NeWater

ENVIRONMENTAL FLOWS AND ECOSYSTEM SERVICES

A Framework for Implementing Environmental Flows in the Amudarya Basin

Report of the NeWater project -
New Approaches to Adaptive Water Management under Uncertainty

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Policy Summary

NeWater outputs are a stepping stone in the process of moving from current water management concepts to more flexible and adaptive regimes. Within Work package 2.3 water quality aspects were related to water quantity aspects and water ecological aspects. The focus was on new approaches to balancing water quantity and water quality for adaptive management. The aim of Task 2.3.3 was to develop and apply strategies for incorporating environmental flows and ecosystem services into river basin management. The focus was on the Amudarya basin, which is shared between Afghanistan, Uzbekistan, Tajikistan, Kyrgyzstan and Turkmenistan.

Environmental flows refers to water provided within a river, wetland or coastal zone to maintain ecosystems and the benefits they provide for people and the environment. A useful way of understanding environmental flows is thinking of it as the 'ecological water demand', in just the same way as there is agricultural or industrial water demand. Thus, environmental flows are effectively a balance between water resources development and the need to protect freshwater-dependent ecosystems.

A general framework was adapted from *FLOW: The essentials of environmental flows* to be applied to the Amudarya Basin. The FLOW toolbook is available in electronic format at http://www.iucn.org/dbtw-wpd/edocs/2003-021.pdf. The framework included processes and methods for incorporation of environmental flows dialogue with stakeholders. Furthermore, lists of experts, relevant case studies, relevant assessment methods, and tools for incorporation of environmental flows into IWRM have been made available through the Environmental Flows Network (www.eflownet.org), which was developed by IUCN and partners.

Policy recommendations

When carrying out assessment or implementation of environmental flows it is important to have a holistic approach that considers ecological, social, economic and political perspectives. Decisions should be made on the basis of values and tradeoffs of stakeholders rather than only through technical debates. Consequently, there should be direct contact between technical staff and involved decision makers, local people and interest groups is the best pathway to translating information into understandable concepts and building trust.

The involvement of decision makers such as river basin managers and government officials in each step of the process ensures they have a good grasp of why the assessment is important and what the data means thereby increasing the likelihood of implementing environmental flows when deciding on water allocation.

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1 Introduction

When planning development on a river, decision making on water allocation can be improved if stakeholders and those responsible have more and better information. This includes information on the water needed to sustain ecosystems that provide essential goods and services to people in the river basin. For example, if a decision maker has information that shows the location of a dam further upstream will help reduce negative impacts downstream, this knowledge can be put on the negotiating table when deciding on dam construction and water allocation. Furthermore, to conduct an adequate cost – benefit analysis that reflects upstream and downstream impacts of infrastructure, knowledge of how impacts vary under different flow regimes is needed. It is easier and less costly to spend time and money upfront determining potential impacts rather than trying later on to fix problems that could have been avoided.

The aim of Task 2.3.3 is to develop and apply strategies for incorporating ecosystem services into river basin management. A general framework was adapted from *FLOW: The essentials of environmental flows* to be used in the Amudarya case. The FLOW toolbook is available from IUCN or in electronic format at http://www.iucn.org/dbtw-wpd/edocs/2003-021.pdf. The framework included processes and methods for incorporation of environmental flows dialogue with stakeholders. Furthermore, lists of experts, relevant case studies, relevant assessment methods, and tools for incorporation of environmental flows into IWRM have been made available through the Environmental Flows Network (www.eflownet.org), which was developed by IUCN and partners.

An environmental flow can be defined as “the water regime within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated” (Dyson et al. 2003). The concept of environmental flows aims at a natural flow regime, which does not necessarily mean a larger volume of water is available after an intervention (Meijer 2007). The level of health at which a river is maintained depends on the judgments from society, which can vary between countries and regions.

