

ENVIRONMENTAL COMPLIANCE FACESHEET

**Program / Activity Number/SO:** Strategic Objective 1.6  
**Country/Region:** Central Asian Republics: Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan

**Activity Titles:**

1. AgFin+ (\$3,248,269)
2. Water User Associations Assistance Programs (WUASP); (\$8,970,155)
3. Regional Energy Market Assistance Program (REMAP) (\$3,698,807)

**Funding:** FY2005 – FY2007  
**Resource Level(s)/Amount(s):** \$15,917,231 million

**IEE Prepared By:** Ken McNamara, Mission Environmental Officer, USAID/Almaty  
 Date: September, 2005

**IEE Amendment?** Yes  No  **Date of Original IEE:**

**Environmental Media and/or Human Health Potentially Impacted** (check all that apply):  
 Air  Water  Land  Biodiversity (specify)  Human health  Other  None

**Environmental Action(s) Recommended** (check all that apply):

- 1. *Categorical Exclusion(s)*
- 2. Initial Environmental Examination:
  - Negative Determination:* no significant adverse effects expected regarding the proposed activities, which are well defined over life of activity. IEE prepared:
    - With conditions (special mitigation measures specified to prevent unintended impact)

**SUMMARY OF FINDINGS:**

Based on the environmental review presented in this IEE, the following determinations are made:

**1. A Categorical Exclusion** is recommended for all of the AgFin+ and REMAP activities with the exceptions noted in the following sections of the IEE; and those components of the WUASP which consist of training and technical assistance in policy reforms in the irrigation agriculture sector.

The proposed activities as identified above are entirely within the classes of action(s) cited in Title 22 of the Code of Federal Regulations (CFR) Section 216.2, (Applicability of Procedures) paragraph (c)(2), [22CFR216.2(c)(2)] and therefore, are categorically

excluded. Pursuant to 22CFR216.2(c)(3), the originator of the proposed action has determined these activities are fully within the following classes of action:

- The action does not have an effect on the natural or physical environment [22CFR216.2(c)(1)(i)]:
- Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (such as construction of facilities etc.). [22 CFR 216.2(c)(2)(i)].

**2. A Negative Determination with Conditions** (22 CFR 216.3(a)(2)(iii) is recommended for physical interventions under WUASP. These activities include the installation of flow measuring devices in irrigation canals, equipment installation and/or handovers, and small scale irrigation infrastructure repairs.

The conditions presented in this IEE are intended to make certain that these activities will be implemented and monitored by the prime contractor Winrock International. This will be carried out in conjunction with its local partners, in a manner, which ensures that they have no significant environmental impacts.

There are, however, some components of the proposed interventions in the irrigation systems which, unless carefully identified as impacts on the environment (physical, biological and social-see Appendix B, Leopold Matrix), properly mitigated during implementation using Standard conditions (Appendix A); and monitored as baseline environmental condition before activity implementation as well as following construction or repairs, could potentially result in significant adverse environmental effects. These impacts could be both direct or indirect [see 22 CFR 216.6 (c ) (5)-Environmental consequences]. This approach does not relieve the implementer from considering and/or identifying during documenting baseline conditions at a particular site, the cumulative effects of past actions which require analysis and a concise description of present effects. This consideration of past actions need only be to the extent that they are useful in analyzing whether the foreseeable effects of the agency funded actions and its alternatives may have a continuing additive and significant relationship to those effects.

Potential environmental impacts of the planned activities shall be mitigated by adopting the measures detailed in Section 4.0 of this IEE. The contractor, through the use of the attached Leopold Matrix or similar tools will review the environmental consequences of these demonstration projects and recommend mitigation measures before an activity is begun. Once impacts have been identified, the implementer will use the applicable/appropriate Standard Conditions criteria as provided by the Bureau Environment Officer (Appendix A). Their report will determine whether an environmental assessment of any specific demonstration model is warranted and will provide full environmental assessments for those demonstration models that require one. It is anticipated that these activities will not require environmental assessments in that they entail modification or retrofitting of already existing equipment, are very small in scale, and/or are meant to mitigate previous environmental failings. The Contractor will be trained to use the Standard Conditions criteria to mitigate environmental impacts and

they will have a memo to the file for each activity implemented which will describe the project and mitigation measures taken as well as before and after site photos.

