

Rethinking of Water Security for Ukraine

based on results of National Policy Dialogue



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Publication presents the Global Water Partnership (GWP) - Ukraine view on challenges and vision of water security for Ukraine, as well as formulations of national water goals, targets of sustainable development and indicators to assess the progress in goal achievement; water-energy-food nexus in Ukrainian context. Publication is based on materials and results of national policy dialogue (NPD) of stakeholders, which was organized by GWP-Ukraine in 2016 and focused on the role of water management and water security for Ukraine in today circumstances. The presentations of S. O. Afanasiev, I. M. Baysarovych, O. G. Obodovskiy, and Y. F. Rudenko were used in this publication.

Publication can be useful for water policy makers and managers, environmentalists and for environmental education.

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CONTENT

Summary	4
Challenges.....	5
Vision	7
Goal, main objective and its indicators	7
Targets and indicators	7
The main principles of the Water Strategy	9
Responding to new challenges in water sector	11
Water and health security.....	13
Water and food security nexus	16
Water and energy security nexus	17



Summary

The inclusion of notion to water management in the Sustainable Development Goals (SDG), taking into account both the old definition of IWRM and a new dimension of water management, water security and the associated risks, was highlighted by the Global Water Partnership (GWP) as the most important achievement at this year celebration of 20th anniversary. Adaptation to climate change and transition in this regard from reactive to proactive management was recognized as the biggest challenge.

In 2016 GWP-Ukraine organized a series of discussions in the framework of the National Policy Dialogue on rethinking of the role of water management and water security, and offers a view on the challenges and the vision of water security for Ukraine, as well as the formulation of national water goals/targets of sustainable development and indicators to assess the achievement of these goals and progress of execution of targets; the nexus of water security and security of other sectors of the Ukrainian society.

GWP-Ukraine believes that the prior challenge is that the Environmental Agencies, instead of the management of water resources for the benefit of society and nature, continue to just control a compliance based on the “zero” risk concept of Soviet standards/norms and still consider that security is the absence of risks. To the contrary, GWP understands water security not as the absence of risk, but as management of all water risks. Without understanding and the quantitative-qualitative definition of relations and risks in the energy - water - food nexus tailored to the needs and maintenance of ecosystem services it is impossible to develop water policy and to implement integrated water resources management.

The second challenge of integration is that State Water Agency continues to operate only that water, which abstracted from the rivers, what is less than 10% of the available water resources. The rest of the water is actually under no operation, making water management extremely disintegrated. It was clearly seen during national formulation of Water SDG №6, where “sustainable management” was translated as “rational usage”, “availability” was replaced by “needs” and the words “for all” were omitted. Lack of understanding of integration and proactive strategic goal-oriented management was demonstrated in the

approximation of EU Water Framework Directive (WFD) into Water Code of Ukraine approved currently. In the EU WFD it is stipulated that Government should make all efforts to achieve “good” status for all water resources. However, the proposed amendments to the Water Code of Ukraine incorporated the words “good” status, but there is no emphasize that all water plans must include now this common Goal – achieving “good” status. The opportunity to introduce in Ukraine of European mechanism to define a “good” status, by using not only the maximum allowable concentrations (MAC), but, first of all, basing on deviation from the reference state, taking into account the impacts on aquatic biota, was also missed. Thus the opportunity to introduce the concept of resilience, which is important for understanding of necessity of adaptation to climate change, into Ukrainian water policy was lost.

GWP Vision is that water secure world maximizes the productive power of water and minimizes its destructive force. It is a world where every person has enough safe, affordable, clean water to lead a healthy and productive life.

GWP-Ukraine believes that the integrated approach to management and equal allocation of limited water resources among many different and competing water uses is the best way to achieve water security and shared definition of Johannesburg Summit and the EU WFD, that an integrated approach means coordinated action of ALL stakeholders to achieve their COMMON goals. GWP-Ukraine believes that global SDG No. 6: “Ensure availability and sustainable management of water and sanitation for all” is the best-suited definition of such common goal for Ukrainian stakeholders.



Challenges

GWP-Ukraine sees the main challenge in the field of water management in the fact that despite substantial decrease over the past 25 years of independence of the population, industrial production, water abstraction and discharges, the water quality shows no improvement. At the same time, water managers keep explaining the fresh water quality deterioration by reduction of water availability and consider water scarcity as the main problem of Ukraine. It proves that promotion of integrated water resources management (IWRM) and rethinking of water security (the main tasks of GWP) is still far from understanding and implementation in Ukraine, despite the successful legal approval of European approaches to IWRM and environmental impact assessment (EIA).