The FLOW toolbook developed by the IUCN Water and Nature Initiative (WANI) offers practical advice for the implementation of environmental flows in the river basins of the world. It explains how to assess flow requirements, change the legal and financial framework, and involve stakeholders in negotiations. ‘Flow’ sets out a path from conflict over limited water resources and environmental degradation to a water management system that reduces poverty, ensures healthy rivers and shares water equitably. In addition, the toolbook has been translated into 9 languages. From Khmer to Portuguese, and from Chinese to French, the toolkits are proving to be valuable assets in water management across the globe.

FLOW is part of a toolkit series that has been developed under WANI to support learning on how to mainstream an ecosystems approach in water resource management. Aimed at practitioners, policy-makers and students from NGOs, governments and academia, the series builds on practical case studies to show how key principles of sustainable water management are implemented in river basins.

WANI is a 6 year action programme that has worked with 80+ partner organizations across the world to demonstrate water management that supports healthy rivers and communities.

A road map of activities of WP2.3 for the NeWater Amudarya case study was drawn up in May 2007, which outlined how to incorporate environmental flows into water management in the Basin.

LP = local partners (AMII, UzGip, NIGMI, CEWM)

Mid June 2007	Conceptual note on general framework and its adoption to Amudarya case (process/methods for incorporation of envflows & dialogue with stakeholders)	IUCN
Mid June 2007	First results of water quantity and quality models of Christian, implications of climate scenarios	Alterra
Mid June 2007	List of experts, relevant case studies, relevant assessment methods, tools for incorporation of envflows into IWRM	IUCN
Mid June 2007	Concepts and methods for linking water quantity and quality to ecosystem services (beyond simple hydrological indicators) Input of expertise of Christer and team	Alterra
Jun 25 – Jul 8, 2007	Consultations with local experts and stakeholders in the river basin (Uzbekistan – Tashkent and delta region), data collection, scenario development	UFZ, LP
Jun 25 – Jul 8, 2007	Meeting with 2.4 on local livelihoods and use of ecosystem services in the delta, discussion of first field work results	UFZ, SEI, LP
July – Dec 2007	Preparation of stakeholder workshop	UFZ, LP, USF
	Assessment of current state of ecosystems and their sensitivity	LP, UFZ
	Development and analysis of scenarios	LP, Alterra, UFZ
	Adaptation of general framework to Amudarya case	UFZ, LP, IUCN
	Selection of relevant stakeholders	LP, UFZ, USF
	Selection of methods and tools	all
Nov 2007 CAIWA conference	Presentation of results of modelling water quantity and quality	Alterra, CEWM
	Presentation of first results of assessment of env flows and ecosystem vulnerability	UFZ, UzGip, NIGMI
	Meeting for preparation of stakeholder ws	All
End 2007/Beg 2008	Stakeholder workshop on incorporating environmental flows into IWRM in AD river basin (maybe including a joint scenario analysis workshop?)	All plus invited guests from NeWater and

beyond

2 Application of Flow Toolkit

The outline from FLOW: The Essentials of Environmental Flows was used to provide a general framework of how to adopt environmental flows and how to engage stakeholders in this process in the Amudarya Basin.

1. Getting started – Developing a situation Analysis

In order to get an overview of available information and what issues need to addressed, a first step would be to develop a situation analysis of the Amudarya Basin. The purpose of the situation analysis would be to provide an assessment that is sufficiently adequate for priority themes or areas for actions to be developed in each basin. The situation analysis can be used as background material for proposed project interventions. For example, IUCN commissioned a detailed situation analysis on environmental issues in the Pangani Basin with a focus on water resources to determine project priorities. A range of stakeholders, including water managers, water users, environmental organizations and government agencies provided comments on the situation analysis and contributed to the problem analysis and the development of the preliminary logical framework for the project on integrated water resource management in the Basin. The situation analysis can be accessed at: http://www.iucn.org/dbtw-wpd/edocs/2003-079.pdf

The analysis involves documenting all problems and conflicts in the basin through literature review and interviews of stakeholders. This includes:

