National Policy Dialogue on Integrated Water Resources Management in Turkmenistan (NPD)

Report

Proposal for implementation of the river basin management approach in Turkmenistan

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April 2013

Background

This report is elaborated to follow the objectives and tasks of the EU Water Initiative National Policy Dialogues (NPDs) on Integrated Water Resources Management (IWRM) in the countries of Eastern Europe, the Caucasus and Central Asia (EECCA). NPDs on IWRM aim to improve the regulatory and administrative frameworks for implementation of IWRM in the region.

This report is presented for discussion at the NPD Expert Group, following the mandate given by the second Steering Committee of the NPD on IWRM in Turkmenistan (Ashgabat, 27 September 2012). This report aims to suggest the approaches for implementation of the river basin management approach in Turkmenistan, including institutional aspects and division of the country into river basins.

Contents

1. General principles of basin approach

In August 2012, Turkmenistan acceeded to the 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention). The Water Convention provides a framework to be used by the Parties to implement IWRM. It promotes a holistic approach, which takes into account the complex interrelationship between the hydrological cycle, land, and flora and fauna, based on the understanding that water resources are an integral part of the ecosystem. In particular, the Convention is based on the concept of catchment area (see article 1 (2)). The entire catchment area or parts thereof comprise the physical unit on which the Riparian Parties shall cooperate by developing harmonized policies, programmes and strategies under article 2 (6).

The integrated approach to water management and protection laid down in the Water Convention has been further advanced and expanded in the 2000 EU Water Framework Directive which is commonly recognised as a key reference tool for the introduction of basin approach and other principles of IWRM also beyond the EU Member States. The EU Water Framework Directive, largely influenced by the Water Convention, establishes a framework for EU action in the field of water policy. The EU Water Framework Directive is complementary to other key pieces of water-related legislation, in particular, the 1991 directives on urban waste water treatment and on nitrates pollution from agriculture, the body of rules governing the authorization and use of pesticides and biocides, as well as the 1996 directive on integrated pollution prevention and control. The following description in paragraphs 1.1 and 1.2 gives a short overview about major tasks and actions for the introduction of river basin management, taking into account the abovementioned EU legislation and the experience of EU Member States and other Parties to the Water Convention.

1.1.Principal tasks to be undertaken

In the introduction of the basin approach, the following major tasks should be taken into account:

- Identify river basins and assign them to individual river basin districts. Two or more river basins may be combined into one river basin districts.

- Establish competent authorities, using either existing structures or creating new ones, and establish administrative arrangements to ensure that the directive is implemented effectively within River Basin Districts.

- Where a river basin is shared with other state, coordination across the whole river basin has to be ensured (establishment of an International River Basin Districts).

- Elaborate operational objectives for "high, good or moderate status" for the surface water and groundwater in the river basin. Good status has to be based on ecological, physic-chemical and hydro-morphological criteria.

- Identify waters used for the abstraction of drinking water and establish environmental quality standards for these waters; identify other protected areas (e.g. those under nature protection legislation).

- Based on an analysis of impact of human activity on the waters within the river basin, based on the monitoring of waters as well as based on the operational objectives of "good status", establish a River Basin Management Plan for each River Basin District, including programs of measures for achieving the specified objectives.

- For each River Basin District, undertake:
- an analysis of its characteristics;
- a review of the impact of human activity on the status of waters; and
- economic analysis of water use.

- Establish programs for monitoring the status of:
- surface waters and groundwater; and
- protected areas.

- Implement program of measures included in River Basin Management Plans.

- Take action to prevent or reduce the impact of accidental pollution incidents.

- Establish controls over abstraction of fresh surface water and groundwater, as well as discharges and other activities with significant adverse impacts on the status of waters.

- Establish an effective system of penalties for non-compliance with national provisions.

- Ensure that the price charged for services related to water (e.g. drinking water supply, waste water disposal and treatment) reflects the true economic costs of providing the service.

- Disaggregate the different water users into at least industry, households and agriculture.

- Prohibit the direct discharge of a list of dangerous substances into groundwater.

- Allow the public to have access to draft River Basin Management Plans, consult the public on the content of the draft Plans, and publish the final Plans.

- Consult interested parties on additional interim measures to combat pollution of waters.

- Report periodically on:
- exemptions from the provisions on cost recovery;
- plans and programs;
- penalties under national law;
- measures taken to comply with the River Basin Management Plans.

1.2. Minimum contents of the River Basin Management Plans

1.2.1. Arranging databases and establishing GIS

Information should be systemized before starting to work out river basin management plans or in the preliminary phase of the process of creating river basin management plans. It is recommended that databases are stored in the format, which is compatible for GIS programs. For these purposes each object on a map must have its unique identification number and co-ordinates in general system.

Databases needed in the first place:
Surface water status:
Location of surface water bodies, borders (map)
Monitoring network of surface water
Database for surface water quality
Database of the hydrology of surface water bodies
Data on flora and fauna of surface water bodies;
data on habitats places;
Database for bathing water quality;
Data based on water permits.
Groundwater status
Location of groundwater bodies
Drinking water quality database
Monitoring network of groundwater
Database on groundwater resources
Data based on water permits (wells, water levels, water quality)
Human Impact on Surface- and Groundwater Quality
Database of towns and settlements
Database of water permits
List of enterprises with integrated permits
Database on wastewater treatment plants
Database of chemical storages
Past pollution objects
Nature protection areas and objects
Land use
Data on use of fertilizers in agriculture and forestry
Yields in agriculture for calculating the nitrogen balance
Manure storages
Fertilizer depositories
Fuel terminals and storages
Waste treatment facilities and landfills
Using plant protection chemicals in agriculture and forestry
Enterprises using dangerous substances (chemicals)

Recommended databases:
Surface water status
Hydro technical structures
Land reclamation structures
Groundwater status
Human impact on surface and groundwater quality
Energy conduction stations
Cemeteries

Fish breeding

1.2.2. Description of the River Basins and Sub River Basins

Overview

Location of the sub river basin, general information, density of population, sizes of towns and settlements, economical activities related to the water management.