The substitution of “integrated management” by “rational use” is manifested by the fact that the Ministry of Ecology and Natural Resources and the State Agency of Water Resources of Ukraine so far, even after renaming of the State Committee of water economy, continue to deal with water infrastructure and abstracted water only. In fact, in Ukraine abstracted water is one fifth of the internal water resources and 6% of the total one, that is far from the international definition of water scarcity or stress. Of course, in some rivers this figure is much higher (in Siverskyi Donets River more than half of the annual river flow has been used, in Ingulets River – almost all river flow), during droughts the water availability is really reduced. To assume that the six percent water stress is the main water problem in Ukraine means misunderstanding of the reasons of transition to IWRM, the approximation of water legislation to the EU WFD and the adaptation of the Ukrainian society to it.

National specific of the approaches to the problem was demonstrated by the Ukrainian Government experts in the national formulation of the Global Water Goal # 6 “Ensure availability and sustainable management of water and sanitation for all”, when “sustainable management” has been translated as “rational use”, “ensure availability” – as “ensure needs” and words “for all” were lost at all. The same problems of transition to integrated management can be found in the struggle for the approximation of the Water Code of Ukraine to the EU Water Framework Directive in the Law on amendments to some legislative acts of Ukraine concerning the implementation of integrated



approaches to water resources management of the river basins. According to the WFD requirements Governments should make all efforts to “achieve “good” status for all waters”, where “good” means only non-significant deviation from the reference (natural) conditions and defined first of all based on the assessment of impacts on aquatic biota. However, the proposed changes to the Water Code include the words “good” status, but there is no emphasize that all Water Plans now must have the main objective to achieve this “good” status for all water bodies. Also, the status identification methodology is not determined. The proposed changes are referring to the Soviet system of water quality definition based on averaged indexes. European-type River Basin Management Plans were introduced without clarification of the entity responsible for their development and implementation. The financing sources for implementation of these basin plans were not identified, although in the integrated management the financing of the water plans should be based on the integration of polluter and user pay principles, there are no plans like “State plan of water infrastructure development” in WFD. Existence of 2 parallel management/planning tools leads to duplication and complicates their administration and financing. So, one could say that this is only the first steps towards the approximation of Integrated Water Resources Management (IWRM) and EU WFD. The main differences between the pre-IWRM thinking and current IWRM, that must be overcome in this way, are summarized in the table below.

		Pre-IWRM thinking	IWRM thinking
What	What water interventions are needed?	Water supply or irrigation infrastructure to be designed and built	Holistic management of water, land, and ecosystem in a catchment/basin perspective through supply and demand-side interventions
Where	Where is the action concentrated?	Where the infrastructure is being built	A catchment/basin plan provides the framework for all infrastructure design as well as policy and management interventions
Who	Who will implement the intervention?	Municipality or government department or a territorial organisation	Catchment/basin level institutions will play the overarching planning and coordination role
Why	For what purpose is the intervention designed?	To improve welfare and livelihoods by making more water available from nature to project beneficiaries	To promote holistic supply and demand-side management of natural resources to enhance productivity, equity, and environmental sustainability
How to implement	How will water interventions be planned and implemented?	Engineers and hydrologists will plan, design, and build water infrastructure	Catchment/basin level institutions create stakeholder platforms to plan and implement water interventions in a gender-participatory process
How to finance	How will management, operations and maintenance (MOM) costs be covered?	Government pays for the capital cost and recovers part of the MOM cost by charging a user fee	User fee covers not only the MOM cost but also interest and depreciation of fixed capital and the cost of internalising various externalities originating from the intervention

Source: GWP TEC BACKGROUND PAPERS No. 22 Increasing water security: the key to implementing the Sustainable Development Goals, https://docs.google.com/viewer?url=http%3A%2F%2Fwww.gwp.org%2FGlobal%2FToolBox%2FPublications%2FBackground%2520papers%2FGWP_TEC22_web.pdf.

The explanation of the deterioration in water quality by increasing concentrations in water discharges proves the need of better efforts to promote the European approaches to integrated management. Actually environmental impact depends on the volume of discharge as well as on the amount of pollution in it. However the deterioration of freshwater quality together with economy decline and demographic decrease illustrate the collapse of industrial and municipal wastewater treatment and self-purification capacity of aquatic ecosystems. This situation confirms once again the conclusion, used by EU as a basis for transition towards modern environmental impact assessment (EIA) and integrated management of pollution releases/discharges and transfers, – if the pollution has produced, there is no difference how to treat it to improve the freshwater quality, “end of pipe” control works badly.

GWP-Ukraine sees that such outdated Ukrainian “reactive” approach to EIA based upon maximum allowable concentrations criteria is caused by traditional approach to environmental management as a post factum response to anthropogenic and natural changes of water resources state expecting that in some time the situation will return to the normal state. Although in current conditions, especially under conditions of comparatively big impacts and relatively slow climate

changes, one needs to shift from reactive to proactive, strategic management of water resources. A proactive approach to changes, especially with the overcoming of which we are not able to cope, should also include adaptation – forecasting/modelling changes, prevention and preparedness, and should be done on the basis of a risks analysis taking into account as threats from the existing state of water resources as well as forecasted impacts of the threat.