- Identifying the resources that occupy the river basin and the process and events that affect them
- Identifying a series of broad action areas where interventions may be feasibly delivered
- Identifying key stakeholders that control and are affected by environmental flows
- Identifying other organisations, interests or institutions that can be approached to develop partnerships in order to implement environmental flows

Some key questions that can be asked in developing the situation analysis include:

- What are the main geographical and climactic characteristics of the river basin?
- What is the land use and property rights situation?
- What is the water use and water rights situation?
- Who are the different groups of actors that exploit resources in the basin?
- What types of conflict are present in the basin (i.e. conflicts of scale, conflicts of tenure, and conflicts of location)?
- What threats does the basin face from impacts such as population growth, and climate change?
- What are the key organisations and initiatives in the basin that aim to protect and manage resources?
- How is the basin managed? What is the administrative structure?
- What are the main problems and issues threatening water resource management in the basin?
    - What are the main environmental issues?
    - What are the main socio-economic and political issues?

  - What are the issues associated with management and administration?
- What are the priority areas for action in the basin in order to improve water resource management?

2. Building capacity for design and implementation - Communication and awareness raising

Understanding of the need to provide environmental flows is essential to implementation. Internal and external communications and awareness building are important to ensure the ongoing viability of a project. Also, communication of the project outputs and progress by the project stakeholders to a wider audience at the national and international levels strengthens ownership and raises awareness on environmental flows. Communication, training and awareness materials documenting methods, examples and experiences must be developed and disseminated and can include:

- Publicity material
- Environmental flows educational material
- Regional training seminar to improve the understanding among water resources planners, managers and dam operators, and equip them with skills that promote the determination and management of environmental flows. Modules covered under the training can include the ecosystems approach to environmental flows, managing environmental flows for sustainable livelihoods, methods for determining environmental flows, introduction to water resources classification and operationalising environmental flows.
- Networking

Some key questions that can be asked in developing the communications component should include:

- Who are the key stakeholders that need to be addressed?
- What media forms are best to communicate to the audience?
- Who should the educational material be targeted to?
- At what events should the promotional material be communicated?
- What expertise and capacities are available in the basin area?
- What expertise and capacities are needed?
- What training is needed to asses and implement environmental flows?
- Who should attend this training?
- What network of environmental flows experts exists in the region?
- Are they part of the Environmental Flows Network?

3. Defining water requirements- Environmental Flows Assessment

Over the past 20 years, a range of methods, approaches and frameworks have been developed to determine environmental flows. As the science of environmental flows has evolved so have the various methods, which amount to more than 200 (Meijer 2007). Environmental flows methods can be grouped into four categories: ‘hydrological’, ‘hydraulic rating’, ‘habitat simulation’ and ‘holistic’ methods (Tharme 2003). Reviews of various methods have been conducted by a variety of authors including Karim et al. 1995; Jowett 1997; Dunbar et al. 1998; King et al.

1999; Tharme 2003; Acreman and Dunbar, 2004. The reviews indicate that there is not one method that can be applied to all situations, rather the method used depends on various factors such as the availability of data for the studied river, location and extent of the study area, time and financial constraints or the level of confidence required in the final output (Meijer 2007).

Only a few environmental flow assessment methods include the evaluation of livelihoods and social well-being in relation to river flow regimes. These include the Building Block Method, DRIFT (Downstream Response to Imposed Flow Transformation) and the Managed Floods Approach (Meijer 2007). These methods are classified as holistic and require considerable multidisciplinary expertise and input. Holistic methodologies are frameworks that incorporate hydrological, hydraulic and habitat simulation models, and sometimes socio-economic aspects of environmental flows (Korsgaard 2006). A successful decision making process for determining environmental flows needs to include representatives of different interest groups as well as scientists and experts from the initial stages (Dyson et al. 2003).

