Дара -Гарм	**1174-T18-2.8**
57.	72.	Вынос автодороги по направлению Куляб - Шугноу - Тавпль-Дара -Гарм - Комсомол-абад. Том IV, части XI - Сметная документация. Раздел 1 - Сводная смета.	**1174-T18-2A**

58.	**73.**	Вынос автодороги по направлению Куляб - Ховалинг - Шугноу - Тавиль Дара - Гарм - Комсомолабад из зоны водохранилища. Том IV. книга 18-3 - ДРП в Сиафарке.	**1174-T18-2.18.3**
59.	74.	Вынос автодороги по направлению Куляб-Ховалинг-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. Том IV, книга 18-7 - ДЛМ в к-к Курбозтанак. Чертежи.	**1174-T18-2.18.7**
60.	75.	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том V, книга 18-9 -ДЛМ в кишлаке Дегрез. Чертежи.	**1174-T18-2.18.9**
61.	76.	Вынос автомобильной дороги по направлению Куляб—Ховалинг-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том V, книга 18-11 -ДЛМ в кишлаке Зилалак. Чертежи.	**1174-T18-2.18.11**
62.	77.	Вынос автомобильной дороги по направлению Куляб-Ховалинг- Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том V. книга 18-15 -ДЛМ в кишлаке Калачаи Пойон. Чертежи.	**1174-T18-2.18.15**
63.	**78.**	Вынос автомобильной дороги по направлению Куляб-Шутноу-Тавиль-Дара-Гарм- Ховалинг-Комсомолабад из зоны водохранилища. Том IV, книга 20-1 -ДРП в Сангикар. Чертежи.	**1174-T18-2.20.1**

64.	79.	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шутноу-Тавнль-Дара -Гарм- Комсомолабад из зоны водохранилища. Том V. книга 20-3 ДЛМ в кишлаке Ш\ле. Чертежи.	**1174-T18-2.20.3**
65.	80.	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том IV, книга 20-5 -ДЛМ в кишлаке Шуль. Чертежи.	**1174-T18-2.20.5**
66.	81.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том VI, книга 27-6/1.10- Дом линейного мастера в кишлаке Дегрез.	**1174-T18-2.27.20**
67.	82.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм— Комсомолабад из зоны водохранилища. Том VI, книга 27-8/1.10 -Дом линейного мастера в кишлаке Дегрез.	**1174-T18-2.27.21**
68.	83.	Автодорожный туннель под перевалом Хорсанг. Объектная смета на сооружение автодорожного туннеля. (Вариант 1).	**1174-T18-2.27.3**
69.	**84.**	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы ДЭУ в кишлаке Бутайкабад. Том VI - Сметная документация. Раздел I - Сметы. Книга 27-3. 17 - Благоустройство территории предприятия.	**1174-T18-2.27.7**
70.	**85.**	Вынос автомобильной дороги по направлению Куляб—Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы ДЭУ в к-ке Бутайкабад. Том VI -Сметная документация. Раздел 1-Книга 27-3. 19[a]-Сметы АТС.	**1174T18-2.27.8**

71.	86.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы в кишлаке Чиль-Дора. Том VI -Сметная документация. Раздел II - Сметы. Книга 28-5.4. 5. 6 - Трансформаторная подстанция. Наружные сети электроосвещения. Радиофикация и связь.	**1174-T18/2.28.15**
72.	87.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм-Комсомолабад из зоны затопления водохранилищем. На строительство базы ДЭУ в кишлаке Чиль-Дора. Том VI - Сметная документация. Раздел II - Сметы. Книга 28-5/17 - Благоустройство территории предприятия.	**1174-T18-2.28.23**
73.	88.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара—Гарм— Комсомолабад из зоны водохранилища. Том VI - сметная документация. Раздел I - сметы. Книга 28-4 1) - Дом линейного мастера в кишлаке Езганд.	**1174-T18-2.28.4**
74.	89.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. На строительство базы ДЭУ в к-ке Чиль-Дара. Том VI - сметная документация. Раздел II -сметы. Книга 28-5/3, 7, 8 - Здание стоянки машин. Проходная будка. Моечная эстакада.	**1174-T18-2.28.6**
75.	90.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. На строительство базы ДЭУ в к-ке Чиль-Дара. Том Раздел -сметы. Книга 28-5/24 -Водозаборная скважина в п.Чильдара.	**1174-T18-2.28.7**

76.	91.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Даштимур. Том VI - сметная документация. Раздел — сметы. Книга 28-6/4, 5,6- Трансформаторная подстанция. Наружные сети электроосвещения. Радиофикация и связь.	**1174-T18-2.28.9**
77.	**92.**	Вынос автомобильной дороги по направлению Куляб— Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Сангикар. Том VI. Часть I - сметная документация. Раздел -сметы. Книга 28-6/18 — Станция биологической очистки сточных вод.	**1174-T18-2.29.15**
78.	93.	Вынос автомобильной дороги по направлению Куляб— Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. На строительство ДРП. Том VI - сметная документация. Раздел II - сметы. Книга 29-6/22 - Водозаборная скважина на участке в кишлаке Сангикар.	**1174-T18-2.29.16**
79.	94.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Том VI - сметная документация. Раздел II - сметы. Книга 29-2 - Мосты.	**1174-T18-2.29.2**
80.	**95.**	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Сангикар. Том VI - сметная документация. Книга 29-6/10 -Котельная с двумя котлами «Универсал» - 6м.	**1174-T18-2.29.5**

81.	96.	Вынос автомобильной дороги по направлению Куляб-Шугноу-Тавиль-Дара-Гарм- Ком-сомолабад из зоны водохранилища. На строительство ДРП в к-ке Сангикар. Том VI - сметная документация. Раздел - сметы. Книга 28-6/47 - Благоустройство территории предприятия.	**1174-Т18-2.29.6**
82.	**97.**	Вынос автомобильной дороги по направлению Куляб—Шугноу-Тавиль-Дара—Гарм— Ком-сомолабад из зоны Рогу некой ГЭС. Том VI - сметная документация. Раздел I - сметы. Книга 29-7/1,9 - Дом линейного мастера в кишлаке Такоба.	**1174-Т18-2.29.8**
83.	**98.**	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу Тавиль-Дара—Гарм—Комсомолабад из зоны водохранилища. Участок Куляб - Тавиль-Дара (а/дорога). Том IV- сметная документация. Раздел II — Каталог единичных расценок. Книга 30-1.	**1174-Т18-2.30Л**
84.	**99.**	Вынос автомобильной дороги по направлению Куляб-Ховалинг-Шугноу Тавиль-Дара-Гарм- Комсомолабад из зоны водохранилища. Участок* Гарм - Комсомолабад. Том IV-сметная документация. Раздел II-Каталог единичных расценок. Книга 32.	**1174-Т18-2.32**
85.	**100.**	Комплексный проект по планировке и застройке сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 1. Пояснительная записка.	**1174-Т18-4.1**
86.	**101.**	Проект планировки и застройки сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 3. Сводка сводных смет и сводные сметы.	**1174-Т18-4.3**

87.	**102.**	Проект планировки и застройки сельских населенных пунктов с производственными зонами совхозов и колхозов для населения. переселяемого из зоны затопления водохранилищем. Книга 4. Объектные и локальные сметы. Объекты коммунального строительства и благоустройство с-за «Миенаду». Центральная усадьба.	**1174-Т18-4.7**
88.	**103.**	Гидрогеологическое заключение об условиях водоснабжения проектируемого поселка Тавильдара с-за «Рогун» Комсомолабадского района.	**1174-Т18-4.13а**
89.	**104.**	Застройка центральной усадьбы совхоза «Миенаду» с производственной зоной для населения, переселяемого из зоны затопления. Книга 5 -организация строительства.	**1174-Т18-4.15**
90.	**105.**	Комплексный проект по планировке и застройке сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 8.	**1174-Т18-4Л8**
91.	**105а.**	Проект планировки и застройки сельских населенных пунктов с производственными зонами совхозов и колхозов для населения, переселяемого из зоны затопления водохранилищем. Книга 7. Поправка на стоимость местных и привозных материалов.	
92.	**106.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем, включая внешнее электроснабжение поселков и совхозов для переселяемого населения. Том I - Подстанции 35-1 10 кВ. Часть 11- Заказные спецификации по подстанциям. Книга 7 - сборник заказных спецификаций по и/ст 35/10 кВ «Тавиль-Дара».	**1174-Т18-6.П.7**

93.	**107.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем и внешнее эл.снабжение поселков и совхозов для переселяемого населения. Том II - ВЛ-35-110 кВ. Часть I- Общая пояснительная записка.	**1174-T18-6.12**
94.	**108.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем. Том IV. Книга 2 -Объектные сметы № 16. 17. 18 на стр-во п/ст 1 10/35/10 кВ «Тегерми» и «Чильдора» и на РПБ при п/ст «Чильдора».	**1174-T18-6.26**
95.	**109.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем. Том IV. Книга 3 - Объектные сметы № 12. 13. 14. 15 на стр-во п/ст 35/10 кВ «Кизрок», «Миенаду», «Чореады», «Хуфак».	**1I74-T18-6.27**
96.	**110.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем, включая внешнее электроснабжение поселков и совхозов для переселяемого населения. Том IV, Книга 4 - (Объектная смета № 19 на реконструкцию п/ст 35/10 кВ «Тавиль-Дара».	**1174-T18-6.28**
97.	**111.**	Вынос ВЛ-35кВ из зоны затопления водохранилищем. Том IV - Сметная документация. Книга 8 - Объектная смета № 30 на строительство ВЛ-110 кВ и ТП для поселков вновь осваиваемой зоны.	**1174-T18-6.32**
98.	**111а.**	Вынос линий связи из зоны водохранилища и строительство линий связи от р. центра Чнльдора и Гарм к вновь организуемым поселкам и совхозам. Том V- Сметная часть. Раздел 4-Локальные сметы на монтажные работы по станционным сооружениям.	**1174-T-18-5.9**
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100.	**116.**	Орошение новых земель взамен затапливаемых водохранилищем. Часть **III.** Книга I - Схемы орошаемых участков.	
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102.	**119.**	Смета на строительство ПТУ на 720 учащихся строителей-гидротехников в поселке Оби-Гарм.	
103.	**120.**	Технико-экономическая оценка ПТУ на 720 учащихся строителей-гидротехников в поселке Оби-Гарм.	
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Приложения 3

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4. Том 2 «Основной отчет »
5. Том 3F «Проектные параметры»

WORLD BANK

MANAGEMENT RESPONSE TO

REQUEST FOR INSPECTION PANEL REVIEW OF THE

TAJIKISTAN ENERGY LOSS REDUCTION PROJECT

(IDA Credits 40930-TJ and HI7S0-TJ)

Annex 4

Vakhsh Report: Multi-Country Consultant Report (June 2010

November 22, 2010

Multi-Country Consultations on Terms of References for Techno-Economic Assessment Study and Environmental and Social Impact Assessment for Rogun HEP in Tajikistan

June 2010

Sustainable Development Department
Europe and Central Asia Region

Document of the World Bank

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Background

The construction of the Rogun Hydropower Project (HPP), located in the Vakhsh River Cascade upstream of the existing Nurek Hydropower Station in Tajikistan, began in 1980. Its original design included a 335 m dam, a 13 km^3 reservoir extending upstream over a distance of about 70 km, and an installed capacity of 3600 MW (6x600 MW). Construction work stalled after the breakup of the Soviet Union in 1991, about 18 years ago. Currently most of the site preparation work, as well as 60-70% of the underground work, have been completed. In late 2007, the Government of Tajikistan requested World Bank assistance in carrying out the studies needed to assess reviving and completing the construction of the Rogun Hydropower Project. Since the project involves creation of a major reservoir across the Vakhsh River, an important tributary of Amu Darya River, and since the Amu Darya basin encompasses the Kyrgyz Republic, Tajikistan, Afghanistan, Turkmenistan, Uzbekistan and the Aral Sea shared by Kazakhstan and Uzbekistan, it triggers important riparian issues, which need to be fully taken into account besides the normal technical, financial, economic, environmental and social issues, while carrying out the studies.

In December 2007, the Government of Tajikistan notified all riparian countries of its intent to use the proceeds of a World Bank credit to initiate techno-economic, environmental impact and social assessment studies for the proposed Rogun HPP, in full compliance with the World Bank Safeguards policies, notably the Operational Policy (OP/BP) 7.50. Projects on International Waterways. The Government of Tajikistan intended to apply part of the proceeds of this funding towards the preparation of the Assessment Study consisting of: (a) Techno-Economic Assessment Study (TEAS); and (b) separately, but in parallel, an Environmental and Social Assessment (ESIA).The studies would include a comprehensive analysis of hydrological and other impacts that the proposed Rogun HPP and other developments in the cascade (such as Nurek and Sangtuda I&II HPPs) would have on riparians countries, to inform the design and operation of existing and future structures, and mitigate downstream impacts while maximizing economic benefits.

There will be an intensive information flow between the techno-economic Study and the Environmental and Social Studies. In addition a Strategic Environmental Assessment (SEA) will be conducted to investigate power production scenarios and establish the relative economic, environmental and social performance of identified scenarios, tradeoffs and linkages to other energy sector projects both in country and region. The Assessment would comprise two complementary parts – (i) Technical-Economic and (ii) Environmental-Social including riparian issues and cross border impacts. Consulting services will be rendered by two separate firms for these two parts, while the work is to be carried out in parallel and in an interactive manner. The two sets of Assessment studies would be professionally reviewed on a running basis by two International Independent Panels of Experts (PoE), one for techno-economic and dam safety, the other for environmental/social aspects. The work would include assessment of all the previous

work done to date. The most relevant reports/documents that need to be reviewed are: (a) Rogun HPP Technical Project, 1980, by Hydroproject Tashkent, technical projects/documents done in 2008-2009 by design institutes Hydroproject and Moshydrostal.

Scope and Objectives of Consultations

The World Bank subsequently invited all riparian countries to attend in-country consultation workshops, initially scheduled during May 2008[1], organized around the following topics: Impacts on Irrigation; Hydroelectricity; Environment; Water Supply; Climate Change and Regional Cooperation, Social and Health impacts. The countries which took part in these consultations were Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan.

The consultations had the following objectives:

(i) Understand the riparian country's views both from a country and regional points of view on the potential construction of the proposed Rogun HPP in particular and the development of Vakhsh River basin in general;

(ii) Obtain comments and inputs on the draft Terms of References (TORs) of the proposed Environmental Impact Assessment (ESIA) to ensure that the ESIA adequately addresses all possible impacts that the proposed Rogun HPP individually or in connection with other proposed developments in the Vakhsh cascade may have on riparian countries;

(iii) Obtain comments and inputs on the draft ToR for the independent assessment of regional impacts from Vakhsh river basin developments,

(iv) Explain the Bank's rules, procedures and safeguard policies applicable to such large projects with cross border implications, and

(v) Discuss broader regional issues of energy and water resources development in the Central Asia region.

Consultations with local and potentially affected peoples are being undertaken separately and will be reported by the facilitator under contract to the Government of Tajikistan.

[1] At the request of the Government of Uzbekistan, the consultation workshops were postponed to September 2008, and then again to January 2009 (for Tashkent consultation).

Chronology and Summary Description of Events

Date	Event
27-06-08	Meeting in Tashkent between the First Deputy Prime Minister and the World Bank Country Manager for Uzbekistan (as part of the new Conference on the Aral Sea discussions) confirming that: - Government of Uzbekistan (GoUz) is ready to receive the World Bank team for consultations but wants to have the results of their own study ready to engage in a discussion with the World Bank team on aspects they are concerned about. - GoUz would share the report with the World Bank prior to the consultations.
30-09-08	Consultations in Ashgabat, Turkmenistan. Participants generally: - Recognize the need and the right of Tajikistan to utilize its water resources to generate power to improve the living standards of its people. - Are concerned that though Rogun was originally designed to operate in an "irrigation mode" with multi-year water regulation as the primary objective, it might be operated in the "power mode" resulting in adverse changes to the water flow; - Need detailed information on the ecological, financial and social impact of Rogun HPP and the associated risks to the downstream population - Need guarantees that (a) there would be no reduction in the present level of flows as well as in the present flow regime (based on the 1992 Agreement), and (b) that there would be no violation of the ecological safety in the downstream countries.
01-10-08	Consultations in Astana, Kazakhstan. Participants generally: - Confirm that the water sharing arrangements made in 1987 and continued in the 1992 Agreement are still valid. - Believe it is better to be involved in hydro developments (such as Kambarata and Rogun) to achieve better coordination. - Are interested in various energy linkages between Kazakhstan and Tajikistan
03-10-08	Consultations in Bishkek, the Kyrgyz Republic. Participants generally: - Support the construction of Rogun, which would help water flow regulation and Central Asian Power System regulation.

Date	Event
	- Believe that Uzbekistan and Turkmenistan should be invited to participate in the ownership of the Rogun project, because of possible benefits to all participants. - Remind that there are lands under irrigation by Kyzyl Su (in the upper reaches of Vaksh in the Kyrgyz Republic); however planned levels of expansion are unlikely to pose problems - Recommend that power transmission planning focuses on Datka-Rogun, Datka-Kemin linkages to enable (a) to supply Tajik power to the Kyrgyz Republic; (b) to supply Rogun power to Kazakhstan; and (c) to enable exports of Kazakh and Kyrgyz power to South Asia.
05-10-08	Consultations in Kabul, Afghanistan. Participants generally: - Express general support to the proposed Rogun HPP - Stress the need for development of large HPPs on the Pyanj River jointly with Tajikistan in the future. - Indicate that Afghanistan is planning to pursue a number of projects on the Kokcha River (a tributary of the Pyanj-Amu Darya.) for irrigation and power generation and asked whether their evaluation can be included in the Vakhsh/Amu Darya basin review.
20-01-09	Consultations in Tashkent, Uzbekistan. Participants generally: - Are concerned about quality assurance for TEAS and ESIA, need guarantees that Panel of Experts will be truly independent, and would like to see the involvement of other international organizations (e.g. UN family) - Are concerned about outdated information sources, specifically seismic and geotechnical data, - Express the strong wish that its experts should have access to the Rogun site - Underline that potential impacts of energy exports to Pakistan on the Central Asia energy system should be assessed.
11-03-09	World Bank Group Statement on Water/Energy Developments in Central Asia (see Annex II): - Informing that the World Bank Group plans to elaborate a Regional Water-Energy Development Framework for Central Asia which would address winter energy security and seasonal demand for water, concentrate on energy export potential and review water resource development and water management issues with stakeholders and partners in Central Asia. - Clarifying that with regards to Rogun HPP, the World Bank has only committed to provide financing to the Government of Tajikistan to carry out studies to assess the possibility of the

Date	Event
	project, with particular emphasis on its potential regional impacts, and that the ToR of these studies take into account issues for consideration identified by the riparians. - Informing that to ensure transparency and inclusion of all the stakeholders' concerns, the World Bank has recently initiated consultations in all riparian countries (Afghanistan, Kyrgyz Republic, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan), that will continue, as the results of the studies and the views of the independent experts become available.
14-09-09	Follow up consultations in Ashgabat, Turkmenistan - Participants underlined the key issues that should be properly analyzed during the assessment including: (i) seismic risk, (ii) impact on water quality, (iii) impacts on water flows, (iv) quality of civil works carried out during Soviet times at Rogun, (v) how the agreed operational regime (irrigation mode) of the proposed Rogun HPP could be guaranteed (there should be no significant reduction in the present level of flows as referred in the UNECE convention which is based on the "no significant harm principle"), and (vi) absence of a reliable data collection protocol in the river basin area. - Participants requested the World Bank team to share experience of other countries with regard to the fees to be paid for water resources.
15-09-09	Follow up consultations in Tashkent, Uzbekistan - To discuss how comments received so far are being incorporated into the final version of the ToR for Rogun HPP studies, notably those related to seismic risk, transboundary water management, consultation, and quality and objectivity.
08-03-10	World Bank provides no objection to the TOR
03-05-10	Requests for Proposals sent to short-listed candidates
10-06-2010	Three proposals were received for TEAS and one for ESIA

DETAILED COMMENTS, RESPONSES AND AMENDMENTS TO TORS (October 2008- April 2009)
Source: Annex 6, ESIA Terms of Reference

Para/ Bullet	Issue/Concern	Modification of Original Draft Terms of Reference	Coverage in Final Terms of Reference (ToR)
Government of Uzbekistan Expert Opinion: Rogun Hydro-electric Power Station Across the Vakhsh River and its Construction Risks (November 2008)			
1.	Engineering design documents for the construction of Rogun are being developed in violation of the international rules (norms).	The term "feasibility" has been replaced with "assessment" to properly reflect the stage of project study and align English and Russian terminology. References to possible future steps such as preparation of bid documents etc have been removed from the TORs. World Bank President Zoellick's letter dated April 15, 2009 underscores that the World Bank has only agreed to assist in the conduct of the two assessment studies. Reference to a fourth phase has been added to the ToR to enable continuation of studies and next stage preparation. However, this fourth phase will not proceed as it is subject to additional funding from the World Bank, and will depend on the results from the assessments.	Engineering designs are not being prepared now. The studies are at the review and assessment level of detail (as designed earlier and partly implemented), covering technical, economic, financial, environmental and social aspects. For completeness, a fourth phase is identified in the ToR but is subject to funding and the results of the assessments themselves.
	The Tajik Party is implementing engineering design and construction of the Rogun HPS without any information exchange or consultations with the transboundary states	Several consultations have taken place since release of the original draft Terms of Reference, including World Bank led consultations in Turkmenistan, Republic of Krygyz, Kazakhstan, Afghanistan and Tajikistan (Sept-Oct 2008), receipt of the Expert Opinion from Government of Uzbekistan (Nov 2008), consultations in Uzbekistan (Jan 2009), letters between the Government of Uzbekistan and the World Bank Group (August 14, 2007, November 10, 2998, April 18, 2008, April 25, 2008, March 3, 2009, March 30, 2009, April 15, 2009). The ToR require panels of experts that are selected as objective technical experts. The World Bank will provide	These studies will encompass consultation with stakeholders, as per the World Bank's Safeguards Policies and will provide comprehensive information as requested to enable a meaningful consultation with the riparian states (see also letter from Lars Thunnel to President Azimov dated March 30, 2009). Specifically, paragraph 41 of the ESIA ToR requires at least two rounds of consultation as well as public disclosure of documents according to World Bank policies (See section 4.3 paragraphs 60-64 of the ESIA ToR). The ToR specify the need for panels of experts and indicate the consultants are to work closely with those panels.

		no objections and oversight on these panels, and integrate the findings into its ongoing consultations with riparians on cross-border impacts. Outside the scope of the ToR, efforts are being made to coordinate these panels with a regional institution for dialogue on transboundary waters. This approach would be supported by international advisors on a range of energy and water issues in the region, funded through donor trust funds. The World Bank will work with the panel, providing documents and outputs from the studies, and inviting comment on the techno-economic and environment/social assessments, as well as dam safety studies. The World Bank may also access independent experts as counsel on cross-border impacts. All reports by consultants and the environmental and social panel are public and subject to stakeholder review, scrutiny and comment.	Paragraph 74 of the ESIA ToR and Section 3of the TEAS ToR elaborate that the consultants will be aware of the progress and the activities of the panels and draw upon / integrate relevant findings. The panels will oversee execution of the consultants' services. The World Bank will provide no objections and oversight on these panels, and integrate the findings into its ongoing consultations with riparians on cross-border impacts. Outside the scope of the ToR, efforts are being made to coordinate these panels with a regional institution for dialogue on transboundary waters. This approach would be supported by an international Panel of Experts to advise on a range of energy and water issues in the region, funded through donor trust funds. The World Bank will work with the panel, providing documents and outputs from the studies, and inviting comment on the techno-economic and environment/social assessments, as well as dam safety studies. The World Bank may also, separately, access independent experts as counsel on cross-border impacts All reports by consultants and the environmental and social panel are public and subject to stakeholder review, scrutiny and comment.
2. and 3.	If Rogun is built and operated following a power regime then the number of years with intermittent water availability would vary from 12 -23 within a 50-year period, with a worst case scenario of 28-39 years, to the great disadvantage of vital interests of downstream countries	Reference to both local and riparian impacts has been specified in the objectives of the ESIA (Paragraph 24). An additional set of tasks has been specified in the ESIA ToR dealing explicitly with impact assessment in riparian countries (Box 7). The section refers to the 1992 agreement but also requires assessment of water use, impact of flow regimes on environmental, social and economic interests downstream, and links the ESIA to reservoir simulations undertaken in the TEAS, with particular reference to project costs and design. The impact on river flow regime in Box 6 has been detailed in terms of changes in water quantity, pattern and quality downstream. A paragraph on water regulation both upstream and downstream has been added to the description of the initial	The ESIA ToR explicitly includes riparian and cross-border impacts in the scope of assessment (paragraph 27). Downstream water regimes and riparian impacts are captured in several places, especially in the ESIA ToRs (e.g., paragraphs 16, 33, 44, 47, 51, 52, 55, 56, 58, 60) The reservoir simulation study (paragraph 6.11) will explore operating regimes. Emerging opportunities for increased mutual benefits (see note below) and possible of risks of alternative reservoir operating regimes will be assessed in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Paragraph 6.11 also instructs the consultant to prepare an initial reservoir filling schedule as well as simulating reservoir operations for the next 50-60 years.

		environmental and social screening (paragraph 44). The ToR have been revised to explore a range of possible reservoir operations to identify opportunities for increased mutual benefits and to articulate risks, in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Additional references have been made throughout the ESIA ToR to emphasize the inclusion of riparian interests and cross-border impacts of the project.	
4.	Present seismic and tectonic conditions shows that the area for construction of the Rogun HPS had been picked very unfavourably, raising risks of increased seismic activity and new earthquakes, washouts and dam failure, and salt formation	Reference to the "favourable" site has been removed. Reference to safety of the has been added in paragraph 6.3, with specific instructions that it should be thoroughly investigated. The first phase of the TEAS is the geological and Geotechnical Investigation of the Salt Dome in the Dam foundation and Reservoir. It has been added that the consultant shall not proceed to the next phase of assessment unless the client authorizes after careful review and acceptance of the salt dome report, in consultation with the Panel of Experts	Section 4.1 (Phase 0) of the TOR for TEAS specifies a review of the salt dome question (including influence on dam safety) and section 6.3 addresses the safety of the underground power house cavern. Sections 6.5, 6.6 and 7.12 focus on geological and seismic aspects of dam safety. Paragraph 53 and Box 2 of the TORs for ESIA also examine these issues.
5.	Dam failure in case of earthquake would result in formation of an outburst wave with a flow of 2.35 to 1.56 mlm m3, and flooding in an area of 69 thousand km2 populated by approximately 5 million people	Provisions for an instrumentation plan for monitoring the behavior of the dam through its lifetime and an emergency preparedness plan have been added to the risk evaluation (paragraph 6.20) and assessment report (paragraph 7.23 and 7.24). The environmental and social aspects of dam monitoring and emergency preparedness, with particular reference to the transboundary context are captured paragraph 60 of the ESIA ToR.	Paragraph 6.6 of the TEAS requires seismic studies including evaluation of seismic hazard, operating basis design earthquake, and review and improvement of existing seismic monitoring network in the region. Both the TEAS (paragraph 7.23) and ESIA (two bullet points below paragraph 60 (g)) require the preparation of a dam monitoring plan and emergency preparedness plan and communication plan as outlined in the World Bank safeguard guidelines.
6.	The Rogun HPs area is known for active manifestation of recent physical-and-geological processes, with dangers of landslides	Linkages between the TEAS and ESIA studies have been specified to ensure consistency.	Paragraph 6.5 of TEAS covers these aspects within a comprehensive geological, geophysical and geotechnical investigation. Related environmental and social risks are covered in 53 of the TORs of ESIA

7.	Capacity of the Tajik Civil Defense and Emergency Service staff, equipment technology and training are not adequate to ensure safety and rapid elimination of disasters with the Rogun HPS area	See comments for point 5 above	This issue is covered under the Emergency Preparedness Plan in section 7.23 in the TEAS. Also reinforced in the TORs of ESIA under paragraph 60
8.	Unscheduled intensive winter discharges would result in land degradation in the lower reaches of the river	Reference to both local and riparian impacts has been specified in the objectives of the ESIA (Paragraph 24). An additional set of tasks has been specified in the ESIA ToR dealing explicitly with impact assessment in riparian countries (Box 7). The section refers requires assessment of water use, impact of flow regimes on environmental, social and economic interests downstream, and links the ESIA to reservoir simulations undertaken in the TEAS, with particular reference to project costs and design. The impact on river flow regime in Box 6 has been detailed in terms of changes in water quantity, pattern and quality downstream. A paragraph on water regulation both upstream and downstream has been added to the description of the initial environmental and social screening (paragraph 44). The ToR have been revised to explore a range of reservoir operations to identify opportunities for increased mutual benefits and to articulate risks, in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Additional references have been made throughout the ESIA ToR to emphasize the inclusion of riparian interests and cross-border impacts of the project.	Section 6.11 of TEAS addresses operations and flow management in addition to the requirement for hydrologic modeling.. See also paragraph 55 and Boxes 6 and 7 in the TORs for ESIA. These paragraphs: • Require examination of a range of reservoir operations and associated flow regimes in terms of environmental, social, economic and financial impacts in Tajikistan and riparian countries • Include a review and evaluation of alternative institutional arrangements to monitor and enforce operating regimes • Require assessment of an environmental flow The studies will also explore possible exports to Afghanistan and Pakistan, which could provide a financial incentive for summer generation.
9.	Reduced water flow in summer will cause accumulation of salts within the irrigated area		
10.	Reduced runoff and decreased water discharge to the Aral Sea would cause further desertification and change in temperature regime. Climatic conditions would become inappropriate for living, but also detrimental for flora and fauna		
11, 12 and 13.	Estimates of losses and damages if water flow is reduced (e.g., US$4.1 billion per year from land degradation, US$146.5 million from loss of flora and fauna)		
14.	Instead of Rogun consider alternatives such as small hydropower projects, with small daily storages.	Small hydropower has been specified as one resource to be considered in the generation expansion plan.	Evaluation of the alternatives from the power point of view is provided for in the generation expansion plan in Paragraph 33 and Annex 4 of the TORs for ESIA, and Annex 3 of the TEAS. Note that some small hydro is already being pursued in Tajikistan.

	The ESA should cover not only the project area but all the affected countries Reputed UN agencies (UNDP, UNEP, ICARDA, IPCC, and IUCN should be involved in this exercise.	See comments for points 8-13 above Involvement of other UN agencies is outside the scope of the consultants work, although documents are available to UN agencies for review and comment. However, outside the ToR, the World Bank, in partnership with UNRCCA, is investigating opportunities to coordinate with an international panel of advisors to support activities of IFAS.	The geographic scope for the ESIA covers the relevant areas in Tajikistan and the relevant areas in all riparian states (see for example paragraph 55, Box 6 and Box 7 of the TORs of ESIA).
Points from the Minutes of Consultations with Uzbek Authorities (January 2009)			
1.	UZ is concerned about quality assurance of TEAS and ESIA, needs guarantees that the Panels of Experts (PoE) will be truly independent,	The ToR require panels of experts that are selected as objective technical experts. The World Bank will provide no objections and oversight on these panels, and integrate the findings into its ongoing consultations with riparians on cross-border impacts. Outside the scope of the ToR, efforts are being made to coordinate these panels with a regional institution for dialogue on transboundary waters. This approach would be supported by an international Panel of Experts to advise on a range of energy and water issues in the region, funded through donor trust funds. The World Bank will work with the panel, providing documents and outputs from the studies, and inviting comment on the techno-economic and environment/social assessments, as well as dam safety studies. The World Bank may also access independent experts as counsel on cross-border impacts. All reports by consultants and the environmental and social panel are public and subject to stakeholder review, scrutiny and comment.	The ToR specify the need for panels of experts and indicate the consultants are to work closely with those panels. Paragraph 74 of the ESIA ToR and Section 3of the TEAS ToR elaborate that the consultants will be aware of the progress and the activities of the panels and draw upon / integrate relevant findings. The panels will oversee execution of the consultants' services. The World Bank will provide no objections and oversight on these panels, and integrate the findings into its ongoing consultations with riparians on cross-border impacts. Outside the scope of the ToR, efforts are being made to coordinate these panels with a regional institution for dialogue on transboundary waters. This approach would be supported by an international Panel of Experts to advise on a range of energy and water issues in the region, funded through donor trust funds. The World Bank will work with the panel, providing documents and outputs from the studies, and inviting comment on the techno-economic and environment/social assessments, as well as dam safety studies. The World Bank may also, separately, access independent experts as counsel on cross-border impacts. All reports by consultants and the environmental and social panel are public and subject to stakeholder review, scrutiny and comment.