This approach requires rethinking of the water security concept in Ukraine, where security is understood still as the absence of risk, i.e. the risk is absent when impact norms are not exceeded. It means a sudden transition between only two possible states – security and insecurity. The transition to continuous risk management, as compliance with acceptable levels of all water risks – of inadequate water quality, aquatic ecosystems degradation, lack of water (drought) and abundance of water (floods), will also provide for introduction of assessment of the effectiveness of measures based on cost-benefit assessment. Moreover, this approach significantly increases the variety of possible measures of risk management, since risk is the intersection of two variables: impact (amount of damage) and likelihood (loss occurrence) of threat and reducing each of variables results in risk reduction.

Vision

Unacceptable levels of water risks hold millions of people in poverty around the world, prevent the human capacity development and break the economic growth. Increasing of water risks and, accordingly, the water insecurity is strengthening by population and economic growth, urbanization, competition and conflicts for water and climate change.

GWP vision is a water secure world, which is vital for a better future: a future in which there is enough water to support social development, sustainable and inclusive growth, and ecosystems life. In a water secure world, we will respect the intrinsic value of water and recognize its vital role in supporting human lives and livelihoods.

A water secure world harnesses the productive power of water and minimizes its destructive force. It is a world where every person has enough safe, affordable,

clean water to lead a healthy and productive life. It is a world where communities are protected from floods, droughts, landslides, erosion, and water-borne diseases. Water security promotes environmental protection as well as social justice, and addresses the impacts of poor water management. All of these will become even greater challenges as climate variability increases.

GWP-Ukraine believes that an integrated approach to managing and equitably sharing the world's limited water resources among the many different and competing uses is the best way to achieve a water secure world. An integrated approach means coordinated activities to achieve the COMMON goals of ALL stakeholders. Effective management and willingness to work together are widely recognized as keys to solving the problem of equitable distribution of limited water resources among many different and competing water users.

Goal, main objective and its indicators

National Water Goal should be to achieve the acceptable levels of all water risks in Ukraine by implementing targets under the Sustainable Development Goal # 6 "Ensure availability and sustainable management of water and sanitation for all". Sustainable management and risk management should be based on the forecasting/modelling of water resources and their natural and anthropogenic changes.

Taking into account that Ukraine has committed to implement the EU WFD and Flood Directive, the main objective for achieving this goal is to "achieve good status for all waters". The key "qualitative" indicator of the progress sustainability should be a change in the

length of rivers/basin area/number of water bodies that have achieved "good" status. In the risk management terms it should be a reduction of risk of not achieving good status, as well as reduction of risks of floods/droughts during the reporting period.

The main quantitative indicator of sustainable management should be "the share of water abstracted from water bodies in the river basin", which corresponds to the indicator 018 of European Environment Agency Common Set of Indicators – Water Exploitation Index (%) = Annual total water abstraction/ Available long-term freshwater resources. The rest of the proposed GWP-Ukraine objectives and indicators are given below.

Targets and indicators

The formulation of national goals and indicators for the sustainable water development should take into account also the commitments taken by Ukraine in accordance with the Association Agreement between Ukraine and the European Union in the area of water quality and water resources management, Water framework Directive EU 2000/60/EC, National targets to

the Protocol on water and health as well as the strategic goals and objectives of the national environmental policy (Basic principles (strategy) of state ecological policy of Ukraine for the period until 2020 and the draft Law of Ukraine "On amendments to the Law of Ukraine "On main principles (strategy) of state ecological policy of Ukraine for the period up to 2020") and tasks of the

National targeted program of development of water economy and environmental restoration of the Dnipro River Basin for the period till 2021”.

The main strategic goal of the national water policy is to achieve acceptable levels of water security and water risks, ensuring availability and sustainable management of water resources and sanitation for all.

Accordingly the primary targets for the implementation of the strategic goal should be the following:

Target 1. By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

Target 2. By 2030, achieve universal and equitable access to adequate sanitation and hygienic items, with particular attention to vulnerable groups of the population.

Target 3. By 2030 enhance the quality of natural waters by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and significant increasing in recycling and safe reuse of wastewater.

Target 4. By 2030, significantly increase water use efficiency in all sectors and to ensure a balance of abstraction and delivery of fresh water to solve the shortage and a significant reduction in the number of people who suffer from water scarcity.

Target 5. By 2030, implement integrated water resources management at all levels, including, where appropriate, transboundary cooperation.

Target 6. By 2020, to ensure the protection and restoration of water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, lakes.

Target 7. By 2030, to achieve a significant reduction of risks of floods and other manifestations of the harmful effects of water.

Target 8. By 2030, expand international cooperation and support to strengthen the capacity of Ukraine regarding the implementation of activities and the implementation of programs in the field of water supply and sanitation.

Assessment of the achievement of the goals and targets of the water policy needs the introduction and

monitoring of relevant progress indicators for each target. Thus, in particular, for Target 1 the indicators should relate to improvement of drinking water safety and quality, increasing the access to water supply for urban and rural population. Relevant targets and progress indicators should include the availability of water resources, the quality of drinking water, access to improved water sources of population, preschools, schools and health care institutions, etc.