An assessment of environmental flows should include the following:

- Water audit – This includes a summary of the water resources availability in the river basin, trends and anomalies based on available data. The audit also assesses main flow characteristics, trend s anomalies and main uses.
- Classification of major stretches of the river basins includes river sources, pristine areas, and highly developed areas. Also development can be classified into urban centers, agriculture, protected areas, industry, mining, and hotspots, overview of groundwater resources, overview of estuary, and some management practices.
- Interdisciplinary team needed to carry out the assessment of the current health of the river at different times of the year (i.e. wet and dry seasons)
    - Sociology/participatory rural appraisal
    - Economics
    - Agriculture
    - Hydrology, hydrogeology and hydraulics
    - Mapping
    - Geomorphology
    - Botany
    - Icthyology (fish water requirements)
    - Zoology
    - Land use planning

Some key questions to be asked when designing and carrying out the assessment include:

- What are the economic, ecological and social objectives of the environmental flows assessment?
- What will be done with the results of the assessment?
- What methods should be used during the assessment (see FLOW toolbook – chapter 2)?

- When is the best time to carry out the flow assessment?
- What specialists are needed to carry out the flow assessment? In the Amudarya, it might be necessary to have someone who specailises in water quality as this is a major concern.
- What area of the river will be assessed?
- Which communities will be involved?
- Which community members will be interviewed?
- What is the timeline to complete the assessment (helps determine detail of assessment)?

4. Modifying water infrastructure - Scenario analysis

Once an assessment of the environmental flows in the Basin has been carried out, the next step is to conducts a scenario workshop where an interdisciplinary team works together to determine how flows will change and what the impacts will be downstream under different scenarios (climate change, land use change, increasing water demand, new water infrastructure). The team should include not only scientists and water managers, but also decision makers. The scenario analysis should include the socioeconomic impacts of changing flows. In the case of the Amudarya basin there should be a focus on how changing flows will impact water quality

Some key questions to be considered during scenario design and analysis include:

- What type of methods will be used when carrying out the scenario analysis?
- What are the main issues in the region?
    - Environmental
    - Economic
    - Social
    - Demographic
    - Political
    - Management
    - Administration
    - Transboundary
- Who will be affected and how?
- What geographical areas of the basin will be affected?
- What communities will be affected?
- What groups of population will be affected and how (i.e. farmers, fishers)?
- What mitigation and adaptation strategies are in place?
- What mitigation and adaptation strategies are needed?

5. Covering the costs

To be successful, implementation of environmental flows needs to haveclear societal benefits and improvements in environmental, social or economic conditions, rather than impacts on specific actors. There should be a clear understanding of the costs and benefits of flow restoration will be important in proposing an environmental

flow regime (Dyson et al., 2003). There also needs to be an understanding of who gains and who loses from implementing environmental flows. Thus, it is important to identify the relevant stakeholders and the necessary incentives and compensation for participation in environmental flow implementation, and how communities can benefit from change.

A number of key financial and economic questions need to be addressed in order to successfully assess and implement environmental flows:

- What will be the financial cost of implementing environmental flows?
- What will be the transaction costs (financial, economic or social)?
- Who will pay? Public, private, NGOs?
- Why finance environmental flows? What are the benefits?
- What incentives are needed to implement environmental flows?
- What are the alternatives (i.e. water markets, watershed payments)?

6. Creating a policy and legal framework

Treaties and law instruments do not usually address environmental flows in a single provision. So it is necessary to explore whether other mechanisms, such as legislation relating to non-navigational uses of rivers or the protection of the environment, address environmental water allocations. The first step is to determine what legal instruments exist that can have an influence on policy decisions and actions. Next, the focus should be on determining what policies, regulations and institutions exist at the national and sub-national levels to protect and manage water resources and the environment. Reviewing current institutional framework, policy and laws can be a starting point. It is also necessary to consider who controls the flow from upstream to downstream (water board, municipalities, national government) (Dyson et al., 2003).