General description of water bodies and borders of the river basin

Existing information shall be used for composing the river basin management plans. Relevant information shall be provided by the information centers or relevant information units.

Classification of surface water bodies based on the size and peculiarities of use.

A proper system for the classification of surface water bodies does not exist in Turkmenistan. A proposed classification:

General classification of rivers in EU for example is as following:
Large rivers (navigable), with the drainage area of more than1000 km2
-Average sized rivers with the drainage area of 250-1000 km2
-Average sized rivers with the drainage area of 100-250 km2
-Small rivers, drainage area 10-100 km2
-Streams, small rivers related to land reclamation and irrigation structures
According to new draft of the Water Code of Turkmenistan, there is proposal to divide rivers into three groups: large, medium and small rivers.

Requirements of water quality and ecology of stagnant water bodies depend on their location, size and peculiarities of use.

They can be classified:
-Internal water bodies with international importance
-Large internal water bodies with significant economical importance .
-Mainly polluted water bodies
-Dystrophic water bodies
-Small water bodies

Describing the status of surface water bodies

It is needful to systemize water bodies according to their peculiarities: drinking water sources, bathing water bodies, habitats places, recreational water bodies, fish breading. Characterization shall be made based on the flow rates and water balance. This is important mainly for discharging wastewater and using hydroenergy.

An overview of the impact of pollution sources on the water quality and analyses the water use, an overview of the compliance of the quality parameters of the water bodies.

The compliance to the quality parameters shall be described based on the following prioritization:

Surface water quality requirements for abstracting drinking water
Surface water quality requirements for bathing water
Surface water quality requirements for habitats
Surface water quality requirements for fish breading
The general compliance of water to its natural status (compliance to ecological quality classes)
Requirements for restoration of surface water bodies for recreational needs
Maintenance of the irrigation systems

Implemented measures for the protection of groundwater against the agricultural pollution

Restrictions for fertilization
Upgrading the manure storages
Ensuring the protection of geologically problematic areas (karst areas for example) and
Impact of the polluted groundwater to the quality of surface water bodies and coastal waters

Sea water

Mainly on the status of coastal water shall be focused. At least following should be considered:
Sea water quality in bathing districts
Status of the sea fauna, protected areas, results of the implemented programs
Sea water quality in protected areas
The impact of dangerous substances on sea fauna
Preparations for avoiding accidents and eliminating causes of accidents
The impact of wastewater discharges on the quality of coastal waters

A separate overview shall be made and recommendations drafted for the protection of sea water.

Human Impact on surface and groundwater

Overview of population density, public water supply and sewerage systems, number of people connected to the sewerage systems.

Estimation of the impact of pollution from the point pollution sources.
Point pollution sources.
Overview of the allowed discharges to groundwater. Used measures to control the pollution.

Estimation of the impact of the diffused pollution.
The pollution load shall be described and estimated, measures for decreasing the impact of diffused pollution.

Overview of the water use

Water use by types of water users

Drinking water

The overview shall provide information on the number of people receiving the drinking water compiling with the quality parameters compared with the number of total population in the river basin.

Necessary information in the river basin management plans

Location of the people and other consumers in the river basin area

How many people receive good quality drinking water, how many of the not.

Reasons for non compliance

Non compliance of the drinking water source
Derogation of the water quality in pipelines
Other

Information shall be provided for each settlement and local government, main problems must be indicated.

Other human impacts on water quality.

Other possible impacts shall be explained (building and reconstruction of dams, changes in the water level caused by mining activities)

Identifying protected areas.
The situation and needs for protected areas shall be described.

Monitoring network

Contains information of existing monitoring networks and supervision system, and proposals for changing the monitoring network based on the objectives and criterias of the river basin management plans.
Overview of the drinking water quality supervision
Overview of the surface water monitoring networks and monitoring program
Overview of the groundwater monitoring network and monitoring program
Overview of the monitoring network and monitoring program of the protected areas

Environmental objectives

Following objectives shall be considered in the river basin management plans

To ensure the provision of safe drinking water. Depends on the economical situation of the region.
Sustainable use of groundwater.
The natural status of the surface water bodies
Protection of flora and fauna of water bodies
Analyze on water use
Sustainable use and protection of coastal waters

For each objective criteria shall be identified to measure the changes and movement towards the objectives.

Analyse on water use

Economical aspects of the water use, drinking water and wastewater services, incomes of the consumers in the river basin districts, ability to pay.

1.2.3. Program of measures

General

List of measures needs to be established in order to reach the objectives. Measures shall be divided into groups according to the objectives. Measures shall be prioritized and the costs for them estimated, responsible authorities for implementing measures should be identified. Main measures shall be described on maps. Economical criteria's of implementing the measures shall be described.

The program of measures shall be long-term and short-term measures, based on their priorities and economical possibilities. Measures shall be presented in the table format for each settlement and region.

Drinking water sub-program

Information about the changes in drinking water quality after implementing the measures. Clear measures shall be provided in the river basin management plan on how to gain the use of safe drinking water during 6 years.

Cost for each settlement and region shall be estimated.

Groundwater sub-program

Ensuring the quality of groundwater
Ensuring the quality of significant groundwater bodies, ensuring the protection of water intakes, protection of groundwater in densely populated areas

Sub-program for coastal waters

Surface water sub-program

Following shall be described:
Construction and renovation of wastewater treatment plants, restoring polluted water bodies, restoring water bodies for recreational purposes, harmonizing the monitoring programs with the monitoring program of the river basin management plan.

Sub-program for the protection of species

Criteria exists only for the protection of salmonids and cyprinids. Specified requirements shall be adopted from the local nature protection programs.

Additional measures

Measures needed for the implementation of the requirements according to the laws and regulations on dangerous substances, bathing water, drinking water, diffuce? pollution, wastewater, wastewater sludge.

Practical steps for implementing the cost recovery principles.