This IEE does not cover activities involving assistance for the procurement (includes payment in kind, donations, guarantees of credit) or use of pesticides or activities involving procurement, transport, use, storage, or disposal of toxic materials, which will require an amended IEE submitted to EE/BEO for approval.

In addition, appropriate actions will be taken by the implementers on addressing public participation aspects in accordance with the 22 CFR 216.3 and 216.8 requirements.

This IEE does not include construction or reconstruction activities beyond those identified for irrigation canals. If AgFin+ activities are to work with or support Agro-processors, Environmental Due Diligence reports will be required of their facilities requiring an amendment to IEE.

The implementer responsible for overseeing the mitigation resulting from application of Standard Conditions (Appended A) will use only qualified staff to undertake such work. Monitoring shall occur on an as needed basis. Quarterly Reports shall contain a separate section on environmental compliance and monitoring as described by this IEE, this section of the reports shall be sent to the E&E BEO in AID/W on a semi annual basis to meet 22 CFR 216.10 requirements.

**REVISIONS:**

Pursuant to 22CFR216.3(a)(9), if new information becomes available which indicates that activities to be funded by the Project might be "major" and the Project's effect "significant," this negative determination will be reviewed and revised by the E&E Bureau Environmental Officer and, if appropriate, an environmental assessment will be prepared.

**APPROVAL OF ENVIRONMENTAL ACTION RECOMMENDED:  
CLEARANCE:**

|                                |                                     |       |                |
|--------------------------------|-------------------------------------|-------|----------------|
| Mission Director:              | <u>Tom DeLong</u>                   | Date: | <u>9/15/05</u> |
| Mission Environmental Officer: | <u>[Signature]</u>                  | Date: | <u>9/15/05</u> |
| <b>CONCURRENCE:</b>            |                                     |       |                |
| Bureau Environmental Officer:  | <u>[Signature]</u>                  | Date: | <u>9/16/05</u> |
|                                | <b>(MOHAMMAD LATIF)</b>             |       |                |
| Approved:                      | <input checked="" type="checkbox"/> |       |                |
| Disapproved:                   | <input type="checkbox"/>            |       |                |

## INITIAL ENVIRONMENTAL EXAMINATION

### PROGRAM/PROJECT DATA:

|                        |  |
|------------------------|--|
| <b>Program Number:</b> | <b>Strategic Objective 1.6</b>   |
| <b>Country/Region:</b> | <b>Central Asian Republics: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan</b> |

## 1.0 BACKGROUND AND PROJECT DESCRIPTION

### 1.1 Background

Within the Central Asian Republics, it is the energy and agriculture sectors that have the greatest impact on the social and economic lives of her citizens, as well as on the environment. It is for this reason that the USAID/CAR office of Energy and Water (EW) has focused its activities in these two areas. Energy has especially been the engine of growth in Kazakhstan and Turkmenistan and hydro energy has great potential for both Kyrgyzstan and Tajikistan. During the Soviet Union era energy resources were managed on a regional basis. The hydropower resources in the Kyrgyz Republic and Tajikistan were operated primarily as an irrigation system with power generation being secondary. Energy systems were then designed to take account of the location of various energy sources. The result was a system in which energy was exchanged regionally among the various republics. Following the break-up of the Soviet Union, however, these energy exchanges have declined as the individual republics have focused on achieving a greater level of energy self sufficiency.

Since the early 1990s, the USG has been interested in the expanding energy trade and investment in Eastern Europe and the former Soviet Union and the integrating of these energy systems with Western Europe and international energy markets. The impetus behind this interest was to: 1) help these countries diversify their energy imports and markets, 2) reduce the heavy dependence where possible on Russia imports, and 3) create new suppliers of oil and gas to international markets. Major strides have been made in developing new energy networks and supply sources over this 15-year period. The development of new East-West oil and gas pipelines (CPC, BTC, and South Caucasus) has taken place. Both Eastern Europe and Southeast Europe have synchronously connected their electricity systems and gas/oil pipelines with Western Europe. Major new oil discoveries in Azerbaijan and Kazakhstan have created a major new world oil frontier and the prospect for mitigating world dependence on the Persian Gulf.