2.	UZ is concerned about outdated information sources, specifically seismic and geotechnical data,	Additional cautions have been added.	Use of best available data and ensuring its quality is the professional responsibility of the consultants. The Dam safety POE will be alert to this issue and provide oversight.
3.	UZ expresses the strong wish that its experts should have access to the Rogun site (inaccessible for the past 18 years)		Access is the prerogative of the Government of Tajikistan and is outside the scope of the consultant's authority.
4.	UZ underlines that potential impacts of energy exports to Pakistan on the Central Asia energy system should be assessed		Paragraph 7.21 of the TEAS and paragraph 33 of the ESIA require the consultants to analyze this issue.
5.	UZ has little trust in the long term reliability of any arrangement to jointly operate Roghun HPP (such as international commission, PPP/consortium), citing operation of Toktogul, Nurek and Kairakum, all of which allegedly deviated significantly from operational modes agreed when they were once commissioned	Consultants are asked to present various institutional options and their strengths, weaknesses and implementation. Determining the appropriate system is outside the scope of the ToRs; however, the information developed by the consultants would support consultation among riparians.	Paragraph 6.11 requires the TEAS consultants to "review, in light of international experience, possible institutional arrangements (e.g., a reservoir management commission with multi-country representation) for monitoring reservoir operations and regimes for ensuring compliance with prescribed" operations. A permanent international commission to monitor the releases and a sanction regime linked to the escrowed export revenue are likely to be credible mechanisms.
6.	UZ suggested that the PoE might be hired directly by the Bank, preferably not by the same department which is preparing / supervising the project (ECSSD) but by a Bank section which has no "personal, political or commercial stakes" in the project.	See point 1 above	See point 1 above
7.	The TORs contain words and expressions indicating possible bias of the WB towards Rogun	With apologies, terminology has been modified and such words and expressions removed to ensure a neutral stance.	
	General		Section 6.9 of the TEAS and Box 8 of the ESIA deal with climate change aspects in detail.
Points from Turkmenistan Consultations(Sept-October 2008)			
1.	Though Rogun was originally designed to operate in an irrigation mode with multi-year water regulation as the primary objective, it might be operated in the "power mode" resulting in adverse changes to the water flow.	Reference to both local and riparian impacts has been specified in the objectives of the ESIA (Paragraph 54). An additional set of tasks has been specified in the ESIA ToR dealing explicitly with impact assessment in riparian countries (Box 7). The section requires assessment of water	The ESIA ToR explicitly includes riparian and cross-border impacts in the scope of assessment (paragraph 27). Downstream water regimes and riparian impacts are captured in several places, especially in the ESIA ToRs (e.g., paragraphs 16, 33, 44, 47, 51, 52, 55, 56, 58, 60)

		use, impact of flow regimes on environmental, social and economic interests downstream, and links the ESIA to reservoir simulations undertaken in the TEAS. The impact on river flow regime in Box 6 has been detailed in terms of changes in water quantity, pattern and quality downstream. A paragraph on water regulation both upstream and downstream has been added to the description of the initial environmental and social screening (paragraph 44). The ToR (paragraph 6.11 of the TEAS) have been revised to explore additional reservoir operations to identify opportunities for increased mutual benefits and to articulate risks, in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Additional references have been made throughout the ESIA ToR to emphasize the inclusion of riparian interests and cross-border impacts of the project.	The reservoir simulation study will explore a range of operating regimes. Emerging opportunities for increased mutual benefits (see note below) and possible of risks of alternative reservoir operating regimes will be assessed in terms of environmental and social assessments (Box 7 of ESIA) and the economic/financial analysis (paragraphs 6.18/19 of TEAS). Paragraph 6.11 also instructs the consultant to prepare an initial reservoir filling schedule considering effects on the downstream riparian states as well as simulating reservoir operations for the next 50-60 years.
2.	TM needs guarantees (a) that there would be no reduction in the present level of flows as well as in the present flow regime (based on the 1992 Agreement), and (b) that there would be no violation of the ecological safety in the downstream countries.	Consultants are asked to present various institutional options and their strengths, weaknesses and implementation. It is outside the scope of these studies to establish a guarantee. However, the review and analysis of alternative institutions will provide support for deliberations among riparians and indicate their assessment of the preferred option.	Paragraph 6.11 requires the TEAS consultants to “review, in light of international experience, possible institutional arrangements (e.g., a reservoir management commission with multi-country representation) of monitoring reservoir operations regimes for ensuring compliance” with prescribed operations. A permanent international commission to monitor the releases and a sanction regime linked to the escrowed export revenue are likely to be credible mechanisms.

3.	TM needs detailed information on the ecological, financial and social impact of Rogun HEP and the associated risks to the downstream population.	See point 1 above	Collectively the TEAS and the ESIA are aimed at creating such detailed information. The geographic boundaries include impacts downstream of Rogun, extending to all riparian countries. See for example, paragraph 55 and 56 and Boxes 6 and 7 in the ESIA.
Points from Consultations with Kyrgyz, Tajikistan, Kazakhstan, and Afghanistan(Sept –Oct 2008)			
	No significant point calling for revision of the TORs was made.		

ANNEX I

MAIN CONSULTATION MATERIALS
(all countries expect for UZ which was postponed to January 2009)

Vakhsh River Basin Development

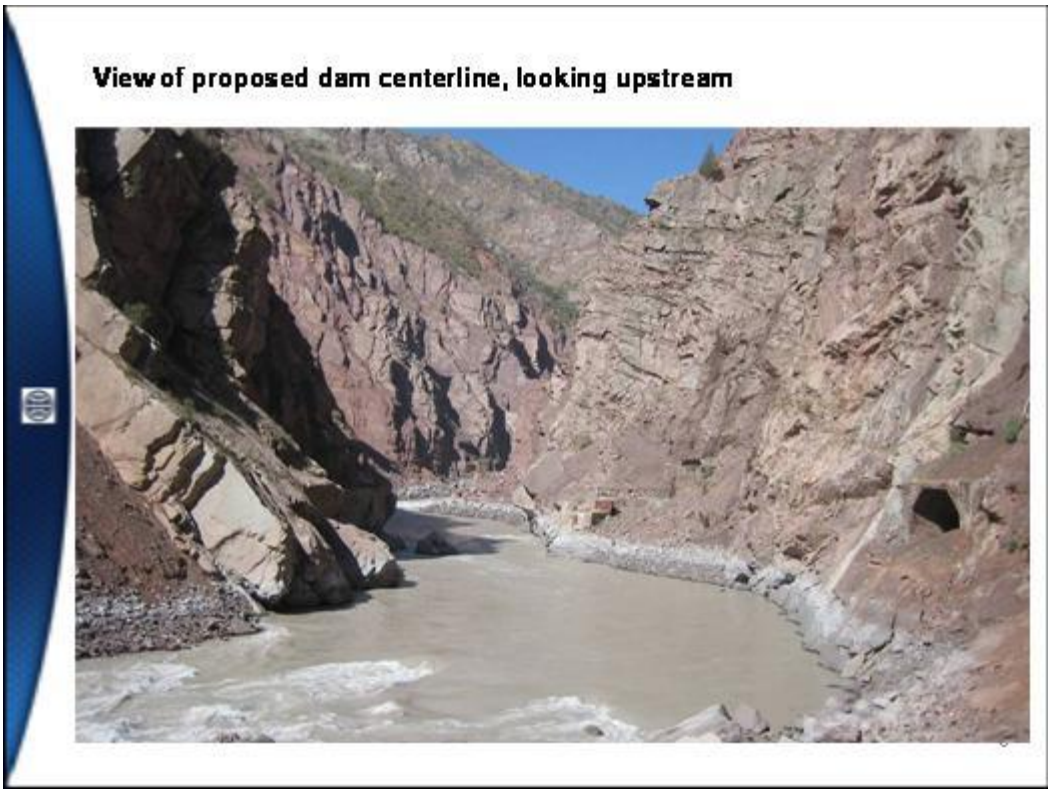
Independent Assessment of
Cross Border Impacts

Introduction

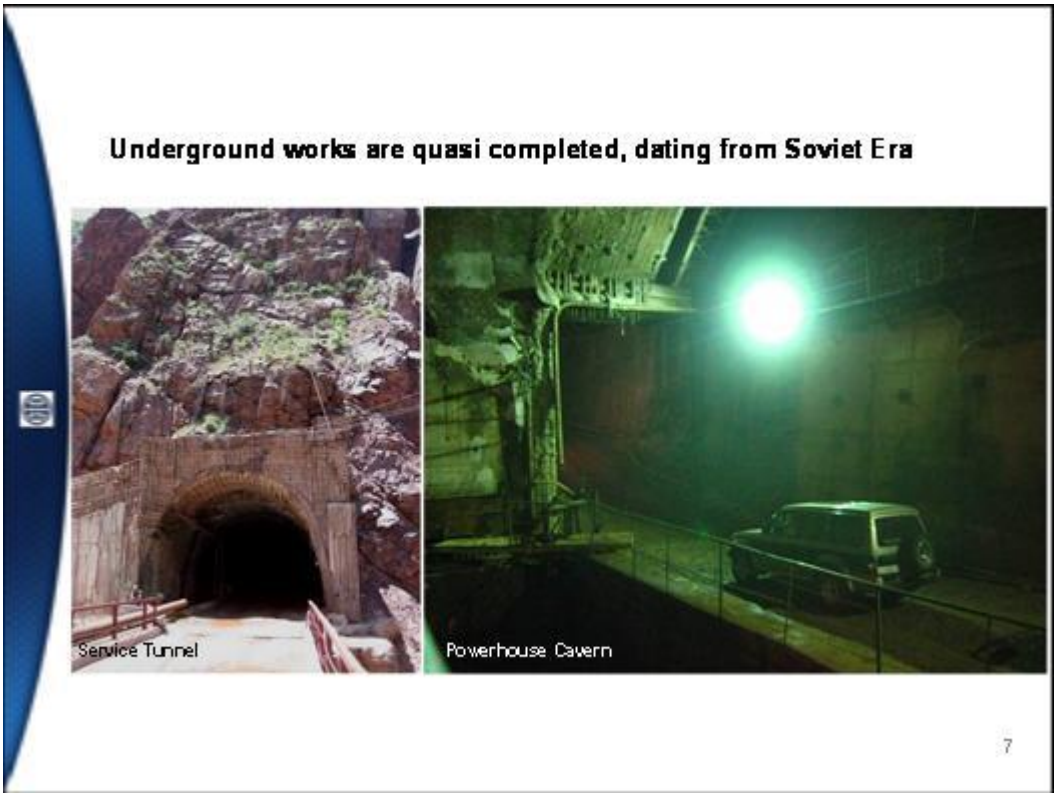
Vakhsh River Basin Development:

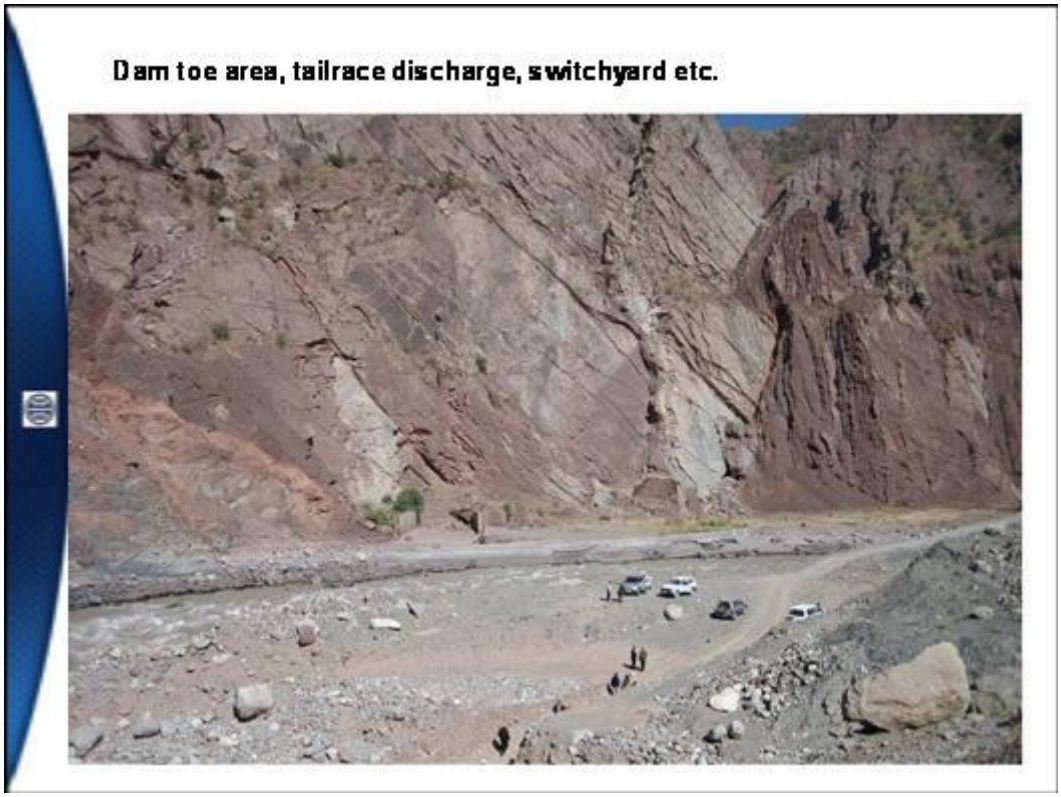
Proposed Rogun HEPP

4


View of proposed dam centerline, looking upstream


View of reservoir area about 5 km upstream future dam site
6


Underground works are quasi completed, dating from Soviet Era
Service Tunnel
Powerhouse Cavern
7


Dam toe area, tailrace discharge, switchyard etc.

View of proposed dam centerline, looking downstream

Vakhsh River Basin Development

Independent Assessment of Cross Border Impacts

Background and context of development of Rogun HEP

Raghuveer Sharma
Pedro Sanchez

Background

Tajikistan has always focused on developing its vast hydro resources and requested the World Bank for help in 2002

World Bank Advise to Tajikistan on Hydro Development

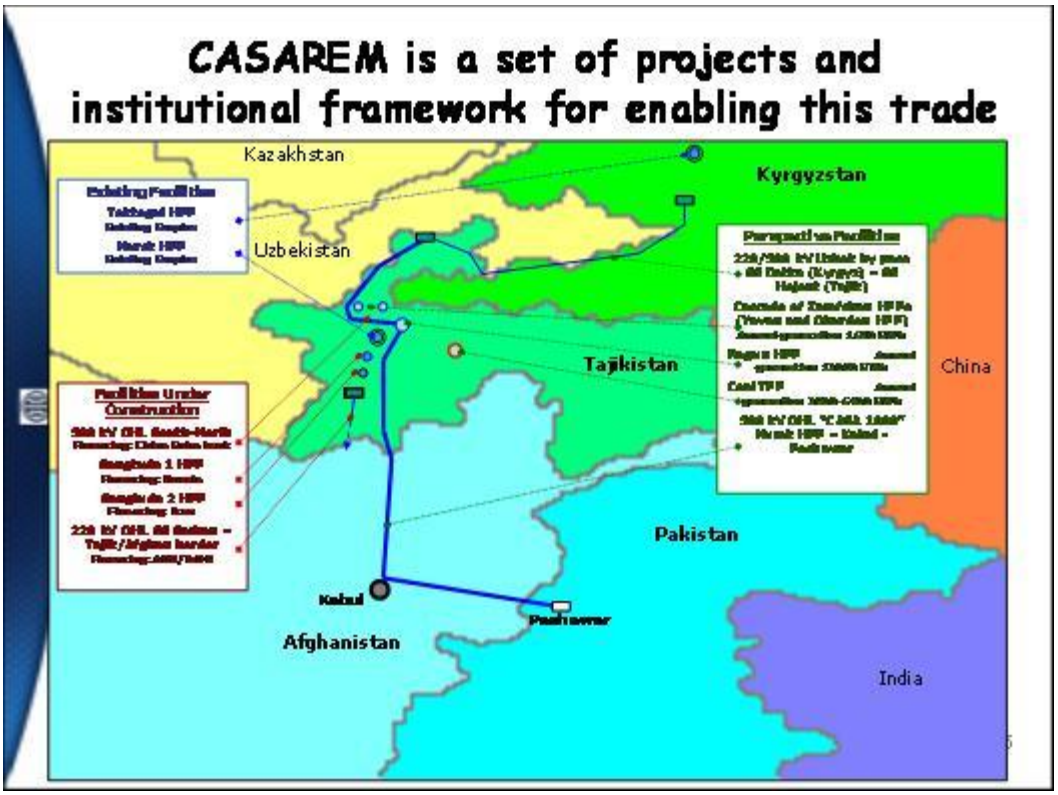
Advice	Action
Find electricity export markets	Reached Agreements with Afghanistan and Pakistan on electricity exports
Find credible private investors	RAO UES for Sangtuda RUSAL initially for Rogun; later turned to World Bank (2007)
Initiate and sustain domestic energy reforms	Carrying out energy reforms

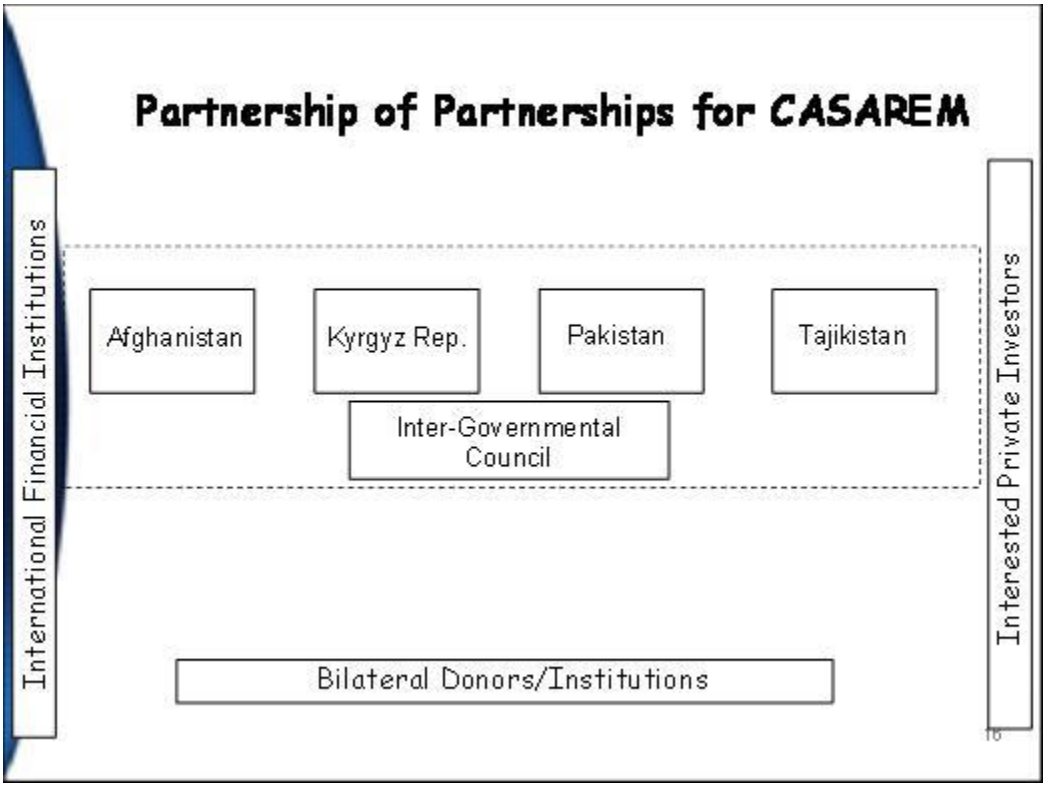
12

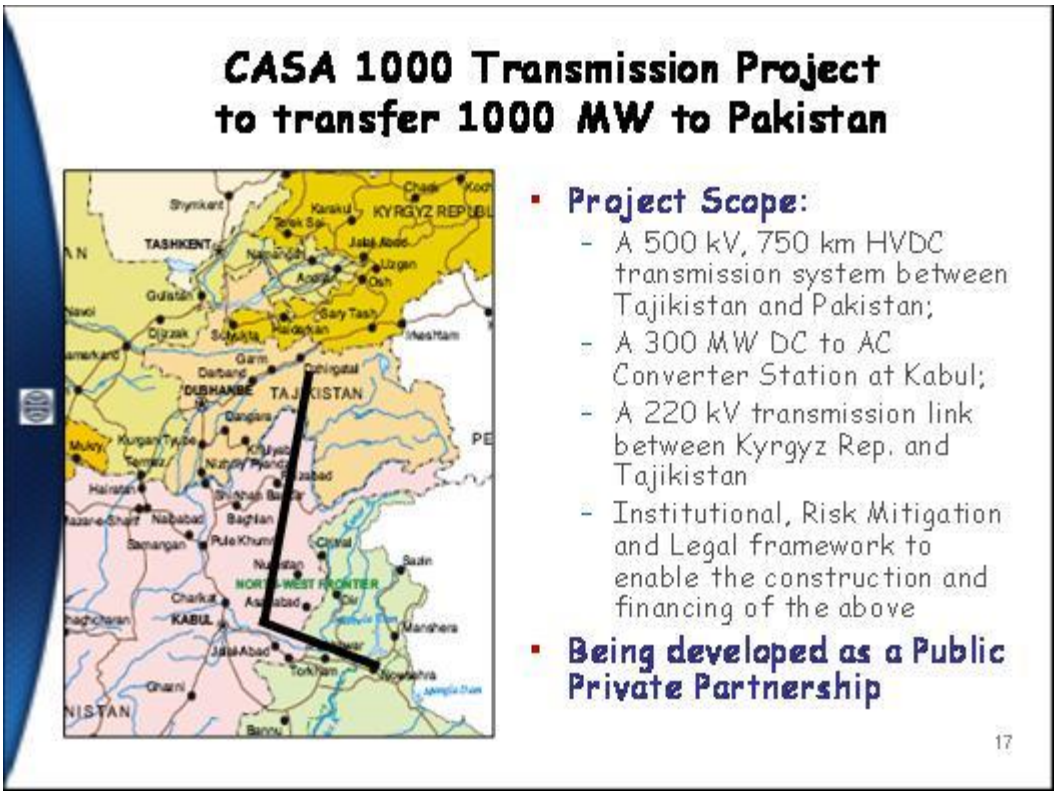
World Bank helping Tajikistan in all these areas

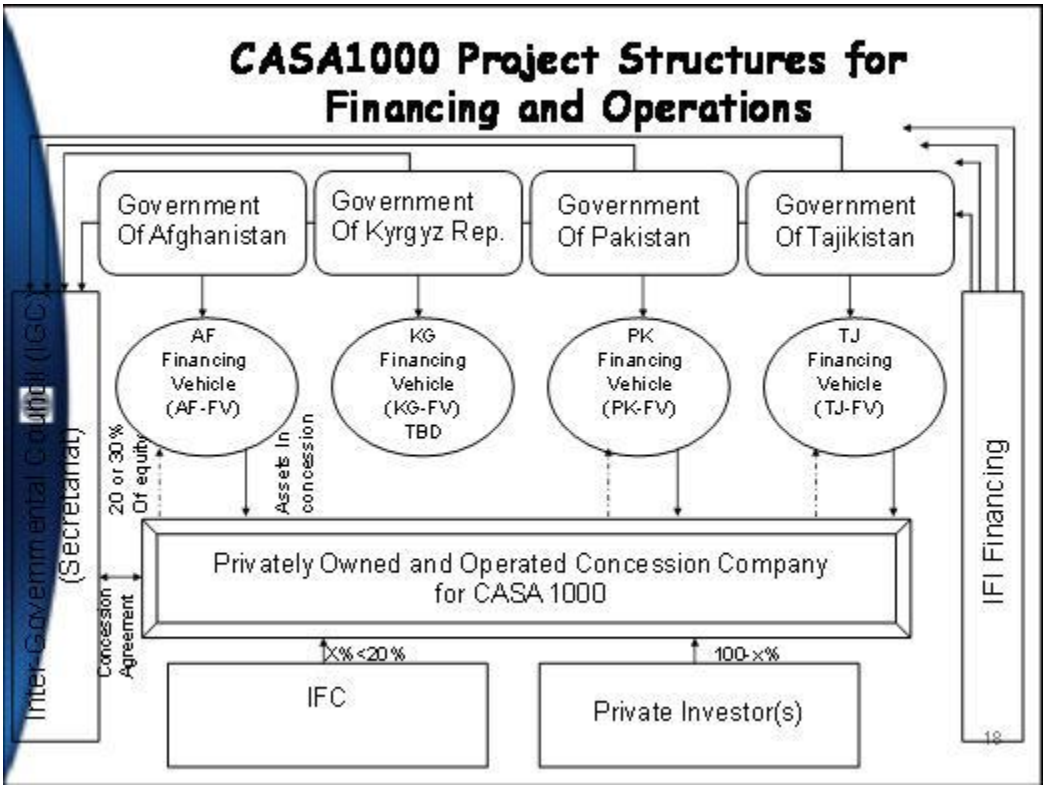
In terms of finding the electricity market, an agenda that is fairly advanced in terms of country agreements and preparation is the Central Asia South Asia Regional Electricity Market (CASAREM)

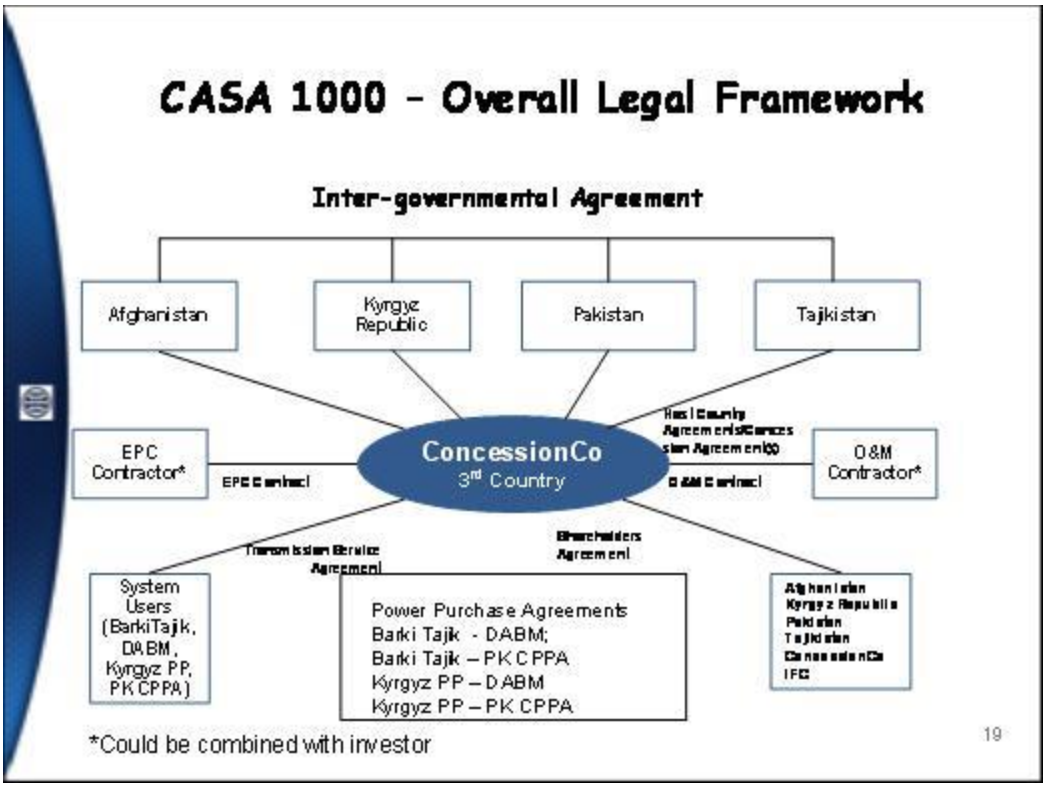
Regional Market Cost-Price Gaps

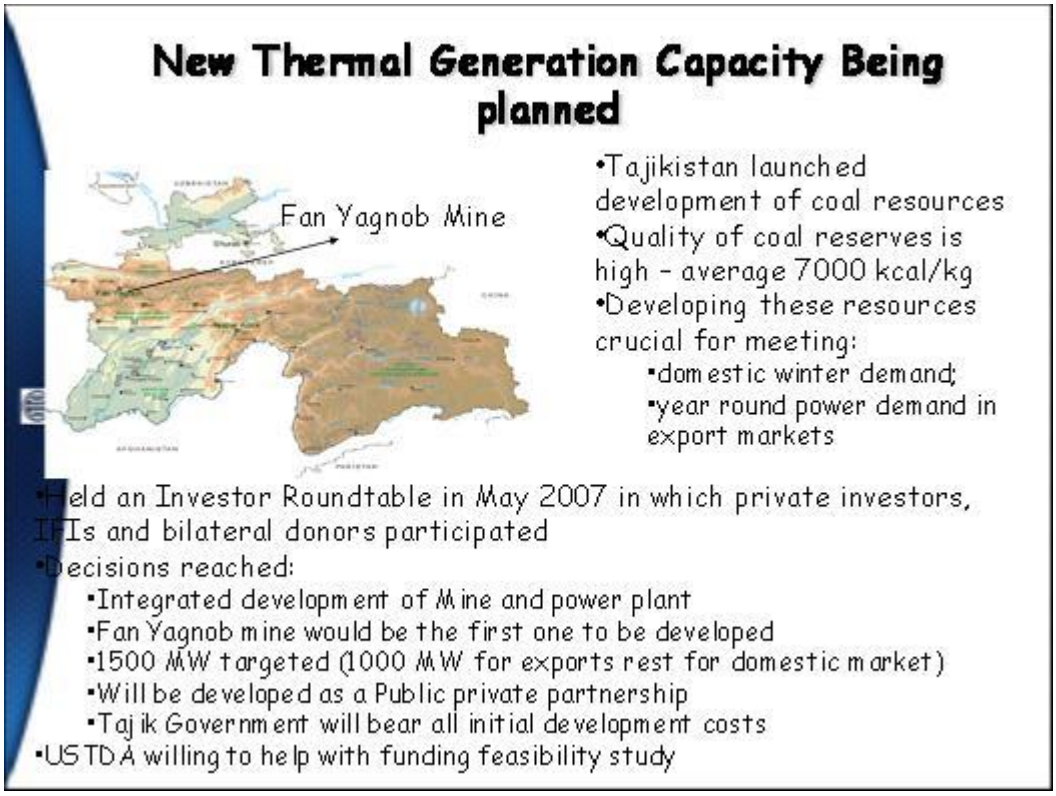

CASAREM is a set of projects and institutional framework for enabling this trade
Kazakhstan
Kyrgyzstan
Uzbekistan
Tajikistan
China
Pakistan
Kabul
Peshawar
Afghanistan
India


Partnership of Partnerships for CASAREM
International Financial Institutions
Afghanistan
Kyrgyz Rep.
Pakistan
Tajikistan
Inter-Governmental Council
Bilateral Donors/Institutions
Interested Private Investors

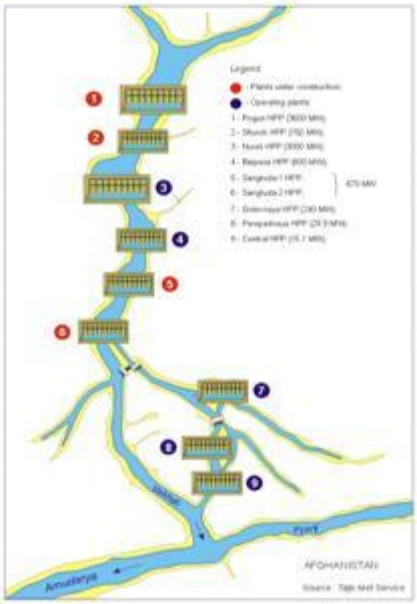

CASA 1000 Transmission Project
to transfer 1000 MW to Pakistan
Project Scope:
- A 500 kV, 750 km HVDC transmission system between Tajikistan and Pakistan;
- A 300 MW DC to AC Converter Station at Kabul;
- A 220 kV transmission link between Kyrgyz Rep. and Tajikistan
- Institutional, Risk Mitigation and Legal framework to enable the construction and financing of the above
Being developed as a Public Private Partnership
TASHKENT
KYRGYZ REPUBLIC
DUSHANBE
TAJIKISTAN
KABUL
17


CASA1000 Project Structures for
Financing and Operations
Government Of Afghanistan
Government Of Kyrgyz Rep.
Government Of Pakistan
Government Of Tajikistan
Inter-Governmental Council (IGC)
(Secretariat)
AF Financing Vehicle (AF-FV)
KG Financing Vehicle (KG-FV) TBD
PK Financing Vehicle (PK-FV)
TJ Financing Vehicle (TJ-FV)
20 or 30% Of equity
Assets In concession
Privately Owned and Operated Concession Company for CASA 1000
Concession Agreement
X% <20%
100-x%
IFC
Private Investor(s)
IFI Financing
18


CASA 1000 – Overall Legal Framework
Inter-governmental Agreement
Afghanistan
Kyrgyz Republic
Pakistan
Tajikistan
EPC Contractor*
ConcessionCo
3rd Country
O&M Contractor*
System Users (BarkiTajik, DABM, Kyrgyz PP, PK CPPA)
Power Purchase Agreements
Barki Tajik - DABM;
Barki Tajik – PK CPPA
Kyrgyz PP – DABM
Kyrgyz PP – PK CPPA
*Could be combined with investor
19


New Thermal Generation Capacity Being planned
Fan Yagnob Mine
•Tajikistan launched development of coal resources
•Quality of coal reserves is high – average 7000 kcal/kg
•Developing these resources crucial for meeting:
▪domestic winter demand;
▪year round power demand in export markets
•Held an Investor Roundtable in May 2007 in which private investors, IFIs and bilateral donors participated
•Decisions reached:
▪Integrated development of Mine and power plant
▪Fan Yagnob mine would be the first one to be developed
▪1500 MW targeted (1000 MW for exports rest for domestic market)
▪Will be developed as a Public private partnership
▪Tajik Government will bear all initial development costs
•USTDA willing to help with funding feasibility study