It must specified into which extent cost can be covered by tariffs and fees.

Feasibility study of measures

The improved of the environment and the costs for that shall be estimated. The improvement should be measurable based on the criterias established in the river basin management plan.

Public participation

The river basin management plan must be easily understandable in different levels of users. Information gathered for the river basin management plan is for public use.

Competent authorities and implementation

In a state level the competent authority shall be the Ministry of the Water Economy. In practical terms it shall be meant as the water department or planning department, who co-ordinates also the establishment of sub-river basin management plans. Establishment and implementation of sub-river basin management plans shall be arranged by the regional basin institutions, by River Basin Organizations.

The responsibilities and competence of different authorities shall be specified on a state level, in Water Code and in relevant governmental subacts.

The success on implementing the river basin management plans shall be assessed based on the criterias determined for the objectives of the river basin management plans.

1.2.4. Proposal for future steps

The Ministry of the Water Economy could consider the list of minimum tasks concerning the introduction of river basin management, including the identification of 8 River Basins. The outcomes of the ongoing river basin based projects ongoing in Turkmenistan and other international expertise may be particularly useful in this respect. Due to complexity of the exercise, careful planning is important.

If the Ministry of the Water Economy manages to co-ordinate the workload systematically and act adequately a River Basin Management Plan in every River Basin or in River Basin Districts could be completed at the end of year 2015. Close symnergies of these plans with the Sub-River Basin Management Plans are important.

Another specific aspect is the participation of the public and the polluter/user paying principles. The success of this River Management Plans relies in close co-operation and coherent action at local level as well as on information and involvement of the public, including users.

In the EU, the Water Framework Directive creates the possibility to decentralize the water management to the local level and thus increasing the public awareness of the environmental friendly use of this renewable natural resource.

For the economic aspects of implementation of River Basin Management Plans relevant funding is crucial. The reallocation of funds for investments in the water sector should then be made at the central level. This creates a problem for implementation that can be solved by creating clear guidelines on objectives and priorities for water investments. By using clear guidelines for the water related investments, this can also be used to divide these investments over the River Basins (or River Basin Districts). Within each River Basin these guidelines could be used to determine the most necessary investment needs. Thus the local level can create an active involvement of the public for local water management at River Basin level despite the fact that financing is centralized.

2. Proposals to improve existing water legislation and some proposals conserning institutions

2.1. Proposals for improvements in the water legislation

The Water Code of Turkmenistan currently in force provides a good start to elaborate relevant water management plans and programs. There are several articles in current Water Code of Turkmenistan where the basin principle could be introduced.

This includes, e.g., article 76 "Method of operation of water basins". This article is part of chapter XVIII "Operation of water basins". Article 76 provides that:
"The organization and coordination of the actions providing an appropriate technical condition and an accomplishment of water basins, and also the control over observance of rules of their operation is carried out by bodies on regulation of use of waters in an order established by the Cabinet of Turkmenistan".

Article 76 may be improved by adding the supervision task over RBMP implementation and reporting to the tasks of the Ministry of Water Economy under the same article.

Another article where improvement is possible, is Article 102 "Schemes of complex use and protection of waters" in Section IV "The state account and planning of use of waters", chapter XXIV "The state account and planning of use of waters". Article 102 provides that: *"General and basin (territorial) schemes of complex use and protection of waters define, the basic water economic and water security actions for preservation of the water fund, directed on satisfaction of perspective requirements for water of the population and economy branches, maintenance of the most effective and rational use of waters, and also for protection of waters and the prevention of their harmful influence. Schemes of complex use and protection of waters are made by the Ministry of Water Economy of Turkmenistan and affirm the Cabinet of Turkmenistan."*

This article could be a good basis to introduce River Basin Management Plans (RBMPs) as a more concrete term to replace *general and basin schemes*. Special clauses on objectives and content of RBMPs, as well as the timeframe for elaboration of such plans should be included in this article. Procedures about public participation in process of elaboration of RBMPs should be taken into account as well and relevant amendments in related articles of water code should be introduced.

Similar proposal refers to article 103, which provides that "*The planning of use and protection of waters should take into account the data of social and economic development of the State, the State water cadastre, water economic balances, and schemes of complex use and protection of waters.*"

In this article, again, *general and basin schemes* of complex use and protection of waters could be replaced with a more concrete term – River Basin Management Plans together with

relevant program of measures. Also, similar improvements in other clauses of Water Code and in other legislative acts should be taken into account.

The draft of the new Water Code which is the subject of discussion by the NPD Expert Group in late 2012 - early 2013, represents an important step forward in introducing the internationally recognised principles and best practices in water resources management and protection. Among other aspects, it advances the basin management of water resources, clarifies the roles of the different institutions involved in various aspects of water management, provides tools and mechanisms for participation of water users and the public in water management. It may however be recommended that the new Water Code goes further and introduces the concept of the river basin management plans instead of the schemes of complex use and protection of waters (see e.g. articles 25-27).

2.2. Organisation of the implementation and establishment of the River Basin Management Plans.

Pursuant to the Art. 102 and 103 of the current Water Code of Turkmenistan and other relevant regulations there are clauses (possibility to use in case of RBMPs) to elaborate general or basin (territorial) schemes of complex use and protection of waters, the basic water economic and water security actions for preservation of the water fund, directed on satisfaction of perspective requirements for water of the population and economy branches, maintenance of the most effective and rational use of waters, and also for protection of waters and the prevention of their harmful influence. Schemes of complex use and protection of waters are developed by the Ministry of Water Economy of Turkmenistan and approved by the Cabinet of Turkmenistan.

Therefore the Minister of the Water Economy (with its Planning Department) could issue a regulation on organization and establishment of the RBMPs, e.g. in the following way:

1. Ministry of the Water Economy Planning Department to organize the establishment of the River Basin Management Plans in Turkmenistan together with all relevant governmental bodies and ministries.