Some key questions to be considered when assessing the current legal, policy and institutional framework relating to environmental flows:

- What is the current institutional framework surrounding water resource management?
- What are the key policy and laws related to water resource management?
- Who creates and implement policy and legislation (i.e. which government department)?
- How effective is the implementation of water resource management policy and legislation?
- Who actually controls the flow in river basins?
- Who makes the decision about water allocation?
- What is the political landscape surrounding what allocation and who are the key players?

- At what scale should the AmuDarya project be involved (nationally, regionally)?
- At what political level is influence needed to implement environmental flows?
- What is the structure of rights over access to water?
- Is water rights are changed, what type of compensation scheme is required?

- What legislation is needed that can be adaptive to respond to changing condition in water resource availability?
- How can the project ensure community engagement and incorporate community values and knowledge?
- What are the likely liability issues?
- What is the legislative framework needed to implement environmental flows?

7. Generating political momentum – stakeholder participation

Gaining political momentum to establish environmental flows involves many different actors, from the highest levels of government to local communities and businesses. Diverse approaches are required when engaging with the various stakeholders as they have different concerns. Parliamentarians and civil servants have different arguments than farmers, environmentalists and tour-operators. Understanding which interest groups are influential with government and the public is critical (Dyson et al., 2003). However, cooperation and balancing a range of competing interest is crucial. Stakeholders have to collectively decide and negotiate on flow regimes that they can agree upon.

Some key questions to be considered when generating political momentum and fostering cooperation:

- Who are the key stakeholders involved in water allocation issues?
- What is their current involvement?
- How do they engage (talk directly to government, lobby, write policy papers, protest, etc)?
- What partnerships exist in the region?
- How do they communicate within partnerships?
- What are their view points on water allocation and environmental flows?

3 Outline for a situation analysis of the Amudarya Basin

1. Introduction

- Geographical location of the river basin (map)
- General socio-economic situation in the region. Includes key statistics such as:
    - Population growth
    - Urban/rural population change and density
    - GDP per capita
    - Distribution of GDP per sector
    - Persons living on less than a $1 day
    - Infant mortality rate
- Overview of national plans in river basin- Country medium term investment strategy (MTIS) priorities (e.g. as described in national Poverty Reduction Strategy Papers (PRSPs), sustainable development framework targets, relevant MDGs etc)
- General impression of the importance given to water in media, parliament, government, president speech etc

2. Water Resources

2.1 Water resources availability

- Description of the river basin hydrology and climate (dependent on available data)
    - rainfall, evaporation, runoff, groundwater availability, water availability per capita
    - trends over the last decades
    - climate change scenarios – some indications of future pathways
- Introduction of overall water situation: a description of the shared waters (river basins and groundwater aquifers) in the region and their relevance for water resources at local level (this can include maps, tables, charts)
    - Watersheds
        - Table and/or map of shared river basins covering countries in the Global Water Initiative area
        - countries within watershed
        - population density
        - land use in watershed
        - water availability per capita
    - Aquifers
        - Tables and/or maps of aquifers
        - Countries sharing aquifers systems
        - Uses of aquifer
    - Estuaries and deltas
        - Tables and/or maps
        - Countries sharing estuaries/deltas
        - Transnational river basins that flow to coastal estuaries and deltas
        - Actual uses

2.2 Water uses and abstractions

- Water use and / or abstractions per sector
    - Agriculture
    - Water supply sanitation
    - Hydropower
    - Fisheries
    - Livestock
    - Transport
    - Industry
    - Ecological uses
    - Tourism
- Water use and abstraction per region/province/ district

2.3 Synthesis of the current and projected situation

- Analysis on constraints and opportunities for further transboundary waters co-operation in regards to water use and abstraction
    - Strengths
    - Weaknesses
    - Opportunities
    - Threats
- Existing and potential uses of watershed areas (rural and urban), and actual degradation
- Protected areas and conservation efforts included in regional river basins
- Competition for the use of water resources (water sources, contamination and degradation of upstream watersheds, who pays for water and who gets paid)