Rogun Hydroelectric Project Background



- **3600 MW storage hydro upstream of Nurek HPP in Tajikistan**
- **Circa 30% constructed during Soviet times**
  - Government is looking to complete it w/ international investors and financiers
  - In 2004 a deal was reached with RusAl, did not work
  - Government keen on World Bank involvement in structuring and financing this project
  - World Bank agreed to finance feasibility study compliant with Bank Group guidelines
    - Which includes assessment of environmental, social and importantly riparian issues
  - Economic viability depends on exporting majority of production
  - Pakistan keen to import
  - Another interesting large project option for PPP

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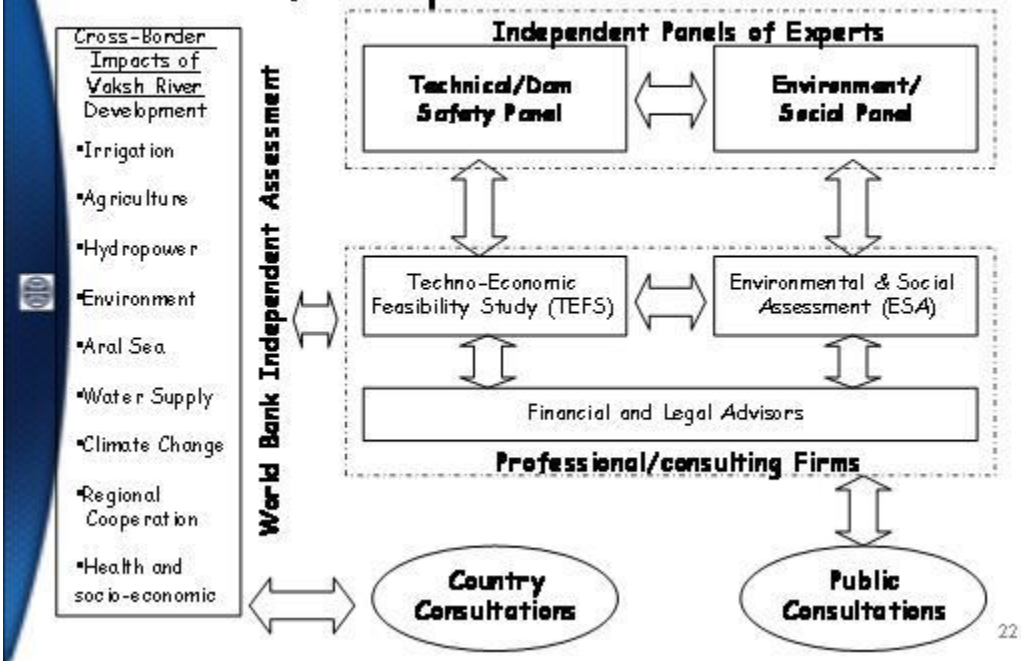
Rogun Hydroelectric Project Plan for Preparation and Assessment



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Key Elements of Techno-Economic Study

- Nurek Power Plant Rehabilitation included
- Will look at entire Vaksh River Development
  - Including Shurab
- Construction to be staged – stage 1
  - Options to assessed to build Stage 1; then develop Shurab; and then revert back to Rogun stage 2
- Valuation of existing assets to be done as part of the study
  - Care needed not to have inflexible positions until the study is done
- Will assess all previous work done todate

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Key Elements of Environmental and Social

- Will look at entire Vaksh River Development
  - Including Shurab and Sangtuda 1 and 2
- Will consider Rogun all stages
- Key issues:
  - Environmental assessment
  - Resettlement
  - Cross border impacts
- Sharing of information is key:
  - at the Terms of Reference level;
  - At the preliminary findings level;
  - Final findings level
- Therefore consultations, within Tajikistan and with neighbors, in critical

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Plan for International Consortium
Rogun Financing Principles

- Focus on Stage 1
- Commission stage 1, use cash flow from Stage 1 to finance Stage 2
  - Do the Feasibility and environmental and social assessment for both stages
- Tajikistan should be able to use the value of existing construction as its equity
- Consortium
  - is a public-private partnership
  - comprises equity investors; and debt financiers

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Investors and Financiers

Equity Investor Types

Strategic Investors	Financial Investors	Hybrid Investors
RAO UES AES Norsk Hydro Hydro Quebec	Country Funds Qatar Inv Fund Turkmenistan Kazakhstan	Aga Khan Fund IFIs IFC, EBRD Contractors others

Debt Investor Types

Development Banks	Export Credit Agencies	Commercial Banks
ADB Islamic Bank EBRD World Bank/IFC KfW (Germany)	Japan Exim US Exim German India China Exim	Citibank Deutsche Bank ABN AMRO KazKommerts Etc etc

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Tajikistan Government has Invited [country] Government to join Rogun Consortium

Президент Республики Таджикистан | *Президенти Ҷумҳурии Тоҷикистон* | *President Republic of Tajikistan*

Уважаемый Гурбангулы Малликулиевич,

Хотел бы сообщить Вам, что Правительство Республики Таджикистан приступило к процессу проведения технико-экономического обоснования и оценки социально-экологического воздействия по Рогунскому гидроэнергетическому проекту (далее Рогунский ГЭП). Всемирный банк удовлетворил просьбу Правительства Республики Таджикистан о финансировании исследований по Рогунскому ГЭП. Рогунский ГЭП признан Правительством Республики Таджикистан и Всемирным банком как важная составляющая реализации стратегии экономического развития страны.

Пользуясь возможностью, позвольте официально пригласить Правительство Туркменистана присоединиться к предложенному международному консорциуму по разработке и реализации Рогунского ГЭП. Как государственные, так и частные хозяйствующие субъекты и организации Вашей страны могут внести свой вклад в завершение строительства Рогунской ГЭС. Правительство Республики Таджикистан всегда рассматривало Рогунский ГЭП в качестве регионального проекта. Мы хотели бы видеть участие дружественных соседних стран в данном проекте.

Примите, Ваше Превосходительство, уверения в моём весьма высоком уважении.

Эмомали Рахмон

Response needed from [country name]

- [Questions tailored for each country]

2

Vakhsh River Basin Development

Independent Assessment of Cross Border Impacts

Independent Assessment: Objectives and Proposed Approach

Christophe Bösch

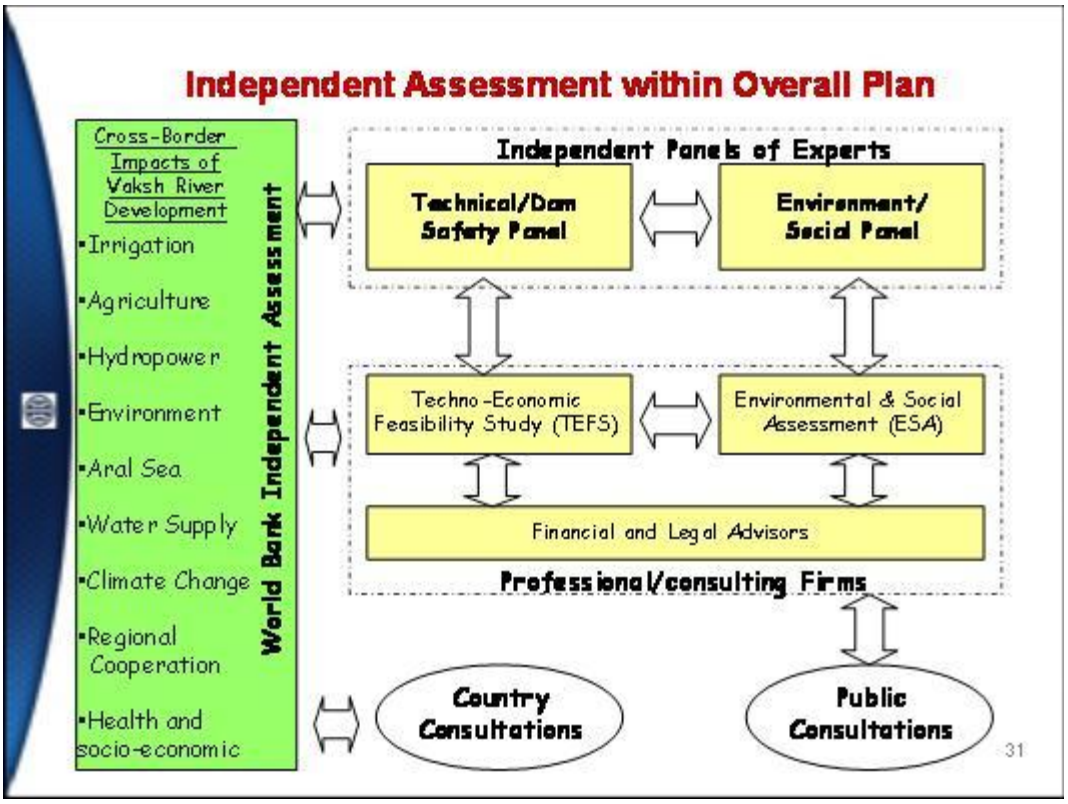
Vakhsh River Independent Assessment

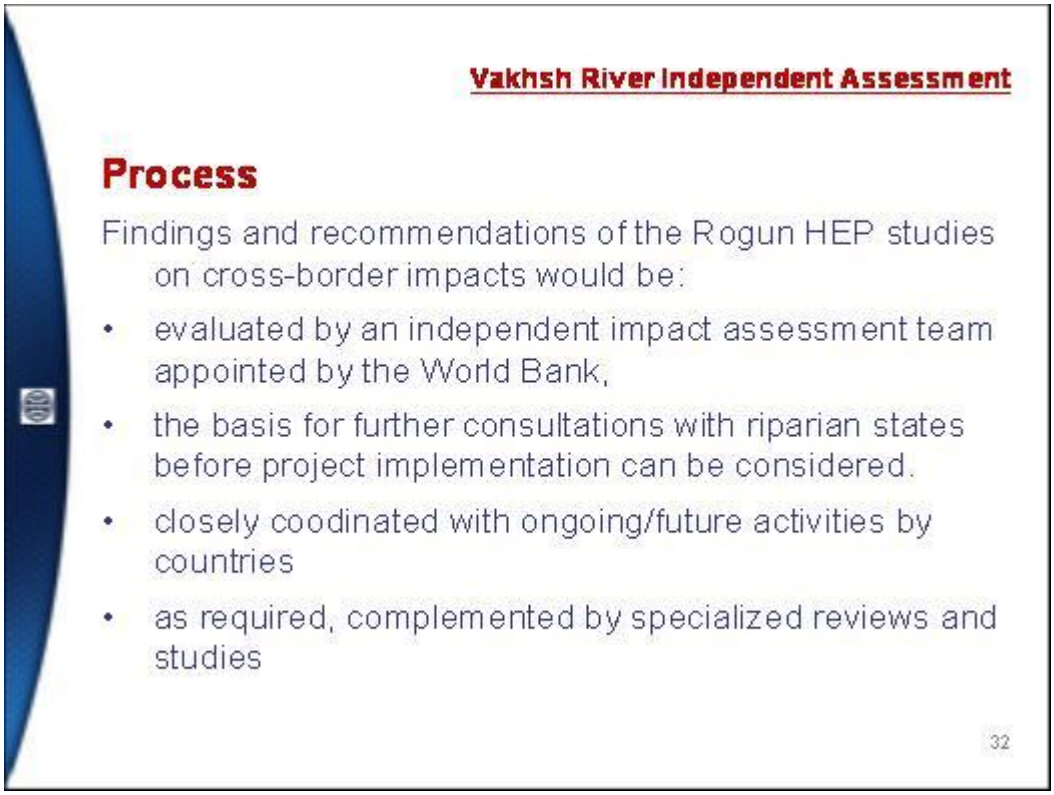
Objective

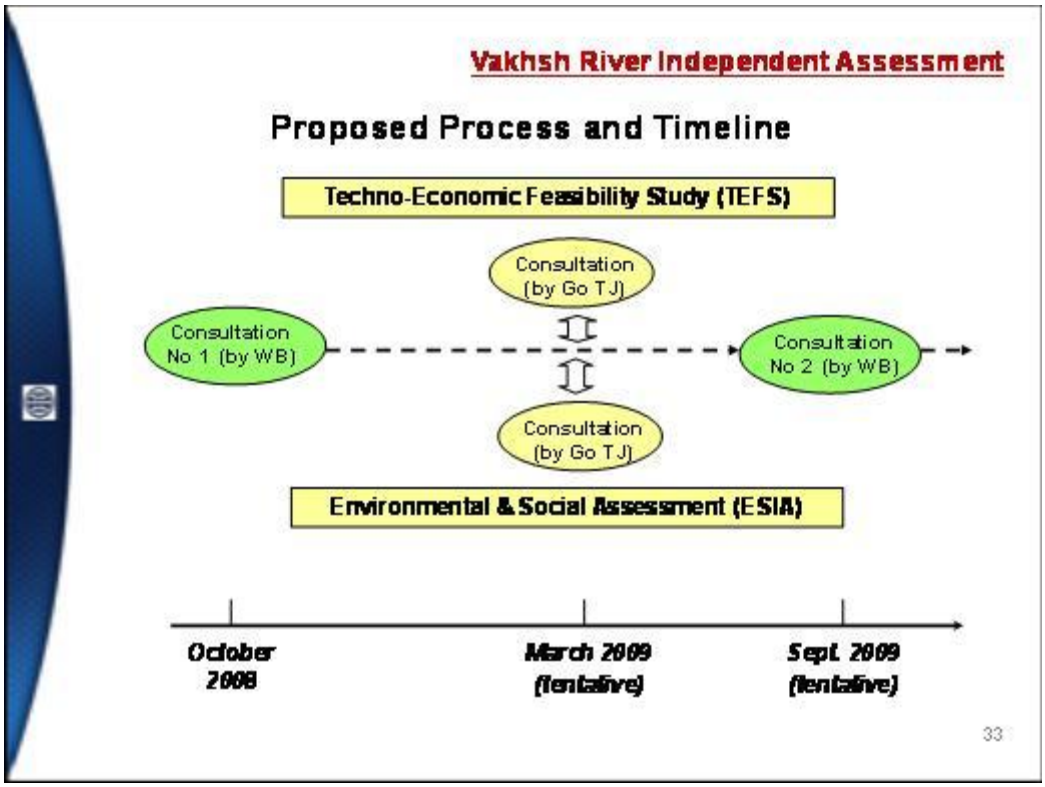
Carry out an independent review of the Cross-Border Impacts of Vakhsh River Basin developments by:

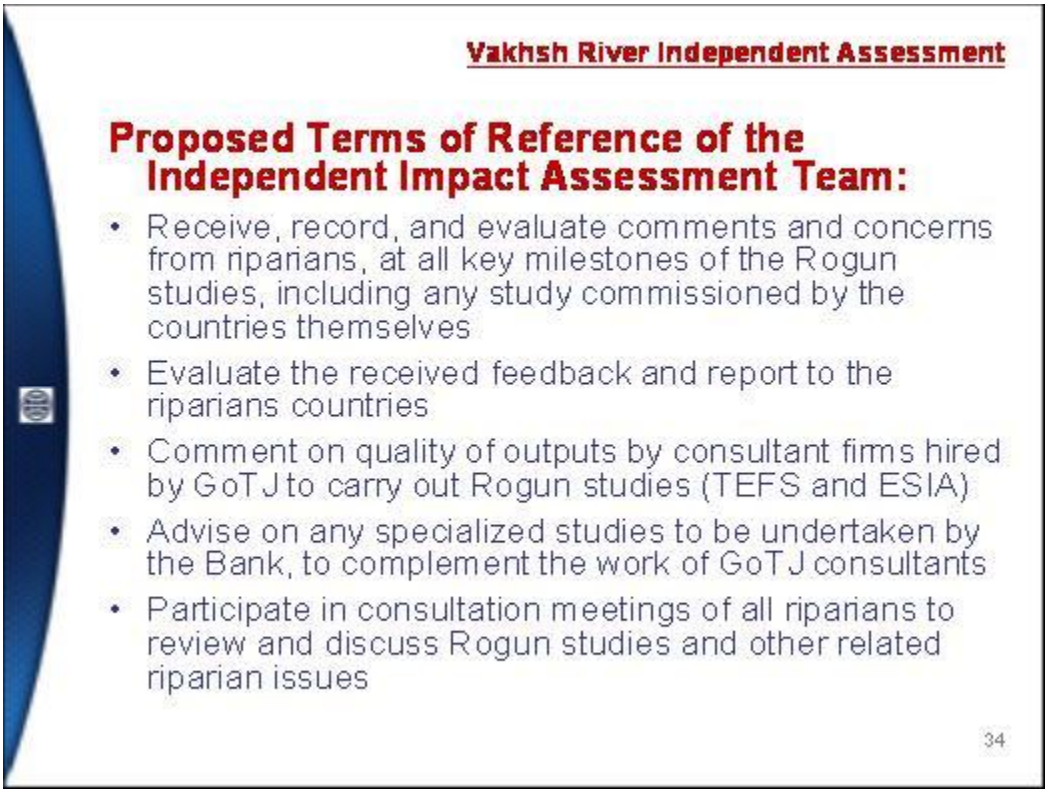
- Providing information to, and receiving information from the Rogun HEP studies executed in parallel.
- Focusing on agriculture, irrigation, power, water supply, environment (including flood control), climate change, Aral Sea restoration, and opportunities for regional cooperation (e.g. to increase energy security).

30


Independent Assessment within Overall Plan
Cross-Border Impacts of Vaksh River Development
•Irrigation
•Agriculture
•Hydropower
•Environment
•Aral Sea
•Water Supply
•Climate Change
•Regional Cooperation
•Health and socio-economic
World Bank Independent Assessment
Independent Panels of Experts
Technical/Dam Safety Panel
Environment/ Social Panel
Techno-Economic Feasibility Study (TEFS)
Environmental & Social Assessment (ESA)
Financial and Legal Advisors
Professional/consulting Firms
Country Consultations
Public Consultations
31


Vakhsh River Independent Assessment
Process
Findings and recommendations of the Rogun HEP studies on cross-border impacts would be:
• evaluated by an independent impact assessment team appointed by the World Bank,
• the basis for further consultations with riparian states before project implementation can be considered.
• closely coodinated with ongoing/future activities by countries
• as required, complemented by specialized reviews and studies
32


Vakhsh River Independent Assessment
Proposed Process and Timeline
Techno-Economic Feasibility Study (TEFS)
Consultation (by Go TJ)
Consultation No 1 (by WB)
Consultation No 2 (by WB)
Consultation (by Go TJ)
Environmental & Social Assessment (ESIA)
October 2008
March 2009 (tentative)
Sept. 2009 (tentative)
33


Vakhsh River Independent Assessment
Proposed Terms of Reference of the Independent Impact Assessment Team:
• Receive, record, and evaluate comments and concerns from riparians, at all key milestones of the Rogun studies, including any study commissioned by the countries themselves
• Evaluate the received feedback and report to the riparians countries
• Comment on quality of outputs by consultant firms hired by GoTJ to carry out Rogun studies (TEFS and ESIA)
• Advise on any specialized studies to be undertaken by the Bank, to complement the work of GoTJ consultants
• Participate in consultation meetings of all riparians to review and discuss Rogun studies and other related riparian issues
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Vakhsh River Independent Assessment

Possible Specialized Studies

- In-depth modeling and analysis of cross border impacts taking inputs from the TEFS and ESIA consultants
  - E.g. to analyse flow regimes under various scenarios to minimize downstream impacts
- Institutional
  - E.g. to assess options for a possible multi-country Rogun reservoir management commission, and longer term options for river basin management (in connection with ADB regional TA)
- Climate change
  - E.g. to account for climate change issues in design of HPPs, and possibly use reservoirs as an element of adaptation strategy to climate change (to mitigate glacier melt and increasing floods)
- Disaster risk management (incl. hydromet)
  - E.g. to strengthen hydromet and early warning systems to improve reservoir management, and design possible risk transfer mechanisms (catastrophe insurance)

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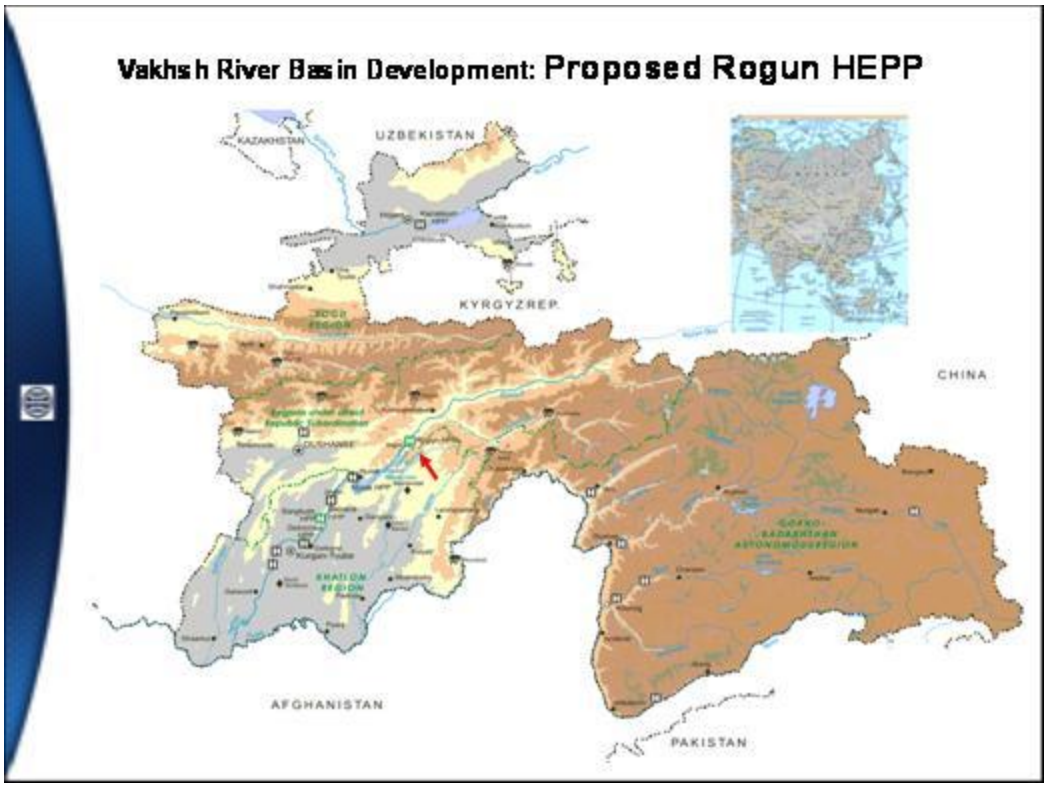
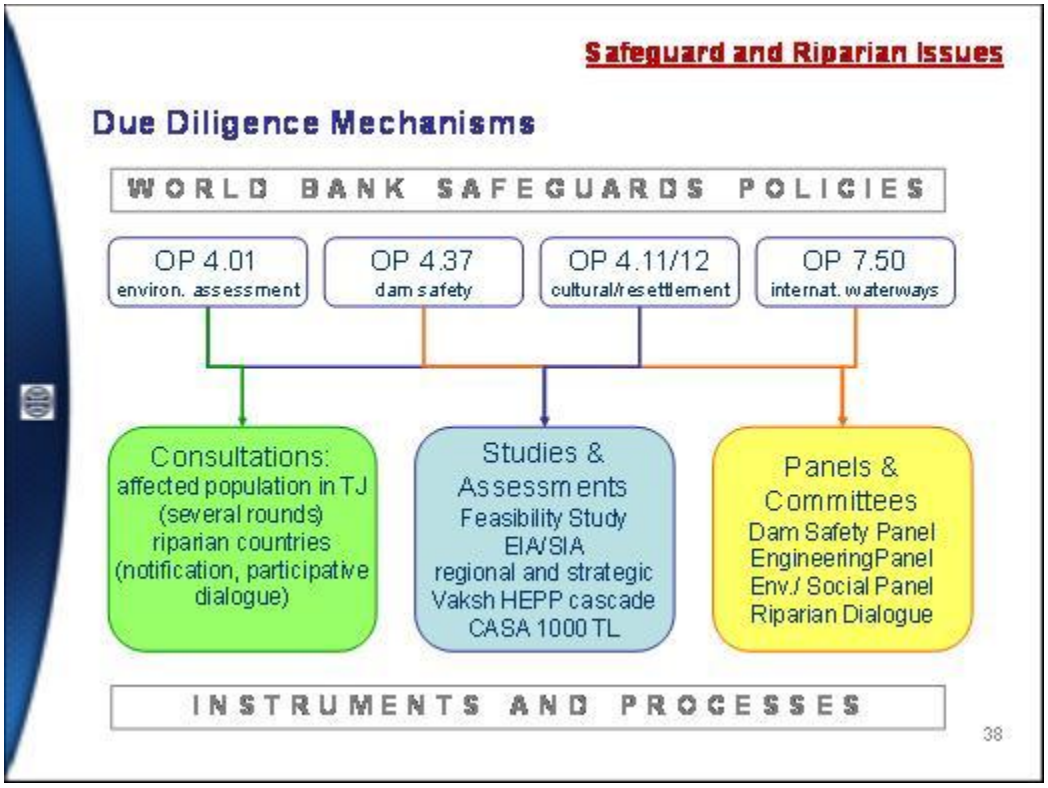
Vakhsh River Basin Development

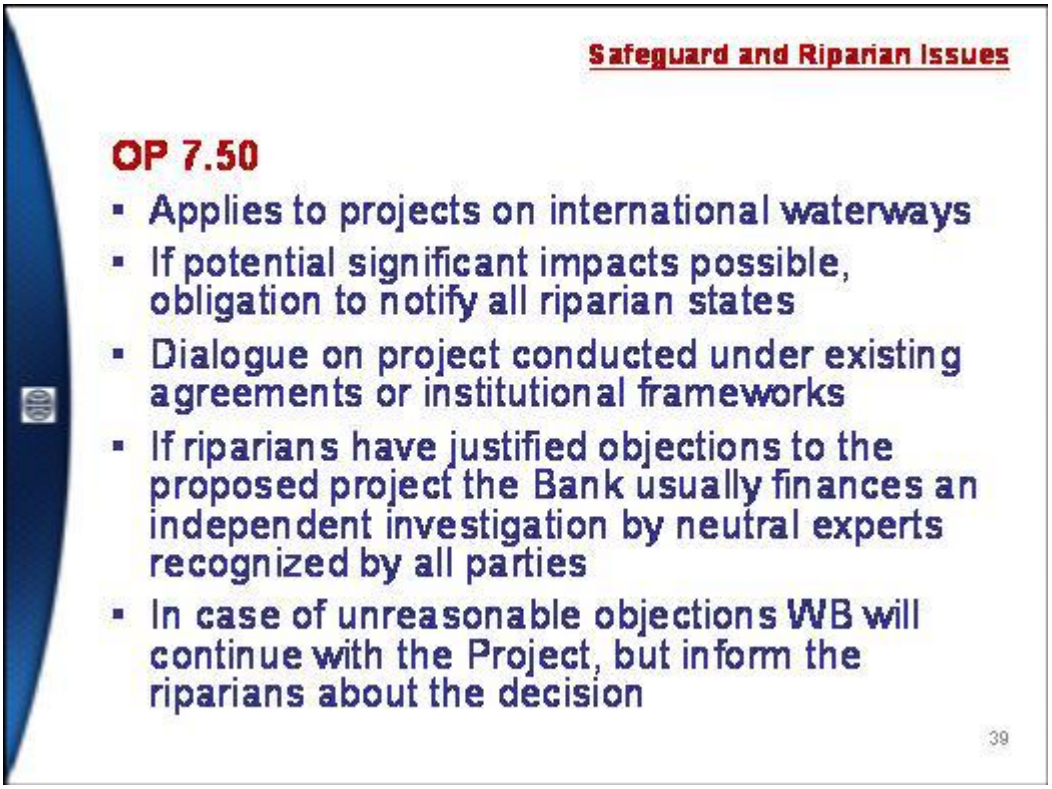
Independent Assessment of Cross Border Impacts

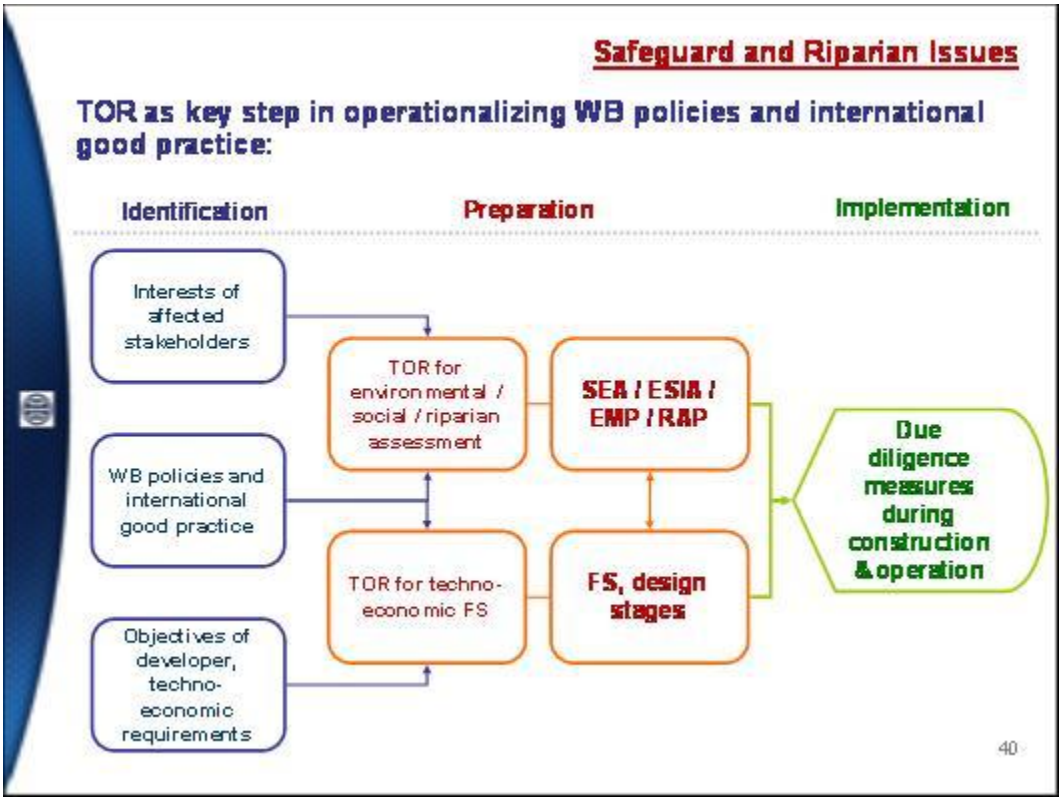
Safeguard issues: WB policies and draft ToRs for ESIA and Panel of Experts

Wolfhart Pohl
Christophe Bösch


Vakhsh River Basin Development: Proposed Rogun HEPP
KAZAKHSTAN
UZBEKISTAN
KYRGYZREP.
CHINA
AFGHANISTAN
PAKISTAN


Safeguard and Riparian Issues
Due Diligence Mechanisms
WORLD BANK SAFEGUARDS POLICIES
OP 4.01
environ. assessment
OP 4.37
dam safety
OP 4.11/12
cultural/resettlement
OP 7.50
internat. waterways
Consultations:
affected population in TJ
(several rounds)
riparian countries
(notification, participative
dialogue)
Studies &
Assessments
Feasibility Study
EIA/SIA
regional and strategic
Vaksh HEPP cascade
CASA 1000 TL
Panels &
Committees
Dam Safety Panel
EngineeringPanel
Env./ Social Panel
Riparian Dialogue
INSTRUMENTS AND PROCESSES
38


Safeguard and Riparian Issues
OP 7.50
Applies to projects on international waterways
If potential significant impacts possible, obligation to notify all riparian states
Dialogue on project conducted under existing agreements or institutional frameworks
If riparians have justified objections to the proposed project the Bank usually finances an independent investigation by neutral experts recognized by all parties
In case of unreasonable objections WB will continue with the Project, but inform the riparians about the decision
39


Safeguard and Riparian Issues
TOR as key step in operationalizing WB policies and international good practice:
Identification
Preparation
Implementation
Interests of affected stakeholders
WB policies and international good practice
Objectives of developer, techno-economic requirements
TOR for environmental / social / riparian assessment
TOR for techno-economic FS
SEA / ESIA / EMP / RAP
FS, design stages
Due diligence measures during construction & operation
40

Safeguard and Riparian Issues

Summary of ESIA ToRs

Objectives:

- Investigation of strategic context and location specific environmental impacts
- *Have an independent* assessment by impartial and objective Consultants
- Conduct detailed invesigations and assessment on environmental and social conditions and potential project impacts, design mitigation measures
- Produce an environmental management plan (EMP) and resettlement action plan (RAP) which can be integrated into contract documents

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Safeguard and Riparian Issues

Scope of Work of Consultant

- **Environmental and social assessment, consisting of:**

i. strategic environmental assessment (SEA)

ii. initial screening and identification of key issues

iii. detailed environmental and social impact assessment (ESIA)

iv. information disclosure and consultations

v. environmental management plan (EMP) and resettlement action plan (RAP)