Energy security issues remain of vital importance to the US and to its trans-Atlantic relationship. The European Union, with its expanded scope, is becoming increasingly dependent on imported energy, especially natural gas from Russia. With the “new neighbors,” the EU has adopted new energy security policies that emphasize the development of common trading and regulatory approaches. In Southeast Europe, including Turkey, this is taking the form of a legally-binding Treaty that is expected to be signed in mid-2005. This Treaty is viewed as one mechanism to both create more

economic growth and stability in the Balkans but also to facilitate transit of new energy imports from the Caspian and Mediterranean region. An energy dialogue has also been initiated with Russia on energy trade and investment, including studies on the potential integration of the Western European and CIS electricity systems.

Central Asia is therefore becoming increasingly important factor in the planning of future regional energy infrastructure policies, from both the European and Russian perspectives with respect to electricity as well as oil and gas. The economic development of Central Asia depends on having reliable and affordable electricity. Furthermore, as with its oil and gas resources, Central Asia has an opportunity to export electricity if export markets can be secured that will attract the needed large investments. The region has both hydro and thermal (gas and coal) energy resources that can meet these domestic and export needs. The countries will have to accelerate reforms and improve regional cooperation to obtain these economic benefits.

The two major near-term markets for power are Russia and Kazakhstan. Electricity demand is growing rapidly in both countries and much of the existing capacity is old and inefficient. Kyrgyzstan has recently signed new export contracts to sell to Russia and stands to gain from increasing prices and demand in the Kazakh market. The mid-term (five years) potential exists to tap the hydro resources in Tajikistan and the gas resources in Uzbekistan to meet growing demands in South Asia. In the short-term, Afghanistan urgently needs to import lower-cost power from Uzbekistan and Tajikistan to meet its needs. Growing demands in Iran are also attracting Russia and Iranian interest in new hydro projects at Santuda and Rogan in Tajikistan.

USAID has a long history of working on transnational energy and water issues in CAR. Other donor interest has increased over the past year. The World Bank has recently released a major study on Regional Electricity Export Potential. And the Presidents of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan have agreed in principle under the Central Asian Cooperative Organization (CACO) to create a Water-Energy Consortium and have asked the World Bank to advise them on this initiative.

In agriculture CAR is a semi-arid region and relies on irrigation water for production. The CAR nations are facing a major problem with declining irrigation systems due to lack of maintenance and investment. Although there have been recent reforms which allow for the transferring of water down to the level of a Water User Association, there is still a great need for policy reform and, more importantly, strengthening of these nascent institutions. The marketing and processing of agricultural crops also has suffered since the breakup of the Soviet Union. USAID and other donors are assisting in helping growers establish linkages to markets and overcoming barriers along the value chain of specific crops.

## **1.2 Project Descriptions**

The objective of AgFin<sup>+</sup>, a three-year agricultural capacity-building activity in the Central Asian Republics of Kyrgyzstan, Tajikistan and Uzbekistan, is to generate personal income for Kyrgyz, Tajik and Uzbek farmers. The project will link value chain

players, including farmers, to specific markets, assist them in overcoming the array of constraints they face in delivering products into those markets and capturing a fair return for their efforts. Generating profit within pilot value chains will attract attention and incremental support; extending the project beyond pilot activities will reduce poverty and stimulate economic growth in the three target republics. The project consists of training and technical assistance to farmers, processors, credit providers and others along a product value chain.

The objective of the Water User Association Support Program (WUASP) is to strengthen WUAs in the Republics of Tajikistan, Uzbekistan, and Kyrgyzstan in the following three ways: 1) as Non-Government Organizations (NGOs) using both sound democratic and business practices, 2) to improve their technical ability in all aspects of the management of local irrigation water delivery and allocation systems, and 3) to improve the legal and regulatory framework in which they operate. As a result of these strengthened WUAs, the irrigation water resource will be used more efficiently, bringing both economic and environmental benefits to rural citizens. Other goals of the program include improved incomes for participating water users through improved crop yields, reducing soil salinity, reduction of the potential for conflict over water, and more transparency and less corruption in the management of irrigation water resources. A smaller project with similar goals is also being implemented in Kazakhstan and Turkmenistan.

This initial phase of the Regional Energy Market Assistance Program (REMAP) would seek to create a sound technical investment plan for increasing the reliability of the transmission system in the region and expanding the capacity for expanded electricity trade. The CAR system would be integrated with Afghanistan through a new interconnection with Tajikistan and possibly Uzbekistan. The expansion of the Kazakhstan competitive power market to the rest of the region would begin with the involvement of Kyrgyzstan and possibly Tajikistan if the planned bilateral interconnection is completed. Within this context, improved rules for the operation of the Toktogul Reservoir would be developed and initial work would begin on the effective management of the Amu Darya River system. This project will be initiated in FY '06 and will be implemented in all 5 CAR nations.