Key indicators of ensuring the right to sanitation (Target 2) are increasing of the portion of urban and rural population, preschool and schools, health care institutions connected to the sewerage or using the improved sanitation; and decreasing the length of an outdated sewerage and sewerage in emergency state.

The Target 3 requires:

- effectiveness (new construction, replacement and upgrading of operating facilities) wastewater treatment plants;
- ensuring safe reuse of wastewater;
- ensuring the establishment and proper management of the coastal protection strips and water protection zones and sanitary protection zones of water sources;
- to reduce of the share of untreated wastewater that discharged into natural water bodies.

Relevant progress indicators to the target have to be quantitative ones, including the quality of waste water and water in water bodies, for example, the share of receiving water bodies, that meet water quality standards.

Target 4 is aimed to decrease water footprint of GDP and water consumption by different sectors of the economy and population through the introduction of advanced technologies for the efficient water use (recycling of water in industrial and other processes, reuse and successive use of water, minimizing water losses during transportation, etc.). The degree of its implementation should be evaluated by indicators (in percent) including the level of water stress.

Progress indicators to the Target 5 could be: level of implementation of integrated water resources management (IWRM) based on the number (percentage) of the River Basin Management Plans developed and implemented, the number (percentage) of basins with the policy to support the integrated risk management for natural disasters (including droughts and floods) within the framework of national development plans, the number (percentage) of transboundary basins



and aquifers with joint management, the number of transboundary basins with the operating cooperation agreements; and the level of compliance (the presence of the relevant normative-legal acts) of the legislation of Ukraine with the EU legislation in the field of “water quality and water resources management, including marine environment”.

The Target 6 can be achieved by addressing issues related to the implementation of the ecosystem approach to the management, ecosystem services costs assessment, development and implementation of financial mechanisms for stimulating renewable natural resources consumption and environment protection or the compensation of economic losses, legal strengthening of liability for the damage caused to the ecosystem. As the progress indicators to this target, the parameters of water-related ecosystem’s habitat and status changing in time, the establishment and proper management of coastal protection strips, etc. can be used.

The implementation status of the Target 7 can be evaluated first of all based on presence of the floods

risk management plans developed and adopted for the implementation, automatic monitoring systems, including forecasting the possible harmful effects of destructive power of water within river basins and the establishment of early warning systems for water-related hazards, as well as the largest direct economic losses from these hazards, a share (percentage) of the communities which have evaluated the water related harmful effects risks strategy.

Progress monitoring for Target 8 implementation may be done using the number of joint agreements on cross-border cooperation, the targeted international projects and grants, cooperation agreements with foreign partners to solve transboundary water management problems, as well as the volume of international assistance to Ukraine for achieving the targets on access to safe water and sanitation.

The main goals and objectives of water policy should be determined by the Water Strategy of Ukraine.

The main principles of the Water Strategy

The key principles of the Water strategy include primarily the guiding principles of integrated water resources management (advanced principles of Dublin-Rio, the Protocol on water and health to the Convention on the protection and use of transboundary watercourses and international lakes 1992, the EU Water Framework Directive), the basic principles of national environmental policy (“The basic principles (strategy) of state environmental policy of Ukraine for the period till 2020”).

The main principles of the Water strategy of Ukraine are the following:

- recognition of the limitations and vulnerabilities of existing high-quality fresh water resources – fresh water is a finite and vulnerable resource, essential to sustain human life, development and environment;
- the principle of equitable access to water – equitable access to high-quality water has to be ensure for all

members of society, especially vulnerable groups of population;

- the principle of integral value of water – water is a public good and has a social, economic and environmental value in all its competing uses;
- the principle of generations solidarity – the responsibility of the present generation for the preservation of water resources for future generations;
- the ecosystem principle – ensuring safety of water resources for the life and health of the people, the implementation of environmentally friendly water consumption system and conservation of natural aquatic ecosystems; prioritize measures based on environment protection and contribute to the restoration of natural mechanisms of self-regulation of aquatic ecosystems;
- a participatory principle – water management should be based on the participation of users, planners and decision-makers at different levels; the cross-sectoral partnership and involvement of stakeholders, public and business participation in the development and implementation of water policy, taking into account stakeholders' comments for the improvement of water framework;
- the integration principle – integration and ecologization of all management elements, actions and measures, in particular the integration of: environmental, economic and social objectives; management of all types of waters; all types of water uses, functions and powers in one common water policy; integration of national water legislation with

the international acts; all other significant aspects of water use and protection of water resources;

