

EXECUTIVE SUMMARY

The UNDP/GEF Project “Reducing Transboundary Degradation in the Kura Ara(k)s River Basin” is a Full Sized Project with the participation of Armenia, Azerbaijan and Georgia. The Project is assisting the three Kura Ara(k)s riparian states to 1) identify the principal threats and root causes related to the transboundary water resources of the Kura Ara(k)s river basin and 2) develop and implement a sustainable program of policy, legal and institutional reforms and investments to address these threats. Balancing overuse and conflicting uses of water resources in transboundary surface and groundwater basins is seen as the critical issue in the Kura Ara(k)s basin, and is the principal focus of attention from the very outset of project related activities. The long-term development/environmental goal of the project is the sustainable development of the Kura Ara(k)s river basin enhanced through ecosystem-based Integrated Water Resource Management (IWRM) approaches.

The project objective is to improve the management of the transboundary Kura Ara(k)s river basin through the implementation of a sustainable program of policy, legal and institutional reforms and investment options using the Transboundary Diagnostic Analysis (TDA) and Strategic Action Program (SAP) process. In order to achieve this objective, the project has updated the TDA, and is supporting the development of National IWRM plans that will be the base of the SAP.

In accordance with GEF International Waters Best Practices, the project has undertaken the underlying *Updated Transboundary Diagnostic Analysis*. The objective of this exercise is to work with national and international experts to identify and agree to the main water-related transboundary problems in the river basin, to develop as thorough an understanding of these problems, and through rigorous analysis, determine what actions should be recommended to the partner countries in the region to address these. This *Updated TDA* is the culmination of that process initiated under the Project Development Fund- B (PDF-B) phase of the project that ran from 2005-2007. The PDF-B phase of the project produced the *Preliminary Transboundary Diagnostic Analysis* in 2007. The current *Updated TDA* builds on the foundation set by the earlier version, and expands on the issues raised, focusing on the need to judge the transboundary situation based on empirical evidence beyond strongly held perceptions, and considering the impacts of development trends across the basin which will impact water resources in the future.

The Updated TDA is based on the original four transboundary issues identified and agreed in the early phase of the project, and has been updated based on developments and newly available information within the basin. The four transboundary issues are:

- Variation and reduction in hydrological flows.
- Deterioration of water quality.
- Ecosystem degradation.
- Flooding.

In the 6 years between the UNDP/GEF project’s PDF-B phase and the implementation of the current project there have been significant developments in the Kura Ara(k)s river basin, shaping the water management priorities of the countries. In the framework of the Updated TDA several new desk studies were conducted: (1) Water Quality Hot-spots; (2) Hydrological flow; (3) Climate change impacts on water resources; (4) Socio-economic trend analysis; (5) Gender mainstreaming in water management; and (6) Floodplain forests - Azerbaijan. Thanks to the generosity of other projects, specifically the EU Project “Trans-boundary River Management for the Kura River Basin – Armenia, Georgia, Azerbaijan Phase II and Phase III”, as well as the “UNECE Water Quality Assessment”, information was available which has been useful to this

Updated TDA. The findings of these and other projects have been incorporated into the current final Updated TDA, as well as inputs to this draft provided by the Project Steering Committee and National Experts in Armenia, Azerbaijan and Georgia.

The approach used for the *Updated TDA* is in accordance with the Best Practices for TDAs developed under the UNDP/GEF International Waters: Learning, Education and Resource Network project (IW:LEARN), as described in the methodology section. As this is an updated document with a gap of only 6 years, only the major changes in the region impacting on transboundary water issues were addressed, including institutional developments and newly available information, but not all aspects of the Preliminary TDA were repeated.

The description of the basin provides an updated overview of current basin settings. The physical setting reviews the geographic, hydrological, climatic and ecological conditions. The human setting describes populations within the basin, human health and gender issues, as well as the economic setting, providing an update overview of current water-related economic developments in the basin. The institutional setting provides an overview of the national stakeholder organizations involved in the decision-making in the three project countries.