## **2.0 COUNTRY AND ENVIRONMENTAL INFORMATION (BASELINE INFORMATION)**

USAID/CAR views biodiversity impacts as being integral to its economic growth, health and governance programs. The countries' natural resource wealth varies greatly. Kyrgyzstan and Tajikistan have abundant water resources (but little else), while Kazakhstan and Turkmenistan have abundant oil and gas resources. Both Turkmenistan and Uzbekistan also have large supplies of natural gas. All available resources make a significant contribution to its economy. Unfortunately, the conservation and use of these resources has been negatively affected by policy, institutional and market failure, which has created a negative spiral of mismanagement and impact. Illegal poaching is driven by a lack of governance (law enforcement/corruption), a lack of market incentives,

unclear tenure policies as well as institutional weaknesses such as inadequate state financing of national and local bodies to monitor management and trade.

In the second half of the twentieth century, the natural environment of Central Asia underwent tremendous changes. First, the total area of land used for production of crops increased significantly. New efforts in cultivation included large-scale conversion of virgin land in northern Kazakhstan to create fields of grain crops, resulting in significant soil erosion. Throughout the region, the number and size of irrigated fields, especially for cotton production, also expanded far beyond the boundaries of the ancient irrigated oases. In both plains and mountains, large areas of forest fall victim to this intense exploitation for crop and pasturelands. This massive transformation of the natural environment and the heavy use of pesticides and fertilizers is exacerbated by large scale development of local resources such as oil, natural gas, iron, copper, and complex ores in the establishment of the mining industry and related manufacturing industrial enterprises. The development of engineering, chemical, and consumer goods industries was followed by the expansion of cities and industrial settlements. Construction of dams and hydroelectric stations reached a giant scale in Central Asia as the need to transport water and energy to the agricultural and industrial sectors grew exponentially. A huge system of irrigation was created, sprawling for thousands of kilometers and supported by a vast network of hydroelectric stations and reservoirs. Huge filtration and discharge reservoirs became familiar features of the Central Asian landscapes. These systems are concentrated along both the Amy Darya and the Syr Darya River Basins which impact all 5 Central Asian nations as well, as Afghanistan.

Since the dissolution of the Soviet Union, transformation of the environment has continued in other guises. The recent privatization of land in a number of the region's countries has allowed a variety of resource exploitation, such as catastrophic local overgrazing of pastures, forest logging (which increases frequency of mud slides and progressive erosion), and wasteful use of water resulting in the erosion and salinization of soils. During this transitional post-Soviet period, the combination of the rise in poverty, a relaxation in government regulations, and easier access to arms, has rapidly increased hunting pressures on wildlife. Species such as the Central Asian grouse and even the wild boar, which previously had not been used for food by the Muslim population, became vulnerable to local communities; other species, such as argali sheep and raptors, were newly exploited for their commercial value on the international market. All these changes, combined with the arid climate, have led to the degradation not only of natural ecosystems, but also of agricultural and pastoral lands. Most of these areas are affected by some degree of anthropogenic desertification. The Amu Darya and Syr Darya, once the region's largest, no longer reach the Aral Sea, and their deltas are in the process of degradation. The level of the Aral Sea is decreasing catastrophically, exposing salt sediments on the lake bottom and dispersing them throughout Eurasia. For the wild flora and fauna of Central Asia, these anthropogenic pressures have, for the most part, been adverse. Many species of animals and plants have become extinct. An important factor affecting conservation in the region is the extremely complicated socioeconomic situation, which does not allow the countries to pay the necessary attention to the

problems of nature protection. For this reason, international assistance to these republics at this particular point in their history is especially needed.