- basin management principle – integrated water resources management in general and flood risks management, in particular, should cover the whole water catchment area, across administrative boundaries and state borders;
- integration of “polluter pays” and “user pays” principles – the costs associated with measures to prevent, control and reduce pollution are paid by polluter, and economic activity on water supply is gradually turning into a paid service;
- the principle of “water pays for water” – channelize funds from pollution and water charges to sustainable management of water resources and aquatic ecosystems within the basin;
- the combination of the principles of stimulation and responsibility for implementation of measures on protection and recovery of water resources, the inevitability of liability for violation of legislation on protection of water resources and environment;
- the principle of proactive management – goal-oriented management based on the assessment and control of risks of failure to achieve planning objectives;
- the principle of acceptable risks – the transition to continuous security management as compliance with acceptable levels of all water risks: improper water quality, degradation of aquatic ecosystems, lack of water (drought) and abundance of water (floods), implementation of methods to assess the effectiveness of measures based on the cost-benefit analysis;
- the prevention principle – a priority of preventive and precautionary measures (based on analysis and forecasting/modelling) to reduce the negative consequences of harmful effects of waters, including the passage of floods and underflooding areas, for aquatic and terrestrial ecosystems, in particular, to reduce pollution of water and soil;
- the principle of adaptation – the water resources management system must constantly adapt to the variability of natural (climatic) and anthropogenic factors.



Responding to new challenges in the water sector

The state of water resources and water supply of the population of Ukraine remains one of the major current threats to national security in the ecological sphere, which under circumstances of economic and political crisis, military conflict and annexation of the part of country territory and under climate change get new aspects and acute.

Dynamics and quality-quantity specifics of the processes in nature and society require rapid and effective responses as at the level of the development of policy framework for water resources management (strategies and concepts, principles, identification of priorities, development of legislative framework), as well as at management level (development of structures with proper distribution of responsibilities, development of monitoring systems and information management, forecasting, management tools), scientific and technical support of integrated water resources management in Ukraine.

Taking in account the global challenges of development and international obligations (according to the Agenda of Sustainable Development and the Sustainable Development Goals (SDG) for the period up to 2030, the Protocol on water and health, the Association Agreement between Ukraine and the EU, the Ukrainian government should set (adapt) national targets and indicators of sustainable water sector development for the period up to 2030, to define ways to achieve them.

Ukraine has to introduce modern approaches and mechanisms/tools of cross-sectorial cooperation and integrated water resources management. First of all, the government should develop/revise tools of strategic and operational sectoral planning, monitoring and evaluate progress of achieving defined goals and objectives.

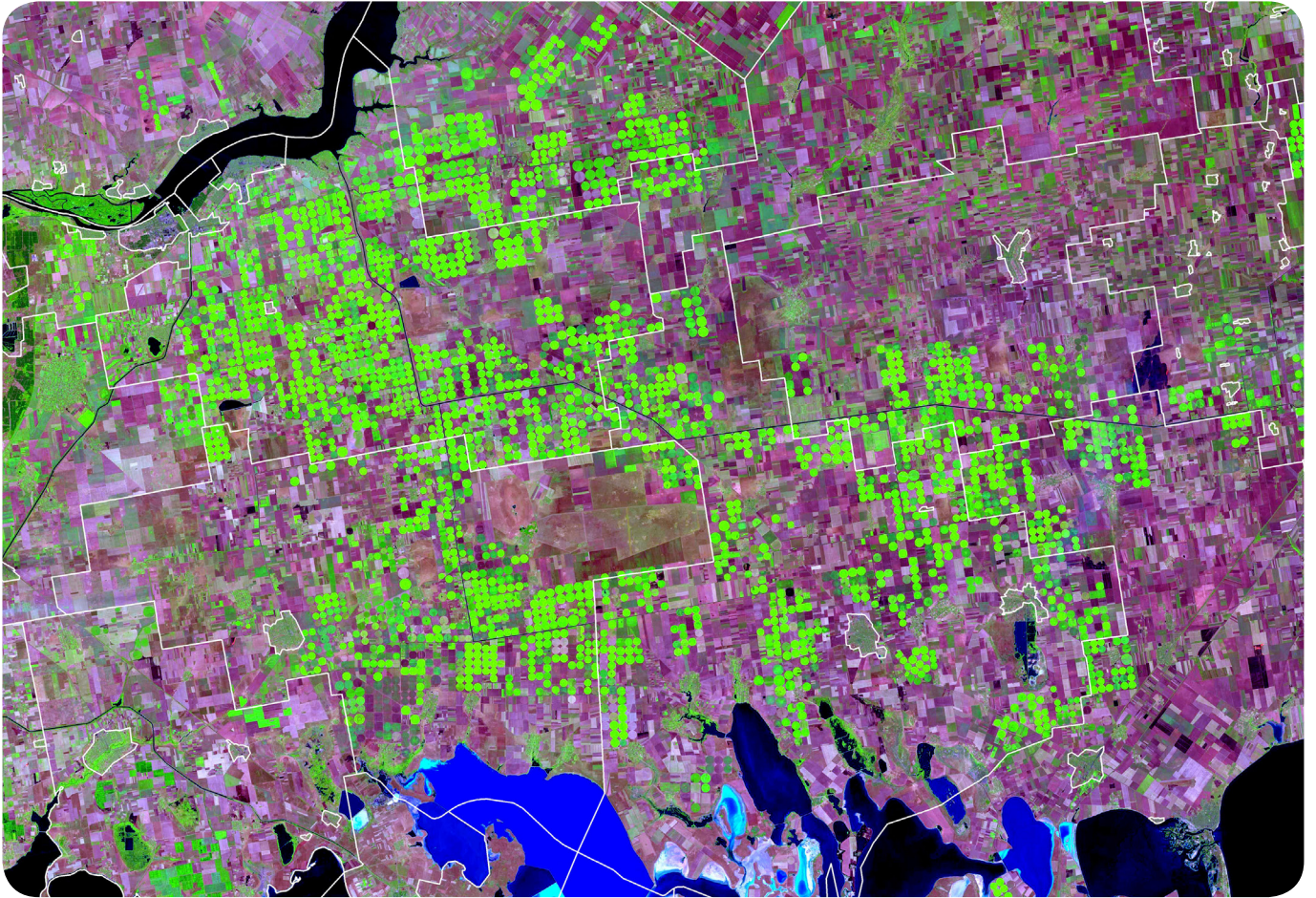
Ukraine has to develop and implement the transition from reactive (response on consequences) to proactive water resources management based on integrated risk management within the river basins. For that the Government should encourage the scientific support for the development and implementation of measures to control in practice the acceptable levels of all water risks: 1) the risk of low quality of freshwater and the risk of lack of resilience of water ecosystems; 2) the risk of scarcity of water (including drought) and the risk of abundance of water (including floods).