2. Each river basin management plan must consist of at least following:

2.1. Overview of the groundwater aquifers and water bodies (maps of location, types of water bodies, information on monitoring programs of groundwater and surface water and maps on monitoring results, information on approved available groundwater resources by aquifers, information on the evaluation of the status of types of water bodies and groundwater aquifers, maps characterizing the status and classes of water bodies and groundwater aquifers);

2.2. Analyze of the impact of human activity on groundwater aquifers and water bodies (evaluation of the impact of point and diffuse pollution sources, wastewater outlets including information on discharges including discharges of dangerous substances, map of pollution sources, map of land use, water abstraction points including information abstracted water, other information describing the impact of human activity);

2.3. General maps of areas under protection or which are planned to take under protection;

2.4. Objectives for improving or maintaining the status of water bodies and groundwater aquifers as close to natural conditions as possible, including maps of established objectives by groundwater aquifers and types of water bodies;

2.5. Information on economical analyses of the water use;

2.6. Program of measures for water bodies and groundwater aquifers, not complying with the objectives established, dependent on the cause of non compliance, the program of measures shall specifically point out:
2.6.1. Measures for the protection and improvement of groundwater aquifers and water bodies;
2.6.2. Measures for the protection of water fauna;
2.6.3. Measures to ensure the compliance with the existing legislation in force (drinking water quality requirements, requirements for the protection of drinking water intakes, permitting of the direct discharges into groundwater, minimization of the impact of dangerous substances, minimization of the risk of the accidental pollution incidents, measures for the restoration of groundwater aquifers and improvement of the status of water bodies in places where the achievement of the good water status is complicated);
2.6.4. Measures for the cost-recovery of water use;
2.6.5. Measures to control the water abstraction and impacts on water;
2.6.6. Measures to minimize the impacts of point and diffuse pollution sources;

2.7. Overview of areas where the use of water must be restricted or the further use of water prevented, considering the vulnerability and sensibility to pollution of groundwater aquifers;

2.8. Feasibility study of measures stated in section 2.7., based on the information of the economical analyses of the water use;

2.9. Overview of the strategy to ensure the public participation and involvement in the river basin management planning.

3. River basin management plans shall be revised and updated after every six years. To revise the river basin management plans, the following must be completed:
3.1. Overview of the implementation of the river basin management plan;
3.2. Evaluation of the achievement of the objectives established;
3.3. Analyses of the monitoring results, including maps implicating the status of the water bodies and groundwater aquifers;
3.4. Explanatory notes on environmental objectives, which had not been achieved;
3.5. Overview of the measures, which were not implemented;
3.6. Overview of revised objectives and programs to implement these;

4. To establish the work-group in order to provide guidance for establishment of river basin management plans with following members:
4.1. Head of the Work-Group, Ministry of the Water Economy, Vice- Minister
4.2. Ministry of the Nature Protection, Environmental Protection Department,
4.3. representative of State institution Turkmengeologiya,
4.4. representative of the Ministry of Construction and Construction Materials,
4.5. representatives of five velayat subdivisions (Production Association Akhalsuvhodjalyk, Production Association Balkansuvkhodjalyk, Production Association, Dashguzsuvkhojalyk, Production Association Lebapsuvkhojalyk,

Production Association Marysuvkhojalyk),
4.6. representative of Central Directorate for Irrigation Systems and Facilities,
4.7. representative of Scientific-Research and Design and Survey Institute Turkmensuvylymtaslama,
4.8. representative of Scientific-Production Association Ecology,
4.9. representative of Karakumderyasuvkhojalyk Association,
4.10. representative of Khyakimliks housing and utility services (HUS) and water treatment plants,
4.11. representative of Production Association Karakumderyagurlushik,
4.12. representative of Production Association Altyn Asyr Turkmen Koel Gurlushik,
4.13. others, pointed by the head of the Work-Group.

5. Ministry of the Water Economy shall lead the establishment of the Turkmenistan River Basin Management Plans and Sub River Basin Management Plans and their implementation.

6., The Guidelines for the Establishment of River Basin Management Plans shall be prepared and submitted for the approval by the Ministry of the Water Economy by the 1st of July 2013.

7. The following *regional services (River Basin Organzations if those will be in place at that time)* of the Ministry of the Water Economy shall coordinate the establishment of river basin management plans and control the implementation in respective river basins or in the river basin district as specified:

- Amudarja Lebap zone basin district;
- Amudarja Dashoguz zone basin district,;
- Murgab Basin;
- Tedjen Basin;
- Atrek Basin;
- Akhal Basin;
- Karakum canal basin district
- Caspian Sea basin district.

8. Institutions in administration of the Ministry of the Water Economy shall ensure that the necessary information needed for River Basin Management Plans shall be provided as required

9. The financing of the river basin management plans shall be considered in planning and drafting the budget of Ministry of the Water Economy until 2014.

10. For the establishment of River Basin Management Plans and their implementation the need for additional employees shall be considered in drafting of the national budget.

11. The river basin management plans shall be finalised by the 1st of September 2015.

3. Proposal on the division of the country into river basins

Generally in future the water management must be based on clearly defined hydrological boundaries, the river basin management concept, rather than administrative boundaries and according to agreed international principles of integrated water resource management (IWRM). There must be a single, overarching body responsible for overseeing nation-wide water resource management and thereby addressing three major areas: policy, regulatory and operation. However, there must be a clear and effective division of responsibilities between those tasks with undertaking these major issues. Control of all future water operation, management and allocation functions must be conducted through appropriate management structures.

According to the EU Water Framework Directive the river basin means the area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta. In Turkmenistan we see that this is partly correct as some rivers run-off flows into manmade canal system.

There is also definition of sub-basin, what means the area of land from which all surface run-off flows through a series of streams, rivers and, possibly, lakes to a particular point in a water course (normally a lake or a river confluence).

Most practical term with regard to the actual management is river basin district. River basin district means the area of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters, which is identified as the main unit for management of river basins.