### **3.0 EVALUATION OF PROJECT/PROGRAM ISSUES WITH RESPECT TO ENVIRONMENTAL IMPACT POTENTIAL**

#### **3.1 Introduction**

Many of the proposed SO 1.6 activities are training, technical assistance, and public outreach; or very small-scale and as such will have no significant direct or indirect adverse effect on the environment (physical, biological and social-see Appendix B, Leopold Matrix). There are, however, some components of the proposed interventions in the irrigation systems which, unless carefully identified as impacts, properly mitigated during implementation using Standard conditions (Appendix A); and monitored as baseline environmental conditions before activity implementation as well as following construction or repairs, could potentially result in significant adverse environmental effects. These impacts could be both direct or indirect [see 22 CFR 216.6 (c ) (5)-environmental consequences].

#### **3.2 Activity Type 1 – Training and Technical Assistance**

A Categorical Exclusion is recommended for all of the AgFin+ and REMAP activities with the exceptions given in the IEE. These activities will not result in adverse environmental impacts.

#### **3.3 Activity Type 2 – Small-scale Pilot Projects**

Small-scale demonstration project in the irrigation sector if not planned and implemented properly could have a potential for significant adverse environmental impacts. USAID intends these impacts to be beneficial, and not adverse, and will improve the deteriorating irrigation infrastructures in this region which will lead to water saving and improved efficiencies. This will be because local system operators will be able to better plan water deliveries, control water flows through improved equipment such as gates and measurement devices, and reduce water losses through repair of broken canals or diversions. As these are small scale activities that replace or repair existing systems, it is anticipated that the impact on the environment will be minimal. These system upgrades will be implemented by Winrock International as part of the WUASP activity.

### **4.0 RECOMMENDED MITIGATION ACTIONS**

The contractor for the projects will identify the environmental consequences of these irrigation demonstration projects through the use of the Leopold Matrix (Appendix B) or similar tools and recommend possible mitigation measures before an activity is begun including undertaking the baseline conditions and cumulative aspects at a particular site as outlined in the Section 5. Once impacts have been identified, the implementor will use the applicable/appropriate Standard Conditions included in Appendix A. Their

implementer will determine whether an environmental assessment of any specific demonstration model is warranted and will provide full environmental assessments for those demonstration models that require one. In the event that an environmental assessment is warranted for any portion of these activities, USAID/CAR will work with their procurement officer to develop a task order or contract with an appropriate firm. It is anticipated that these activities will not require environmental assessments in that they entail modification or retrofitting of already existing equipment, are very small in scale, and/or are meant to mitigate previous environmental failings. The contractor will be trained to use the Standard Conditions criteria to mitigate environmental impacts and they will have a memo to the file for each activity implemented which will describe the project and mitigation measures taken.

### **Promotion of Environmental Review and Capacity Building**

The prime contractors for the WUASP will carry out most of the activities through a variety of contract and sub-grant arrangements with local implementing partners, usually Water User Associations. While these local partners will be given comprehensive responsibility for implementation of various project activities, the objective and detailed scope of work for a given activity will be clearly established. Contracts, letters of understanding, and other types of formal agreements will be the norm. Within this framework, relevant environmental mitigation and monitoring measures established in this IEE will be incorporated into the agreements with Winrock International and its agreements with local partners.

## **5.0 SUMMARY OF FINDINGS**

Based on the environmental review presented in this IEE, the following determinations are made:

1. A **Categorical Exclusion** is recommended for all of the AgFin+ and REMAP activities; and those components of the WUASP which consist of training and assistance in policy reforms in the irrigation agriculture sector. These projects consist of Training and Technical Assistance as quoted as one of the classes of action under 22 CFR 216 requirements:

- The action does not have an effect on the natural or physical environment [22CFR216.2(c)(1)(i):
- Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (such as construction of facilities etc.). [22 CFR 216.2(c)(2)(i)].

2. A **Negative Determination with Conditions** (22 CFR 216.3(a)(2)(iii) is recommended for physical interventions under WUASP. These activities include the installation of flow measuring devices in irrigation canals, equipment installation and/or handovers, and small scale irrigation infrastructure repairs.

The conditions presented in this IEE are intended to make certain that these activities will be implemented and monitored by the prime contractor Winrock International. This will

be carried out in conjunction with its local partners, in a manner, which ensures that they have no significant environmental impacts.