The main transboundary issues are each explored through rigorous analytical review of relevant information by teams of national and international experts collaborating together. The discussion of each of the transboundary issues includes a description of the issue, its transboundary relevance, and the existing perception of the issue as a transboundary problem. This is followed by a presentation of the factual evidence supporting the scope and scale of the issue, and an analysis of gaps in evidence hampering a full and systematic assessment. Subsequently the impacts of the issue are discussed, both to the environment and the socio-economic sectors, while also the “super impacts” that make the issue relevant to decision makers and broader society are introduced. In order to develop recommendations on how to best address these super impacts, and take steps toward improving the transboundary conditions, the causal chain analysis approach is used to identify primary, intermediate and root causes. Additionally, for each transboundary issue, the impact of the cross cutting issue of climate change is discussed, based on a review of predicted climate change for the basin.

For the transboundary issue of **reduction and change in hydrological flow** the main finding is that there is a notable decline in hydrological flows, specifically in the downstream basin and in Armenia, as expressed in five-year annual running means. Additional analysis are conducted as part of the supplemental Desk Study, including the trends in both high and low flows as well as flow variability over the same period. The decline in flow metering stations, especially in Armenia and Georgia, and the lack of reliable data on past and present water abstractions create challenges in assessing the current state and future developments, and will need to be addressed. In addition, the impacts of declining availability, ecosystem degradation and the super impact of conflict over water resources use are discussed in light of the causal chain focusing on climate change, irrational water use, excessive demands on water resources from multiple sectors, lack of reliable information on available resources, and lack of effective integrated planning for water resources management, including at the transboundary level.

The **deterioration of water quality** as a transboundary issue addressed both the national and regional concerns of the need to assess the state of water pollution in a standardized and mutually agreed manner. As the countries of the Kura Ara(k)s basin currently assess water quality using different standards, the EU WFD methodology provides a strong basis towards obtaining improved, comparable empirical evidence throughout the basin. Water quality monitoring information from the countries at the national level provided the key input data to analyze pollution levels along the main Kura and Ara(k)s rivers, as well as selected transboundary tributary basins, included in this Updated TDA. The impacts of deteriorated water quality are ecosystem degradation, decline in human health, and loss of GDP due to impacts on

the labor force, by lowering productivity, and costs of pollution, by increasing the need for water treatment. The causes of water quality deterioration are land, air and water discharge of pollution, with climate change reducing the available volumes of water, as such increasing the concentration of pollutants. Intermediate causes include the lack of regulation and enforcement, lack of reliable information for decision-making, and the lack of incentives to reduce pollution. The root cause is a lack of information on the real costs of pollution of waters and the river system.