Well defined river basins will in addition to river flows, include groundwater, springs, lakes, glaciers and other water bodies. Management of river basins depends on their size, complexity, trans-boundary issues, number and type of users, environmental factors, etc. The practical understanding of river basins must be rationalized in order to ensure optimal and sustainable management. For relatively simple basins, several may be combined into one management unit.

The UNECE Environmental Performance Review of Turkmenistan (2012) provides that:

"The main principles of integrated water management are specified in the current Water Code, as a requirement for the development of Basin Schemes for Integrated Use and Protection of Water Resources. Schemes for Integrated Use and Protection of Water Resources are designed by Ministry of Water Economy and approved by the Cabinet of Ministers. At the same time, water distribution and environment protection functions are separated between Ministry of Nature Protection and Ministry o the Water Economy, and coordination mechanisms between the two Ministries are not well developed. Other water management functions are also divided between a number of ministries and institutions, and coordination of activities is also insufficient."

Consequently, it is necessary to reorganize water management system throughout the country, by means of a national integrated water resources management plan covering not only the country but also concrete basins separately, by RBMPs.

The UNECE Environmental Performance Review recommends that:

The Ministry of Water Economy should:
(a) Develop a national integrated water resource management plan with involvement of relevant water users in the planning process
(b) Establish basin management structures for Murgab, Tedjen and Atrek rivers and also for relevant canal systems and ensure the coordination of actions according to a developed plan.

Taking into account all those recommendations, there is need to determine water basins for further management.

Considering hydrological boundaries and taking into account various aspects of Turkmenistan river basin systems, the following basins are proposed to be designated:

- Amu Darya Basin (2 districts)
- Murgab Basin
- Tedjen Basin
- Atrek Basin
- Akhal Basin
- Karakum canal basin district
- Caspian Sea basin district

The proposed basins are described below.

-Amu Darya Basin; consisting of the Amu Darya River and its tributaries within Turkmenistan. From management point of view it is reasonable to divide this basin into:
-Amudarja Lebap zone basin district. Lebap oasis (midstream of the Amudarya) – with above 330 thousand ha of irrigated lands and around 400 000 of rural population and
-Amudarja Dashoguz zone basin district. Dashoguz oasis (downstream of the Amudarya) – with above 470 thousand ha of irrigated lands and around 600 000 of rural population.

The Amu Darya River is the most important river in Turkmenistan. It is 2,400 km long and has a drainage basin of 534,739 km2. Amu Darya River basin covers the territory of Turkmenistan and part of Tajikistan and Uzbekistan, Kyrgyzstan and Afghanistan. Amu Darya River plays an important role in the economy of the country. Amu Darya belongs to the rivers of ice-snow feed with long spring-summer high water and steady low level of water. The increase of water of the river is in March - April. The decrease and recession levels of water is observed at the end of July - August and proceed till January - February. About 62 % of an annual flow of the river is in May - August, that is favorable for irrigation.

Average annual sediment transport of the river is 3.8 kg/m^3. Downstream sediment transport is decreasing.

Salinity, the contents of the main ions at any time of the year are implicitly the same. The relative contents of ion SO_4 varies from 15 up to 25% at the town Atamurad (Kerki) and within the limits of 10-25% at Kishlak Chatly, and contents of Cl within the limits of 10-25% along the entire length of the river. The degree of water salinity of Amu Darya is approximately similar along its entire length and varies from 600 up to 800 mg/l in high water

and from 430 up to 1800 mg/l in low water, that is, it undergoes insignificant changes within a year

Salinity of water decreases during high water, reaching the minimum in July - August, that is during the period, when there are high water waves in the river caused by melting of high-mountainous snow and glaciers. Salinity increases during low water. Although since this character of change of the water discharge of the river and degree of salinity is varying each year, and the relative dependence of salinity on water discharges has only been roughly established, this relationship can be recommended for calculation of degrees of soluble substances in the flow.

The calculation of the dissolved substances (kg/s) in the flow, executed for the sites of Atamurad (Kerki), Ilchik and Tyuyamuyun, show that the discharges of the dissolved substances decrease downwards the river.

-Murgab Basin; consisting of the entire Murgab River and its tributaries; except that part which lies in Afganistan, it also includes the upper reaches of the Kushka and Kashan inside Turkmenistan as part of this River Basin.

Murab oasis (upper zone is irrigated by the Murgab river only and lower zone has two sources – Murgab and Karakum canal) – with above 480 thousand ha of irrigated lands and around 500 000 of rural population

Currently- Murgab River is the second largest river, with a drainage basin of almost 46,900 km2 and the river is 852 km long, of which 350 km in on Turkmenistan territory. The annual discharge of Murgab River is 1.631 km3/year. Since ancient times, irrigated agriculture has been the predominant water user in the basin. Currently, the return waters (surface runoff and groundwater flow) from the irrigated land do not significantly influence the river's water quality.

The regime of the river is characterized by some stretched spring high water from melting snow in the mountains of Afghanistan and spurs of Paropamiz and rainfalls. The beginning of high water is in March, as a rule, the maximal discharges pass during spring high water. The absolute maximum discharge on Tahtabazar post occurred in 1972 and amounted to 842 m^3/s. Average long-term annual discharge of water in the river amounts to 55.1 m^3/s, and flow volume- 1.751 km^3 per year. Two tributaries Kashan and Kushka run into the river Murgab. However, these inflows do not play an essential role in formation of general flow of the river Murgab, as long-term average discharge of the river Kashan is 1.29 m^3/s, flow volume- 0.060 km^3 per year, and river Kushka, accordingly, is 2.93 m^3/s, flow volume- 0.080 km^3 per year, thus amounting to 7.65% of the total discharge and 8% of the total flow volume of the river Murgab.

With the purpose of attenuating the peaks of high water and regulation of flow of Murgab on the river has been constructed a cascade of reservoirs of various capacities. In 1998 the flow of the Murgab river, within the territory of Turkmenistan, amounted to 1.044 km^3.