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Safeguard and Riparian Issues

Issues to be addressed under TOR:

- Procurement of existing data / studies
- Review of geological conditions at dam site and reservoir area
- Workplace health and safety, hazards to site personnel and population
- Site preparation, cleanup and waste management
- List of potential adverse environmental and social issues
- Downstream hydrological impacts
- Climate Change Impacts

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Safeguard and Riparian Issues

Key Issues to be addressed under TOR (Selected "Highlights")

Procurement of existing data / studies

- Elaborate a comprehensive data review report, which contains
  - List / inventory of available information
  - Contents and abstracts of all key reports in Russian and English languages; list of documents available in English in full version
  - Identification of major data gaps and proposed action to close them, including time and cost estimates
- Assemble all materials and make accessible to all stakeholders (incl. riparians)

Review of geological conditions at dam site and reservoir area

- Identify and comment on special problems such as:
  - Halite and gypsum bearing strata in dam foundation area, potentially dissolving and causing preferential paths of seepage flow
  - Flow through zones of high permeability such as fractured sandstone or faults
  - Landslides/ rockfalls along reservoir slopes can create natural dams and generate peak floods when the latter break
- Review existing geotechnical hazard maps
- Review issue of seismic dam engineering

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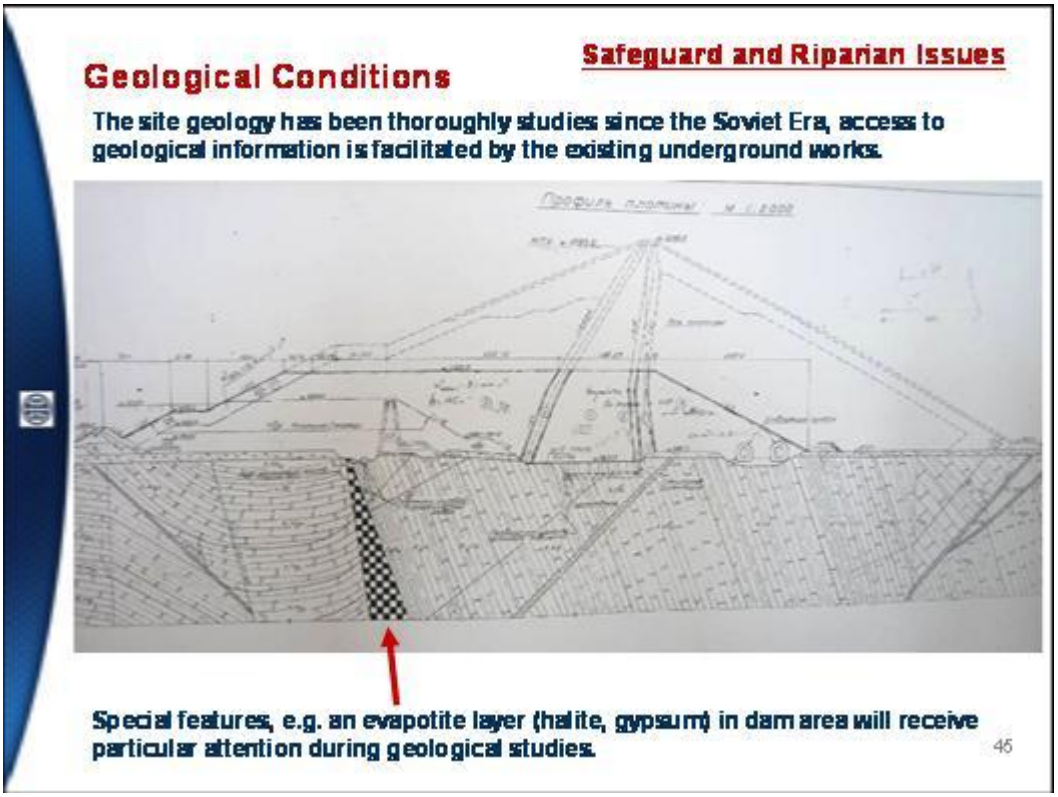
Safeguard and Riparian Issues
Geological Conditions
The site geology has been thoroughly studies since the Soviet Era, access to geological information is facilitated by the existing underground works.
Special features, e.g. an evapotite layer (halite, gypsum) in dam area will receive particular attention during geological studies.
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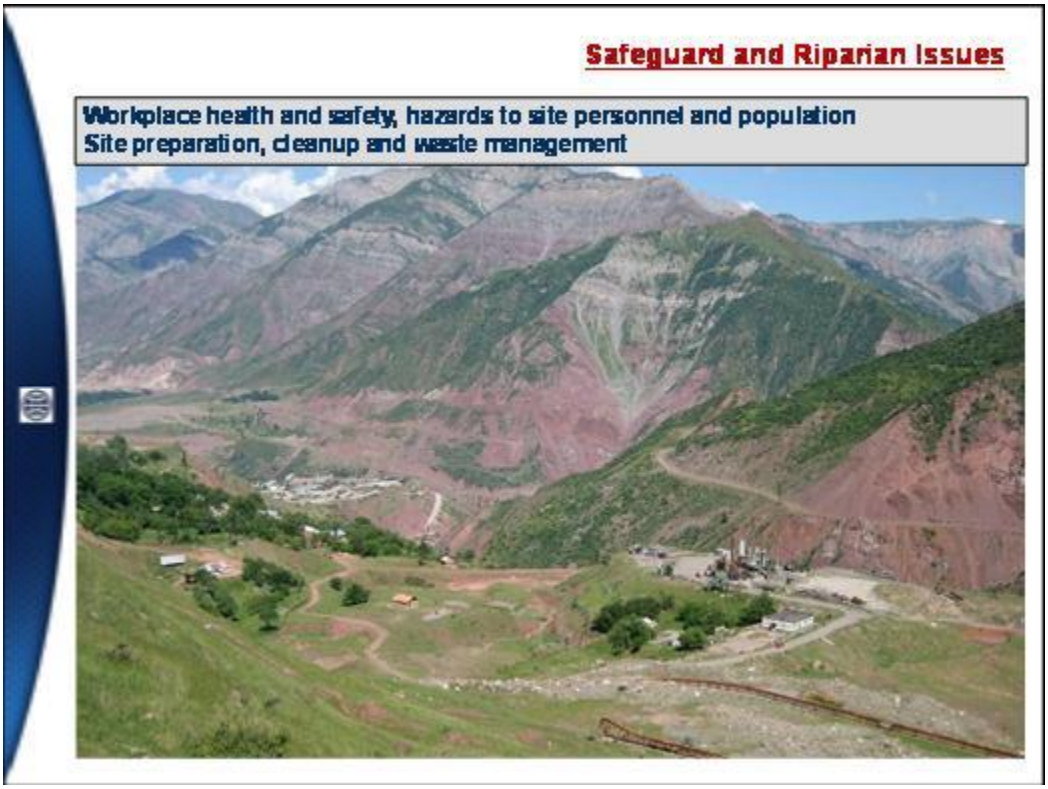
Safeguard and Riparian Issues
Workplace health and safety, hazards to site personnel and population
Site preparation, cleanup and waste management

Safeguard and Riparian Issues

Soil conservation, erosion control, hazard management and biodiversity

- Project area is impacted by past construction, resulting in erosion, slope instability, mass movements and a deteriorated vegetation cover aggravating soil depletion
- Produce hazard maps for dam area and planned site installations
- Produce a biodiversity inventory for the entire affected project area.
- Assess feasibility and options for protection or rescue/recovery of any rare / endangered species or ecological communities

Safeguard and Riparian Issues

List of potential adverse environmental and social issues

Description of the potential impact of the hydropower plant needs to consider whole range of reservoir and river basin management issues, including but not limited to:

- key environmental performance indices, eg.: surface area vs. megawatt production capacity (ha/MW), water retention time (days), biomass flooded (m^3), length of river impounded / left dry, useful reservoir life (years), persons requiring resettlement vs. megawatt production capacity (no. persons/MW), area of critical natural habitats (ha)
- ecological effects of the flooding and construction activities, including risks to habitats and topographical impacts that would induce landslides or flooding
- effect on the hydrology and on the water quality of the river/reservoir
- impact of the changed river flow regime, including impact due to river impounding upstream of the dam, and river left dry downstream of the dam
- determination of the ecological flow between the dam and the tailrace discharge
- effect of river animal and aquatic lives and potential for maintaining them
- likelihood of reservoir stratification

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Safeguard and Riparian Issues

List of potential adverse environmental and social issues (continued)

- foliage and vegetation in area to be flooded and removal requirements before flooding
- impact on local or regional drinking water supply systems
- sedimentation of the reservoir
- land use and soil types, including the potential for reservoir landslides and soil erosion
- biomass flooding potential
- possible loss of cultural property (including archaeological and historical sites), including a site survey and provision for chance finds
- potential impact from short-term or long-term migration to the project area or such induced activities as logging
- potential for incidence of water borne and water related diseases
- impact on fisheries and other sources of local income
- impact on downstream irrigation-based agricultural systems and drinking water supply, both during reservoir filling phase and routine operation

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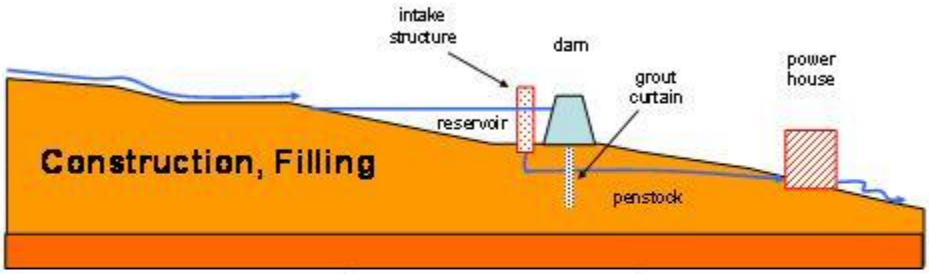
Safeguard and Riparian Issues

Downstream Impacts



Upstream	Dam area	Downstream
▪ reservoir clearing and preparation ▪ geotechnical slope stability (landslides) ▪ deposition of construction waste in reservoir area ▪ resettlement	▪ land take, soil conservation and erosion control ▪ restoration/re-vegetation and afforestation ▪ impact on groundwater by reservoir and grout curtain ▪ resettlement	▪ temporary water quality impact (turbidity, pollution) ▪ accidental pollution ▪ change of hydrological regime during filling period ▪ riparian concerns

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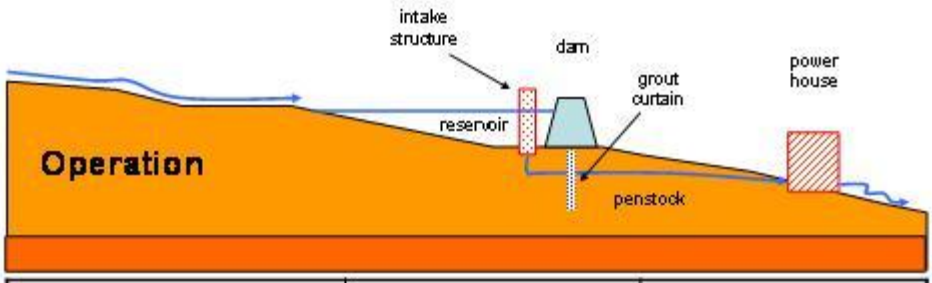
Safeguard and Riparian Issues

Downstream Impacts



Upstream	Dam area	Downstream
▪ water quality impact by reservoir (T, stratification, anoxic conditions) ▪ reservoir area management: erosion, sedimentation, landslides ▪ water availability (climate change, glacial melting) ▪ resettlement	▪ remnants from construction phase: scarred landscapes, land degradation, erosion ▪ access for unsustainable land use (informal quarries, mineral extraction, waste deposition, poaching) ▪ resettlement	▪ water quality (change of T, O_2, H_2S, nutrients) ▪ hydrographical impacts (flow, fluctuations, dry river beds) ▪ water supply for non-power uses (agriculture, drinking water) ▪ fisheries, fauna & flora ▪ riparian concerns

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Safeguard and Riparian Issues

Potential Hydrological Impacts

The expected changes on the downstream hydrological regime should be investigated in the detail necessary to assess any adverse impacts on riparian stakeholders, on individual, community and country/regional level. Examples are:

- Changes in flow regime and annual flow profile, changes in water availability at key periods in the annual cycle, such as the growing/irrigation season?
- Potential for reduced absolute flow during reservoir filling period?
- Changes in water quality and in sediment freight
- Interaction of Roghun HEPP with downstream cascade, especially Nurek reservoir. How will storage and release from the two biggest reservoirs of the cascade be coordinated? Could coordinated operation be a win/win situation for energy production and downstream agriculture?

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Safeguard and Riparian Issues

Climate Change Impacts

- temperature impact change on water balance models of mountainous regions, on glacial melting, water generation from fossil ice, replenishment by precipitation
- changes in amount, type and seasonal/annual distribution of precipitation in the project area and the upstream / downstream watershed of Roghun HPP
- changes in reservoir temperature and resulting stratification / mixing behavior, as well as water temperature of Vaksh, impacts water chemistry, fauna and flora
- changes of upstream / downstream hydrological parameters, notably flow rates and sedimentary load and their seasonal / annual distribution. They might be controlled by underlying phenomena such as glacial melting and subsequent release of water / sediment trapped in ice, glacial retreat and exposition of additional areas to erosion, changes in vegetation and resulting impact on erosion / sediment generation and microclimate
- changes in seasonal / annual demand patterns for water and electricity: shifts in peak demands for energy (heating / cooling) and water (agriculture, irrigation) in annual cycle, interaction with hydrological parameters, such as seasonal flow rates.

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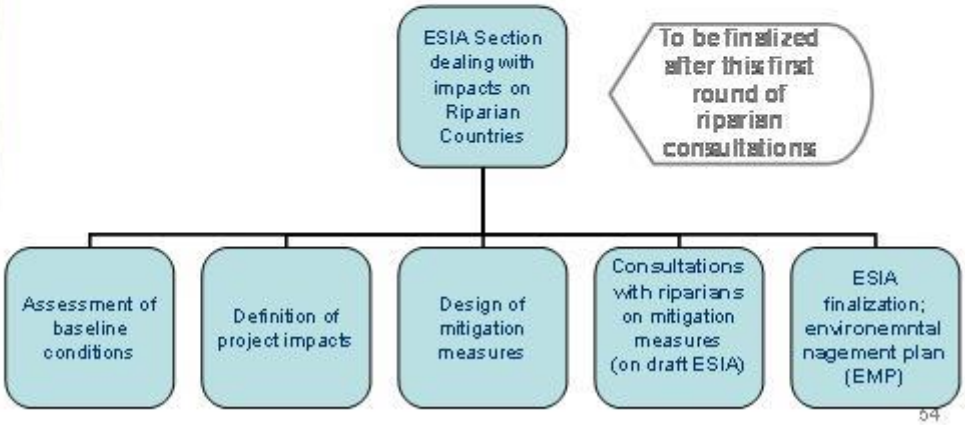
Safeguard and Riparian Issues

Downstream hydrological Impacts:

- **Changes in flow regime and annual flow profile,**
- **Changes in water availability at key periods in the annual cycle, such as the growing/irrigation season**
- **Reduced absolute flow during reservoir filling period**
- **Changes in water quality and in sediment freight**



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Downstream Impacts

Safeguard and Riparian Issues

Downstream view from dam crest. Except a pond fed by toe seepage and a trickle from locks no the river bed is entirely dry.

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Safeguard and Riparian Issues

Outputs and deliverables

Technical Studies	Safeguards Related Studies
Country level and Regional Environmental Studies recently prepared by the World Bank key environmental factors and problems World Bank sponsored study on Vaksh river cascade and climate change	
Vaksh River Masterplan: development of a cascade 5 operating HEPPs with a total installed capacity of about 3,885 MW, 4 new HEPPs with a combined capacity of 5,240 MW	Strategic Environmental Assessment (SEA) on Cumulative impact of (a) the HEPP cascade planned under the Vaksh River Masterplan and (b) the CASA 1000 transmission line project. (c) Potential alternatives to hydropower, e.g. coal fired TPP

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Safeguard and Riparian Issues

Technical Studies	Safeguards Related Studies
CASA 1000 Transmission Line: to deliver 1,000 MW of power from Kyrgyzstan and Tajikistan to Pakistan via Afghanistan. ADB-financed project.	Project Specific Environmental and Social Impact Assessment (ESIA), RAP and EMP reviewed by ADB and World Bank
Roghun Hydroelectric Project: largest HEPP in the Vakhsh River Cascade partly completed during USSR period built assets, esp. underground works exist	Environmental and Social Impact assessment (ESIA) to address the environmental, socio-economic and cultural situation at the project site identify potential negative impacts, mitigation measures environmental management / monitoring plans.

•Plus economic, legal and financial advisory Project

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Safeguard and Riparian Issues

Detailed Summary of PoE ToRs

Objective:

*The POE's general task is to independently review all relevant design, engineering and dam safety aspects, as well as environmental and social safeguards issues, **during the feasibility study phase** for the HPP. The POE may continue to contribute to the project if a decision to finance and construct Roghun HPP is taken as outcome of the FS.*

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Safeguard and Riparian Issues

Detailed Summary of PoE ToRs

Objective of ***Environmental and Social Panel of Experts***:

- *Provide the Client with independent advice on both the Environmental and Social Impact assessment (ESIA) and on the study program for environmental and social aspects of the Roghun Hydropower Project.*
- *Provide guidance on key issues and methods for preparation of the ESIA.*
- *Support and quality assurance of studies including the environmental and social studies and analysis, public consultation and disclosure process.*
- *Support the effective integration of the findings and recommendation of the ESIA into the techno-economic aspects of the feasibility study for the Project.*

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Safeguard and Riparian Issues

(Objectives continued)

- *Advice regarding measures to enhance the overall environmental and social outcome of the Project, identify opportunities for creating positive environmental and social impacts.*
- *Optimizing alternatives and synergies between engineering/techno-economic and environment/social aspects of the Project.*
- *If the Project proceeds, advise on implementation of recommendations of the ESIA, including EMP (env. management plan), RAP (resettlement action plan) and for development of environmental and resettlement management capacity.*
- *Recommend measures to enhance positive project aspects for all water users incl. minimizing negative crossborder impacts.*

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Safeguard and Riparian Issues

Qualifications of PoE Specialists

- ***Environmental Specialist:***
  Experience in: (a) preparation of environmental assessments for large scale infrastructure projects including dams, and their crossborder impacts; (b) design and implementation of environmental mitigation and monitoring plans; (c) development of detailed cost estimates and schedules for environmental mitigation and monitoring plans; and (d) public consultation and disclosure processes.

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Safeguard and Riparian Issues

Qualifications of PoE Specialists

- ***Social Specialist:***
  Experience in: (a) resettlement action plans and land acquisition; (b) review of social baseline data; (c), social assessment and evaluation of social impacts (d) development of detailed cost estimates and schedules for resettlement; and (e) public consultation and disclosure processes, including riparian consultations.

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Safeguard and Riparian Issues

Qualifications of PoE Specialists

- ***Hydrology and Climate Change Specialist***: *Background in hydrology / meteorology, good understanding of current state of the art in climate change discussion. Experience in: (a) meteorological, hydrological and climatologic baseline data and modern databases; (b) assessment of hydrological impacts of large scale dams; (c), experience with qualitative and quantitative hydrological models in regions including glaciated high alpine areas, (d) development of mitigation measures of hydrological impacts, (e) solid experience in mid- to long-term climate projections and mainstreaming climate change information into design parameters.*

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Vakhsh River Basin Development

Independent Assessment of Cross Border Impacts

Open session: views of the stakeholders

Workshop Participants

Open Session

Key Objectives

- Understand stakeholder's views both from a country and regional points of view on the construction of the proposed Roghun HEP in particular and the development of Vakhsh River basin in general;
- Obtain comments and inputs on the draft Terms of Reference of the proposed Environmental and Social Impact Assessment (ESIA) to ensure that it adequately addresses all possible impacts that the proposed Roghun HEP individually or in connection with other proposed developments in the Vakhsh cascade may have on riparian countries.

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Open Session: Introduction

Potential Impacts, Categories

- Irrigation and agriculture
- Hydroelectricity
- Potable water supply
- Environment
- Aral Sea
- Climate change
- Regional cooperation
- Health and socio-economic

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Open Session: Examples of Cross-Border Impacts

Potential Positive Impacts

- Higher degree of local and regional power security
- Potential for better flood and irrigation water regulation, especially in context of climate change (e.g. droughts)
- Participation of regional states as investors & shareholders in CASAREM and Roghun HEPP
- Incentive for joint development of more efficient irrigation methods and other water conservation measures
- Possibility to improve drinking water supply for riparian countries
- Production of carbon-neutral energy

Potential Negative Impacts

- Contaminations and flow regime changes during construction period
- Discharge reduction during reservoir filling
- Modification of annual & seasonal discharge patterns
- Overall flow reduction (enhanced reservoir evaporation)
- Water quality impact during routine operation (reservoir stratification, anoxic conditions)
- Water quality impact during special events (sediment flushing, emergencies)

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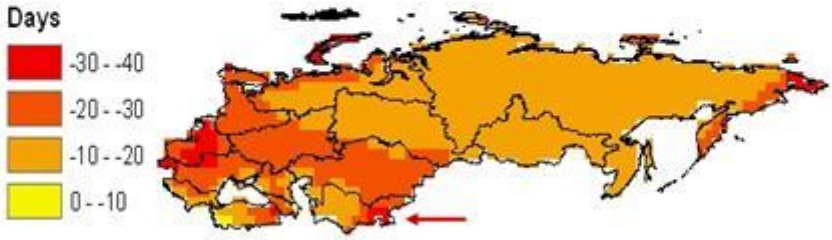
Open Session: climate change example

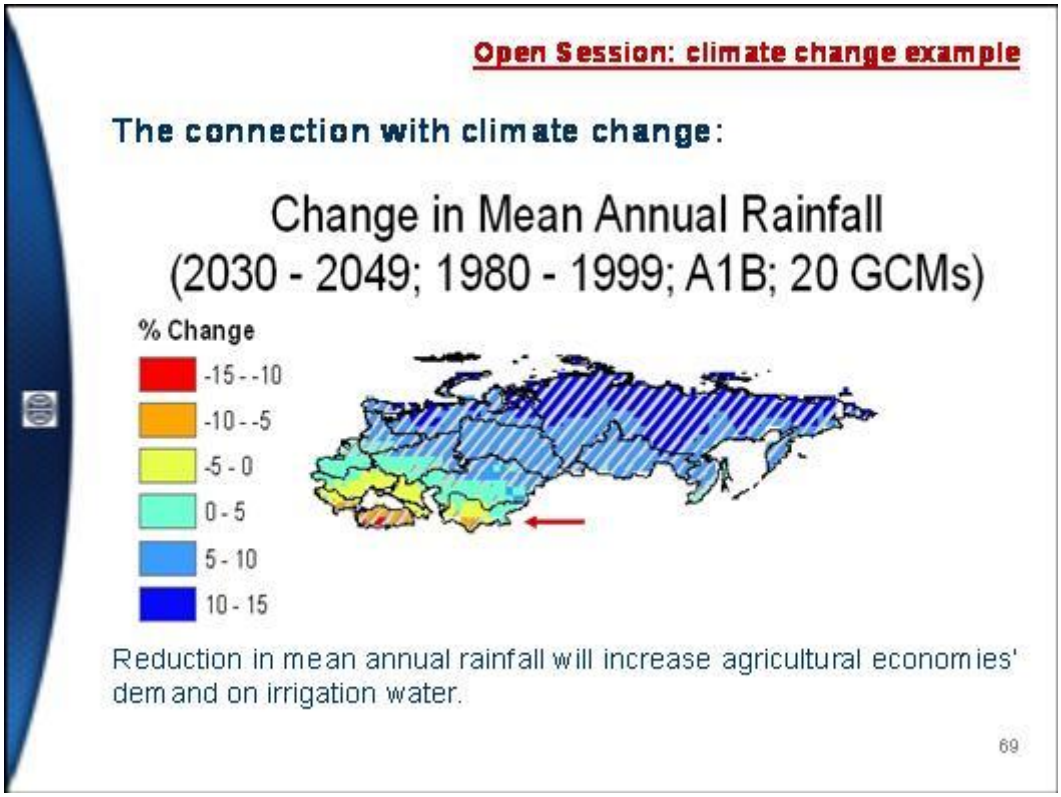
The connection with climate change:

Change in Number of Frost Days
(2030 - 2049; 1980 - 1999; A1B; 8 GCMs)



Reduction in number of frost days will affect glacial melting and seasonal runoff patterns.

68


Open Session: climate change example
The connection with climate change:
Change in Mean Annual Rainfall
(2030 - 2049; 1980 - 1999; A1B; 20 GCMs)
% Change
-15 - -10
-10 - -5
-5 - 0
0 - 5
5 - 10
10 - 15
Reduction in mean annual rainfall will increase agricultural economies' demand on irrigation water.
69


Open Session: climate change example
The connection with climate change: glacier recession in Tajikistan
Fedchenko glacier
2006
Direction of glacial flow
1976
1933
70

Vakhsh River Basin Development

Proposed Independent Assessment of Regional Impacts

Wrap Up and Next Steps

Wrap Up and Next Steps

- October 15, 2008 – Additional comments (if any) on Terms of Reference conveyed (in writing) to Bank and Government of Tajikistan
- November 2008 – comments received from countries incorporated in ToRs
  - Technico-economic assessment
  - Environmental and social impact assessment
  - Panel of Experts (Dam Safety and Safeguards)
- Early 2009 – second consultation meeting, possibly in one location

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ANNEX 1: Additional Consultation Materials
Annex 1.1. Slides specific to UZ consultation on January 20, 2009

AGENDA

1. Introduction
2. Vakhsh River Development Independent Impact Assessment, background and objectives
3. Safeguard issues: WB policies and draft ToRs for ESIA and Panel of Experts
4. Discussion on potential transboundary impacts, and feedback on report
5. Wrap Up and Next Steps

2

Vakhsh River Basin Development

Independent Assessment of Cross Border Impacts

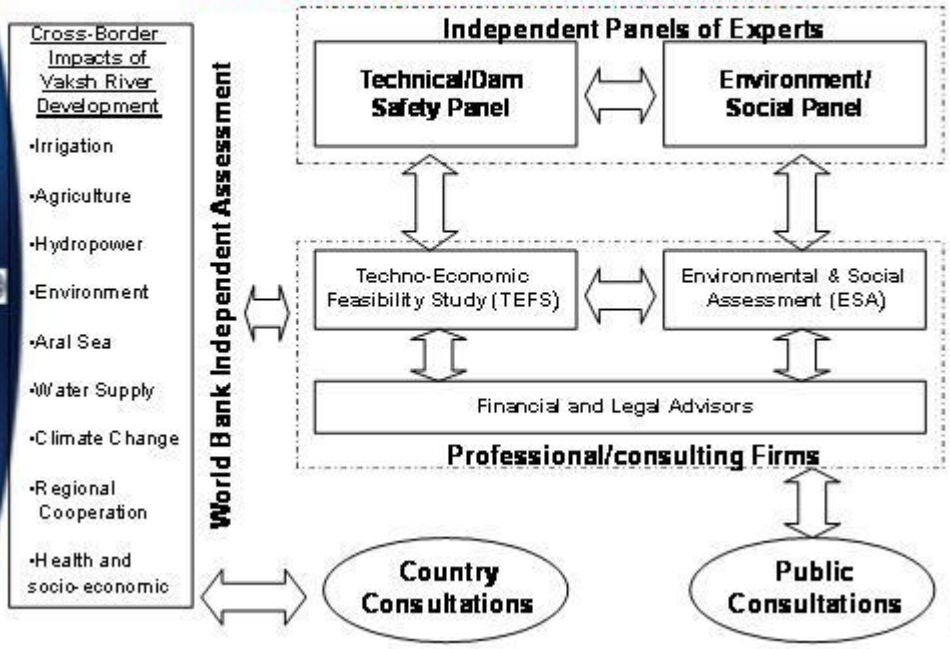
Introduction

Objectives of today's meeting

- Present the purpose, process and contents of the proposed "Independent Assessment of Cross Border Impacts of Vakhsh River Basin Development", and its linkages with studies and assessments that would be carried out in parallel;
- Explain the Bank's safeguards policies in the context of Vakhsh river development;
- Share the way in which the concerns expressed in the GoU Expert Opinion report on Rogun HEP have been incorporated in the Terms of Reference for the various assessments;
- Discuss the process, status and timing of the Bank financed Rogun studies and the logistics of the further consultation process and environmental, social and hydrological studies to ensure that the views and concerns of Uzbekistan and other riparian countries are addressed to the extent possible.

4

Proposed Rogun Hydroelectric Project Plan for Preparation and Assessment



5

Vakhsh River Basin Development

Independent Assessment of Cross Border Impacts

Independent Assessment: Objectives and Proposed Approach

[see slides in Oct. 09 pres.]

Vakhsh River Basin Development

Independent Assessment of Cross Border Impacts

Safeguard issues: WB policies and draft ToRs for ESIA and Panel of Experts

[see slides in Oct. 09 pres.]

Vakhsh River Basin Development

Independent Assessment of Cross Border Impacts

Discussion: views of the stakeholders

Key Objectives of the Consultations

- Understand stakeholder's views both from a country and regional points of view on the construction of the proposed Roghun HEP in particular and the development of Vakhsh River basin in general;
- Obtain comments and inputs on the draft Terms of Reference of the proposed Environmental and Social Impact Assessment (ESIA) to ensure that it adequately addresses all possible impacts that the proposed Roghun HEP individually or in connection with other proposed developments in the Vakhsh cascade may have on riparian countries.

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Potential Impacts, Categories

- Irrigation and agriculture
- Hydroelectricity
- Potable water supply
- Environment
- Aral Sea
- Climate change
- Regional cooperation
- Health and socio-economic

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Consultations and inputs received to date

- ***All draft Terms of Reference were shared by Govt. Tajikistan with all riparians for review in September 2008***
- Turkmenistan: consultation workshop held in Ashgabat on September 29, 2008
- Kazakhstan: consultation workshop held in Astana on October 1st, 2008
- Kyrgyz Republic: consultation workshop held in Bishkek on October 3, 2008
- Afghanistan: consultation workshop held in Kabul on October 5, 2008
- Uzbekistan: consultation workshop planned for October 6, 2008 was delayed at the GoU request; inputs were instead provided through a comprehensive report shared with the World Bank on November 10, 2008 (discussed below)
- Tajikistan: consultation workshop held in Dushanbe on October 8, 2008

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Uzbek Expert Study

Received by World Bank in November 2008, titled: "Expert Opinion - Rogun Hydropower Station on Vakhsh River and its Construction Risks"

- *Contains* a wealth of factual and technical information and data on hydrology, meteorology, irrigation, water management, environmental situation etc.
- *Outlines* Uzbekistan's main concerns with risks, negative impacts and hazards associated with the construction of Roghun HPP
- *Presents* and emphasizes the Uzbek position that Rogun HPP should not be constructed

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Resulting Additional Goal for Riparian Consultations:

Demonstrate how the concerns from Uzbekistan received via the Expert Report have been incorporated into the TORs

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Key Concerns Identified from Uzbek Expert Study (1)

- Impact on Vaksh flow regime would be detrimental to UZ irrigated agriculture (section 4.2, 6.1, 6.3):
  addressed in EIA TOR and TEFS TOR
- Concerns on seismic and geotechnical stability of dam (section 5.1), floods, dam erosion, landslides (section 5.2):
  addressed in TEFS TOR
- Concerns about Capacity technical capacity of Tajik engineering services for safe and environmentally compliant dam operation (section 5.3):
  oversight by POE, would become a key aspect (e.g. regarding capacity building and training) in a potential project preparation phase.

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Key Concerns Identified from Uzbek Expert Study (2)

- Risk of catastrophic flood wave in case of dam failure (section 5.4):
  addressed in TEFS
- A number of second order environmental and socio-economic impacts were presented (section 7 ff), including regional climate change:
  addressed in ESIA TOR
- *Note*: Some of the aspects listed in section 7 ff depend on "first order" impacts and can only be described precisely enough to assess any potential impacts after completion of TEFS and ESIA.

15

Taking Concerns Seriously

- Intense supervision by Bank Team
- Continuous presence and strong mandate of POEs throughout preparation of ESIA and TEFS
- Sharing the Expert Opinion provided by the Government with the Consultants assigned to perform TEFS and ESIA for Roghun HPP
- Including Uzbekistan in all review and consultation processes of studies, especially the final draft versions made publicly available for consultations

16

Vakhsh River Basin Development

Proposed Independent Assessment of Regional Impacts

Wrap Up and Next Steps


Wrap Up and Next Steps
By end January 2009: All Terms of Reference finalized; corresponding RfPs distributed to shortlisted consulting firms
By end February 2009: Consultation report finalized and shared with stakeholders
By end April 2009: South/East Asia study tour on management of large infrastructure on transboundary waters
By end 2009: Second consultation meeting, possibly in one location
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Annex II

The World Bank Central Asia Regional Office
Almaty, Kazakhstan

Press Statement

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WORLD BANK GROUP STATEMENT ON WATER/ENERGY DEVELOPMENTS IN CENTRAL ASIA

ALMATY, March 11, 2009 – The World Bank Group recognizes that the sector of water and energy is critically important for the economies and livelihoods of the people throughout Central Asia. Long-term stability in the region and prospects for future economic growth in all the countries of Central Asia largely depend on the successful regional cooperation and consideration of all national strategic interests.