Adaptation of water resources management became particularly important under climate change conditions. The experience of droughts in 2015 and 2016 and preliminary assessments of experts show a stable warming trend, that together with seasonal changes of the precipitation distribution indicate the alarming forecasts on availability of water resources. The research of quantitative and qualitative status of water resources and forecasting their availability and accessibility in climate change conditions (special attention to extreme weather events: drought and floods) are actual and important tasks for Ukraine and should be the basis for development of adaptation measures for water resources management and components of the River Basin Management Plans.

Water resources availability for population and economy of Ukraine is very actual issue, taking into account that surface and ground water resources are unequally distributed between seasons and on the territory of Ukraine. Available demographic and climate trends require further analysis and evaluation of actual and forecasted availability of water resources for people, economy and ecosystems of Ukraine, by using international methods for water resources availability assessment.

According to the analysis of the state statistics on water consumption in 2015, 9.7 km³ of water was abstracted from natural water sources, including 1.2 km³ of water were abstracted from groundwater sources and 0.6 km³ – from seawater. 5.3 km³ of wastewater, including polluted – 0.9 km³ (16 %) were discharged into surface water bodies. In the river basins context the biggest amounts of water are withdrawn from: the Dnipro River Basin – 6.3 km³, the Siverskiy Donets – 1.1 km³ and the Danube – 0,6 km³.

In recent years, the abstraction of drinking groundwater is constantly decreasing. During the period 2001–2014 it has decreased by 49.6 %. The trend of permanent decrease of groundwater abstraction is mainly caused by economic reasons, reduction of the number of water consumers and the part of groundwater in total balance of water use in Ukraine. Additionally in recent years the contamination of groundwater, particularly pressured (artesian) aquifers is observing. Contamination of pressured (artesian) groundwaters is linked primarily with impact zones of the surface utilities for accumulation of mining drainage waters,



uncontrolled (poor controlled) storages of industrial solid wastes, mineral fertilizers and pesticides, livestock farms, refineries, and other local facilities.

Ensuring of reliable data (including forecasts) for decision-making process is an urgent task that requires upgrading the state environmental monitoring system, in particular the establishment of a unified data collection system for obtaining real and reliable information about the ecological status of surface waters, qualitative and quantitative state of groundwater.

The monitoring of groundwater is an acute problem, because the network of observation points is steadily declining in recent years, that has a negative affect on the reliability of the available data about the status and volumes of groundwater, especially in areas of high technogenic pressures.

However, increasing the role of groundwater in meeting the water demands of population and economy sectors is the prior management task for the regions with a sufficient (proven and probable) capacity of underground water.

Currently the longest period of warming for the entire period of meteorological observations is observed in Ukraine. During 1989–2015 average annual air temperature exceeded the climate norm by 1° C, and in last decade (2006–2015) – on 1.5° C, which is ahead of the global average rate of warming. Together with highly uncertainty of precipitation changes trend the intensive warming exacerbates the risks and increases the threat related to:

- strengthening the climate extremes due to the increasing the air temperature maximums on 1–4° C and the numbers of hot days in 2–3 times. The increasing in number and intensity of severe weather events (extreme temperatures, heat waves, heavy rains, squalls, whirlwinds, hail, frosts, droughts, floods, underflooding) and sudden weather changes affecting public health and effectiveness of different sectors of the economy;

- increasing the duration, intensity and frequency of droughts, spreading them to the North and West – into the Polissia and Northern forest-steppe zones;