Water of the river Murgab is less saline than water of the rivers of Tedjen and Atrek. The proportional relationship between water salinity and water discharge has been established. They are varying both within a year and over the years. However, water discharge of the river Murgab does not have so strong effect on the degree of water salinity, as on the rivers Atrek and Tedjen. In connection with low salinity of ground water in the Murgab river basin, the higher water salinity takes place not in the low water period, but during the river level rise to high water and flooding due to rainfall, when the salts from the ground surface of the basin are washed off into the channel. Water salinity during the river level rise to high water or large flooding increases from 400-500 up to 1000 mg/l. Then after washout of easily

dissoluble salts, it sharply falls due to diluting rain and snow water on recession of high water. Its lowest value of 235 mg/l was observed on18.05.1970.

Salinity of water varies from 200 mg/l in the beginning of the summer season, when less mineralized soil- and groundwater of the top strata join along the channel, up to 400 mg/l in the middle of the summer, when the river is fed by more saline ground water.

Salinity in the autumn-winter period is higher than during summer and is usually 400-500 mg/l, sometimes higher, up to 1000 mg/l. The river at this time is fed by groundwater from deeper aquifer strata, which have stayed in long contact with mountain rocks.

-Tedjen Basin; consisting of the entire Tedjen River and its tributaries except that part which lies in Iran and in Afganistan

Tedjen River is 1,124 km long, with a drainage basin of 70,260 km2, and flows to the west of the Murgab River. The annual discharge there is about 0.87 km3/year. Irrigational agriculture is the predominant 128 water user. However, the river's waters can only satisfy the water demand of 15% of the agricultural land suitable for irrigated agriculture. To satisfy better agricultural water demand, the Islamic Republic of Iran and Turkmenistan completed the construction of the Dostluk ("friendship") dam and reservoir on the Tejen (1,250 million m3). in 2005. Following a bilateral agreement between the two countries, the reservoir's water resources are equally shared. The return waters (surface runoff and groundwater flow) from the irrigated land influence heavily
the river's water quality.

The basin of the river is located on the territory of three states: Afghanistan, Iran and Turkmenistan. Character of river and its tributary Keshefrud, by virtue of their high-attitude situation are mixed and they are fed by snowmelt and rainfall. Long-term average annual flow of the river at hydro Pulihatun post is 1.066 km^3 and the long-term average annual discharge is 33.8 m^3/s. Distribution of the river flow is uneven and adverse for irrigation: 80-85% of flow is during the period of March - May, and in July - August, when demand of irrigation water is maximum, and the river practically dries up.

During certain years significant high water takes place on the river Tedjen. The discharges and flows with 0.01% probability of occurrence amounts to 2192 m^3/s and 7.559 km^3, and at 0.1% - 1759m^3/s and 5.843 km^3. Average annual sediment transport of the river is 15 kg/m^3, at the maximum is 190 kg/m^3.

The annual course of salinity and contents of the main ions correspond to seasonal change of water discharge of the river and character of feed. During spring high water, the water is less saline (450-2800 mg/l), it has also less amplitude of fluctuation in the contents of the main ions. The degree of salinity depends on both the magnitude of a high water and pre-flood rises caused by thaws or rains, which wash off salt into the channel from the ground surface of the basin.

Usually, for high waters with large pre-flood rises for the river, less salinity is characteristic - 500 mg/l. Salinity of water on rise to a high water and absence of pre-flood rises, is higher than on recession.

Any dependence of salinity on magnitude of water discharge of the river Tedjen is not observed during summer low water. In this period the river is fed by groundwater, and the top strata of the aquifers depend on groundwater outflow of past high water. The magnitude of

high water volume and pre-flood conditions are reflected not only on the water salinity during the spring period, but also in summer.

-Atrek Basin: all of the tributaries except that part which lies in Iran

Atrek oasis (the Atrek river with tributaries) – less than 15 thousand ha of irrigated lands and around 30 000 of rural population.

Atrek River is located in the southwest of the country. Its flow to the Caspian Sea is not significant and can occur only with floods. It is caused not only by the small amount of precipitation falling in the Atrek River's watershed, but also by the intensive withdrawal of water for irrigation in the Islamic Republic of Iran. The average annual flow is 0.26 km3 (260 million m3/year).

The river Atrek, like all other rivers, is not only trans-boundary, but also along the boundary of 150 km**.**

The total catchment area of 27.3 thousand km^2 is located on the territory of Iran - about 20 000 km^2, where the basic flow of the river is formed, and remaining 73 thousand km^2 in Turkmenistan. The river Atrek basically is rain fed and non-perennial. On the territory of Iran 15 tributaries flow into the river, on the territory of Turkmenistan Sumbar with tributary Chandyr flow into the river Atrek. Long-term average annual discharge for 35-years period of monitoring amounts to 8.37 m^3/s, and flow volume is 0.293 km^3.

The months with maximum flow in the river are March - May, which contribute up to 50% of the annual flow, minimum flow period is July - September.

The average maximum discharge can reach 40 m^3/s and during individual years peaks - up to 120 m^3/s. The annual flows for the period of monitoring can vary in the range of 0.118-0.903 km^3. Long-term average annual value of sediment transport is 25 kg/m^3, though during specific month sediment transport could reach 170 kg/m^3. Long-term average annual salinity is 1.5g/l, but it is 6g/l and more in the period of low-level of river water.

With the purpose of using most of the flow of the river Atrek in its downstream reach, reservoirs Delili, Kyzylay and Mamedkul with total capacity of about 0.045 km^3 have been constructed and Ajapyap spawning-ground with a volume of 19.3 $mln.m^3$.

-**Akhal Basin** consist of a Kopetdag oasis (mountain zone is irrigated by a number of small rivers only and any irrigated plot in steppe zone has at least two sources – a local small river and the Karakum canal) – more than 500 thousand ha of irrigated lands and around 400 000 of rural population.

-Karakum canal basin district.