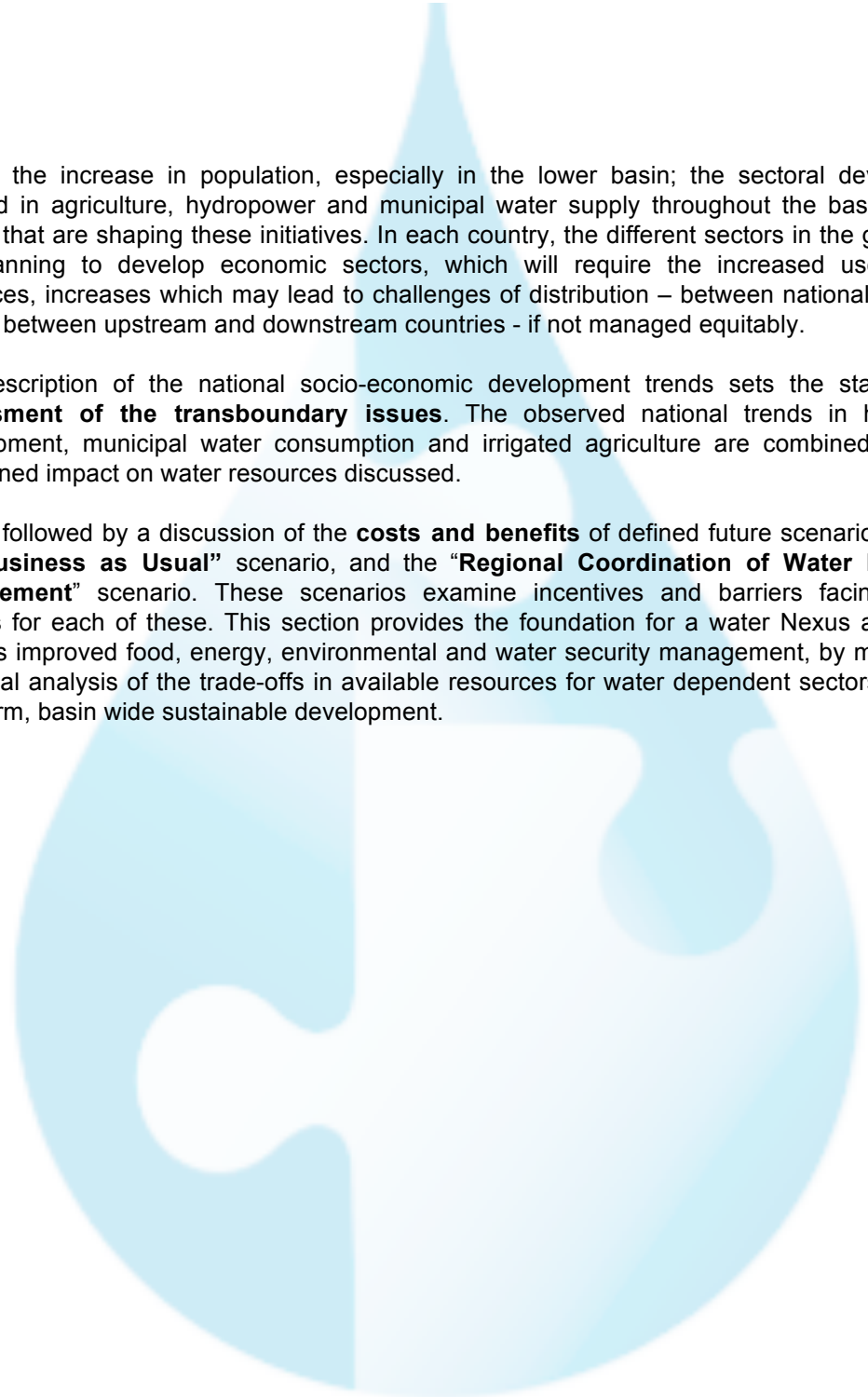
The issue of **ecosystem degradation** is pervasive throughout the basin and is related to a decline in hydrological flows, deterioration of water quality, conditioned by direct and indirect impacts of a multitude of unsustainable human activities, including climate change. The information that is currently available on ecosystem health is largely outdated and has many gaps, therefore it is difficult to adequately gauge the decline in a rigorous manner. The decline in flora and fauna diversity is marked throughout the basin, although more information to systematically account for these changes and losses is needed. Human development activities cause the loss of ecosystem functions, and as such the capacity of ecosystems to provide services of benefit to humans, including the mitigation of negative impacts. This leads to a subsequent loss of income, or additional replacement costs for the local communities as well as the government, which are the “super impacts”. The causes of ecosystem degradation, in addition to those listed above are: unsustainable use of natural resource; unsustainable land management practices – ecosystem degradation, fragmentation and destruction; a lack of information on ecosystems, their processes, services provided, and the impacts of human activities; and a segmented approach to natural resources management. The root cause is a lack of economic valuation of ecosystem services in the Kura Ara(k)s river basin.

The issue of **flooding** is sporadic but pervasive throughout the Kura Ara(k)s river basin. Flooding is part of the natural water cycle, and contributes to the natural and healthy functioning of ecosystems. However with climate change and increased human populations there has also been an increase in the frequency and severity of these events. The impacts of flooding events are loss of property, loss of life. The super impact is the costs to governments for repairs to infrastructure, compensation, and loss of GDP. The causes of flooding include beyond climate change also aspects of ecosystem degradation from overgrazing and deforestation, as well as increased building and land use activities in flood-prone areas. Additional causes include: focus on reactive flooding responses measures (not proactive) and structural control solutions which commonly lead to increased damages; limited understanding of natural flood cycles within ecological river processes, and the impact of human developments on them; lack of coordination between upstream and downstream communities in impacted areas. The key root cause is outdated flood management practices.