Some components of the proposed interventions in the irrigation systems which, unless carefully identified as impacts on the environment (physical, biological and social-see Appendix B, Leopold Matrix), properly mitigated during implementation using Standard conditions (Appendix A); and monitored as baseline environmental condition before activity implementation as well as following construction or repairs, could potentially result in significant adverse environmental effects. These impacts could be both direct or indirect [see 22 CFR 216.6 (c ) (5)-Environmental consequences]. This approach does not relieve the implementer from considering and/or identifying during documenting baseline conditions at a particular site, the cumulative effects of past actions which require analysis and a concise description of present effects. This consideration of past actions need only be to the extent that they are useful in analyzing whether the foreseeable effects of the agency funded actions and its alternatives may have a continuing additive and significant relationship to those effects.

This IEE does not cover activities involving assistance for the procurement (includes payment in kind, donations, guarantees of credit) or use of pesticides or activities involving procurement, transport, use, storage, or disposal of toxic materials, which will require an amended IEE submitted to EE/BEO for approval.

In addition, appropriate actions will be taken by the implementers on addressing public participation aspects in accordance with the 22 CFR 216.3 and 216.8 requirements.

This IEE does not include construction or reconstruction activities beyond those identified for irrigation canals. If AgFin+ activities are to work with or support Agro-processors, Environmental Due Diligence reports will be required of their facilities requiring an amendment to IEE.

The implementer responsible for overseeing the mitigation resulting from application of Standard Conditions (Appended A) will use only qualified staff to undertake such work. Monitoring shall occur on an as needed basis. Each activity requiring mitigation will have a memo to the file describing the project and mitigation measures taken as well as before and after site photos. Quarterly Reports shall contain a separate section on environmental compliance and monitoring as described by this IEE, this section of the reports shall be sent to the E&E BEO in AID/W on a semi annual basis to meet 22 CFR 216.10 requirements.

**REVISIONS:**

Pursuant to 22CFR216.3(a)(9), if new information becomes available which indicates that activities to be funded by the Project might be “major” and the Project’s effect “significant,” this negative determination will be reviewed and revised by the E&E Bureau Environmental Officer and, if appropriate, an environmental assessment will be prepared.

## **Appendix A: Standard Conditions for Small-Scale Irrigation Projects**

USAID's Bureau for Europe and Eurasia finances, directly or indirectly, a range of small-scale irrigation projects. These include, inter alia, maintenance and rehabilitation of irrigation infrastructure, construction of weirs, improved water management, and improved irrigation system operations and management. Small-scale irrigation activities have the potential to result in significant adverse environmental impacts, but most of those impacts can be mitigated down to acceptable levels through the use of choosing good sites, design, construction, operations and maintenance practices.

These standard conditions have been developed by USAID's Bureau for Europe and Eurasia (E&E) to ensure that small-scale irrigation activities financed by the Bureau do not result in significant adverse environmental impact. When adherence to these conditions is required as a condition of project implementation, no significant adverse environmental impact is presumed to result. Project Officers, CTOs, Mission Environmental Officers, Contract Officers and implementing organizations must nonetheless be aware that these standard conditions are generic in nature, and that additional potentially significant adverse environmental impacts may be associated with small-scale irrigation activities. It is the responsibility of the individual USAID missions, and/or their implementing contractors and grantees, to monitor irrigation activities and to ensure that significant adverse environmental impacts do not result.

For the purposes of this guidance, "small-scale irrigation projects" are defined as activities that: (1) cost less than \$100,000 per individual project; (2) do not bring significant areas of currently un-irrigated land under cultivation; (3) do not involve the construction of new dams, trunk canals, or river training works; and (4) do not involve rehabilitation of existing dams over fifty feet in height.

Because of the exceptionally diverse physical, biological and social environments in which Bureau irrigation projects take place, and the broad kinds of irrigation activities that are financed, these Standard Conditions are to be followed "as practicable and appropriate."

## **Standard Conditions for Small-Scale Irrigation Projects**

### ***IRRIGATION SYSTEM IMPROVEMENTS***

As a general rule, small-scale irrigation projects should be designed to achieve or promote some or all of the following objectives:

- Better water management, including better water use efficiency and lower water losses
- Better water quality
- Lower sediment loading
- Less erosion
- Less waterlogging and soil salinization
- Improved irrigation system operations and maintenance
- Healthier conditions for irrigation workers.

Specific actions that can be used to avoid or reduce adverse environmental impacts on small-scale irrigation projects are as follows:

#### **Water Use Efficiency**

- Improve water control through good canal and weir design
- Keep canals, headworks, regulators, modules and water courses free of debris
- Add water storage capacity where water is seasonally scarce
- Improve water depth consistency through improved land leveling
- Ensure the suitability of crops to available water supply
- Monitor groundwater tables when irrigating from groundwater
- Train farmers and system operators in how to improve water use efficiency.