- strengthening the aridity of the climate, as evidenced by three severe droughts observed in the last decade (2007, 2010, 2015) and affected 50–80 % of the country territory;
- reducing of the efficiency of rainfed agriculture, especially in the South and South-East due to almost annual droughts;
- decreasing of yield of early grain crops and late crops because of high temperatures and reduction of vegetation periods;
- extension of the fire periods and increasing fire risks in forests and peatlands;
- decreasing the groundwater levels, drying the shallow wells and sources of drinking water;
- changes of the composition of plant pathogens and weeds, the existing of which is limited by the temperature factor, pathogens' spreading and migration into favorable climatic conditions;
- increasing the probability of mass breeding pests or outbreaks of infectious and parasitic diseases, which were not typical/ not existed before in Ukraine;
- increasing soil erosion due to variation of temperature and precipitation quantity and intensity;

- decreasing spring flow of large rivers due to the reduction in winter season, duration of laying snow cover, and decreasing winter precipitation quantity and depth of soil freezing, what inhibits the formation of normal spring floods on the rivers of Ukraine;
- uncertainty about reduction of annual runoff/flows of the large rivers, in recent years the large river flow forms mainly due to the summer flash-floods and winter floods;
- growing threat of water scarcity for the small rivers flow formation, appearing the water problem due to the growing water demands, especially for irrigation;
- deterioration of ecological status of large and, in particular, small rivers due to droughts and, especially, their combination (in 2015 the meteorological, hydrological and soil droughts occurred simultaneously);
- increasing evaporation from water surfaces as a result of frequent "heat waves", increasing the temperature of the air and water.

According to experts' assessments, the increasing air temperature by 1° C results in a decrease of annual runoff on 2–5 % and increase of evaporation on 2–5 % per year. Most likely the frequency of dry years on the territory of Ukraine can increase and lead to very low or critically low water availability for the population.

Water and health security

Water security, first of all, is ensured access to sufficient quantity and acceptable quality water for all: for people, the economy and nature.

According to UN-Water, Water security is defined as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for:

- sustaining livelihoods, human well-being, and socio-economic development,
- ensuring protection against water-borne pollution and water-related disasters, and
- for preserving ecosystems in a climate of peace and political stability.

Water security for human beings and society based on ensuring equal right to drinking water and sanitation for everyone in the community. The ensuring of water security is defined in the Resolutions of the UN General Assembly and UN Human Rights Council (Resolution of the UN General Assembly "On human right to safe drinking water and sanitation" (A/RES/68/157) and Resolution of the UN Human Rights Council "On the human right to safe drinking water and sanitation" (A/HRC/27/7)), Agenda Post 2015 and Sustainable Development Goal on water and sanitation (SDG No. 6 "Ensure availability and sustainable management of water and sanitation for all" and its targets) and in the international obligations of Ukraine under the Protocol on water and health and the EU-Ukraine Association Agreement and others.



The key challenges to ensure water security for people in Ukraine are:

1) challenges of water availability because of:

- natural water scarcity (lack of local surface or groundwater resources in 13 regions and Crimea; officially less than 1500 cubic meters per capita per year), climate change and extreme weather events (floods, droughts, heat waves, etc.) that affect both the water availability (in particular, lack of access to water during the drought due to drying and/or decreasing of water level in the springs, shallow wells, small rivers) and water quality (deterioration of water quality during i) drought – through evaporation and increase in the concentrations of substances in water sources, lack of surface water resources, particularly river flow for dilution of wastewater discharges from wastewater treatment plants (WWTP) or directly from sewer; and ii) during floods or flash-floods due to flooding of sources of drinking water supply and washing out a variety of contaminants from flooded areas, etc.);
- anthropogenic impacts or inefficient management of available water resources, leading to depletion and contamination of water resources (excessive water abstraction, inefficient water use, water losses in networks and irretrievable losses of water in technological processes, releases/discharges and emissions of pollutants into the environment);

2) problems of equal access to drinking water and sanitation for the population: the growing geographical (inequality between rural and urban populations, between regions and within individual settlements regarding access to improved sources of drinking water and sanitation), social (children, internally displaced persons, population and military staff in the military conflict zone, patients in hospitals, people in prisons) and economic (large families, families with low income, other) inequalities of different groups of consumers.

In Ukraine there is a negative tendency of reduction in the number of settlements (especially small cities, towns and villages) where residents use centralized water supply services; the situation with access to centralized sanitation is even worse, especially in rural areas. Since independence of Ukraine, the number of rural settlements with centralized water supply decreased from 29 % to 18 %, and the number of villages with sewage decreased from 9 % to 1.3 %. The existence of water supply or sewage infrastructure in the settlement does not mean that all its residents have access to centralized water supply and sewage. Geographical inequality is observed even in Kyiv, the capital of Ukraine. Currently 30,000 residents of 346 streets in all parts of the city Kiev are living in the houses without connection to municipal sewer and use cesspool and septic tanks out of control. Source: UNENGO "MAMA-86": Baseline analysis of ensuring equal right to water and sanitation in city of Kyiv, 2016.