In response to requests from the Central Asian governments, the World Bank Group is actively engaged in the dialogue on water/energy issues with the five countries of Central Asia (Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan). In its work the World Bank Group operates in full accordance with the UN General Assembly Resolution of December 19, 2008 – "*The Reliable and Stable Transit of Energy Carriers and Its Role in Ensuring Sustainable Development and International Cooperation*", acts in the best interests of all its member countries, and takes utmost care in the application of its policies and procedures.

In recent years, the World Bank in Central Asia has supported a number of energy and water resources projects, studies, and strategies such as the Central Asia Regional Economic Cooperation (CAREC) energy strategy that was endorsed by all member countries at the November 2008 Ministerial Conference in Baku. The Bank is also providing technical assistance to assess viability and impact of several proposed energy development initiatives in the region.

The World Bank Group believes that it is important to elaborate a Regional Energy Development Framework for Central Asia which would look at all existing and potential energy generation resources in the region, including hydro, coal, thermal power, and others. Such a framework would propose a sequence of actions that will ensure adequate attention to and proper balance between the urgent domestic energy needs of the upstream countries during winter, and environmental and hydrological needs of the downstream countries during summer. The proposed framework will also focus on maximizing energy export potential within the region during winter and beyond the region during summer. The World Bank Group plans to contribute to development of comprehensive short, medium, and long-term plans of actions for consideration of all Central Asian countries as well as potential investors. The establishment of a Central Asia - South Asia Regional Energy Market would be part of the plan of action to realign the energy export potential during summer. In parallel, the WBG will review water resource development and water management issues with stakeholders and partners in Central Asia with a view to support the

development of these resources and to facilitate adequate and fair access to these resources by all stakeholders.

With regards to Rogun HEP, proposed by the government of Tajikistan, the World Bank clarifies that it has only committed to provide financing to the Government of Tajikistan to carry out studies to assess the possibility of the project, with particular emphasis on its potential regional impacts. The studies include a Techno-Economic Assessment and an Environmental Impact and Social Assessment and will be carried out by internationally recognized consultant firms, to be hired in coming months under World Bank procurement guidelines. The Terms of Reference of these studies take into account issues for consideration identified by the riparians. In addition, as required by its safeguard policies, the Bank will establish an International Panel of Experts who will provide independent opinion on the outputs of the studies. In parallel to the above studies, to ensure transparency and inclusion of all the stakeholders' concerns, the World Bank has recently initiated consultations in all riparian countries (Afghanistan, Kyrgyz Republic, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan). These consultations will continue in 2009-2010, as the results of the studies and the views of the independent experts become available and are reviewed by the riparians.

For more information about World Bank's work in water/energy sector in Europe and Central Asia please visit: http://go.worldbank.org/49Q0LV7T20

ANNEX III

List of participants

Vakhsh River Basin Development Consultations

(Afghanistan, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan) (September 2008 to January 2009)

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WORLD BANK

MANAGEMENT RESPONSE TO

REQUEST FOR INSPECTION PANEL REVIEW OF THE

TAJIKISTAN ENERGY LOSS REDUCTION PROJECT

(IDA Credits 40930-TJ and HI7S0-TJ)

Annex 5

Government of Uzbekistan Expert Opinion
(November 2008)

November 22, 2010

EXPERT OPINION
ROGUN HYDRO-ELECTRIC POWER STATION ACROSS THE VAKHSH RIVER AND ITS CONSTRUCTION RISKS

REPUBLIC OF TAJIKISTAN

Acronyms

DSL	Dead-storage level
FS	Feasibility study
HEPS	Hydro-electric power station
MOL	Maximum operating level
SEC	State Expert Commission of the USSR
SPC	State Planning Committee of the USSR
UES	United Energy System
USSR	Union of Soviet Socialist Republics

Table of Content

1. Introduction
1.1 General Information

The Amudarya River is one of the largest rivers in Central Asia by its runoff volume. Its basin covers an extensive area of 1330 thousand km^2, out of which 388,000 km^2 (30%) are on the territory of Uzbekistan. From hydrographic point of view, the Amudarya is formed by two river junction – the Pyandzh and Vakhsh rivers. (Annex 1).

The arable area located along the Amudarya basin averages to 5038.2 thousand ha; 4636.2 thousand ha are irrigated, including 2347.4 th. ha in Uzbekistan, 446.1 th. ha in Tajikistan, and 1842.7 th. ha in Turkmenistan (Table 1).

Table 1.
Arable areas, population, gross agricultural product of Uzbekistan, Tajikistan and Turkmenistan (by provinces located in Amudarya basin)
Source: RIC ICWC, 2006

Country and provinces	Net arable area (th. ha)	Net irrigated area (th. ha)	Population (th. people)	Urban population (th. people)	Gross agricultural product (billion US$)	Including crop production (billion US$)	Including livestock production (billion US$)
Uzbekistan							
Bukhara	291.9	270.1	1537.0	447.0	0.40	0.24	0.16
Kashkadarya	539.2	504.4	2459.0	602.0	0.40	0.22	0.18
Navoi	175.6	121.4	818.0	323.0	0.15	0.04	0.11
Samarkand	556.8	367.3	2936.0	737.0	0.50	0.22	0.28
Surkhandarya	511.8	320.5	1952.0	371.0	0.37	0.18	0.19
Khorezm	328.4	274.5	1472.0	321.0	0.27	0.13	0.14
Republic of Karakalpakstan	436.1	489.2	1585.0	766.0	0.14	0.09	0.05
Subtotal	**2839.8**	**2347.4**	**12759.0**	**3567.0**	**2.23**	**1.12**	**1.11**
Tajikistan							
Khatlon	455.9	314.5	818.0	842.0	0.29	0.21	0.08
Districts administered by Tajikistan	161.3	107.8	2936.0	1020.0	0.2	0.12	0.08
Gorno-Badakhshan	31.6	23.8	1952.0	87.0	0.04	0.02	0.02
Subtotal	**648.8**	**446.1**	**5706.0**	**1949.0**	**0.53**	**0.35**	**0.18**
Turkmenistan							
Dashkhovuz	362.6	417.2	1328.0	402.0	0.1903	0.1667	0.0236
Mary	444	529.3	1374.0	458.0	0.0941	0.0782	0.0159
Lebap	303	304.4	1384.0	659.0	0.1846	0.1668	0.0178
Akhad	440	591.8	1957.0	1223.0	0.0577	0.0466	0.0111
Subtotal	**1549.6**	**1842.7**	**6043.0**	**2742.0**	**0.5267**	**0.4583**	**0.0684**
Total for basin	**5038.2**	**4636.2**	**24508.0**	**8258.0**	**3.2867**	**1.9283**	**1.3584**

There are more than 24.5 million people live in the area of the Amudarya River basin (including urban population averaging 8.3 million people); this includes 12.8 million

people in Uzbekistan (52.2%), 5.7 million people in Tajikistan (23.3%) and 6.0 million people in Turkmenistan (24.5%).

The estimated gross agricultural product harvested from the arable areas of the Amudarya basin values US$3.29 billion, including US$2.23 for Uzbekistan (67.8%), and US$0.53 billion for Tajikistan and Turkmenistan (16.1%).

1.2. The Amudarya river and its water resources

The average multiyear annual river flow of the rivers constituting the Amudarya river basin is more than 78 km^3. Around 5% of the total surface water of the Amudarya River is formed in Uzbekistan, and another insignificant part of 2-3% is formed in Kyrgyzstan; around 15% - on the area of Afghanistan and the major part - around 78% is formed on the area of Tajikistan. (Annex 2).

The natural annual (non-regulated) river flow of the Amudarya basin varies from 58 km^3 - during years of low water (compatible to 1947) to 92 km^3 – during years with abundance of water (compatible to 1945).

An average water flow technically feasible to be used with regulation at the reserve level, is around 72 km^3, 62.5 km^3 of which is allocated for irrigation (57.5 km^3 from the mail river stream and 5.0 km^3 from the internal rivers).

<u>The Amudarya River has a mixed snow-glacial water recharge with a natural hydrographic flow absolutely coinciding with irrigation needs, when the main flow (77-80%) occurs during growing period (April-September) and the minimal one (20-23%) – during non-growing period (October-March).</u>

Due to construction of the large waterworks facilities and water reserves at the border of the river flow formation, the flow pattern significantly varies depending on water flushes.

1.3. The Amudarya River and its water reserves

There are 20 regulating water reserves being currently operational in the Amudarya river basin (with a capacity of more than 100 million m^3 and cumulative total volume of 25.8 km^3), out of which 18 are 'intrasystem' ones constructed across canals or smaller internal rivers and accordingly designed for local purposes of local irrigation systems (Annex 3).

As regards the rivers, there are two large water reserves constructed across Amudarya and Vakhsh with total capacity of 17.3 km^3 and with net available capacity of 9 km^3 – these are Nurek reserve across the Vakhsh River (available capacity – 4.5 km^3) and Tuyamuyun reserve across the border of medium and low river flow of Amudarya (4.5 km^3). Together with a dead storage accessible for release, these reserves could have the total regulating capacity of 11.4 km^3 that would enable to regulate the run-off of the Amudarya *per se* for irrigation needs up to $a_p = 0.88$ with 90% of water probability and without discharge of the dead storage – only to $a_p = 0.85$ with ensured gross productive capacity ~ 55 km^3.

The Nurek water reserve. At the current stage it is the main regulating facility of the basin. This waterworks being located across the Vakhsh River (Tajikistan) is regulating seasonal water discharge (mostly for power supply purposes) and multiyear irrigation discharge for *medium and lower flow* of Amudarya. Also, some self-gravitated water discharge (by tunnel with velocity of 100 m^3 per second) is done for irrigation of 80 thousand ha of lands

in Dangara steppe of Tajikistan. The beginning of the Nurek waterworks construction goes back to 1961. It was commenced in 1980, however for the first time the reserve was filled up to the maximum operating level (MOL) (10.5 km^3) only in 1983.

An average multiyear designed power output of the Nurek HEPS with installed capacity of 3000 MWt is established at the level of 11.2 kWh.

During wintertime, the designed generation of electrical energy at the Nurek HEPS was connected with mandatory reservoir release (*for irrigation*) of 410 m^3 per second (~ 6.4 km^3 during six months) for water delivery to the Karakum canal. It was subsequently established at the moderate capacity level of ~ 950 MWt (~ 4150 million kWh in energy terms). Since 1991, these values of energy generation were increasing by around 12% and in 1998 – by 24%.

To ensure irrigation regulation, the Nurek reservoir was operated even before completion of dam construction in 1974, which was a year with low water availability, with the maximum dead storage level (DSL) of 1.46 km^3. However, the regulation effect was quite limited. In the following years, some use of dead storage for regulation (less than 200 million m^3) was practiced in 1985 and 1986, and then running through 1995 to 2001 years. The reservoir was not filled up to the MOL in 1986, 1989 and 2000, which were the years with low water in the Amudarya river basin.

While reviewing the process of the Nurek reservoir filling and drawdown through the years of its operation, it is evident that during all these years the filling was done within growing period thus decreasing the volume of household discharge of the Amudarya River by averagely 3.5 km^3 per year (at the maximum level of 4.85 km^3 per year in 2000). And the drawdown (almost during all years) was done mainly during non-growing period. More over, the water released during wintertime, as demonstrated by practical operation in 2000, could not always be intercepted in the Tuyamuyun reserve.

The Tuyamuyun reserve on the Amudarya River serves for irrigation and power generation. A regulation is seasonal and partly multiannual and residual (after agricultural water intakes from upper and medium streams). Topographically, the reservoir is complex being composed of a channel storage and three shore storages – Kaparas, Sultansandjar and Koshbulak. Their total capacity at commencing was 7.8 km^3, including effective capacity – 5.27 km^3. However, later due to sedimentation of the bowl, the effective capacity decreased to 4.5 km^3.

The Tuyamuyun reserve provides irrigation to the lands of Karakalpakstan, Khorezm province (Uzbekistan) and of former Tashauz province (Turkmenistan). Also, household water supply to population living in the downstream is ensured from the Kaparas storage. The reservoir was constructed in the period from 1970 to 1986 and commenced in 1981, even though the construction was far from being completed. A start-up of the first HEPS's units was done in 1983 and full capacity launch (150 MWt) was completed in 1985.

1.4. Water intake and water discharge

The General Scheme of Amudarya Water Resource Development was the basis for distribution of Amudarya water through water intakes among Tajikistan, Uzbekistan, Turkmenistan and Kyrgyzstan. According to the Scheme, the distribution ratio of surface water was as follows: to Kyrgyzstan – 0.6% (for the area of 65 thousand ha or 380 million

m^3); to Tajikistan – 15.4% (for the area of 548 thousand ha or 9516 million m^3); to Turkmenistan – 35.8% (for the area of 1220 thousand ha or 21104 million m^3); and to Uzbekistan – 48.2% (for the area of 2274 thousand ha or 37195 million m^3).

The actual water intake during growing period was as follows in 2007: Kyrgyzstan – 0,5%; Tajikistan – 17.0%; Turkmenistan – 40.7%; and Uzbekistan – 41.8%. (An excessive consumption of Turkmenistan can be explained by new agreements on water distribution among the states, which differ form the Scheme provisions).

The current water balance situation in the Amudarya basin is very tense. It is determined by both limited availability of water and its intensive industrial consumption. So called 'limit of water depletion', when water balance tension in process of water management becomes unrenewable, is attained at the level of actual water use.

Direct water intakes from the River exceeded the flow of low water years by the beginning of 80-s, and five-time practiced suspension of downstream flows to the Aral Sea below Takhiatash HEPS (in 1982, 1984, 1985, 1986, and 1989) is a speaking proof of it. The water balances during growing periods of 2000 and 2001 were very tense as well. The similar situation might take place in the coming low water season of 2008-2009.

2. Background of Rogun HEPS' design

2.1. History of project design

The idea of Rogun HEPS construction originated for the first time in the Draft Scheme of Integrated Vakhsh River Use, which was designed by the Sredazhydroproekt Institute in 1959. It envisaged the Nurek HEPS to be constructed first and the Rogun HEPS after it.

The finalized Scheme of the Vakhsh River Use was approved by the State Expert Commission (SEC) of the State Planning Committee (SPC) (USSR, #21 of 25 December 1965), i.e. six years later.

While approving, the SEC emphasised that *'a time of the Rogun HEPS construction ...cannot be determined without adequate substantiation. Considering complexity of the Rogun waterworks facility, which involves a dam construction of 350 m height being located in the grade 9 earthquake zone, and also considering insufficient geological, seismological and other surveys at project design stage, a special attention should be paid, at the later design stages, to the substantiation of relevance and security for establishment of so high hydraulic drop with no analogues in the global practice, in such complex seismic environment'.*

Therefore, the proposed project of Rogun HEPS was approved 15 years later by the Resolution of the Cabinet of Ministers (USSR #2411 of 27 November 1980).

According to the project design, the period of construction was estimated for 16 years, including 5 years of preparation stage (10% of the total volume) and the main stage – 11 years. The Resolution of the CM also instructed the Ministry of Energy of the USSR to consider comments of the State Construction Committee of the USSR while processing further design of the Rogun HEPS.

These are the following reasons for positive approval in spite serious concerns with regards to feasibility of safe construction of the Rogun HEPS:

1. Construction of the Rogun HEPS with storage volume of 8.6 km^3, along with existing Nurek and Tuyamuyun waterworks facilities, would provide for net detention volume of around 18-19 km^3 and accordingly a possibility for ensured 91% of water delivery for irrigation.
2. The site selected for construction of the Rogun HEPS was the only feasible option on ***the territory of the former USSR***. Any other options for construction of large regulating reservoirs with HEPS would touch the territory of Afghanistan that was unacceptable for the Soviet Government.

The only one sluice of Nijne-Rogun site was selected and the dam was planned to be constructed of local materials. The FS was thereafter approved twice: in 1985 and in 1986.

However, the Government of Tajikistan being under the public pressure, made a unilateral decision to decrease the MOL of the reserve to 50 m downwards. Along with that, the Ministry of Energy of the USSR sent an approved assignment to the Sredazhydroproekt Institute on evaluation of the FS and its indicators in case if the MOL be decreased to this size.

Accordingly, the Sredazhydroproekt Institute completed the assignment and submitted a draft FS of the Rogun HEPS considering decrease of the MOL to 30 and 50 m, in 1989.

During the same period, several institutions of the Academy of Science of the USSR being supported by the public opinion, addressed to the SPC with a proposal to suspend construction and review feasibility to reduce the dam height to 50-70-100 m and more, and to conduct additional project survey in the part of seismic substantiation, dam safety and environmental & social aspects that could emerge in process of waterworks construction. This proposal was supported by the State Committee on Science & Technology, State Committee on Nature Protection and by the State Construction Committee of the USSR.

An appropriate decision on additional survey was approved by the letter of the SPC #5799 issued on 10 February 1990. It was emphasised that **considering unique nature of the waterworks facilities and environmental conditions, the construction and operation of the Rogun waterworks are permitted only with assured monitoring of the geological environment, seismic situation and of all units attached to the waterworks with priority attention to the activities preventing washing-out of the salt stratum.**

3. Main designed technical parameters of Rogun waterworks

3.1. Waterworks site

The Rogun waterworks with integrated irrigation & energy generation functions is the sixth upper step of the Vakhsh Cascade. The facility is located in the area of Faizabad district of Tajikistan near by a health resort Obi-Garm, 110 km far from the capital – Dushanbe city and about 70 km far from the Nurek HEPS to the upstream of the Vakhsh River. The site is connected with Dushanbe with the main road going through Ordjonikidzebad to Obi-Garm and to Pamir.

3.2. Main functions of waterworks

The Rogun waterworks was designed for multiyear regulation of the Vakhsh River flow and thus together with Nurek and Tuyamuyun reservoirs, it was designated for irrigation of land farming in the middle and lower streams of the Amudarya River.

The reservoir was intended to assure irrigation of the lands included in the Amudarya basin with future extension of the irrigated area to 4.3 million ha in 1990 (there were around 2.4 million ha irrigated in 1974) and also to provide water for incremental newly developed lands in the area of Karshi, Amubukhara and Karakum canals.

The power generated by the Rogun HEPS was planned to be delivered to the United Energy System (UES) of Central Asia for further development of the entire Central Asian economic region, particularly of the Southern-Tajikistan industrial complex, where the government supposed to extend Regar Aluminium Plant with development of local raw material and to promote Yavan Electrochemical Plant producing magnesium.

However, this did not consider the public opinion of Uzbekistan objecting functioning of the Regar Aluminium Plant, which could make unrecoverable adverse environmental impact on Surkhandarya province.

Besides, 3.6 million kW of the installed capability would enable to cover considerable part of the UES peak loads and to increase the total energy effect by around 1.1 billion kWh per year at the Nurek, Baipazin and Golovnaya HEPSs located downstream. The Rogun HEPS would enable to cut down construction of heating and power plants and to save around 4.2 million tons of conditional fuel being equivalent to 35 km^3 of the natural gas, accordingly.

As designed, the Rogun HEPS would have a significant irrigation & industrial importance for the entire Amudarya basin. Its direct agricultural effect could be translated in increasing of assured water use from the Amudarya river system in amount of 54.0 km^3 (in 1985) and up to 59.0 km^3 (in 1990). A further irrigation development in the basin was connected to prospecting water diversion from the Siberian rivers.

Possible land development under irrigation in the medium and lower streams of the Amudarya River intended for cotton production could increase production volume from 4.1 million tons in 1975 to 5.3 million tons in 1980 and further to 7.15 million tons in 1990. Thus, around 470 thousand tons of mostly fine-stapled cotton could be harvested from the lands irrigated with water delivered from the Rogun reserve. It was supposed that investments would be recovered during the period of 5 years at the expense of earnings from cotton, other crops and livestock production.

The estimates on Rogun reservoir filling demonstrated that the net hydroeconomic useful effect of the waterworks could be assured by 1994-1996 during low water years and only if the construction is completed by 1991-1992 with construction period of 11 years from 1981 to 1992.

3.3 Basic designed parameters

The approved project included the following parameters:

Table 2.

Water intake area	30390 km^2
Average multiyear flow	19.9 km^3
Reservoir surface at MOL of 1290 m	170 km^2
Effective reservoir capacity	13.3 and 8.6 km^3
Area of flooded agricultural lands	6,516 thousand ha
Estimated maximum escapage discharge through facilities (0.01%)	5710 m3/sec
Length of waterfront	0.66 m
Maximum pressure head	320 m
Installed capacity at estimated head of 245 m	600 x 6 = 3600 thousand kW
Firm capacity	590 thousand kW
Average annual energy generation	13300 million kWh
Earth-and-rockfill dam with maximum height	335 m
The head structure includes: a HEPS building (underground type with 6 aggregates of 600 MWt; six divided branches of water conveying head channels with diversion chambers of towel shape; two headless tunnels of diverting channels connected to the construction tunnels.	
Duration of initial reservoir filling up to DSL and MOL, respectively:	
- at 90% of flow probability	6 and 8 years
- at 50% of flow probability	2 and 4 years
Estimated sedimentation volume during 50 years	3500 million m^3

3.4 Construction process of Rogun HEPS in the past

Construction of the temporary salt protection in the foundation of the first-stage upper construction wall was completed in 1987. In December 1987, the Vakhsh River was capped and river discharge was shifted to the left-shore site of the first level construction tunnel.

By the time of flash runoff in 1988, the initial upper construction wall was filled to the 42 m and the left-shore site of the second level construction tunnel was put into operation. In 1989, the works started on the first stage dam construction. The shorefaces were cleaned up and erection of an embankment was made. The total dam volume at the first stage was around 1.9 million m^3, including the first stage dam – 930 thousand m^3. The upper construction wall of the entire profile (with filling of pockets between the dam and wall) was 970 m^3.

Due to many reasons, the construction was progressed with substantial deviations from the design. For instance, construction tunnels commenced in 1987 under a temporary scheme, had to be disconnected after a flash runoff of 1988. However, actually, the tunnel of the 1 level was operational 4-years running (December 1987 – February 1992) and transferred four flash runoffs. As a result, many serious distractions and inrushes with bottom hole coverage took place. Therefore, when in 1993 a powerful landslide crossing the bed of the

Vakhsh River increased the water level in the downstream, the upper wall was washed out thus diminishing previous works to the zero point. An underground machine hall was constructed 35 m high however the designed height was 78 m. Its walls are displacing by 30-47 cm. A comprehensive survey is needed to evaluate a stress and strain state of the site around the working space.

3.5 Peer review of the Rogun HEPS construction costs

A peer review of the Rogun HEPS construction costs is given below and is based on prices available at the design stage. It indicates that less than 23 percent of total capital investments were disbursed, mainly for contracted civil works, as of the beginning of 1993.

Peer review of the Rogun HEPS construction costs

Description	Total Project costs (US$, million)	Disbursed as of 01/01/1993 (US$, million)	Balance (US$, million)
Total hydroelectric complex	3,409.0 2,516.1	795.9 617.7	2,613.1 1,895.3
including:			
Industrial facilities without water reservoir	2,236.4 1,615.3	595.2 452.0	1,641.2 1,163.2
Water reservoir	1,033.0 770.8	126.7 99.6	906.3 671.2
Residential civil works	139.6 127.0	74.0 66.1	65.6 60.9

Various assessments concerning cost of uncompleted construction of the Rogun HEPS ranging US$ 100 to 804 million were made in recent years. The latter and highest assessment declared by Tajik President I. Rakhmon seems overestimated since considerable part of earlier constructed facilities have deteriorated to a various extent whereas procured equipment has become outdated and consequently cannot be further used towards completion of HEPS construction, and yet additional works are necessary to rehabilitate damage caused by the 1988 and 1993 disastrous floods.

Price change and sharp growth in equipment costs contributed to high additional investment needs that are required for completion of the HEPS. Such investment needs are estimated to range US$ 2-6 billion and would require a 30-years payback period.

4. Rogun HEPS efficiency evaluation

Two basic operation modes (irrigation and power generation) were considered to evaluate HEPS efficiency. These included some variations (scenarios) that took into account a certain change in water distribution demand to reflect recent changes in crop patterns in Uzbekistan (and Turkmenistan). Various assumptions and prerequisites used for the purpose of calculations are presented in Table 1, Annex 4.

4.1 Irrigation operation mode of the Rogun hydroelectric complex

Scenario 1 of irrigation mode forecast (Rogun requirements) is based on Rogun water requirements and distribution throughout the year, which were specified in the paper

"Determining the scheme of complex water use and protection in the Amudarya River basin, 1984" (SCWUP).

Scenario 2 of irrigation mode forecast is based on the SCWUP, 1984, and incorporates modified annual water distribution taking into account the current change in crop patterns to reflect increased share of winter grain crops, lower water consumption peaks in summer, and higher demand during the spring and autumn seasons as specified in the schemes elaborated by 'Vodproekt' PC through 2015[1].

Both scenarios related to the irrigation mode of operation employed a complete set of Rogun water requirements while water supply shortages were evaluated based on downstream demand.

Tables 2, 3, 4, and 5 (Annex 4) indicate a short supply (arising from these scenarios) insufficient to meet Uzbekistan and Turkmenistan's demand as compared to design requirements.

Tables 6, 7, 8, and 9 (Annex 4) shows estimated power generation by the Rogun and the Nurek HEPSs for relevant scenarios.

4.2 Power generation mode

Forecasts concerning the Vakhsh River discharge regulation by the Rogun and the Nurek water reservoirs (for 21 year period, 1983 through 2004), based on requirements set for a period of full depletion of water resources in the Amudarya River, showed a probability of 10 percent surplus of power generation and consequently discharge in winter months as compared to summer season. However, this would require the entire useful capacity of the Rogun water reservoir (8.6 million km^3). By that time, a total average annual power generation by the Vakhsh coordinated hydroelectric system would reach ~33 billion KWh/year, while even year-round capacity would be ~3.77 MWh. In winter, however, power generation output may exceed the figure by ~12 percent.

For the purpose of power generation scenarios the experts used the Rogun HEPS requirements as average annual of Vakhsh River discharge norms at the dam site and assumed that discharge rate in winter would be 12 percent higher than in summer.

For power generation mode scenarios of the Rogun coordinated hydroelectric system there were set requirements for the Rogun HEPS, whereas water deficiency assessment was made based on downstream demand and distribution requirements specified in the ***Scheme for Complex Water Use in the Amudarya River (1984)*** and ***Schemes*** elaborated by 'Vodproekt' PC ***through 2015***.

Tables 1, 2, 3, and 4 (Annex 5) indicate a short supply (arising from these scenarios) insufficient to meet Uzbekistan and Turkmenistan's demand as compared to design requirements.

Tables 5, 6, 7, and 8 (Annex 5) show estimated power generation outputs by the Rogun and the Nurek HEPSs, which remain constant in power generation scenarios under

[1] 'General Scheme for Irrigated Agriculture and Water Resources Development in the Republic of Uzbekistan through 2015' elaborated by 'Vodoproekt' PC in 2000.

consideration irregardless of changes in within-the-year demand allocation, since the generation mode of discharge throughout the coordinated hydroelectric system is assumed to be the same irrespective of downstream water demand allocations. Whereas estimated shortages of water consumption vary widely (Tables 5, 6, and 8, Annex 5).

Annex 6 contains summary data of average annual demand deficiencies in all scenarios under consideration, and analyzes their differences in average annual profile.

Difference in scenarios with various monthly demand allocations has a minor effect on deficiency extent whereas its value is slightly less for monthly demand allocations specified in the Scheme through 2015. Therefore all further evaluation is better to make base on these requirements, which reflect current crop patterns.

Analysis of forecast results from the viewpoint of Rogun HEPS construction efficiency enables conclusions as follows:

1. Switching the Rogun water reservoir to power generation mode will increase water deficiency during the vegetation period by an average of 22.2 percent (from 4.5 to 5.5 km^3/year). During low-water years deficit will increase almost twofold (from 5.6 to 10 km^3/year) as compared to the current situation.

   If Rogun is operated in power generation mode the number of years with irregular water supply will range from 12 to 23 over an estimated 50-years period. In the worst case scenario assuming that each state located in the basin will follow their national water consumption strategies the number of years with irregular water supply will be 28-39. years.

2. Considering **a sharp increase in the Rogun HEPS construction costs and that earlier assumptions on revenues from agricultural production growth envisaged in the feasibility study have nothing to do with Tajikistan of today it is quite obvious that the country has no way to repay the project other than operating the HEPS in power generation mode.**
   Construction of the Rogun HEPS will enable the hydraulic power system of Tajikistan to considerably increase (almost double) annual energy-conservation efficiency and yet to bring the level of winter energy-conservation efficiency of the Vakhsh coordinated hydroelectric system higher than that in summer and consequently reduce summer rate of discharge to the downstream countries. This may lead **to catastrophic consequences due to insufficient water supply for domestic needs, irrigation and other sectors in Uzbekistan and Turkmenistan**.
   Table 6 below compares water supply deficit against demand/requirements under considered scenarios of potential operations at the Nurek and the Rogun HEPSs.

   Average annual deficits against demand under considered scenarios.

Table 6

Months	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**01**	**02**	**03**	**Per year**	**Vegetation period**	**Winter**
Scenario	Power generation mode of operation (without the Rogun HEPS) with requirement allocations as per SCWUP, 1984														
Average	-125	-229	-1691	-2135	-1064	-5	0	0	0	0	-268	-1873	-7391	-5250	-2141
Scenario	Power generation mode of operation (with the Rogun HEPS) with requirement allocations as per SCWUP, 1984														
Average	-59	-349	-1714	-3149	-2384	-7	0	0	0	0	0	-678	-8340	-7662	-678
Scenario	Irrigation mode of operation (without the Rogun HEPS) with requirement allocations as per SCWUP, 1984														
Average	-232	-70	-151	-315	-531	-22	0	0	0	0	0	0	-1321	-1321	0
Scenario	Irrigation mode of operation (with the Rogun HEPS) with requirement allocations as per SCWUP, 1984														
Average	-247	-75	-184	-114	0	0	0	0	0	0	0	0	-620	-620	0
Difference between scenarios with and without the Rogun HEPS regarding requirement allocations as per SCWUP, 1984															
Scenario	Power generation														

	-66	120	23	1014	1320	2	0	0	0	0	-268	-1195	949	2412	-1463
Scenario	Irrigation														
	15	5	33	-201	-531	-22	0	0	0	0	0	0	-701	-701	0
Difference between power generation and irrigation scenarios (without the Rogun HEPS)															
	107	-159	-1540	-1820	-533	17	0	0	0	0	-268	-1873	-6070	-3929	-2141
Difference between power generation and irrigation scenarios (with the Rogun HEPS)															
	188	-274	-1530	-3035	-2384	-7	0	0	0	0	0	-678	-7720	-7042	-678
Scenario	Power generation mode of operation (without the Rogun HEPS) with requirement allocations as per the Scheme through 2015														
Average	-1731	-234	-563	-1060	-490	-159	0	0	0	0	-797	-2052	-7085	-4236	-2849
Scenario	Power generation mode of operation (with the Rogun HEPS) with requirement allocations as per the Scheme through 2015														
Average	-1615	-338	-568	-1631	-1461	-232	0	0	0	0	-405	-857	-7105	-5843	-1262
Scenario	Irrigation mode of operation (without the Rogun HEPS) with requirement allocations as per the Scheme through 2015														
Average	-1479	-282	-89	-92	-124	-138	0	0	0	0	0	-413	-2616	-2203	-413
Scenario	Irrigation mode of operation (with the Rogun HEPS) with requirement allocations as per the Scheme through 2015														
Average	-1374	-75	-163	-9	0	0	0	0	0	0	0	0	-1620	-1620	0
Difference between scenarios with and without the Rogun HEPS regarding requirement allocations as per the Scheme through 2015															
Scenario	Power generation														
	-116	104	5	571	971	73	0	0	0	0	-392	-1195	20	1607	-1587
Scenario	Irrigation														
	-105	-207	74	-83	-124	-138	0	0	0	0	0	-413	-996	-583	-413
Difference between power generation and irrigation scenarios (without the Rogun HEPS)															
	-252	48	-474	-968	-366	-21	0	0	0	0	-797	-1639	-4469	-2033	-2436
Difference between power generation and irrigation scenarios (with the Rogun HEPS)															
	-241	-263	-405	-1622	-1461	-232	0	0	0	0	-405	-857	-5485	-4223	-1262

5. Existing risks of Rogun HEPS operations safety

5.1. Aseismic stability of the project and potential consequences of natural disaster

Seismotectonic situation in the area of Rogun HEPS construction. Tajikistan is located in an area of the most intensive seismic activity among the other Central Asia countries. There occurred a number of strong and catastrophic earthquakes that resulted in numerous victims and destructions and caused enormous environmental effect. Basically, geological structures separated by active ruptures concentrate seismotectonic stress whereas ruptures themselves represent an area of seismic energy release, i.e. a source of earthquakes of various magnitudes.