Karakum canal is important in surface water resources and it is one of the largest artificial water courses. In current circumstances the extent of it exceeds to 1300 km. Head intake of the river is on the left bank of Amu Darya river on the site of Mukry gorge. Average annual head intake of the Karakum canal, depending on wetness of the year amounts to 11.5 km^3. At maximum discharges, the head intake works can divert 600-650 m^3/s to the Karakum canal. Total average annual flow of the Karakum canal surpasses more than 8 times the flow of all other surface water sources. Three internal system reservoirs with a total capacity of about 2.5 km^3 have been constructed and are operated for guaranteed seasonal flow regulation in the Karakum canal.

Salinity of Karakum canals depends basically on water salinity of the river of Amu Darya. The contents of the basic ions have not obviously been expressed and are similar during the year. Water salinity along the length of the channel remains practically at a similar level. The minimum amount of salinity is observed in August - September, maximum during autumn-winter at low water.

The considerable changes of water salinity have, in our opinion, taken place recently on the river Amu Darya in connection with reduction of its water discharge and removal of saline drainage flows in the middle reach of the channel.

The determination of water discharges or supply is not accurate, as the natural hydrological regime of the river Amu Darya undergoes considerable changes along its entire length. It is connected with extractions of water from the river channel for irrigation and other needs, and considerable amounts of collector-drain spill.

- Caspian Sea basin district

This basin district is with very small surface flow and more issues are related to water supply issues for inhabitants and coastal zone management.

4. Recommendations for institutional and administrative changes

The improvement of water management structures in Turkmenistan should include clear separation between policy and regulatory functions, on one hand, and operation and maintenance, on the other hand. The separation between these two levels of management constitutes the major principle governing the management of institutional structures. Institutional changes should therefore be introduced at two levels:

Policy and regulatory: creation of a National Water Commission; integration of water resources regulation, management and planning functions through the formation of Water Resource Planning Unit (department) within the Ministry of Water Economy and its River Basin Organizations;
Operation and maintenance: for the different uses of water resources to various water supply aspects. This is irrigation, water supply and sanitation, generation of hydropower, industry, but also tourism and recreational uses, fisheries, environmental protection, and any other water uses.

Policy and regulatory level

a) **National Water Management Commission** (NWMC) should be as the supreme policy and regulatory authority, that will provide political oversight about national water policy; approve national river basin plans, oversee the reform process, etc. It is composed of representatives of all Ministries and governmental bodies related to the water sector.

Roles and Responsibilities of NWMC:

-develop state policies in the sphere of multiple and integrated use of water and protection of water resources for purposes of irrigation, municipal use, industrial use, generation of hydropower, tourism and recreational use, environment protection and any other uses;
-develop relevant state programmes in the sphere of effective usage and protection of water resources;
-develop State investment policies for water resources development, usage and protection;
-develop policy on rational use of water resources and protection of natural environment to sustain water resources for economic and social development
-develop policies to mitigate the impact of climate change on the use and protection of water resources.
-supervise over river basin management plans, over the rational usage of water resources for irrigation, municipal, industrial, hydropower, and recreational, and setting the norms and limits of water use by water users, irrespective of their form of ownership

Regulatory tasks

b) **River Basin Organizations** (RBO under the water resource planning unit in the Ministry of the Water Economy) for each particular basin.

Roles and Responsibilities of the RBO:
-participates in the governance of basin through its representatives in the River Basin

Administration.
-coordinates, consolidates and protects intrests of water users in the River Basin. Contributes to solving problems of water users with regard to access to and distribution of water resources in the river basin;
-guarantees the increase of public awareness on water management problems of the river basin and current situation in the water management sphere;
-take into account contribution of Union of water users to solve water management problems across the river basin with regard to delivery, allocation and distribution of water;
-solutions of conflict situations and issues among representations of users and between River Basin Organization and representations of water users;

The RBOs is a critical function since it provides regulatory functions at the basin level through its River Basin Administrations. The number of RBOs should be minimized—Roles and responsibilities of the RBO and its RBAs as determined above are an ongoing and developing process, but they should become effective entities within 3 years, since the establishment of the various secondary agencies/organizations into one coherent regulatory agency will be a very timely exercise.

c) **River Basin Council (RBC)** supports each River Basin Administration to provide consultative services, as well as serves as a water users' platform to have a voice in basin planning and management activities and decision-making processes. It is made up of representatives of government agencies using water resources such as irrigation, drinking water, industrial water, hydropower, and recreational, etc., farmer organizations, NGOs and others as are appropriate. The hierarchical structure starts from Water User Groups, users for larger irrigation schemes, Basin Union of Water Users.

Operational and maintenance level

These functions will be carried out by various agencies, depending on the use of water resources, i.e. irrigation, urban or rural water supply and sanitation (e.g. Vodokanal in urban areas for municipal use), industry, generation of hydropower, fisheries, environmental protection, tourism and recreational uses etc.

Currently, the Ministry of Water Economy is primarily an operational agency. Most of its functions are related to the operation of the irrigation infrastructure.

MoWE is responsible for water management, water delivery and canal systems. The majority of water intakes, bigger canals and mains, and reservoirs are under MoWE management and supervision. For example, MoWE operates 33,400 km of internal canals of the irrigation network. In addition, Kara Kum Canal, which has a length of over 1,300 km, incorporates 115 hydro-technical facilities and features 3 reservoirs with a total capacity of 2.4 km3, is under the responsibility to this Ministry as well. Among the key tasks of MoWE are (i) water resource management; (ii) water use and planning; (iii) allocation of water to different uses; and (iv) monitoring and control over water use. MoWE has branches at the provincial levels, with provincial administrative boundaries. The main tasks of the MoWE are:
- Water resources management, planning, distribution, control and accounting for the rational use of water;
-Management of the water inventory;
-Implementation within its competence, monitor compliance with the work of metrology and standardization;

-Acting as customer and general contractor for the design and construction of the Kara Kum Canal, as well as other large water projects and our own production facilities, to implement the maintenance activities on water systems, as well as contractor for the construction of water facilities on the orders of the ministries, departments, enterprises and organizations;
- Issuing in due course a license to perform work on the design, construction and operation of water systems and carries out state supervision over the correctness of the implementation of commitments on these issues

Local administrations also have certain responsibilities in water conservation management, as local executive power approve water protection zones at the water distribution mains and other sources of water supply facilities.