#### **Water Loss**

- Use drip irrigation where practicable
- Use piping where practicable, instead of canals
- When using canals, employ design standards that limit evaporative loss
- Design canals that are relatively narrow and deep
- Cover open canals
- Line canals to limit water loss through percolation
- Reduce evapotranspiration by keeping canals clear of vegetation
- Monitor and repair leaks from cracked canal and containment structures, broken pipes, faulty valves and similar infrastructure
- Reduce evaporation on center pivot and sprinkler systems by irrigating at the coolest time of day
- Train farmers and system operators in how to reduce water loss.

### **Water Quality**

- Use design standards that lower sediment loads in irrigation water
- Identify and monitor water quality parameters with adverse crop and human health impacts
- Train farmers and system operators in how to improve water quality.

### **Erosion**

- Use terracing and similar techniques to reduce land surface erosion
- Plan for devices that can protect against scour where water scour potential is an issue (e.g., culverts, drops, chutes, control structures)
- Train farmers on how to reduce land and facility erosion.

### **Waterlogging and Salinization**

- Monitor groundwater levels and salinity
- Use sprinkler or drip irrigation systems where possible
- Improve system drainage
- Train farmers to recognize waterlogging and salinization problems.

### **Operations and Maintenance**

- As a rule, financing for irrigation infrastructure improvements should not be provided unless appropriate operations and maintenance (O&M) provisions are in place.
- Establish an appropriate maintenance schedule for inspection and reporting performance conditions.
- Periodically review system components to verify that they meet the original design criteria for efficient operations and uniform distribution of water.
- Where appropriate, prepare an O&M Manual before the irrigation system starts operations.
- O&M plans should address, *inter alia*, financial and system power issues.

### **Human Health**

- Understand what water-related disease vectors occur in association with the irrigation system, and design system improvements to reduce those vectors
- Don't use irrigation water as a potable water source
- Line canals and ditches
- Cover or pipe water where possible
- Prevent backwaters or slow-moving water where vegetation and disease vectors are more easily established
- Use application rates that avoid generating areas of standing water

- Keep canals and ditches free of weeds, sediment and snails
- Actively control disease vectors
- Train farmers and system operators to recognize and deal with system characteristics with the potential to adversely affect human health.

#### **Other Irrigation System Conditions**

- Design canals to maintain appropriate flow velocities
- Plan for access of canals to facilitate cleaning, sediment removal and vector control
- Design appropriate canal crossing structures at appropriate intervals
- Plan for gates at the lower end of canals so they can be flushed to the nearest drain
- Do not use materials containing asbestos on USAID funded projects.
- Replace lead pipes and joints in delivery system.

#### ***STANDARD CONSTRUCTION CONDITIONS***

- Establish and adhere to construction timetables that minimize disruption to the normal activities of the construction area.
- Post construction timetables and traffic diversion schedules at the project site
- Coordinate truck and other construction activity to minimize noise, traffic disruption and dust
- Where significant environmental impacts may occur, document and photograph pre-construction and post-construction conditions
- Fill should avoid pockets of segregated materials, it should use well-graded materials, and it should be compacted to recognized standards
- Install temporary erosion control and sediment retention measures when permanent ones either are not feasible or are delayed
- Use proper bedding materials for pipes, and backfill appropriately for the pipeline
- Use riprap (cobbled stone), gravel, or concrete as needed to prevent erosion of drainage structures at the outfall according to established standards
- Do not allow animals to drink directly from water sources
- In coastal areas, maintain withdrawals within safe yield limits to avoid salt water intrusion and well contamination
- Ensure that spilled water and rainwater drain to a soakway or equivalent structure.
- Re-vegetate areas damaged during construction. Do not remove erosion control measures until re-vegetation is completed.
- As practicable, landscape construction sites in a way that is appropriate to local conditions.

#### ***EXCAVATION AND BORROW PITS***

- Use material from the required excavations first, since it produces a fairly durable aggregate for both surface stabilization and erosion control and is very cost effective.