2.4 Learning, training and development in relation to water resources

- Types of training and capacity building available:
    - Appropriate training by level and subject (examples):
        - Hydrology
        - Integrated water resource management
        - River basin watershed management
        - Irrigation: large and small scale (engineering, water management)
        - Other agricultural water management (erosion control, water conservation measures, etc)
        - Other
- Institutions involved in training and capacity building
    - Institutions in the region
- Technical capacity within a region working on water resources (number of engineers, scientists, technicians and what they are doing, such as operating dams, reservoirs, wells, etc)

- Data as available from the public and private sector
- Perception of technical capacity available (from organizations that are recruiting)

3. Governance

3.1 Policy frameworks used

- Description of most relevant policies on water resources and water supply and sanitation. (highlights)
    - Water resources
    - Water supply and sanitation
    - Decentralisation /transfer of authority
- Possible reference to other policies where needed (e.g. land, fisheries, irrigation etc)
- Possible reference to other transboundary, regional and national policies where needed (e.g. land, fisheries, irrigation, economic cooperation, etc)

3.2 Legal framework used

- Description of the current legal framework (core principles and highlights)
- Effectiveness of implementation and enforcement
    - Perceptions of key stakeholders/recent reviews
- Indication of changes under discussion or recently adopted
- Overview of treaties, agreements, and the principles of international water law that has been applied
- Effectiveness of implementation and cooperation
- Indication of changes under discussion or recently adopted between countries

3.3 Institutional framework used

- Overview of the institutional arrangements around water, water quality, water quantity
- Sectoral players (Who does what in water)
    - Government, NGOs, private sector, district assemblies, towns and villages, academia, advisory bodies
- Capacity to up-scale / enlarge water management and service delivery (private sector, public sector, NGOs, academia & engineering); coordination and decision making
- Overview of the transboundary institutional arrangements around water, water quality, water quantity (River Basin Organisations)
- Who does what in regional water governance – government, NGOs, private sector, academia, advisory bodies Capacity to up-scale / enlarge water management and service delivery (private sector, public sector, NGOs, academia & engineering); coordination and decision making

3.4 Social frameworks

- Inter and intra community structure of water distribution, collection, use, etc
- Community involvement
- Co-operation with government
- To improve water management and service delivery (private sector, public sector, NGOs, technical); coordination and decision making
    - Technical capacity at the regional level on transboundary water management
    - Organisations involved in institutional training and strengthening

4. Finance

4.1 Public financing

- Overview of the amounts of public financial resources spent on water supply and sanitation (urban, rural), water resources management, hydropower, agriculture water & drainage and (since 2000 and projected up to 2015)
    - Past and current investment
    - Projected level of spending
- Specification of internal and external sources of funding (e.g. WB loans, donor support etc)

4.2 NGO financing

- Overview of total amount of NGO funding to water and WSS projects since 2000 and projected up to 2015.
    - Past and current investment
    - Projected level of spending

4.3 Private sector and user financing

- Overview of total amount of investment by private sector in water sector (e.g. irrigated agriculture, urban water supply, industrial water supply etc)
    - Overview of total amount of turn-over in the water sector
    - Past and current investment
    - Projected level of spending
- Overview of financing required by water users
    - Norms, accepted practice

Difficulties in financing the water and sanitation sectors

- Overview of key constraints and difficulties as perceived by key stakeholders
- Cost recovery

5. Challenges and Opportunities

- Overview of the opportunities and constraints for establishing a more integrated approach to deliver water supply and sanitation and sustainably manage the water resources and ecosystems associated.
    - Critical factors in:
        - Improving water resources management
        - Improving water supply and sanitation
        - Establishing an integrated approach
        - Networking, capacity building and learning
        - Communications and outreach
    - Strengthening community involvement in decision making
        - Water resources
        - Rural water supply and sanitation
        - Urban water supply and sanitation

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