An analysis shows that modern geological structure of Tajikistan contains a number of large tectonic ruptures. One of them, the Ilyaksk-Vakhsh rupture, goes across the site of Rogun HEPS construction. This rupture has enormous length (over 500 km) and thrust morphology with horizontal displacement amplitude ranging from 1,300 m to 10-12 km. Vertical displacement amplitude reaches up to 2-4 km, with the amplitudes tending to reduce from the east to the west.

Seismically, the rupture zone refers to the category of seismic hazard and is featured by a high density of earthquake epicenters of average magnitudes. The earthquake focuses are located throughout the Earth crust near vertical drop to the north. A depth of seismic layer is about 20 km. According to A. M. Babaev, K. M. Mirzoev (1976) the potential of the Ilyaksks seismic zone is up to M=7.4 with earthquake intensity being 9 points. Under certain conditions the release of such potential may cause earthquakes with intensities exceeding 9 points that would result in catastrophic consequences particularly if seismic focus is not deep.

It should be taken into account that the Gissar-Kokshaal rupture (category 1) relates both directly and indirectly, to seismic hazard in the area of Rogun HEPS construction. This rupture goes in parallel with Ilyasks-Bakhsh rupture and has the highest seismic activity among other seismic zones in Tajikistan. Earthquakes with M>6.5 are most often to occur within its limits. This zone was a source of catastrophic earthquakes such as Karatag (1907) with M=7.3 and M=7.4, Sarez (1911) with M=7.4 and Khait (1949) with M=7.4.

The Gissar-Kokshaal zone of ruptures is very long (about 800 km). Displacements along the rupture have distinctly differentiated nature. Vertical displacement amplitude reaches 3-4 and more km. A width of destructive zone reaches 30 km thus defining a width of seismic zone attributed to this rapture.

The area of Rogun HEPS construction will undergo shakings from earthquakes that occur in this zone. Since construction site is located not far from the rupture, intensity damping will be minor and sometimes may exceed 9 points. Moreover, construction of a solid dam in the zone of seismic activity can provoke new earthquakes.

Therefore, current seismotectonic situation indicates that a wrong place was selected for construction of the Rogun HEPS. The ill-considered decisions may result in heavy material expenditures and human victims.

Geotechnical conditions at site of main civil works. Geologically this site refers to a structural facial zone of Afghan-Tajik depression and represents an integrated tectonic block oblong south-eastward. In the north-west and south-east this block is limited by the Ionakhsh and Gulizindan ruptures of 2nd order, accordingly, and in the north-east (2.5 km from the dam site) by the Vakhsh deep break.

A geological composition of that part of the block where civil works of hydroelectric complex are located is formed by rocks of Upper Jurassic and mostly Lower Cretaceous periods. A major complication here is a steeply dropping stratum of mine salt near the basement of the dam. This stratum is located in a zone of active seepage, and therefore feasibility, technical reliability and cost-effectiveness of the Rogun hydroelectric complex construction in such difficult conditions is a key issue for the project.

A major part of salt stratum head is located at a depth of 25-30 m below the river bank line (956-970 m above sea level) and is actually exposed near the intake portals of diversion tunnels (990-1000 m a.s.l). Salt-containing rocks are low permeable and have tight contact with salt. Salt is not available above an altitude of 956-970 m a.s.l. There is a zone containing softened rocks (7-8 m high and up to 10-12 m wide) just above the head of salt stratum.

Taking this into account, necessary to implement reliable protective measures that would ensure protection of the basement and civil works was acknowledged as a must. **For the HEPS construction it is necessary to protect the head of salt stratum from dissolving due to seepage that begins as water level at the upstream wall of the hydroelectric complex goes up.**

Besides Ionakhsh rupture, the strata are dissected by the breaks of higher orders and the tectonic cracks. The largest are breaks #35 and 28. The dam site is located in a zone characterized by high intensity of current tectonic displacements. These displacements are inherited in a sense that their directivity has remained permanent since the very formation of the area's structure. A vertical constituent of speed is 1 mm per year, and that for break #35 is 0.7 mm per year.

The massif is featured by relatively high compression tectonic stresses: in the area of underground building of HEPS at a depth of 400 m an average horizontal stress is equal to 15-18 MPa and an average vertical stress does not exceed 14 MPa, whereas overlying stress is 10 MPa.

A hydrogeological process at the dam site evolves from the valley borders towards the river, which serves as a ground water drain. Underground cavity water is evolved in the depth of strata, its water table going up from the river with an average gradient of 0.03. The break seams filled with impervious argil formed as a result of friction sometimes create local underground headwater of up to several dozens of meters high.

Chemical composition of ground water changes with depth. The upper part of water-flooded rocks is associated with sulfate water with dissolved solids concentration of 2-7 g/l. As mineralization changes with depth, sulfate waters turns into chloride water, and at a level of the head of salt stratum dissolved solid concentration increases to 17 g/l.

The reservoir of Rogun HEPS is located in an upstream Bakhsh River valley, the right border/wall of which is represented by the Karateginskiy and Surkhku ridges and the left – by the Vakhsh ridge. The rock base of reservoir is formed by solid and not dissolvable rocks. The bottom and 45 percent of reservoir walls are covered with loose and bound quaternary sediments. **Creation of water reservoir would actuate physical and geological processes and lead to marginal erosion of its bank line and underflooding adjacent area.**

High seismic activity, tectonic ruptures and their displacement, availability of salt stratum at the basement of the dam and considerable natural stresses in the rock massif would pose a high risk of facilities' construction and operation.

With respect to protection of salt stratum from dissolution, the non-departmental project expertise (1991) mentioned that "basement of the Rogun HEPS is so complicated a geological object that any prediction of seepage and piping to occur inside the object can not be sufficiently justified solely based on materials of a survey".

During a period of long-term usage (1987-1992) of diversion tunnels there appeared all types of destructions in still coating, reinforced concrete lining and chips typical for a long-term impact by turbulent flow, containing abrasive materials (dispersion, scour, dynamic and pulsation destructions). **Nowadays both diversion tunnels have suffered from inrushes that block the entire cross-section. The inrushes are probably spreading up to the day surface.**

Underground generator hall, unique in its size, has been developed up to a height of 35 against 78 m of its designed height. **Convergence of generator hall walls is already 300-320 mm in sandstone and 450-470 mm in siltstone.**

According to V. V. Kayakin and A. S. Pigalev, actual convergence is evidence of insufficient calculation of factors affecting a project being implemented in mountain geological conditions and, first of all, stress conditions of the massif. In this respect, the authors believe that it is expedient to consider rejecting underground location of the HEPS civil works.

5.2. Risks of floods, dam washout, and landslides

1. Complicated mountain geological conditions and high seismic activity in the Rogun HEPS construction zone pose a high risk of dam washout, breach and consequent flooding. Yet the threat remains pertinent during both the implementation of civil works and at various stages of operation start-up.

Considering a unique nature of the coordinated hydroelectric system and natural conditions, construction and operation of the hydroelectric system is only permissible if a reliable monitoring system of geological situation, seismicity and all hydroelectric facilities is in place.

2. High level of vulnerability and mere unavailability of the waterways and mudflow protection during the stage of construction pose a threat of mudflow destruction (e.g. similar to that in 1988).

3. Threat is also posed by the salt stratum located at the basement of the dam: it only takes to suspend salt protection works (for objective or subjective reasons), even for a short period of time, and the dam basement would undergo irreversible process ending up in destruction of the entire hydroelectric system.

Since water reservoir is planned to be used for power generation, which yet may start only when required discharge head is achieved, it is most likely that filling of water reservoir will be carried out with accelerated pace that may lead to increased seismic activity.

Parameters of dam break wave were calculated back in 1980s by a task team of the Geologic Engineering Unit of the 'Sredazgidroproekt' (Central Asia Waterworks Design) design bureau[2].

Technical design included 2 sets (scenarios) of calculations:

Scenario 1: The Rogun reservoir and all other downstream reservoirs of the hydroelectric system are filled to normal maximum operating level (NMOL).

Scenario 2: All reservoirs of the hydroelectric system are filled to SPU.

The following upstream waterline and volume of water in reservoirs correspond to scenarios under consideration:

Table 7

HEPS	**Type of dam**	**Dam chest level, m abs.**	**Upstream waterline, m abs.**		**Volume of water in reservoir, km^3**	
			NMOL	SPU	NMOL	SPU
Rogun	Rock-fill dam	1,300	1,290	1,225	13.3	5.6
Nurek		920	910	865	10.5	6.6
Baipazin		635	630	617	0.096	0.027
Sangtudin #1		551	571.5	557	0.266	0.130
Sangtudin #2		511.5	508.5	507	0.066	0.057
Golovnaya		487	485	---	Silted 0.0155	---
Tuyamuyun		134	130	120	5.27	0.250

[2] Adopted methodology of dam break wave calculation is based on computational solution of Sen-Venan equation and employs implicit difference scheme that allows passing free surface discontinuity (upstream wall and tail-water) by through count, calculate discontinuous wave, and after its cooling calculate further flash flood transformation with long time intervals.

Break wave parameters were defined based on conditions of its superposition on the low stages and discharge rates. A time of the Rogun HEPS dam destruction to a size of calculated closure channel is assumed as ‘zero’ time (computing origin).

Results of calculations. Scenario 1. Immediate destruction of the Rogun HEPS dam to the value of calculated closure channel assuming that reservoir is filled up to NMOL (1,290 m abs.) will create a break wave of enormous destruction power. The highest rate of discharge at the tail-water will reach 2.346 million m^3/sec. and a speed of 40-129 m/sec. within the first 4-5 km.

A full discharge of the Rogun HEPS water reservoir will happen in about 40 hours. Moving downstream the Vakhsh River the wave will enter the Nurek reservoir in 30 sec. at a speed of 103 m/sec. Having involved large masses of water while moving through the reservoir, the wave flow will largely increase lengthwise with simultaneous reduction of its speed. In 10 min. the wave will be at a distance of 15.5 km from the Nurek HEPS with a flow of 5.237 million m^3/sec., an average speed of 19.3 m/sec. and a height of 41 m above the elevation of water in the reservoir. It will destroy the dam in 25 min.

A total flow behind the closure channel of the Nurek dam will increase up to 9.1 million m^3/sec. A full time of Nurek reservoir discharge is 43 hours. At approximately the same time the town of Nurek located on the right bank of the valley will be covered by 280 m high wave moving at a speed of 86.8 m/sec. From the Nurek depression the wave will enter the gorge and in half an hour, having lost part of its strength in the narrow valley, will approach the Baipazin hydroelectric complex with a flow of 876,000 m^3/sec. Water level at Baipazin dam site will drop to its natural level in 70 hours. In about 54-60 min. the wave will reach the Sangtudin HEPSs #1 and 2.

The last stage of the Vakhsh coordinated hydroelectric system, the Golovnaya HEPS, will be destroyed in 1.45 hours by the wave approaching it at a speed of 9.1 m/sec. A height of the wave in this place will be 61 m and its flow will be equal to 655,000 m^3/sec. The town of Sarban located downstream the Golovnaya HEPS (at a distance of 4 km) will be covered with water layer of about 48 m high. The flow will decrease to 590,000 – 600 m^3/sec. downstream the town of Sarban as a result of abrupt widening of the valley, the wave height being 20-40 m.

Having flooded the entire city of Kurgan-Tyube and almost the whole town of J. Rumiy, the wave will proceed downstream the Vakhsh River and adjacent flood plain of the Amudarya River. Having become 10-20 km wide the catastrophic flood will submerge several dozens of settlements on its way, including Jilikul settlement and nature reserve “Tigrovaya balka”.
Before the confluence with the Pyanj River the wave flow will reach a rate of 516,000 m^3/sec. and an average cross-sectional speed of 11 m/sec.

At the Vakhsh River mouth reach area the wave will be split by an elevation into two flows, one of them heading over a small watershed to the mouth reach area of the Pyanj River, another continuing to move along the Pyanj River approaching the Vakhsh River from the mouth. Backwater thus created at the mouth of the Pyanj River will be 21-23 m high and spread up covering an area of 30-35 km long.

Having lost part of its volume for flooding high-water bed of the Pyanj River the wave will inflow the Amudarya River with a flow of 533,000 m^3/sec. and a speed of 11 m/sec.

Before the Termez expansion the wave height will drop to 16-20 m. The wave will arrive to Termez with a flow of 350,000 m^3/ sec., its height being10-11 m and maximum average speed – 5.4 m/sec. In 35 hours following the dam break the wave will reach the town of Kerki. Water level will continue to rise to its maximum (237.1 m abs.) over 45 hours and then will be slowly dropping for about 7.5 days. The entire town will be submerged.

Heading downstream the Amudarya River the wave will continue to transform and will reach the town of Turkmenabad with a maximum flow of 250,000 m^3/sec. Water elevation over its natural level will be 23 m. With low floodplain banks a land strip of 20-22 km will be flooded. A maximum average cross-sectional speed will decrease to 0.7-1.1 m/sec. due to considerable increment of effective cross-section area. The entire Turkmenabad will be cover by up to 23 m high water layer. The flood will last for about 8 days.

The wave will reach the Tuyamuyun hydroelectric complex in 5-6 days following the Rogun HEPS dam break, with a flow of about 95,000 m^3/sec. The Tuyamuyun dam will break in 133 sec. The elevation of water is expected to drop to its natural level in about 10 days.

Near the city of Urgent wave height will drop to 6-7 m, its flow being up to 76,600 m^3/sec. and speed of about 1.1-1.2 m/sec. Urgench and neighboring settlements will be covered by 6-7 m high layer of water.

In the vicinity of Nukus water elevation in the Amudarya River will rise in 8-9 days following the Rogun dam break. Water will continue to rise to a maximum level (83.8 m abs.) for about 3 days, with a maximum flow being about 44,000 m^3/sec.

In some cases flow may deviate from the general directivity of movement. Such deviations are normally associated with wave's entering water reservoirs and abrupt narrowing or widening of valleys. The superposition of secondary (reflected) waves also affects maximum flow and elevation of water.

Scenario 2. All water reservoirs of the system are filled up to SPU. At a level of 1,225 m abs. a volume of the Rogun reservoir will be 5.6 m^3. A 2.4 times volume reduction will affect discharge time and change a maximum flow of effusion and maximum elevations of water.

Immediate destruction of the Rogun dam to the value of calculated closure channel will result in a flow rate of up to 1.56 million m^3/sec. and with elevation of water at the tail-water going up to 1,136 m (145 m higher than its natural level). A full discharge time of the reservoir will be 6 hours 20 min.

In 1 minute the break wave will enter the Nurek reservoir (maximum flow – 1.35 million m^3/sec., level of water – 933.4 m abs.).

After entering the reservoir, the break wave flow rate will begin to grow. Within 28 min. the wave will reach the dam of Nurek HEPS at a cross-sectional speed of 28.5 m/sec. and destroy the dam on the 30th minute. A maximum flow at the Nurek dam site will be about 6.13 million m^3/sec. A full discharge time of the Nurek reservoir will be 14 hours. The town of Nurek will be covered with a 244 m high layer of water.

Having lost part of its strength in the reservoir a 215 m high wave will approach the Baipazin dam with a flow of 710,000 m^3/sec. The reservoir will be fully discharged in 31 hours.

Further transformation of wave will occur similar to the process described in NMOL scenario. Reduction of upstream wall elevation of the Rogun reservoir by 65 m (from 1,290 to 1225 m) will not prevent the threat of destruction to all downstream dams of the Vakhsh-Amudarya coordinated hydroelectric system and will only reduce catastrophic flow rates, levels, average cross-sectional speed and reservoirs' full discharge time.

The wave will reach Nukus in 10.5 days following the break of the Rogun dam, at a speed of 0.1 m/sec. A maximum flow and level will be 27,100 m^3/sec. and 80.8 m abs. respectively.

Flood zone outlines in the NMOL and SPU scenarios are almost the same since in the mountainous area and foothills the Vakhsh River flows through rather deep and narrow gorges with very steep walls whereas in wider places it spreads over the entire bottom of a valley.

A spreading zone of the Amudarya River is artificially limited as floodplain has a slope from the riverbed spreading over a distance of up to 10-20 km.

An area of the Rogun HEPS is characterized by active manifestations of modern physical and geological process stipulated by both exogenous and endogenous factors. **First**: it demonstrates considerable stresses, high seismic activity, and release of natural stresses in the upper part of the massif. **Second**: intensive physical weathering that contributes to the contrast of relief due to a various extent of weathering effect on lithotypes of the rocks, and erosive and accumulative impact of water flows. **This results in forming sharply intersected landscape with high potential energy being released in the form of rockslides, collapses, landslides and mudflows.**

As to landslides, which are very common phenomena in the area under consideration one of them, located at the tail-water of HEPS, particularly mentioned. Its volume is 900 million m^3. It was formed as a result of structural and morphologic features of the area and is characterized by distinct morphologic forms and has a relatively smooth surface with prominences and cavities. Its rear edge is formed by a deep ravine whereas a side edge near the dam site is seen on the slope of the valley as an oblique ravine.

5.3 Capacity of the engineering services of the Republic of Tajikistan to ensure safe functioning of the Rogun HEP

The downstream areas of the Rogun HEP cover rayons which report to the central government, as well as the cities and rayons of Khatlon province. These administrative units have the forces and facilities of the regional Civil Defence Emergency Offices (CD EO). These offices have four staff members (head of the offices and three assistants) who shall be used in emergency cases related to the Rogun dam failure.

The forces and facilities of the regional Civil Defence Emergency offices consist of non-military civil defence units which are formed by staff members of economic objects and administrative bodies, and which are funded by those economic objects and administrative bodies.

Besides, according to the regulations of the Republic of Tajikistan, the National Center for Coordination of Disaster Relief Projects shall be mobilised to mitigate the

consequences of disasters. This Center has 11 vehicles and 45 staff members. Furthermore, all people of active working age can be mobilised, as well as all material and technical resources of administrative bodies and public organisations, for which compensation will be paid later in accordance to the legislation.

In addition to the above, every HEP has civil defence teams and units. There are also volunteers among the people living in the vicinity of the HEP, who form volunteer teams in emergency cases.

The numbers of CD EO staff members, their professional level and technical resources of these services are not sufficient to ensure safety and swift mitigation of consequences of industrial and natural disasters in Rogun HEP area.

5.4 The possible consequences of industrial and natural disasters for Tajikistan and the downstream riparian states in Syrdarya river basin.

The failure of the Rogun HEP waterfront shall lead to formation of a dam-break wave with the breach discharge from 2.35-1.56 million cubic meters per second, depending on the water reservoir filling option. This dam-break wave shall move down the Vakhsh river and destroy the Nurek HEP dam.

The break-wave on its way down will move above the crests of the downstream hydroelectric complexes of the Vakhsh cascade, completely destroying them almost immediately.

As a result of the Rogun HEP break-wave passing, large land areas, settlements, bridges, water intake structures, canals and hydroelectric complexes shall be destroyed, and the population shall suffer a large material damage as a result. All the large and small-scale hydraulic complexes laying on the way of the break-wave shall be destroyed, namely:

the whole HEP cascade (6 hydraulic complexes);

canal water intake structures (Vakhsh, Karakum, Amu-Bukhara, Karshi, Tamsakiy, Bairamsakiy and other canals, four large road and railroad bridges and two gas crossover pipes).

The greatest damage to the people and economies of Tajikistan, Uzbekistan, Turkmenistan and Afghanistan shall be caused in case of the breakage of Rogun water reservoir dam when it is filled to the normal water level. In that case, the flooded area shall be as large as 1.5 million ha.

About 700 settlements or their parts are situated in this zone. The following cities and towns shall be destroyed and flooded: Nurek (40 thos. people), Sarband (more than 12 thos. people), Kurgantube (more than 61 thos. people), Termez (126 thos. people), Mukri (11 thos. people), Kerki (20 thos. people), Turkmenabad, Urgench (136 thos. people) and Nukus (263 thos. people).

The hydraulic structures of all sizes situated on the way of the dam break-wave shall be destroyed. If Rogun water reservoir dam shall be filled to the lowest water level, the total flood control area shall reach up to 1.3 million ha.

The summary of estimated data on the damage depending on the filling options is given in the table.

Table 8

Filling option	**Total flooded area, mln**	**Settlements in the flooded zone**		**Number of hydroelectric complexes**	**Number of flooded**	
		Total	**Large**		**Road and**	**Head**

	ha			(HEPs) destroyed	railroad bridges	structures and large canals
normal water level	1500	More than 700	9	6	4	15
lowest water level	1300	No estimate	9	6	4	15

In case of the dam breakage, large populated areas of Tajikistan, Uzbekistan, Turkmenistan and Afghanistan may be flooded. The total population of these areas is about 5 million people, where 3 million people live in Uzbekistan, including about 190 thos. people in Surkhandarya province, about 2 thos. people in Bukhara province, 1.3 mln people in Khoresm province and about 1.5 mln people in the Republic of Karakalpakstan.

Thus, the projected flood area shall include 28 rayons, large cities (Termez, Urgench, Khiva, Nukus, Turtkul, Khodjeili, Kungrad, etc.), settlements, buildings and enterprise facilities, power transmission lines, agricultural lands and irrigation canals, public utilities systems, personal property and railroad sections (Termez-Kerki, Turkmenabad-Urgench-Kungrad, Turtkul-Nukus) as well as large highways (section of the Great Uzbek Highway, Gazochak-Urgench-Kungrad, Turtkul-Nukus-Chimbay, etc.).

In case of the Rogun HEP dam breakage, a number of industrial objects which use highly toxic substances (mainly chlorine and ammonia) in their technological processes can also be flooded. These objects include Kungrad Soda Plant, dyeing units of textile plants, etc.). Although in case of destruction of these facilities by the dam-break wave and storage rules violation of conditions there shall be no massive contamination of the area by these substances, but the water carrying debris shall also contain ammonia and chlorine along with other toxic substances.

6. Rogun HEP influence on water resources, agroclimatic conditions and hydro meteorological processes in the riparian states in Amudarya River basin

6.1 Assessment of the influence on the river flow and total volume of water resources of the Amudarya river basin in the short-term, medium-term and long-term perspective.

In theory, the Rogun HEP with its capacity of 13.3 cubic kilometres is able to accumulate virtually the whole discharge of Vakhsh river in a very dry year (14 cubic kilometres).

Short-term period: in order to fill the reservoir to the dead-storage level (4.7 cubic kilometres) in 6 years, it would be necessary to withdraw 0.78 cubic kilometres of water or about 4% of the long-term average Vakhsh river flow; if normal water level is to be reached within 2 years, it would be necessary to withdraw annually about 2.4 cubic kilometres of water from the Amudarya River, or about 12% of Vakhsh river flow. In order to fill the reservoir to the normal water level (+2 years after the dead-storage level is reached), 4.3 cubic kilometres of water or more than 21.6% of Vakhsh river flow will have to be withdrawn in each of the two following years.

There were calculations done using the mathematic model by Scientific Research Center of the Interstate Commission for Water Coordination of Central Asia[3] taking into

[3] V. Duhovni, A. Sorokin: Assessment of the Rogun HEP on the Water Regime of the Audarya River, Tashkent 2007 (В. Духовный, А. Сорокин "Оценка влияния Рогунского водохранилища на водный режим реки Амударья", Ташкент, 2007 г.)

account the joint functioning of Rogun and Nurek HEPs. These calculations have shown that if these stations work in the power mode during the initial period of Rogun HEP filling (5 years), additional withdrawal of Vakhsh river flow amounting to 1.2-1.5 cubic kilometres in the vegetation period would be expected. The Nurek HEP would only be able to compensate up to 0.2-0.3 cubic kilometres of water.

The fact that the existing water resources are not sufficient to cover the needs of people and economy is already obvious. However, as a result of the Rogun HEP construction, for the whole water reservoir construction and filling period the downstream countries of Amudarya basin will face an even more acute shortage of water.

In the short-term period after the construction of the Rogun HEP is finalised, the HEP functioning shall lead to the reduction of Vakhsh river flow in the summer and, accordingly, to the reduction of the total flow which makes up the Syrdarya river. In normal years, such decrease can reach up to 400 cubic meters per second in July. In the low water years, the situation shall be even worse.

Percentage

Vakhsh in the total flow - Vakhsh as a ratio of the total of Pyandj and Kafirnigan

The percentage share of Vakhsh, Pyandj and Kafirnigan rivers' flow

The lowest water year in Vakhsh basin was 1989 with the flow of 14.0 cubic kilometres. As the working capacity of Rogun reservoir is 13.3 cubic kilometres, if the stored water is used up completely during the previous winter, the flow in the summer of a low water year shall not be sufficient to fill the reservoir to the normal water level. The flow volume in the period from April to September in low water years is 12-13 cubic kilometres. Also, it is not feasible to wotk in the winter using a lower water pressure. Thus, in the low water years it can happen that there will be no more than 200 cubic meters of water per second passing through the power site of Nurek HEP to satisfy the irrigation needs of Tajikistan. Accordingly, in the mouth of Vakhsh there shall be a water discharge of no more than 100 cubic meters per second.

Medium-term period. After the Rogun HEP starts functioning in the power mode, when the planned production capacity is reached, it is expected that about 2-2.9 cubic kilometres of average annual Vakhsh river flow or up to 15% of its average annual flow shall be withdrawn additionally during the vegetation period.

The preliminary analysis shows that in case of simultaneous functioning of Rogun and Nurek reservoirs in power mode (at present there is little doubt that this shall be the mode used by the Republic of Tajikistan) **the deficit of water resources in the Amudarya river basin in the medium-term period shall amount to 11-11.5 cubic kilometres in the vegetation period and to 6.5 cubic kilometres in the whole year. For the Republic of Uzbekistan, these figures would be 5.3-5.5 and 3.2-3.5 cubic kilometres, accordingly, in case of parity water sharing with Turkmenistan below Kerki Gauge Station.**

Long-term period. The estimates based on 50-year data series indicate that if Rogun HEP is used in the power mode the number of years when outages occur shall reach from 12-23, including up to 10 years with the outage severity above 10%. In the worst case scenario, when every riparian state shall continue applying its national water use mode, the frequency of outage years shall be from 28 to 39, including 28-34 years with outage severity above 10%. The average annual water deficit shall reach 4.52% in the vegetation period and 3.1% in the whole year on average. In the worst case scenario these indicators shall reach 23.14% and 16.3%, accordingly.

6.2 The estimated changes in the agroclimatic conditions of the region caused by the Rogun HEP establishment

In the last decade, the agroclimatic conditions of Central Asia were becoming increasingly dependent on the anthropogenic activities, including inefficient water distribution systems, river flow regulation by the reservoirs being part of such systems.

The river water regime should be in accordance with the natural mode, and water release volume should not be higher than the maximum or lower than the minimum volume for each time period. However, that cannot be done, if the reservoirs are used in the power mode, as was the case with Toktogul reservoir and, to a certain extent, with Nurek reservoir, in the recent years. As a result, the river flow in the lower course of Amudarya and Syrdarya which goes further to the Aral Sea became much lower in the summer period.

The lowered river flow in the lower course of Amydarya and reduced water entering the Aral Sea leads to further desertification and changes in the temperature regime. The summer months shall become increasingly hotter, which, jointly with water shortfall, shall lead to elimination of all economic activities and enlarged desertification areas.

The climatic conditions in the lower course of Amudarya shall become virtually unsuitable for human living and deadly for the flora and fauna.

The unilateral changes from irrigation to the power mode have already started causing severe negative consequences for water resources and environment in general, especially in the lower and medium course of the Amudarya River. In the summer period, these changes lead to lack of irrigation water, whereas in the winter they result in flooding of houses, irrigated agricultural lands, pastures and economic objects.

As of today, the water resources of the remaining Aral Sea are not stable due to the limited flow of Syrdarya and Amudarya rivers; in some years, the flow is absent. As a result, the water level in the sea is growing lower, the water surface area decreases, and the mineral concentration in the water becomes higher.

6.3 Assessment of the risks of intensification of hydro meteorological hazards related to the construction of the Rogun HEP

The unilateral changes from irrigation to the power mode have already started causing severe negative consequences for water resources and environment in general, especially in the lower and medium course of the Amudarya River. In the summer period, these changes lead to lack of irrigation water, whereas in the winter they result in flooding of houses, irrigated agricultural lands, pastures and economic objects.

The capacity of Tuyamuyun reservoir is not sufficient for accumulation and re-regulation of winter water release by the Rogun HEP working in the power mode. This shall cause additional difficulties with the release of these water flows to the Aral Sea in the winter.

Excessive regulation of the Amudarya River flow and changes in its hydrological mode shall result in the development of channel processes. Excessive regulation of floods leads to sedimentation of suspended and tractional loads in the Amudarya River channel and reduction of its transmission capacity. It will become necessary to carry out continuous reconstruction of canal water intake structures. In the rare high-water years, the channel and main delta branches shall not be able to let pass the increased flow, which shall result in increased flooding area and destruction of infrastructure.

It must be noted that at present, due to the low temperatures in the lower course of Amudarya in the winter, the situation can become more difficult: studge ice generation shall occur, leading to obstruction and ice blocks. Water discharge to Amudarya, related to Rogun HEP functioning in the power mode, especially in the river freezing-over period, can result in flooding of the levee areas, pastures, wells, roads, settlements, etc.

The most complicated situations can arise in the period of winter water release when due to the ice blocks the passing capacity of the channel shall be further reduced. In the recent years, similar situations can also be observed in Syrdarya river basin. The scope of negative consequences in Amudarya basin can be much greater due to its higher natural water level.

The unplanned intensive water releases in the Amudarya River in the winter can cause negative processes both in terms of public safety and land degradation processes in the lower course of the river.

1. Amudarya channel deterioration in the lower course of the river, natural disasters: floods, settlement underflooding, top-soil washing-off on irrigated lands (water erosion) and increased pressure by groundwaters due to increased river flow in the winter.
2. Waterlogging in the winter shall make it difficult to leach the land efficiently (due to the increased groundwater table), and lead to collector silting and deterioration, which in the future shall lead to increased soil salinity and, as a result, their degradation and reduced productivity.
3. Water deficiency in the summer shall intensify soil salinisation processes.
4. The formerly irrigated lands which shall become abandoned due to the shortage of irrigation water shall accumulate salts as they will serve as dry drainage for irrigated fields.
5. Salt accumulation in the unused unstructured lands in the lower course of Amudarya shall turn these lands into puffy solonchaks (up to 500 thos. ha area). Salt shall be dispersed throughout the whole surrounding area, further worsening an already difficult situation with the land condition and environment on the whole. One of the examples of such consequences is the desertification of the Aral Sea bottom where salt and dust are blown with the wind (500-2702 kg/ha per year) to many kilometres away.
6. Reduced water use in the summer shall affect the hydro chemical properties and mineralization of river water, which in turn shall lead to salt accumulation in the irrigated lands.

If the situation in Amudarya basin remains the same (water excess in the winter and its deficiency in the summer), the damage to the soil fertility shall be growing more severe and eventually shall lead to the new environmental disaster such as the suspension of agricultural production in the lower course of the Amudarya River. The lands which were abandoned after their degradation (more than 200 thos. ha) can hardly ever be reclaimed. After the hydrological regime of the medium and lower courses of the Amudarya River changes, the channel losses which now amount to 10-15% in low water years shall further increase. In low water years, water flow deficit shall lead to a hydrological drought.

The increased water mineralization and water resources shortage shall result in further soil salinization. The drying of lakes and wetlands in the lower course of the Amudarya River is already accompanied by appearance of new solonchaks and saline takyrs. These areas, jointly with the dry bottom of Aral Sea, act as large sources of dust and salt transmitted to the adjacent reclaimed lands. Salt fall-out decreases soil fertility and productivity.

7. Assessment of the Rogun HEP social, economic and environmental impact on the riparian states in the the Amudarya River basin

At present, the Amudarya River water is used to irrigate about 2.35 mln ha in five Uzbekistan provinces: Surkhandarya, Kashkadarya, Navoi, Bukhara, Khoresm and the Republic of Karakalpakstan. Of this area, more than 800 thos. ha are prone to severe salinity (medium and strong salinization degrees). Cotton yield losses amount to 30-40% in case of medium degree of salinization and to 60-80% in case of strong degree

salinization. In order to prevent yield losses related to soil salinity, farmers usually conduct leaching in autumn-winter and spring periods.

Due to the Aral Sea shrinking, there is already a whole complex of socioeconomic and environmental problems which have a global significance in terms of their origins and implications.

There are protected natural zones with more than 793.3 thos. ha total area situated in the Amudarya basin. These zones include three national parks covering more than 42.3 thos. ha, four national reserves on 155 thos. ha, 15 game and fish husbandries on more than 542 thos. ha, and 13 water pools on more than 359.2 thos. ha which are important for fish husbandry purposes. In case of the Rogun HEP construction and use in the power mode.

The fisheries pools dependant on Amudarya water are located in the Republic of Karakalpakstan, as well as Khoresm, Bukhara, Kashkadarya, Surkhandarya provinces, and, partially, in Navoi province. There are eight water reservoirs important for fish breeding in this area, with the total area of 115 473 ha. At present, they are used for industrial fish production. Of these, the following water reservoirs are located in Surkhandaya province: South-Surkhan water reservoir (6957 ha); Uchkizil (1047 ha); and Aqtepe (2812 ha). The following water reservoirs are located in Kashkadarya province: Talimarjan (6900 ha); Chimkurgan (5000 ha); and Pachkamar (1240 ha). There is Tudakul water reservoir with 21670 ha area in Navoi region, Shurkul reservoir (4817 ha) on the border of Bukhara and Navoi provinces and Tuyamuyun reservoir (65000 ha) in Khoresm province.