However, institutional arrangements indicate that there is not a considerable overlap between functions of main agencies, as the water resource management system is mainly based on administrative territorial methods. In the current situation, the interdepartmental communication between different parties, such as water supply organizations, provinces, districts and community-based organizations, NGOs and the population is insufficient and may reduce finding a more efficient solution to the water problem. Also, the participation of the private sector in water resource management activities is insufficient and needs to be improved.

Therefore, there in Turkmenistan is important to follow NPD on institutional and administrational issues together with relevant Ministries in more direct way, keeping in mind country specific issues with Karakum canal and relevant collector systems. Simple water basin approach, like in many EU countries is not applicable in Turkmenistan. But there are possibilities to divide country into several basins or basin districts with the main idea to have more target oriented RBMPs with relevant RBOs.

5. Conclusions and recommendations

There are good chances to improve water management practices of Turkmenistan in near future by merging internationally accepted principles with local practice. Such possibility is evident, taking into account relevant information and outcomes of different projects about Turkmenistan water management, main principles of EU Water Framework Directive on river basin management, as well as information delivered during the National Policy Dialogue process. It is therefore recommended to move ahead with concrete actions:

1. It is utmost important for Turkmenistan to go ahead with a comprehensive legal approach towards hydrological River Basins (or Water Basins) with Integrated Water Resource Management (IWRM). However in Turkmenistan the Complex Schemes of Use and Protection of Water Resources are used and it's known that those are not sufficiently comprehensive to over different economic sectors and may lead to parallel activities with scarred water conditions. The main shortcoming of the Schemes is the lack of social and economic analyses in context of rational use of water resources and inadequate organizational structure for basin management.

2. According to current analyses it is proposed to have 8 Basins or River Basin districts for Turkmenistan:

- Amudarja Lebap zone basin district
- Amudarja Dashoguz zone basin district
- Murgab Basin
- Tedjen Basin
- Atrek Basin
- Akhal Basin
- Karakum canal basin district
- Caspian Sea basin district

Precise name and description of basins and relevant characteristics shall be determined in frame of detail analytical work, at the time when water management plans are elaborated. However, as the formation of water for those areas of basins is completely different, it is proposed to keep the names of basins as simple as possible to avoid misunderstanding with administration and management. In further preparatory work the latest recommendations of different projects such as the one by GIZ (Concept of basins approach) and others should be taken into account. As the Complex Schemes of Use and Protection of Water Resources are strongly supported by different authorities, the term is still used in draft new Water Code. There is also a proposal to have those complex schemes on different levels: on general, basin and territorial. The goals and tasks of those plans need to be specified more concretely. So far the goals of those plans are still quite general, referring to idea of solving water problems within different sectors of economy and for environment in concrete basins. It is hereby proposed to improve draft Water Code relevantly and foresee goals and targets that would be measured and reviewed periodically. For this concrete targets with tasks to review those targets should be included to the secondary laws or relevant regulations, for example requiring the review after every 6 years with intermediate review after every 3 years.

3. There is need to elaborate guiding principles or documents on elaboration on

RBMPs as IWRM plans for concrete basins, taking into account the principles of IWRM, methodological approach of current schemes and preliminary results of ongoing projects. In these guiding principles it is important to cover also the timeframe of elaboration of IWRM plans together with indications to financial aspects. Taking into account current institutional arrangement in Ministries and Institutes, it seems to be realistic to prepare first IWRM plan during 2 years by the year 2015, covered by state budget. In that context international donor funding is possible as well it takes time to prepare and apply. It is desirable to use the term "IWRM plans" instead of Complex Schemes of Use and Protection of Water Resources, at the same time following more precisely the IWRM principles as well.

4. There is strong need to upgrade current water administration organization so that they can fulfil functions of River Basin Organization, RBO (in Russian context the term Basin Organization or Water Basin Organization is used more often). Main tasks of RBOs are sufficiently well listed in draft new Water Code. Among of main duties of RBOs are the tasks to: (a) be responsible for the governance and lead water management of the respective basins' water fund through their activities based on IWRM Plans (so far Complex Schemes of Use and Protection of Water Resources); (b) coordinate activities of water users with the idea to achieve sustainable water management and control the effective use and protection of water resources in accordance with law. RBOs may have tasks to carry out state monitoring of water objects and keep the water cadaster together with other relevant organization; to coordinate and harmonize relevant water permits or other permits, documentation and project of different economic sector activities, such as cable lines, pipelines, constructions, forest works, etc and they shall also determine limits for water use between different water users. One of their important tasks is to participate in elaboration of IWRM plans and River Basin Management Plans. In that job they coordinate, consolidate and protect water users' interests in the River Basin, contribute to solving problems of water users with regard to access to and distribution of water resources in the basin. RBOs also guarantee the increase of public awareness on water management problems in the river basin.

5. River Basin Councils are important to be established. Indication for this is in new draft of Water Code as there is a proposal to have a possibility to establish Basin Council with tasks to provide consultative services and advice to concrete Basin Organisations on water management issues, as well as to serve as a platform for water users to have a voice in basin planning and management activities and in decision-making processes. They would consist of representatives of government agencies and local authorities responsible of water and land resources in concrete basin, also involving farmer organizations and NGOs.

For final conclusion, taking into account the NPD as process in Turkmenistan, one can see that country has rich potential and sufficient knowledge to develop sound water management and economy in those severe climate and water conditions. Support by Government and by the President for this is visible. In last statement for National Water Day in the beginning of April 2013, President referred to aspects like the needs to reconstruct water and irrigation schemes, to take more into practice the modern water-saving solutions, and also to introduce successful solutions and practiced by others. For sure Basin approach can pave the road for that all.

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