- Place fences around borrow pit excavations, as necessary.
- Ensure excavation is accompanied by well-engineered drainage to control runoff into the pit.
- Develop specific procedures for storing topsoil, and for phased closure and reshaping and restoration of the pit when extraction has been completed. Include plans for segregating gravel and quarry materials by quality and grade for possible future uses. Where appropriate, include reseeded or re-vegetation to reduce soil erosion, prevent gullying and minimize visual impacts.
- Discuss with local communities the option of retaining quarry pits as water collection ponds to water cattle, irrigate crops or for similar uses. Issues of disease transmission, and prohibiting the use of pit water for human consumption, bathing, and clothes washing, should be highlighted.
- Decommission/restore areas so that they are suitable for sustainable use after extraction is completed.
- Backfill and/or restore borrow areas and quarries before abandonment if alternative uses for those sites are not planned.

#### ***MATERIAL STORAGE AND HANDLING***

- Identify sites for temporary/permanent storage of excavated material and construction materials.
- Avoid pollution of waterways with stockpiled construction materials.
- Set protocols for vehicle maintenance to control contamination by grease, oil and fuels.
- Build collection channels leading to oil and/or silt traps, particularly around areas used for vehicle washing or fuelling.
- Build appropriate containment structures around bulk storage tanks and materials stores to prevent spillage entering watercourses.
- Build tanks or other separators for silt-laden material prior to allowing significant outflow into watercourses.
- Cover stockpiled construction materials, as practicable.
- Minimize the disturbance of, and reduce the spread of, ground contaminants.
- Handle, store, use and process branded materials in accordance with manufacturer's instructions and recommendations.
- Segregate construction waste that can be salvaged, re-used or recycled.
- Take construction waste materials to appropriate, designated local disposal areas.
- Minimize burning of waste materials.
- If construction waste will be buried on site, avoid siting burial pits up-gradient from drinking water sources such as wells. Pits should be lined with impermeable material (e.g., clay or polyethylene).
- If construction waste will be buried on site, avoid siting waste pits where water tables are high or underlying geology makes contamination of groundwater likely. If no alternative site is available, ensure that pits are lined with impermeable material.

***HUMAN HEALTH AND WORKER SAFETY DURING CONSTRUCTION***

- Provide workers with appropriate safety equipment.
- Protect workers from injury by flying or falling rock, slope failures and avalanche
- Explore off-site accommodation for crew
- Keep camp sizes to a minimum.
- Provide temporary sanitation on construction sites
- Maintain good first aid capabilities on site.

## Appendix B: Leopold Matrix –Potential Impacts

Project Name:  
 Project Location:  
 Name of Reviewer:

| <div style="display: flex; justify-content: space-between;"> <span>Project Component</span> <span>Environmental component</span> </div> |  | PHYSICAL ENVIRONMENT |              |                 |                |               |               |              |              |             |       | BIOLOGICAL ENVIRONMENT |                    |             |                    |                   |                   |                    |             |              |                 | SOCIAL ENVIRONMENT |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|---|--|----------------------|--------------|-----------------|----------------|---------------|---------------|--------------|--------------|-------------|-------|------------------------|--------------------|-------------|--------------------|-------------------|-------------------|--------------------|-------------|--------------|-----------------|--------------------|-------------------|----------------------|------------|--------------------|--------------------|---------------------|--------------------|--------------------|-----------|--|--|--|--|
|   |  | Agricultural Land    | Soil Erosion | Slope Stability | Energy/Mineral | Surface Water | Surface Water | Ground Water | Ground Water | Air Quality | Noise | Aquatic Ecosystems     | Wetland Ecosystems | Terrestrial | Endangered Species | Migratory Species | Beneficial Plants | Beneficial Animals | Pest Plants | Pest Animals | Disease Vectors | Public Health      | Resource/Land Use | Distribution Systems | Employment | At Risk Population | Migrant Population | Community Stability | Cultural/Religious | Tourism/Recreation | Nutrition |  |  |  |  |
| <b>PLANNING &amp; DESIGN</b>  |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
| <b>Construction</b>   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
| <b>OPERATION</b>  |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |
|   |  |                      |              |                 |                |               |               |              |              |             |       |                        |                    |             |                    |                   |                   |                    |             |              |                 |                    |                   |                      |            |                    |                    |                     |                    |                    |           |  |  |  |  |

**KEY:** Beneficial: O - High; O - Medium; O - Low      Adverse: ■ - High; ■ - Medium; ■ - Low