Most of these reservoirs are fed directly by the Amudarya River. Some of them also receive water from other sources, but Amudarya water is still important for their sustainability. Even Tudakul reservoir which is located quite far from Amudarya, to a large extent feeds on Amudarya water provided by Amu-Bukhara canal. Kuyumazar reservoir, located nearby, which has a strategic importance as a source of clean water for the city of Bukhara and the nearest settlements, also has an inflow of Amudarya water.

Besides, the majority of Uzbek lakes with the total area of more than 200 000 ha is located in this area. There are five fishery lakes covering more than 7500 ha in Kashkadarya region, the largest of them being Sichankul (more than 5000 ha) and Achin (1700 ha). In Bukhara region, there are seven lakes on the total area of 99000 ha, the largest ones being Dengizkul (35000 ha) and Kara-Kir (more than 26000 ha). Besides, there are five lakes covering about 2000 ha in total in Khoresm region. The majority of fishery lakes of this region is located in the Republic of Karakalpakstan. There are more than 35 lakes with the total area of more than 100000 ha; the largest ones are Sarykamish cross-border lake (300000 ha), the major part of which lays in Turkmenistan; Jiltirbas (15000 ha) and Sudochie lake (about 14000 ha).

The hydrologic regime of all these lakes is directly related to the regime of the Amudarya River. Thus, in the low water years of 1999-2002, when water bodies of Khoresm and Karakalpakstan in Amudarya basin became much shallower, many of the water bodies lost up to 75-80% of water level, and some dried up completely.

The water bodies located in this area are very important for fish husbandry. In the 1990ies, fish production in this region amounted to 5000 ton per year or about 70% of the total national fish production. In 2007, fish production was more than 1800 ton which is about 60% of national fish production.

In the beginning of the 1990ies, fish production by Karakalpakstan water bodies amounted up to 4400 ton per year. However, due to the negative influence of water shortage in the Amudarya River (2000-2001), production volume sharply decreased, amounting to just 200 ton in 2002 and 131 ton in 2003. The consequences of water shortage can still be felt. Fish production in Karaklpakstan, albeit growing, is still very far from former volumes. In 2007, about 800 ton of fish was produced.

There are around 100 fisheries functioning in this region, employing more than 600 fishers besides other personnel members. Three of these fisheries are in Surkhandarya province, 14 in Kashkadarya province, 16 in Bukhara province, 2 in Navoi province (at Tudakul and Shurkul water reservoirs), 3 in Khoresm province and 53 in the Republic of Karakaplakstan.

7.2 Assessment of the Rogun HEP impact on access of population of Uzbekistan and Turkmenistan to clean water

The Amudarya River provides 837.5 thos. cubic meters pf water per day through 19202 kilometres of utility networks to the Republic of Karakalpakstan, Khoresm, Bukhara, Navoi and Kashkadarya provinces.

In the recent years, there were serious problems related to water quality in terms of chemical properties. Amudarya water in the lower water course became virtually unsuitable for drinking. Amudarya water quality at the level of Tuyamuyun water station only meets the standards for drinking water with regard to mineralization in the period from June to August, when fresh water can be accumulated in Kaparass reservoir. The main reason for decreased quality of the river water is the lack of systematic water release to channels and canals. For this reason, the explored exploitation reserves of groundwater of about 1 mln cubic meters were discharged from the books.

The quality of water provided to the population through the water supply networks in the Republic of Karakalpakstan does not meet the criteria of drinking water quality by 30%; in some provinces, such as Takhtakupir and Nukus, this figure reaches 95%. Besides, such provinces as Shumanay, Amudarya and Beruni are only covered by centralised water supply networks by 20-22%.

Chemical properties of drinking water in Nukus province of Karakalpakstan Republic do not meet the standards by 85%, in Khodjeili province – by 76%, in Beruni province – by 64%.

The quality of water provided to the population through the water supply networks in Khoresm province also does not meet drinking water standards by 20-25%, and in some locations, such as the city of Urgench, this figure reaches 52.7%.

The reduced quality of Amudarya River water has a negative effect on virtually all sources of industrial and drinking water. At present, only large settlements are covered by centralised water supply networks. The majority of the population uses surface waters of the Amudarya River and canals as well as surface waters located in river and canal streamside sites. As of today, the majority of water supply sources reviewed balance on the edge of satisfactory quality level.

The actual average daily water use by person in the Republic of Karakalpakstan is 66.7 litres, in Khoresm province – 73.6 litres, in Bukhara province – 85.8 litres, in Navoi – 101.8 litres, whereas the accepted norm is 115-160 litres. On the whole, 3.4 mln people or 42% of 8.15 mln people of the Uzbekistan part of the population of this area have no guaranteed access to water. One of the reason for that is the shortage of water.

In these conditions, even minor withdrawals of the Amudarya River flow which serves as the only water-way for Khoresm and Karakalpakstan Republic, shall result in a threat for the health of local population and complicated social conditions in the region.

In order to improve the situation with drinking water, in the last 20 years the Republic of Uzbekistan was making large investments in improved water supply for the population of the region. Interregional water supply networks Tuyamuyun-Nukus-Chimbay-Takhtakupir, 530 km long, and Tuyamuyun-Urgench-Gurlen-Magnit, 380 km long, which take water from Kaparass reservoir, and the total cost of which was US $328 mln, were constructed. Besides that, in order to ensure improved access to water for the population of Priaralie rural areas, Uzbekistan mobilised ADB and IBRD loan funds in

amount of US $155 mln. However, these funds can be virtually wasted if the Rogun HEP is to be constructed and used in the power mode.

After the HEP is launched, the volume of water releases from the Vakhsh River in the periods of reservoir filling shall drastically reduce, which shall affect drinking water availability for the people living in the lower course of the river;

In the dry years, it shall not be possible to accumulate fresh water reserves in the Karapass reservoir;

When the flow is reduced, mineralization levels of river water shall grow;

Because of increased salinization of Amudarya water, the quality of groundwaters which are fed by the surface waters shall decrease, and there shall be a critical reduction of reserves of drinking quality groundwater, resulting in a threat of complete abandonment of points of water intake for drinking purposes places in the lower course of the river and canals;

If the existing water intake structures are put out of operation, it shall become necessary to make significant investments in construction of new intake structures in more remote places, extending the water supply networks as well.

In order to preserve the quality of surface and ground water (drinking water sources) in the Amudarya River basin, it is crucial to develop a plan for integrated use and protection of the river surface water which should be approved by the Interstate Commission for Water Coordination of Central Asia.

8. The estimate of projected economic-ecological losses related to the proposed Rogun HEP construction

8.1 Economic-ecological losses related to contamination of water resources and reduction of their quality

The increased mineralization of waters of the main water-way in Khoresm province and the Republic of Karakalpakstan, and, a result, of the whole irrigation system of the region, reaching 1.3 g per litre, can cause decrease of agricultural production.

According to the analysis carried out by Uzgipromeliovodhoz, as a result of increased average weighted mineralization of irrigation water up to 1.3 g per litre, the losses of cotton yield shall reach 2 hundred kilogram per ha. The total yield losses shall amount to 213.4 thos. hundred kilogram or 21.3 thos. ton of raw cotton per year, given that the irrigated areas in the Republic of Karakalpakstan cover about 106.7 thos. ha. Even if soil salinity level does not grow, in such case the minimum losses of raw cotton yield shall total 106.5 thos. ton in 5 years.

In case of Khoresm province, if mineralization of irrigation water increases (diagram 1), cotton yield shall decrease by 5 hundred kilograms per ha. The irrigated lands under cotton in Khoresm province cover 110.87 ha, and the total yield losses shall amount to 554.4 thos. hundred kilograms or 55.4 ton of raw cotton per year. Even if soil salinity level does not grow, in such case the minimum losses of raw cotton yield shall total 277.0 thos. ton in 5 years.

Thus, as a result of changes in productivity of cotton grown on irrigated land caused by the deterioration of the Amudarya River water quality related to increased mineralization because of the Rogun HEP construction, the estimated economic-ecological losses caused solely by reduced raw cotton production shall be as following:

L_{lvl} - economic-ecological losses, US$;
R – minimum reduction of raw cotton production, ton;
O – lint cotton output = 0.366;
P – market price of 1 ton of lint cotton = US$1600.

Legend:

1 - Republic of Karakalpakstan
2 - Andijan province
3 - Bukhara province
4 - Jizzakh province
5 - Kashkadarya province
6 - Namangan province
7 - Navoi province
8 - Samarkand province
9 - Surkhandarya province
10 - Syrdarya province
11 - Tashkent province
12 - Ferghana province
13 - Khoresm province

Y – Yields, hundred kilograms/ha
X – Mineralisation, grams/litre

Diagram 1. The curve of changes in cotton productivity on irrigated lands as a result of drinking water deterioration depending on average weighted mineralization (Ministry of Amelioration and Water Resources, 1995)

$L_{lvl\ total} = L_1 + L_2$

In Khoresm province: L_1 = 277.0 x 0.336 x 1600 = US$148.9 mln

In the republic of Karakalpakstan: L_2= 106.5 x 0.336 x 1600 = US$57.3 mln

$L_{lvl\ total}$ = 148.9 + 57.3 = US$206.2 mln

In only five years, the economic-ecological losses caused solely by decreased cotton yields in the Priaralie region shall amount to US$206.2 mln.

8.2 The projected losses due to decreased yields of cereal crops and cotton in case of reduced water release

According to the estimates given in Appendix 8, the total losses in a five-year period due to loss of cereal and cotton yield in case of reduced water release shall amount to **US$5105.9 mln.**

For US$1 equivalent of agricultural production, there is up to US$2.5 equivalent of production of goods and services in adjoining industries.

It means that the total losses in adjoining industries shall amount to US$5105.9 million x 2.5 = US$12764.7 million.

The total losses in five years shall reach US$5105.9 million + US$12764.7 million = US$17871 million.

8.3 The expected losses in fish and livestock production sectors due to reduced water entry to the delta of the Amudarya River

In case of reduction of water entry to the delta of the Amudarya River by 25%, the total surface area of the water bodies which are important for fish production shall decrease by 25000 ha and shall amount to about 75000 ha.

The reduced water inflow by 25% shall contribute to the threat of loss of 43 or 57% existing water bodies in the delta of the Amudarya River, as well as to the increased water mineralization in the remaining water bodies.

The increase of water mineralization to more than 10 gram per litre shall result in cessation of natural fish spawning. As a result, in such water bodies there shall be no natural fish reproduction.

Given that in case of mineralization increase the natural spawning shall virtually stop, the the fish in the water body shall become extinct. In order to prevent that, it shall be necessary to stock such water bodies with juvenile fish reared on pond fish farms.

Such fish varieties as sazan, pike perch and crucian (carp) need 3-4 years to reach a 1 kilogram weight. This means that, in order to obtain 50 kg fish per 1 ha of water surface, it will be necessary to stock it with the young of the year (average weight of 1 fish is 30-35 gram) at the rate of about 500 fish per 1 ha of water surface, and even this measure shall only allow restoring up to 10% of commercial fish resources.

In order to stock a water body with surface area of 75000 ha, so that to obtain up to 50 kilograms of fish per ha on average, it would be necessary to rear commercial juvenile fish on the pond fish farms in amount of 75000 ha x 500 fish = 37500.0 thos. fish.

The total weight of the juvenile fish of commercial varieties reared in the pond fish farms to populate natural water bodies shall amount to 1312.5 ton.

In order to rear 37500.0 thos. juvenile fish it would be necessary to stock 7118.75 ton feed per year and consume about 39.4 million cubic metres of fresh water with mineralization not higher than 1-3 gram per litre annually.

The costs of rearing young of the year (average weight of 1 fish is 30-35 gram) during five years are shown in Table 9.

The total cost of rearing young of the year fish for stocking

Table 9

Year	**Young of the year fish needed for stocking (thos. fish)**	**Total cost of young of the year fish production (thos. US$)**	**Total weight of young of the year fish (ton)**	**Feed used for young fish rearing (ton)**	**Water used for young fish rearing (thos. m^3)**
2009	37500.0	1299.7	1312.5	7218.75	39375.0
2010	37500.0	1819.6	1312.5	7218.75	39375.0
2011	37500.0	2547.4	1312.5	7218.75	39375.0
2012	37500.0	3666.4	1312.5	7218.75	39375.0
2013	37500.0	4992.9	1312.5	7218.75	39375.0
Total	**37500.0**	**14326.0**	**6562.5**	**36093.75**	**196875.0**

The expected losses for the 5-year period for fish production sector shall amount to US$14.3 million without taking into account the costs of additional consumption of 196.9 million m^3 .

Livestock production. Based on the example of the low water period of 2001-2002, when due to reduced rangeland capacity about 5 million ton of valuable feed were lost, and assuming that in order to gain 1 kilogram of meat about 50 kilograms of feed are needed, it is possible to use the analog approach to calculate the minimum losses resulting from reduced water release to the Amudarya River. Such losses shall constitute 100.0 thos. ton (5 million ton : 50 kilograms). As a result, the annual losses due to the decrease in

meat production (given that the average meat price is US$5) shall amount **US$500 million** (100.0 thos. ton x US$5), and in five years they would pile up to **US$2.5 billion.**

Results of economy-ecological assessment

Table 10

No	Type of economy-ecological losses	Units (US$ million)
1	Reduced raw cotton yields in the Republic of Karakalpakstan and Khoresm region	**206.2**
2	Reduction of cropping areas by 30-40$, decreased yields of cereals and cotton in the Republic of Karakalpakstan, Khoresm, Bukhara, Kashkadarya, Navoi and Surkhandarya provinces, decreased production rates in adjoining sectors	**17871**
3	Reduced total area of water bodies important for fish production and reduced fish resources	**14.3**
4	Reduced weight gain by cattle and small cattle and lower meat production rates	**2500**

As a result, the total losses ($L_{lvl\ total}$) due to deteriorated water quality, productivity loss, reduced water body area and diminished fishing resources in 5-year period shall be as follows:

$L_{lvl\ total}$ = 206.2 x 17871 + 143.3 + 2500 = US$20591.5 million

$L_{total/annual\ average}$ = US$4118.3 million

The shown figures do not take into account the damage to the flora and fauna of the region caused by insufficient water release, the damage to agricultural crops besides cereals and cotton, and social damage due to growing unemployment and population health worsening.

9. Assessment of losses to the environment, flora and fauna of the Amudarya river basin due to the construction of the Rogun HEP

Construction of the Rogun HEP shall lead to substantially reduced water runoff and to severe irreversible changes of natural landscapes over large territories.

River's drying out will result in extinction of not only separate species but also of whole landscape zones, such as reserved areas Kyzylkumskiy and Baday-Tugay. Such landscapes in the Amudarya river delta include areas where tugai forests grow, i.e. flood-plain forests with prevalence of woody plants. Natural complex of tugai forests with its incidental flora and fauna can be completely lost.

As a result, the damage caused by the death of Bukhara Deers and pheasants in the Amudarya floodplains only will reach US$2094.5 thos. There is a real threat of complete extinction of Bukhara Deer which uses tugai overgrowth as the only habitat.

Drought zone shall also include three national reserves: Dengizkul, Sudochie, Kara-Kir and nature's monument Yangibazar which are classified as biodiversity reserves of Uzbekistan, mainly with regard to natatorial and semi-aquatic birds. Dengizkul is an area of international importance. It is included in the International List of reservoirs included in the Ramsar Convention on protection of wetlands.

Natural reserves are of significant importance for the project on the most important ornitological territories of Uzbekistan. These reservoirs are included into the international database in Cambridge as internationally important ornitological territories compliant with the criteria defined by BirdLife International.

There are 14 hunting and fishery businesses in the Amudarya river basin: Aktepe, Cundukli, Kara-Kir, Khadicha, Zakhri, Karakul, Tudakul, Kaladjik, Amudarya, Yangiarik, Khazaresp, Dautkul, Ayatkala and Kazakhdarya.

There are 700 wild boars, 500 badgers, 300 jackals, 20000 pheasants inhabiting the hunting husbandries. These animal species are linked with water-swamped areas and are doomed to die. The damage will be at US$2323.6 thos. With the lost kindle added this amount would be multiplied by tens of times. As a result of swimming birds changing their flying routes and thus will not be subject to hunting, the state will lose hunting products worth US$5.1 thos. every year.

Changes in hydrological regime are one of the main threats to existence of the region's biodiversity. The Aral Sea's environmental crisis had negative impact on water and near-water ecosystems of the country. Further reduction in water inflow to the Amudarya lower course will aggravate the consequences of shrinked habitats for hydrofile complex and to the loss of valuable biodiversity and animal resources of Uzbekistan.

Reduced water inflow to Aral Sea region as a result of Rogun HEP commissioning will make the situation in this region catastrophic, and the consequences cannot be eliminated in the next decades.

Growing water deficit and worsened water quality resulted in reduction of tugai forest areas by 175 thos. ha, of arundinaceous growth by 570 thos. ha, of natural pasturesin the Amudarya's overflow area by 223 thos. ha, and of fish production by 50 times.

Total damage as a result of reduced tugai areas in the region will be at US$8355.5 thos..

Total damage as a result of reduced arundinaceous growth shall be US$27215.2 thos.

Total damage as a result of reduced natural pasture areas shall bUS$10647.3 thos..

Water deficit over the period when the Aral Sea was shrinking alread resulted in the loss of almost 20 fish species, reduction of bird species by 300, mammal species by 92.

Today, this region includes the Badai-Tugai and Kyzylkum natural reserves created with the main aim of preserving and increasing the population of Bukhara deer which is listed in the International Red Book and the Red Book of Uzbekistan.

Today, over 135 animal species live in these reserves, including 91 bird species, 15 mammal species, 15 fish species, and these include 5 fish species, 4 bird speciess and 2 mammal species listed in the International and National Red Books.

The limited volume of water resources inflowing to the natural reserves' territories bring the animal and plant species in the area to the edge of extinction.

Thus, overall damage as a result of reduced tugai forest areas, arundinaceous growth, natural pasture areas and of reduced and extinct rare animal and bird species is estimated at minimum US$146.5 million. However, actual losses of flora and fauna are hard to evaluate given the fact that this process is irreversible.

10 Alternatives to Construction of Rogun Hydropower Station

Development of solar and wind power generation, construction of small-scale hydropower plants, as well as implementation of comprehensive measures to reduce power consumption by applying power-saving technologies and rational power use could be viewed as alternatives to construction of the Rogun Hydropower Station.

Construction of Medium-Scale Hydropower Plants in Pamir

In 1976, the *Sredazgidroproekt* Institute (Central Asian Design Institute for Hydropower Development) had studied the conditions for hydropower development of rivers located in the area of main settlement and power consumption and issued an Observation Memorandum to the Feasibility Study for the Pamir Hydropower Station, which had been approved by the Ministry of Energy of the USSR (Protocol No.104 of September 15, 1977). The review considered Bartang, Gunt, and Shakhdara rivers. Gunt River was acknowledged as primary source of hydropower because of:

- possibility to place the projected facilities in the local center with major power consumption loading;
- existing favorable transportation links between construction sites and the rest of the Republic and Horog town, which hosts industrial enterprises that could be based on during the initial construction stage;
- existence of Yashilkul Lake with a capacity of 400 MCM in the upper reaches of the river, as the lake could be used for seasonal regulation in order to increase the firm winter capacity of hydropower stations of the Gunt cascade.

The scheme considered employment of hydroelectric resources of Gunt River within a 180-km long section from the place of Alichur River inflow into Yashilkul Lake down to the estuary of Shakhdara River, which flows into the Gunt a bit downstream of the Khorog Hydropower Station tailrace (altitude 2099.5m), i.e. within a section with altitude difference of 1620.5 meters.

The theoretical (gross) power generation potential for the considered river section (by 1980 estimate) is 5.5 billion kWh/year. It is recommended to employ Gunt River resources by means of construction of 13 diversion hydropower stations (including 12 with tunnel diversion and one with an open canal).

Increment in firm winter discharges available for power generation would be provided by drawdown of Yashilkul Lake by seven (7) meters or 145 MCM of water (during dry years). Here, the firm power generation capacity at the cascade in January (P=97.5%) increases from 84.3 to 265.9MW, i.e. by 303%, while average long-term hydropower output increases from 1.44 to 1.8 billion kWh/year.

As it is impossible to exercise daily streamflow regulation, the installed capacities of most power stations of the cascade are assumed to be close to firm winter ones. As high-water (summer) flows are many times higher than low-water (winter) ones, while summer loadings, conversely, are lower than winter ones, therefore utilization of summer flow is relatively small. Thus, for the accepted throughput capacity of tunnels, the technically usable resources of Gunt River (performance potential) for the near term are estimated as 1.8 billion kWh (i.e. 30% of the gross potential).

Smaller Hydropower Development

Tajikistan could facilitate development of renewable energy sources, the issue being as important for the country, as the construction of large-scale hydropower stations. It would be uneconomic to install high-voltage power transmission lines to remote mountain villages, which are abundant in the Republic. Therefore, smaller villages could be supplied with power generated by isolated small-scale hydropower plants (SHPP).

According to the Ministry of Energy of Tajikistan, in case of construction of small-scale hydropower plants the theoretical power generation potential of minor and medium rivers of the Republic would make over 30 million kW with annual power output about 100 billion kWh. Tajikistan had adopted a package of legislative and regulatory documents to regulate, encourage, and create preferential treatment for SHPP construction and operation

projects, the legislative package being effective nowadays. However, little progress could be seen in this regard. Development of small-scale power generation operations could significantly increase the economic efficiency and reliability of power supply, and improve the social working and living conditions in the challenging climatic environment.

Even a superficial analysis shows that employment of hydropower resources of Tajikistan would contribute to the development of national economy. Already in 1958, there had been 53 SHPPs with aggregate capacity of 12 MW operating in the Republic; by 1978, the number of constructed SHPPs was increased up to 69, their aggregated capacity being 32MW. It is unfortunate, but at that time the industry was reoriented to large-scale power generation facilities, the program for construction of SHPPs was wrapped up, and eventually only five small-scale hydropower plants remained in operation by early 1990-s.

According to the information available, at present the Agreement on Further Cooperation in Construction of Small-Scale Hydropower Plants in Rural Areas of Tajikistan between the Ministry of Energy of Tajikistani, Bangladesh Engineering Technological Services (BETS), Ltd. in cooperation with Atlanta Enterprises (both companies represent Bangladesh) and the Tajikistan *Gidroenergoproekt* Institute is being implemented. The ultimate goal of this project is to build eight more small-scale hydropower plants and to ensure reliable power supply to hard-to-reach rural communities.

Another project for development of small-scale hydropower plants in the Republic of Tajikistan was developed as part of Islamic Development Bank (IDB) program. The goal of the project is to build eleven SHPPs to ensure reliable power supply to hard-to-reach rural communities in Tajikistan.

The Tajik State Research and Design Institute *Gidroenergoproekt* has developed the following projects related to small-scale hydropower plants:

- SHPPs Tekharv and Anderbag – in Pamir;
- SHPPs Khazara-1 and Khazara-2 – in Varboz District;
- SHPP Khiztevarz – in Naus District of Sogdian Oblast;
- SHPP Kyzyl-Mazar – in Khatlon Oblast;
- SHPP Kukhiston – in Ainin District;
- Reconstruction of main hydropower installation of Varboz HPSs and Varboz HPSs cascade facilities;
- Reconstruction of hydropower installation of Vanch HPS;
- Scheme for Development of Small-scale Hydropower Operation in Staro-Matchan, Garm, and Djirgital districts in the Republic of Tajikistan;
- Employment of Hydropower Resources of Minor and Medium-scale Rivers of Gorno-Badakhshan Autonomous Region by means of Small-scale Hydropower Generation Operations.

Table 11. SHPPs to Be Constructed as Part of IDB Program

SHPP Name	Design Water Flow, m^3/s	Design Head, m	Designed Capacity, kW
Marzitch	3.0	110	2750
Shash-Boloi	0.42	29	100
Sangikar	5	16	667
Fatkhobod	1.2	52	600
Pitavkul’	3.5-5.0	21	850
Nurbakhsh	1.2	50	500
Khorma	0.96	48	360

Todzh	2.5	24.0	500
Shirkent	2.1	40	700
Andigon	3.0	12	300
Kukhiston	3.0	21	500

Along with construction of new small-scale and micro hydropower plants, there are projects on rehabilitation of the existing stations.

For example, the *GidroOGK OAO* (Russia) is working on rehabilitation of low powerhydropower statiom named for 10th Anniversary of Independence with the installed capacity of 550 kW located in the Vakhdat District of the Republic of Tajikistan some 30 km away from Dushanbe. Built in 1962, the Station was shut down and mothballed in 1990. The project envisages restoring hydro-engineering facilities, powerhouse building, diversion and discharge canals, and replacing waterpower and hydro-mechanical equipment. Commissioning of the HPS is scheduled for the Year 2009. This HPS rehabilitation project is a pilot project of *GidroOGK OAO* in development of small-scale power generation operations in Tajikistan. There are three more prospective projects on construction and rehabilitation of low power hydro-engineering facilities in Tajikistan – these are three small-scale HPPs, namely Nurbakhsh, Kysyltumshuk, and Kuibyshev, with the aggregate installed capacity over 7.5 MW.

Table 12. Abandoned and Mothballed Small-scale HPPs, Subject to Rehabilitation

No.	HPP Name	Location R=River Ch=channel	Commissioned/ Shutdown in Year	Design Flow m^3/s	Design Head, m	Installed Capacity, MW	Average annual output, long-term, GWh	No. of Units, Ea
1.	Maikhura	Maikhura R	1967/1978	0.88	85.0	0.62	2.79	2
2.	Kaznyuk	Kaznyuk R	1958/1967	0.8	107.0	0.62	3.0	1
3.	Named for XII PartS'ezd	Uzun C	1950/1966	3.0	22.0	0.53	2.54	2
4.	Named for Thalmann	Uzun C	1950/1974	3.0	22,0	0.53	2.54	2
5.	Djoi-Bor	Djoi-Bor C	1957/1977	30.0	5.0	1.2	5.04	4
6.	Khushikat	Khushikat R	1957/1968	0.5	176.0	0.52	0.55	2
7.	Shirkent	Shir R	1962/1976	5.95	40.5	0.93	4.6	2
8.	Chil'-Gazy	Isfara R	1962/1970	3.52	37.25	1.08	5.86	2
9.	Kulyali	Uretch R	1954/1978	1.9	40.0	0.6	3.3	2
10.	Named for Lenin	Gunt R	1941/1964	1.13	33.0	0.312	1.2	3
11.	Named for Kalinin	Kshtut R	1953/1967	0.25	110.0	0.23	1.03	2

Solar Energy

Geographically, being located between 36th and 42nd degrees of Northern latitude, Tajikistan lies within the sunshine zone. Average number of sunny days varies from 260 to 300; annual sunshine duration in the Republic varies from 2000 to 3000 hours, and the land surface receives some 25 billion kWh of solar power per year. Already during the Soviet times, intentions to utilize solar energy for both industrial and communal use had been quite serious. Thus, 250,000 m^2 of solar collecting panels manufactured in the town of Bratsk had been delivered to the Kurgan-Tyube Oblast only. At present, solar energy development had been included into the Draft Program for the Use of Renewable Energy Sources of the Republic of Tajikistan for the Years 2006-2015.

Potential for utilization of solar radiation is enormous. Subject to hundred percent utilization of solar energy, it is possible to gain some 170 kWh per year per one square meter of the area, which would make some 240 billion kWh per year for the entire Republic. The most promising course for Tajikistan would be to use solar energy for heat supply to communal and industrial consumers located in hard-to-reach high-mountain areas, as it is quite costly to deliver organic fuel to the areas by road.

Power-saving Technologies

Solar water heaters could be viewed as an example of power saving technology. Tajikistan enjoys over 280 sunny days per year. Water in solar collector would be heated up to 100 degrees in summer, and up to 40 degrees – in winter. This would allow a family to save up to 60 percent of electricity. The downside is that solar water heater needs stable clear water pressure, while water availability is a major problem in Tajikistan. Minimum pressure required for operation of the devices is 0.5 atmospheres, which is not provided by water distribution systems.

Ii is also worthwhile looking at low-energy house structures. In 2006, Swiss company CEEBA in cooperation with the Tajik Technical University named for Academician M. S. Osimi completed construction of a pilot building with zero power consumption as part of new public facility in Chormagzakoni Tochik village. Developers used new erection technology, thermal insulation with natural biogenic materials specific for mountain settlements, technology of simplified manufacture of porous concrete for thermal insulation of the floors. To improve thermal insulation properties of outside walls, the developers used the locally available natural materials.

In the climatic conditions of Dushanbe, it would be possible to use the passive heating construction option. Here, the outside wall structures should have adequate heat transfer factor (at least 0.3 W/m^2), floor structures should be made of a material with good storage capacity, a backup heater would be required to heat up premises during cloudy weather. If additional solar collectors and heat accumulators are available it would be possible to construct such buildings without any active heating systems.

11. Construction of Rogun HPS in the Light of International Law

Universal Conventions in the Sphere of International Water Law

Main multilateral universal conventions in the sphere of International Water Law at UN level are:

Convention on Environmental Impact Assessment in a Transboundary Context of February 25, 1991.

NB: The Convention became effective on September 10, 1997. Forty-one states are parties to the Convention. Presently, the draft Law on Uzbekistan joining the Convention is being cleared by *Goskompriroda* with the interested ministries and agencies.

Convention on the Protection and Use of Transboundary Watercourses and International Lakes of March 17, 1992.

NB: Uzbekistan had joined the Convention by the Decree of the President of the Republic of Uzbekistan No. ПП-683 of August 9, 2007. The Convention became effective for Uzbekistan on December 12, 2007.

Convention on Non-navigational Uses of International Watercourses of May 21, 1997.

NB: Uzbekistan has joined the Convention by the Decree of the President of the Republic of Uzbekistan No. ПП-683 of August 9, 2007. As per July 8, 2008 the Convention had not become effective. The document becomes effective upon deposition of 35 ratification documents.

International Documents of CACO in the Sphere of Energy Industry and Water Resources adopted by EurAsEC

Along with the conventions, there is a number of international documents of CACO adopted by EurAsEC:

Agreement between the Republic of Kazakhstan, Republic of Kyrgyzstan, Republic of Uzbekistan, Republic of Tajikistan and Turkmenistan on Cooperation in the Sphere of Joint Control over the Use and Protection of Water Resources of Interstate Sources of February 18, 1992.

NB: Since Turkmenistan is also a party to the Agreement, the Secretariat of EurAsEC Integration Committee suggested leaving the Agreement effective outside the framework of EurAsEC.

Agreement between the Government of the Republic of Kazakhstan, the Government of the Kyrgyz Republic, and the Government of the Republic of Uzbekistan on the Use of Fuel-and-Power and Water Resources, Construction and Operation of Central Asian Gas Pipelines of April 5, 1996.

NB: The Secretariat of EurAsEC Integration Committee suggested adapting the Agreement by taking account of the provisions in development of EurAsEC documents in the sphere of grouping of a common energy market for EurAsEC member-countries and efficient use of water-and-power resources of the Central Asian Region.

Agreement between the Government of the Republic of Kazakhstan, the Government of the Kyrgyz Republic, and the Government of the Republic of Uzbekistan on the Use of Water-and-Power Resources of Syr Darya Basin of March 17, 1998.

NB: The Secretariat of EurAsEC Integration Committee suggested adapting the Agreement by taking account of the provisions in development of EurAsEC documents in the sphere of grouping of a common energy market for EurAsEC member-countries and efficient use of water-and-power resources of the Central Asian Region.

Agreement between the Government of the Republic of Kazakhstan, the Government of the Kyrgyz Republic, the Government of the Republic of Tajikistan, and the Government of the Republic of Uzbekistan on Parallel Operation of Energy Systems of the Central Asian States of June 17, 1999.

NB: The Secretariat of EurAsEC Integration Committee suggested adapting the Protocol by taking account of the provisions in development of EurAsEC documents in the sphere of grouping of a common energy market for EurAsEC member-countries and efficient use of water-and-power resources of the Central Asian Region.

Protocol on Introduction of Revisions and Additions to the Agreement between the Government of the Republic of Kazakhstan, the Government of the Kyrgyz Republic,

and the Government of the Republic of Uzbekistan on the Use of Water-and-Power Resources of Syr Darya Basin of March 17, 1998, signed on June 17, 1999.

NB: The Secretariat of EurAsEC Integration Committee suggested adapting the Protocol by taking account of the provisions in development of EurAsEC documents in the sphere of grouping of a common energy market for EurAsEC member-countries and efficient use of water-and-power resources of the Central Asian Region.