The **cross cutting issue of climate change** is addressed in each of the specific transboundary issue chapters, guided by a review of observed climate change in the recent past and predictions available for the basin until 2100, as described in the National Communications to the UN Framework Convention on Climate Change (UNFCCC). The interpretation of modeling results specific for the Kura Ara(k)s basin region shows that climate change is expected to cause an increase in temperatures, decrease in precipitation, increased glacial melting, increase in evapotranspiration and increase in frequency of severe weather events.

Subsequently an analysis of the **linkages and commonalities between the transboundary issues** assesses the overlaps in both causes and impacts of the issues and shared challenges for each, such as lack of reliable data and lack of prioritization for decision makers. In this way, addressing one challenge can also help to address others.

The linkages chapter is followed by a regional trend analysis that examines the **social and sectoral economic trends envisioned to impact on water management** in the coming 5, 10 and 20 years, within the cross-cutting challenges of climate change. Specific trends analyzed



include the increase in population, especially in the lower basin; the sectoral developments planned in agriculture, hydropower and municipal water supply throughout the basin, and the drivers that are shaping these initiatives. In each country, the different sectors in the government are planning to develop economic sectors, which will require the increased use of water resources, increases which may lead to challenges of distribution – between national sectors as well as between upstream and downstream countries - if not managed equitably.

The description of the national socio-economic development trends sets the stage for the **assessment of the transboundary issues**. The observed national trends in hydropower development, municipal water consumption and irrigated agriculture are combined, and their envisioned impact on water resources discussed.

This is followed by a discussion of the **costs and benefits** of defined future scenarios including the “**Business as Usual**” scenario, and the “**Regional Coordination of Water Resources Management**” scenario. These scenarios examine incentives and barriers facing decision makers for each of these. This section provides the foundation for a water Nexus assessment towards improved food, energy, environmental and water security management, by means of an empirical analysis of the trade-offs in available resources for water dependent sectors to ensure long term, basin wide sustainable development.

The Updated TDA is concluded with a set of recommendations based on its findings, categorized by the Agreed Water Resource Objectives (WRO) from the Preliminary 2007 SAP:

WRO I To achieve sustainable utilization of water resources to ensure access to water and preserve ecosystem services

1.1 *Achieve improved management of existing quantities of groundwater and surface water resources*

- Update hydro-meteorological data collection systems with improved national and transboundary stations including the use of online real time monitoring techniques and established data information exchange mechanism to make information regionally available.
- Develop national and regional conjunctive use strategies for sustainable utilization of surface and groundwater resources based on future trends in water use for different sectors and the potential impacts of climate change, and using updated monitoring information for the groundwater aquifers in line with international BAT for national and transboundary aquifers.
- Assess water demands and sectoral net economic return to GDP per unit of water, applying the most appropriate and staged water nexus approaches to develop, and implement demand management mechanisms to optimize the utilization of available water resources, including allocations to environmental flows in sub-basins for subsequent use on the regional level.
- Provide support for capacity building to improve the sustained implementation of IWRM and ongoing assessments based on the water nexus and economic approaches.

1.2 *Achieve reduced losses of water resources*

- Adopt modern technologies to improve water use efficiencies in irrigation systems, using incentive structures for farmers based on the public/private partnership approach.
- Improve public awareness and participation in decision making, among farmers, water end-users and other stakeholders, through among others Water User Associations, Basin Management Authorities and gender mainstreaming at local levels.
- Implement demonstration projects on alternative agricultural practices, including no-till rotations and low water use crop varieties, to increase yields and their reliability with public/private partnerships.

WRO II To achieve water quality such that it would ensure access to clean water for present and future generations and sustain ecosystem functions in the Kura-Ara(k)s river Basin

2.1 *Improve monitoring programs*

- Adopt revised national physicochemical and hydromorphological monitoring programs for both surface and groundwater, including geographical coverage, sampling schedule and parameters measured in line with the EU WFD and international standards.
- Adopt national bio-monitoring programs with shared databases on local taxonomy and water status indicators including environmental flows.
- Improve Quality Assurance & Quality Control in sampling & analytical practices.