Bilateral Agreements of the Republic of Uzbekistan

In addition, it is necessary to note the bilateral agreements of the Republic of Uzbekistan in this sphere:

Agreement between the Government of the Republic of Uzbekistan and the Government of the Republic of Tajikistan on Cooperation in the Sphere of Rational Use of Water-and-Power Resources of February 4, 1998;

Protocol on Cooperation in the Sphere of Rational Use of Water and Power Resources in the Year 2008 between the Government of the Republic of Uzbekistan and the Government of the Republic of Tajikistan;

Protocol between the Committee for Water Resources of the Republic of Kazakhstan, Ministry of Melioration and Water Resources of the Republic of Tajikistan, and the Ministry of Agriculture and Water Management of the Republic of Uzbekistan on Cooperation in Maximum Utilization of Water Resources of Kairakkum Water Reservoir in the Year 2008;

Agreement between the Government of the Republic of Uzbekistan and the Government of the Kyrgyz Republic on Cooperation in the Sphere of Environmental Protection and Rational Nature Use of December 25, 1996.

Agreement between the Republic of Kazakhstan, Republic of Kyrgyzstan, Republic of Uzbekistan, Republic of Tajikistan and Turkmenistan on Cooperation in the Sphere of Joint Control over the Use and Protection of Water Resources of Interstate Sources.

Article 1 of the **Agreement between the Republic of Kazakhstan, Republic of Kyrgyzstan, Republic of Uzbekistan, Republic of Tajikistan and Turkmenistan on Cooperation in the Sphere of Joint Control over the Use and Protection of Water Resources of Interstate Sources (Almaty, February 18, 1992) (further referred to as Agreement of Feb. 18, 1992)** says, “Recognizing community and integrity of water resources in the region, the Parties shall have *equal rights for the resource use and equal responsibility* for providing rational use and protection”.

Further, Article 3 of the Agreement says, “Each Party to the Agreement *undertakes* to prevent any activities on its territory that could affect the interests of other Parties and *cause damage to them*, result in change of the agreed discharge volumes, and pollute the water sources”.

Article 4 of the Agreement specifies, “The Parties *undertake* to work jointly on resolution of environmental problems associated with shrinkage of the Aral Sea, as well as to establish the volumes of sanitary releases for each specific year basing on water content in the interstate sources”.

In addition, Article 13 of the Agreement contains a provision, stipulating that, “All matters of dispute are to be resolved by the leaders of water management authorities of the republics with involvement of a representative of a disinterested party on an as needed basis”.

Along with this, it is necessary to note the following relevant provisions of the preamble of the Agreement:

- "*following the necessity in the concerted and organized resolution of the issues related to joint control over water resource of the interstate sources*…" (Par. 2 of the preamble);
- "*recognizing the inextricable dependence and interconnection of the interests of all republics* in resolving the matters of joint water use, and equitable regulation of water consumption based on the principles common for the entire region" (Par. 4 of the preamble);
- "considering that *only integration and joint coordination of activities* would contribute to development of favorable conditions for solution of socio-economic problems, would allow mitigating and stabilizing the environmental tension resulting from depletion of water resources…" (Par. 5 of the preamble).

In this regard, it would be appropriate to note that Article 26 (*Pacta sunt servanda)* of the Vienna Convention on the Law in International Treaties of May 23, 1969, specifies that, "Every effective agreement is binding to the parties and must be performed by them in good faith".

According to Article 31 of the Convention, for the purpose of interpretation of international treaties, the preamble provisions are to be taken into account along with the articles.

This way, following the listed above articles of the Agreement of Feb. 18, 1992, and basing on the content of the preamble it could be concluded that the parties to the document recognize the necessity in concerted and organized resolution of matters related to joint control over water resources from interstate sources, as wells as the inextricable dependence and interrelation of interests of all the republics in this sphere, and their equal rights and responsibilities.

Furthermore, they have voluntarily undertake the obligation to prevent any actions on their territories that could affect the interests of other Parties and cause damage to them, as well as to work jointly to ensure rational water use and protection of water resources.

Universal and Regional Declarations

At the same time, there are a number of **universal and regional declarations** (to which both, Republic of Uzbekistan and Republic of Tajikistan are parties), where the parties have specified protection of human environment including water resources as an imperative goal of the humanity.

For example, the Principle 21 of the UN Stockholm Declaration of June 16, 1972 says, " States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and ***the responsibility*** *to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States* or of areas beyond the limits of national jurisdiction.

Furthermore, the Declaration states "To defend and improve the human environment for present and future generations has become *an imperative goal for mankind - a goal* ***to be pursued together*** *with*, and in harmony with, the established and fundamental goals of peace and of worldwide economic and social development" (Clause 6), and that "Local and *national governments* ***will bear*** *the greatest burden for large-scale environmental policy and action within their jurisdictions*".

The Stockholm Declaration Principle was further developed and reconfirmed in Principle 2 of Declaration on Environment and Development of June 14, 1992 adopted by the UN Conference on Environment and Development in Rio de Janeiro, which states, "Pursuant to the UN Charter and the International Law Principles, States have sovereign right to develop their own resources in accordance with their own environmental and development policies and ***are responsible for ensuring*** *that the activities within their jurisdiction or control* ***do not cause damage to the environment of other States*** *or regions beyond the limits of national jurisdiction*.

In addition, Principle 19 of the Declaration reads, "Governments shall send to the potentially affected countries *advance and timely notices* and relevant information on activities that could have significant negative *transboundary consequences and shall hold consultation* with these countries at the early stage and in the spirit of goodwill.

Although the mentioned above norms had been stated in declarations, still their significance lies in the fact that most countries acknowledge them and agree to them. When implementing international relations, government used to refrain from the steps that would contradict to such principles. This could be viewed as establishment of broadly acknowledged principles at the level of international community. For this reason, the principles had acquired not only powerful and undeniable spirit, but also the force of rules of customary international law, and have found their expression in universal conventions on water resources codified by the UN Commissions.

Wording like "*have responsibility*" or "*are responsible to ensure*" do also emphasize that these principles have the power of customary international law and are binding to the states.

This is the case for the Central Asian countries, since principles of the said declarations are concordant with the goals stated in a number of regional declarations adopted by the five Central Asian states in addressing the environmental and socio-economic crisis in the Aral Sea basin.

In addition, Article 3 of the Agreement of Feb. 18, 1992 where each of the parties undertakes to prevent any activities on their territory that could affect the interests of other parties and cause damage to them, is a *de facto* reflection of one of such principles of customary international law, which is "Cause no damage to the environment of other countries".

In the Nukus Declaration adopted at the International UN Conference on Sustainable Development of the Aral Sea Basin on September 20, 1995, the Parties have declared "complete support to international agreements, in particular *the Declaration on Sustainable Development* (Rio de Janeiro, 1992), the World Charter of Nature, international conventions on desertification control, on global climate change, on biodiversity conservation, and on *protection of transboundary watercourses*".

As can be seen from the above, the parties have declared their support openly and clearly, and therefore their concordance with the fundamental principles of *the Declaration on Sustainable Development* (Rio de Janeiro, 1992) and *international conventions on the protection of transboundary watercourses*.

As reported above, the main principle of the Declaration on Sustainable Development is the principle of *causing no damage to the environment of other states* (Principle 2) and the principle of *sending to the potentially affected countries advance and timely notices* and relevant information on activities that could have significant negative transboundary consequences and *holding consultation* with these countries at the early stage and in the spirit of goodwill (Principle 19).

In the **Almaty Declaration** of February 28, 1997, the Heads of Central Asian States have recognized that, "water management in transboundary watercourses should be based on ecosystems approach and should be carries out in *an equitable and reasonable manner, causing no mutual damage*…"

The **Dushanbe Declaration** of October 6, 2002 the Central Asian States have reconfirmed the earlier decisions on comprehensive use and protection of water resources of the Aral Sea basin *with due account of the interests of all countries in the region* and observation of good neighborhood and mutual respect principles.

As indicated above, the parties to the **Nukus Declaration** supported the international conventions on protection of transboundary watercourses, one of them being the **Convention on the Protection and Use of Transboundary Watercourses and International Lakes of March 17, 1992,** according to which (Clauses a, b, and c of Article 2) the parties shall take all necessary measures to:

- prevent, restrict, and reduce water pollution, which has or may have transboundary consequences;
- ensure the use of transboundary waters for the purpose of environmentally substantiated and rational water management, conservation of water resources, and environmental protection;
- ensure the use of transboundary waters in a reasonable and equitable manner, taking into account their transboundary character, when carrying out activities that have or might have transboundary impact.

Convention on Non-navigational Uses of International Watercourses of May 21, 1997

Along with it, Part II of the Convention on Non-navigational Uses of International Watercourses of May 21, 1997 reflects the main principles and standards of behavior of States in terms of transboundary water use, such as equitable and reasonable use and participation (Article 5), obligation not to cause significant damage (Article 7), general obligation to cooperate (Article 8), regular exchange with data and information (Article 9).

This Convention is a result of almost 30-year long work of the International Law Commission of United Nations on progressive development and codification of international law in the sphere of non-navigational uses of international watercourses. Fundamental principles of the Convention find cognizance in practice and in statements made by the states (including the Central Asian ones), reflect their common interests and, with no doubt will have actual and potential influence on development of international water law and the content of future interstate agreements in the sphere.

These considerations are confirmed by the fact, that principles of the Convention of May 21, 1997 are being supported by provisions of universal declarations of United Nations, regional declarations of Central Asian states, as well as the Agreement of Feb. 18, 1992.

Principles of the Agreement of Feb. 18, 1992 not only concord with the provisions of the mentioned international documents, but even further develop them within specific geographical and historical contexts.

Preamble of the Agreement states, that the Parties adopt the Agreement following the necessity in concerted and organized resolution of matters related to joint control over water resources from interstate sources and for the purpose of further implementation of coordinated policy to promote economic development and improvement of living standards of population. This means that any unilateral steps without consultations and negotiations with other Parties would be inadmissible.

Conclusion

The expert review of legal grounds and existing risks resulting from construction of Rogun Hydropower Station had shown the following:

1. **Engineering design documents for the construction of Rogun HPS at present are being developed in violation of international rules (norms).** Pursuant to Article 12 of the Convention on Non-navigational Uses of International Watercourses, "prior to implementing or authorizing implementation of planned activities that could have significant negative consequences for other watercourse states, one watercourse state shall notify other watercourse states in a timely manner about the planned activity. Such notification shall be accompanies with technical data and information, including the results of any environmental expert assessment, so that the notified states could assess the possible consequences of the planned activities.

   Similar requirement is contained in the International Convention On the Impact of Hydropower Production on other States, which says, that if it is possible that hydropower development causes serious damage to any of the member-states, then the interested state should initiate negotiation with the purpose to come to and Agreement that would allow implementing such development.

   Clauses 4, 5, and 7 of the Operating Policy of the World Bank Projects on International Watercourses OP 7.40, dated October 1994, specify the entire mandatory procedure for coordination of such projects with the interested countries.

   However, the Tajik Party is implementing engineering design and construction of the Rogun HPS without any information exchange or consultations with the transboundary states, without any negotiations on the use of transboundary water resources, as well as without adoption of all necessary measures to prevent significant damage to other watercourse states.

   The said rules must be observed even though the Republic of Tajikistan is not a party to the Convention of Protection and Use of Transboundary Watercourses and International Lakes of March 17, 1992, and the Convention on Non-navigational Use of Transboundary Watercourses of May 21, 1997, since their refraining from signature of the said Conventions and from implementation thereof do not exempt the Republic of Tajikistan from the fundamental principles of universal international documents, which at present have acquired the nature of norms of customary international law.

   Furthermore, the obligation to follow the fundamental principles of international law with regard to transboundary rivers appears from the Agreement between the Republic of Kazakhstan, Republic of Kyrgyzstan, Republic of Uzbekistan, Republic of Tajikistan, and Turkmenistan on Cooperation in the Sphere of Joint Control over the Use and Protection of Water Resources of Interstate Sources (Almaty, February 18, 1992).

2. Amu Darya has a mixed snow-and-glacier-derived feed with a **natural runoff hydrograph that plainly matches to the irrigation needs**, when maximum (77-80%) of consumption falls on April through September, and minimum (20-23%) – on October through March periods.

   At the same time, analysis of filling and drawdown of the Nurek Reservoir throughout the years of operation had shown that during the last years it had been filled during the vegetative season, thus reducing the household effluent

by 3.5 km3 per year on the average (maximum by 4.85km3, and by 4.36km3 in 2000), while reservoir drawdown (in almost all years) was mostly performed during non-vegetative period. Here, the water released in winter (as could be seen from operational practice in 2000) sometimes could not be contained in Tuyamouyun Reservoir. The situation may become even worse if the Rogun Hydropower Installation is built.

Initially, the Rogun Reservoir was designed to perform long-term regulation of Vakhsh river runoff together with the Nurek and Tuyamouyun reservoirs, and was intended to serve irrigated farming in the middle and lower reaches of Amu Darya. However, as could be seen from the Terms of Reference for Assessment of Environmental and Social Impact of the Rogun HPS developed by the Tajik Party together with the World Bank, it is envisioned to operate the Rogun Reservoir in a hydropower production mode with subsequent supply of generated electricity to Pakistan. Here, the mentioned Terms of Reference considers environmental impact of the project predominantly within the project area.

Experts consider that such approach would result in man-caused change in natural runoff during the flooding period and vegetative season in the lower reaches; runoff pattern would be considerably changed and would become dependent on water discharges from the upstream water reservoirs, i.e. the change would be to the detriment of vital interests of downstream countries.

3. In case of transition of the Rogun Reservoir to hydropower production regime, water shortage during vegetative season would increase by 22% on the average (from 4.5 to 5.5 km^3/year), while on some low-water years the increase could be two-fold (the shortage would vary from 5.6 to more than 10 km^3) as compared to present conditions.

   If Rogun is run in hydropower production regime, the number of years with intermittent water availability would vary from 12 to 23 within a 50-year period. In worst-case scenario, when each basin state would implement its own national water consumption regime, the number of intermittent water availability years would vary from 28 to 39.

   Along with the change in hydrological regime in the middle and lower reaches of Amu Darya, overregulation of flood flows during low water years would cause increased deposition of sediments on Amu Darya riverbed thus reducing its throughput capacity and increasing channel losses up to 20 – 30% as compared to current 10 – 15%. **During low-water years, the runoff shortage and decrease in storage volume of reservoirs would result in hydrological drought, i.e. to reduction of soil moisture content and decline of groundwater level.**

4. **Present seismic-and-tectonic setting shows that the area for construction of the Rogun HPS had been picked very unfavorably. The poorly thought-out decisions may result in considerable material expenses and human casualties in the future**, because:

   A) The area selected for construction lies within the Iliak-Vakhsh Fault, which extends for more than 500 kilometers. The fault has thrust morphology with earth layers' lateral movement amplitude varying from 1300 m to 10 – 12 km, while vertical movement amplitude reaches up to 2 – 4 km. Seismically, the fault zone is known to be seismically hazardous with highest density of epicenters of middle magnitude

earthquakes. The earthquake sources are distributed over the entire crust with near-vertical dip northwards. The depth of seismogenic layer is about 20 km, the possible earth tremor intensity is 9 and more points. Category I Gissar-Kokshal Fault, also has both direct and indirect relation to seismic hazards of the Rogun HPS construction area. The fault stretches in parallel to the Iliak -Vakhsh Fault and has the highest seismic activity as compared to other areas of Tajikistan, M>6.5. It was this area, where such catastrophic earthquakes as Karatag (1907), Sarez (1911), and Khait (1949) had emerged.

Construction of a monolithic dam in this seismically active zone could provoke new earthquakes.

B) Construction of a reservoir would activate the current physical-and-geological processes and result in transformation of the shoreline, and waterlogging of adjacent areas.

C) For a number of reasons, construction of hydropower installation was carried out with significant deviations from design solutions. According to the available information, during exploitation of tunnels there appeared all kinds of damage of steel lining, reinforced concrete encasement, and rock, typical resulting from continuous impact of a turbulent flow containing abrasive materials (dissipations, washouts, and dynamic and pulsation fracturing). Presently, inrushes occurred in both construction tunnels, which had completely shutoff of the clear opening.

The underground powerhouse hall, unique by its dimension was build to the height of 35 m, while the design height was 78 m. Within the period of 18 – 20 years after construction, the walls had been displaced by 300 – 320 mm in sandstone, and by 450-470mm in siltstone, thus witnessing insufficient consideration of mining and geological conditions, and primarily the stress condition of rock mass. This constitutes a high risk of destruction of installations of the hydropower installation under the influence of physical-and-geological processes.

D) Complexity of geological conditions and high seismic activity in the area of construction of the Rogun HPS constitute a high risk of washout and failure of the dam, and overflow of water contained in the reservoir. The risk remains both during construction and at different startup stages. Because of high vulnerability and simple unavailability of discharge facilities and mudflow protection, there is a risk of destruction of facilities by a mudflow (like the one that occurred in 1988) already during construction stage.

Another risk item is a salt formation, which lies in the foundation of the dam, some 25 – 30 meters below the river bank line and almost outcrops to the surface at the site of intake portals of construction tunnels. If mudflow protection activities are suspended for a relatively short period of time (for either objective or subjective causes), irreversible processes of salt dissolution by seepage flow coming from the head reach of the installation would take place in the foundation of the dam, thus resulting in destruction of the facility.

Since it is intended to use the reservoir for power generation purposes, and since power generation would depend on water head attained, it is

likely that the reservoir would be filled following an accelerated procedure, and this could induce an increase in seismic activity.

5. **Destruction of waterfront of the Rogun HPS dam in case of an earthquake would result in formation of a outburst wave with a flow of 2.35 to 1.56 MCM/s** (depending on the reservoir filling) **at the site of outburst.**

   The wave would reach hydropower installations of the Vakhsh cascade (Nurek, Baipaz, Sangutdin Nos 1 and 2, and Golovnaya (Main) HPS) located downstream of Rogun HPS within 2 hours after destruction of the Rogun dam. The wave would be high above the crest thus causing their complete and practically instantaneous destruction.

   If the Rogun reservoir is completely filled up, the outburst wave would flood and destroy all large and small hydropower installations on its way: the entire cascade of Vakhsh HPSs (6 hydropower installations), water intake facilities of channels (of Vakhsh, Karakum, Amu-Bukhara, Karshi, Amu-Karakul, Tamsakii, Bairamsakii, and other channels), highway and railroad bridges, gas pipeline crossings, etc. Some 700 settlements are completely or partially located within this area, including Nurek (40,000 persons), Sarband (>12,000), Kurgantube (>61,000), Termez (126,000), Mukry (11,000), Kerki (20,000), Urgench (136,000), and Nukus (263,000).

   In case of reservoir dam failure, large populated areas of Tajikistan, Uzbekistan, Turkmenistan, and Afghanistan would be flooded. The total affected area would be 69 thousand km^2, the territory being inhabited by approximately 5 million people, including some 3 million people in Uzbekistan (approx. 190 thousand in Surkhandarya Oblast, ~2 thousand in Bukhara Oblast, ~1.3 million in Khorezm Oblast, and ~1.5 million in the Republic of Karakalpakstan).

   According to the estimates of worst-case scenario, the outburst wave could reach the borders of the Republic of Uzbekistan in 30 hours, Termez – in 35 hours, Tuyamouyun Hydropower installations– in 100 hours, Nukus – in 124 hours, and Kungrad – in 138 hours.

   If the reservoir is filled up the outburst wave would surpass the level of Amu Darya in Termez by 11-12 meters, near Tuyamouyun Hydropower installations – by up to 5 meters. The flood zone could extend up to 14 meters to the North of Amu Darya, while the depth of flood water would vary from 3 to 7 meters depending on the topography.

   In case of Rogun HPS dam failure the flood would reach some industrial facilities that use virulent poisonous substances in their manufacturing processes, mostly chlorine and ammonia (e.g. the Kungrad Alkali Works, dyeing shops of textile works, etc.).

6. The Rogun HPS area is known for active manifestation of recent physical-and-geological processes. Intensive physical weathering increases contrast of the topography because of different weathering of rock lithotypes and denudating activity of water streams. Severely dissected topography has high latent energy realized in the form of rockfalls, landfalls, landslides, and mudflows, which would not only cause damage to the nearby Tajik settlements and the population, but also impair safe operation of the reservoir, thus posing a threat to the downstream countries in case of dam failure. For example, speaking about landslides it is necessary to note a large 900MCM landslide sitting in the lower pool of the facility.

7. Personnel strength, availability of equipment and technology, and professional training of Civil Defense and Emergency Service staff of the Republic of Tajikistan would not capable to ensure safety and rapid elimination of man-caused accidents and natural disasters within the Rogun HPS area.

8. **Unscheduled intensive winter discharges to Amu Darya in winter would result in land deterioration in the lower reaches of the river**.

   If large quantities of water are discharged from the reservoir along with temperature fall in winter, formation of slush and ice, ice jams and ice blocks in the lower reaches of Amu Darya would cause flooding. Discharges to Amu Darya resulting from operation of the Rogun Reservoir in hydropower generation mode during the freezing period may cause flooding of lands near the river, including pastures, water wells, roads, settlements, etc.

   During the last years, such situations used to occur in the Syr Darya basin. In case of Amu Darya, because of naturally higher water content, the consequences would be of a different scale, as seen in 2008 when considerable land areas, bridges and road communications on the Turkmen territory had been flooded.

   Abrasion of Amu Darya riverbed in the lower reaches, natural disasters, such as floods, waterlogging of populated areas, drift of fine soil from the irrigated lands (soil ablation), increasing head of ground and underground waters due to rising river water level, waterlogging in winter – all these would affect the possibility of efficient soil flushing (because of water table rise), and cause destruction and silting of collectors thus leading to deterioration and loss in land productivity because of salinization.

9. **Reduced water flow in summer would affect the hydrochemical regime and salinity of river water, which consequently will cause accumulation of salts within the irrigated territory.**

   Irrigated lands withdrawn from agricultural use (wasted because of lack of irrigation water) would accumulate salts. Salt accumulations on the unused residual soil in the lower reaches of Amu Darya (on an area of up to 500 thousand ha) in the course of time would turn into puffy solonchaks, and then the salts would be spread all over the area by the wind thus aggravating the already unfavorable state of environment and land reclamation in the region.

   In case of perennial recurrence of the situation in Amu Darya basin (unnecessary excessive water in winter and heavy shortage of water in summer), the magnitude of deterioration of soil and its fertility would be increasing and could eventually lead to a new environmental catastrophe – loss of arable farming in the lower reaches of Amu Darya. It would hardly be possible to reclaim the lands (over 200 thousand ha) withdrawn from agricultural use after their deterioration.

10. Reduced runoff in the lower reaches of Amu Darya and decreased water discharge to the Aral Sea would cause further desertification and change in temperature regime. Summer months would become hotter; temperature growth combined with water scarcity would result in discontinuation of any agricultural activity and expansion of desertification areas. Winter months would become colder.

Climatic conditions in the lower reaches of Amu Darya would become not only practically inappropriate for living, but also detrimental for flora and fauna of the entire region.

11. Because of land deterioration, only direct damage from loss of grain and cotton yields, losses of related processing industries and lost fish resources is estimated to be almost **US$20.6 billion**, or more than **US$4.1 billion** per year on the average. The said amount does not account for loss of crops other than grain and cotton.

    Decrease in cultivated areas and reduction of yields would adversely affect incomes, living standards, and the survivability of more than 12 million people in Uzbekistan and 6 million people in Turkmenistan.

12. The total damage caused by reduction of the areas covered by riparian woodlands (*tugai*), reeds, natural pastures, reduction and extinction of rare animal and bird species is estimated to be **US$146.5 million** as a minimum, however the real losses incurred by flora and fauna can not be estimated as they would be irretrievable.

13. Construction of the Rogun Reservoir and operation of it in hydropower production regime would result in sharp deterioration in potable water supply to some 18 million persons residing in the lower reaches of the river. During dry and low water years, which would be typical, it would be impossible to accumulate fresh water in the Kaparas reservoir. During the periods of reduced runoff, water salinity in the river would increase thus affecting the health of population consuming this water. Salinity of Amu Darya waters would cause deterioration of groundwater sources of potable water, as they are fed by the surface waters. This would pose the threat of complete incapacitation of local water sources located in the lower reaches of the river and the channels for potable water supply, thus implying major costs associated with construction of new water intakes facilities in remote locations and increasing the spread of water distribution network.

14. Alternative to the Rogun HPS would be construction of small-scale hydropower plants on inner rivers of Tajikistan with the use of smaller daily storage reservoirs, which would have no adverse impact on environmental situation and human life.

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Republic of Uzbekistan calls for all international organization to take into account the most severe environmental, social, and economic losses, which, in case of construction of the Rogun HPS, would be incurred by the countries located downstream of Rogun, high degree of hazard to which the lives of some 25 million of people of all the downstream countries would be exposed in case of failure of the reservoir located in a most unsafe seismic zone.

Here, it should be taken into consideration ***that actions taken by the Tajik Party with regard to engineering and construction of the Rogun Hydropower installations already come into serious antagonism with the international law***, as they ignore the following provisions of international legal documents:

A) Principle 2 of the Rio de Janeiro UN Declaration on Environment and Development, June 1992, stating that ”Pursuant to the UN Charter and the International Law Principles, States have sovereign right to develop their own

resources in accordance with their own environmental and development policies and are responsible for ensuring that the activities within their jurisdiction or control do not cause damage to the environment of other States or regions beyond their national jurisdiction"'

B) Article 7, Par. 1 of the Convention of Non-Navigational Uses of International Watercourses, 1997, requiring that "watercourse states when making use of international watercourse on their territory should take all necessary measures to prevent causing significant damage to other watercourse states";

C) Article 2 of the UN Convention of Protection and Use of Transboundary Watercourses and International Lakes, 1992, stating that "states shall take all necessary measures to prevent, restrict, and reduce any transboundary impact";

D) Article 5, Pars. c) and d) of the Protocol on Water and Health Problems as part of the UN Convention on Protection and Use of Transboundary Watercourses and International Lakes, 1992, which stipulates that states "shall be responsible to ensure that activities within their jurisdiction or control cause no damage to environment of other countries or areas beyond the limits of national jurisdiction" and that "water management is carried out in such a manner that the needs of present generations are satisfied with no prejudice to the possibility of future generations to satisfy their own needs".

Taking into account that project implementation is associated with lobbying of strategic regional interests of major shareholders of the World Bank, Government of Uzbekistan requests to conduct a truly independent international expert assessment of environmental an social impact of the Rogun Hydropower Installation not only within the project area, but also with due consideration of downstream countries, and with involvement of such world renown institutions as UNDP Global Environmental Facility, United Nations Environmental Program (UNEP), UNDP Bureau for Development Policy, International Center for Agricultural Research on Dry Areas (ICARDA), Intergovernmental Panel on Climate Change (IPCC), and International Union for Conservation of Nature.

WORLD BANK

MANAGEMENT RESPONSE TO

REQUEST FOR INSPECTION PANEL REVIEW OF THE

TAJIKISTAN ENERGY LOSS REDUCTION PROJECT

(IDA Credits 40930-TJ and HI7S0-TJ)

Annex 6

List of Invitees and Attendees to Dushanbe Consultations (May 2010)

November 22, 2010

Republic of Tajikistan, Dushanbe, May, 20, 2010 г.
Kayon Hotel, Bokhtar str., 7

List of participants of the National Workshop on public awareness and consultations on planning social and environmental assessment, on design and quality of Rogun HPES

№	Name	Organization, position, contact details
1	Arifov Kh.O.	Head of Department, Agency on geology "Tajikglavgeologiya", 907704828
2	Blagoveshenskaya S.T.	NGP «Fund Kuhiston», 919054496
3	Alikhanova T.Kh.	Central Asia experts network on sustainable development
4	Saidov I.I.	Director of the Tajik Scientific Centre on water resources management, Committee on environment protection under the Government of Tajikistan
5	Rahmatillaev R.R.	Professor of the chair of hydromeliorative system operation, Tajik Agrarian University, 981012608
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7	Begmuradov B.N.	Deputy director of the "Bars Consulting" firm; NGO "World harmony", 2274758
8	Babadjanova M.P.	Director, Tajik Branch of the Regional Environmental Centre of Central Asia (CAREC); 2215588
9	Kamilova L.N.	Director Assistant, Tajik Branch of the Regional Environmental Centre of Central Asia (CAREC); 2215588
10	Vorsin S.	NGO «Tarakkiyot" (BIC)
11	Petrov G.N.	Researcher, Academy of sciences, Tajikistan
12	Rohimov Sh.	NGO «Fund of civil initiative support»
13	Mansurov T.	NGO «Fund of civil initiative support»
14	Ulmasov D.R.	Chief Editor, Mass-madea, newspaper "Business and policy»
15	Tolibov F.Z.	First Chairman Deputy of Rogun
16	Dahmardaeva D.	Chairman of Village Council, jamoat Sicharog
17	Bobokalonov K.	Head of the environment protection department, Rogun
18	Choilobov A.	Chairman of the jamoat of Obigarm village, Rogun, г.Рогун
19	Belickaya T.	Mass-media, newspapaer "Folk newspaper (Narodnaya gazeta)»
20	Bobojonov R.M.	Public Sector Reform Project under the Executive Apparatus of the President of the Tajikistan; 918500090
21	Dadobaev D.S.	Tajik Branch of the Regional Environmental Centre of Central Asia (CAREC); 2215588

22	Usupjanov F.	Ministry of economy development and trade, Tajikistan
23	Abdulapieva Z.	Asian Development Bank office (ADB) in Tajikistanb
24	Kamarova M.	OSCE representative office (Bureau) in Tajikistan
25	Dzutceva G.	Mass-media, newspapaer «Vechernii Dushanbe (Tonight Dushanbe)»
26	Ergashev M.D.	Pamir-Alai Land Management Project, European Comission
27	Jali8lov M.N.	«Bakki Tojik», Technical Director
28	Jomakhmedova G.Kh.	«Barki Tojik»
29	Soliev S.K.	UNDP, Expernal affairs Advisor
30	Buzrukov J.J.	Tajik Branch of the Scientific-Information Centre of the Inter-government Commission on Sustainable Development
31	Dubinina L.	Mass-media – Information Agency “Hovar”, 2232335
32	Maskaeva N.	NGO «Tajik Environmental Fund»
33	Akhmedov R.	Tajik Scientific Centre on water resources management, Committee on environment protection under the Government of Tajikistan
34	Kamolitdinov A.	Tajik Agrarian University
35	Latipov R.B.	Majlisy namoyandagon (Parliament of Tajikistan), Chairman of the Environment Comission under the Majlisy namoyandagon (Parliament)
36	Illarionova F.	NGO «Nature Protection Group”
37	Berdiev B.	NGO «DEPAS”»
38	Jalilov A.U.	Ministry of agriculture, Tajikistan
39	Blagoveshenskyi Ya.	Agency «Tajik oil»
40	Saidov A.S.	Institute of zoology, Academy of sciences, Tajikistan

List of invited organizations by official letters, phone, networks of CAREC to the National Workshop on public awareness and consultations on planning social and environmental assessment, on design and quality of Rogun HPES

Dushanbe, May, 20, 2010 г.

Kayon Hotel, Bokhtar str., 7

Name	Organization, position, contact details
Rogun Representatives	
Tolibov F.Z.	First Chairman Deputy of Rogun
Dahmardaeva D.	Chairman of Village Council, jamoat Sicharog
Bobokalonov K.	Head of the environment protection department, Rogun
Choilobov A.	Chairman of the jamoat of Obigarm village, Rogun, г.Рогун
Governmental organizations	
	«Barki Tojik» (6 invitations)
	Committee on environment protection under the Government of Tajikistan
	Ministry of energy and industry,
	Ministry of melioration and water resources,
	Ministry of economy development and trade, Tajikistan
	Ministry of agriculture,
Arifov Kh.O.	Agency on geology “Tajikglavgeologiya”
	Ministry of public labor and social defense
	Ministry of justice
	Ministry of finances
	State Committee on land administration, cartography and geodesy
	State Agency «Tajik oil»
Parliament	
Latipov R.B.	Majlisy namoyandagon (Parliament of Tajikistan), Chairman of the Environment Comission under the Majlisy namoyandagon (Parliament)
Scientific and Education organizations	
	Academy of sciences of Tajikistan
	Tajik Agrarian University
	Tajik National University
Local NGO*	
Blagoveshenskaya S.T.	NGO «Fund Kuhiston»
Skochilov Yu.	NGO “Youth Ecological Centre”
Alikhanova T.	Central Asia experts network on sustainable development
Alikhon Latify, Head of NGO environmental club	Director of the “Bars Consulting” firm
Vorsin S.	NGO «Tarakkiyot” (BIK representative)
	NGO «Fund of civil initiative support»
	NGO «Tajik Environmental Fund»
	NGO «Nature Protection Group”
	NGO «DEPAS”»
International and Regional organizations	
	World Bank office in Tajikistanb
	Asian Development Bank office (ADB) in Tajikistan
	OSCE representative office (Bureau) in Tajikistan
	European Commission representative office

	World Bank Office in Tajikistan
	ACTED
	EBRD
	UNDP
	Pamir-Alai Land Management Project, European Comission
	Tajik Branch of the Scientific-Information Centre of the Inter-government Commission on Sustainable Development
Mass-media	
	Mass-media, newspapaer «Vechernii Dushanbe (Tonight Dushanbe)»
	Mass-media, newspapaer “Folk newspaper (Narodnaya gazeta)»
	newspaper “Business and policy»
	Mass-media – Information Agency “Hovar”, 2232335

*All environmental NGOs and members of climate change, green-club networks, are additionally informed through the mentioned networks, including CAREC TB mailing, and by kind help of Sergey Vorsin – BIK representative.