- Development of water quality information strategies and tools for improved decision making including improved inter-sectoral information exchange.

2.2 Pollution reduction and prevention

- Assess health risk from water borne diseases for local communities with emphasis on the gender dimension in the water sector, and conduct an economic valuation of the environmental and socio-economic impacts due to water pollution, including losses to GDP.
- Reduce water pollution through development and implementation of integrated river water pollution abatement plans.
- Develop and implement a regional strategy for addressing point and non-point source pollution from contaminated sites and agricultural activities, including demonstration projects for BEP.
- Implement demonstration projects on the use of the best available technologies in pollution prevention and treatment for municipal sources.

2.3 Harmonization of Water Quality Standards

- Adopt harmonized national WQ standards in line with the EU WFD and international best practices.
- Introduce a unified water quality assessment system and harmonize methods and procedures for laboratory analysis for different polluting substances, including inter-laboratory testing.
- Develop a common water quality index and related river basin status assessment criteria.
- Improve data sharing on water quality in regional technical task force(s).

WRO III To achieve and maintain ecosystem status whereby they provide essential environmental and socio-economic services in a sustainable manner in the Kura-Ara(k)s River Basin

3.1 Monitoring and assessment of the status of riverine aquatic ecosystems

- Develop and implement national aquatic and riverine biological and environmental monitoring & assessment programs, interlinked at the regional level, including harmonized data collection, analysis and assessment, to be updated regularly.
- Conduct economic valuation of ecosystem services in support of improved decision making and public awareness.
- Support the mainstreaming of aquatic and riverine ecosystem concerns into sectoral economic development (agriculture, hydropower, forestry etc.), by means of implementation support to National Biodiversity Action plans, intersectoral cooperation and planning, in line with the Water Nexus approach towards improved environmental security.

3.2 Improved sustainable use of natural resources

- Assessment and update of legal and policy mechanisms for the protection of areas of ecological significance to river system health.
- Public awareness raising on the sustainable use of floodplain forest, wetlands, and riverine ecosystems, focusing on ecosystem services provided as well as the protection and use of endemic, migratory and rare flora and fauna species.

- Strengthen EIA and SEA procedures towards a more complete, transparent assessment of development impacts on surface and groundwater, and aquatic and riverine ecosystem services and their values, for use in decision making processes on (sectoral) economic development.
- Conduct demonstration project on opportunities for mainstreaming river system biodiversity conservation and sustainable use of biological resources for economic development and production processes with public/private partnerships.

3.3 Restoration of Riverine Ecosystems

- Assess, update and implement environmental flows in different sub-basins in line with international best practices, including flow assessment & design, legislative support, monitoring and enforcement.
- Implement river restoration plans at critical sites for improved ecosystem services, water supply and safety, to enhance surface and groundwater management in line with environmental security priorities.

WRO IV To achieve mitigation of adverse impacts of flooding on infrastructures, riparian ecosystems and communities

- Conduct a preliminary floods risk assessment for the South Caucasus, including flood hazard and flood risk maps in line with the EU Floods Directive.
- Develop flood risk management plans including early warning systems for national and transboundary areas in line with the EU Floods Directive.
- Strengthen linked crisis response centers for flood hazard mitigation equipped with flood forecasting capacity and response equipment.
- Develop community action plans for flood responses, and train the local communities in most vulnerable areas.
- Conduct demonstration projects to reduce flood severity by developing floodplain buffer zone rehabilitation plans, implemented at key pilot sites.

Additional recommendations:

- Review of the suitability of the Nexus approach towards inter-sectoral, transboundary water management in the Kura Ara(k)s river basin.

Climate Change

- Implementation of climate change adaptation measures towards improved water resources management for food, water, energy and environmental security.
- Improved knowledge and understanding of expected impacts of climate change of relevance to targeted stakeholder groups, towards strengthening sustainable climate change adaptation including annual regional meetings of decision makers and researchers to plan climate change adaptation measures in line with IWRM, and share results of tested mechanisms.
- Implement public awareness measures to highlight local adaptation strategies.