The critical situation with access to sanitation is for schools in Ukraine. In 2014 year 5132 (42 % of preschool institutions used pit latrines and 281 (2.3 %) pre-schools had no any sanitation facilities. There were 8479 (44 %) schools used pit latrines and 791 (4.6 %) were not canalized at all. Source: Ukraine. Summary Report according to the Article 7 of the Protocol on water and health, 2016.

3) problems regarding the quality of drinking water due to: a) poor quality of water in the sources (surface water, mainly, Dnipro River is a source of drinking water for 80 % of population of Ukraine, rivers flow regulated by dams, contaminated by organic compounds, nutrients and pollutants, sediments and eutrophication; b) outdated technology of water treatment and wastewater treatment, c) insufficient technical condition of the infrastructure and networks, water transporting means/tanks or small water supply systems – all steps of the entire water supply chain have significant risks to the safety of drinking water “on tap” for consumer;

d) a significant weakening of state control over the quality of water sources and drinking water due to the moratorium on checking in 2014–2015, the elimination of the State SES and legal amendment which defines drinking water as food product; the weakening by local authorities the requirements to wastewater treatment (increasing the maximal permissible concentrations of some components (BOD, COD) for the discharges of WWTPs).

Due to using contaminated drinking water or lack of proper sanitation the outbreaks of acute intestinal infections (All) have occurred recently in Ukraine: in 2015 the fecal contamination of drinking water was identified as a reason of suffering of 8000 residents of the Bortnichi district of Kyiv, and 155 people, including 122 children were hospitalized with a diagnosis of All; in June 2016 the outbreak of ALL was reported in Izmail city caused by contamination of the local water supply network, as a result 776 people, including 449 children, were hospitalized. In Ukraine there are high risks of outbreaks of water-related infectious (viral hepatitis A, typhoid fever, salmonellosis, cholera (the last outbreak of cholera was in Mariupol in 2011, 33 people were hospitalized), poliomyelitis (in 2015, was 2 cases in Zakarpatska oblast) and diseases caused by chemical factors (water nitrate methemoglobinemia due to nitrate contamination of wells water, fluorosis of the teeth of children because by an abundance of fluorine in drinking water); hepatitis C, which can be triggered by long-term consumption of contaminated water, including water from sources "blooming" by cyanobacteria (blue-green algae).

4) Affordability of water supply and sanitation services is now becoming the most critical. In a country where, according to experts assessments, more than 70 % of households unable to pay communal services bills, including water supply and sanitation, there is a real threat to ensure the human right to water and sanitation and to destroy water supplies and sanitation service provision. The way of subsidies provided for the vast majority of households, which was chosen by the government, cannot solve the problem of households' ability to pay neither in the short nor in the long-term perspective. As well as these subsidies do not effect on financial ability of water utilities that have no money today from the payment for their services to invest in the infrastructure modernization, resources (energy and water) saving to ensure the quality and safety of services. The Government has to revise the social aid instruments for households. Increasing the solvency

of the vast majority of households should be the main purpose of economic reforms in Ukraine. The costs of water supply and sanitation services should not exceed 3–4 % of household's income.

The State (President, Parliament, Government and local authorities) is and remains a guarantor and a key actor to ensure equal right to water and sanitation for all, according to the Constitution of Ukraine and international obligations. Now the water strategies and programs of water supply and sanitation sector development need to be revised taking into account focus on achieving the Sustainable Development Goal #6 and its Targets 6.1 and 6.2 to ensure equal rights to water and sanitation in Ukraine. Indicators for tracking of the progress on these targets should be based on national targets to the Protocol on water and health: percentage (%) of urban and rural population/households having access to improved water sources (centralized water supply, artesian wells, protected wells and captages); number/percentage of primary and secondary schools and health care institutions having access to improved sources of drinking water. Relevant indicators should be defined to Target 6.2 of ensuring the equal right to sanitation, based on the monitoring of access to improved sanitation of above mentioned groups of consumers in Ukraine.

The State also has to:

- define the right to water and sanitation as a priority No1 for allocation of available water resources between different water users, to develop mechanisms (including economic ones) of implementation of this priority in practice;
- harmonize and implement water laws in accordance with the EU-Ukraine Association Agreement, in particular to promote integrated river basin management, which is a way to achieve water security, to combat water related diseases, to ensure access to water: drinking water, water for hygiene and recreation, aquaculture and fisheries;
- review and develop water monitoring (in accordance with the requirements of the EU WFD) and annual reports on water related diseases, taking into account the mandatory indicators to the Protocol on water and health;
- develop and implement a plan of measures to implement the Protocol on water and health, aimed

at achieving SDG # 6 and Targets 6.1 and 6.2, taking into account national targets and indicators approved in 2011;

- approve the guidelines for preparation of the River Basin Management Plan (RBMP), promote the development and implementation of RBMPs including the floods and droughts risks management, which are relevant issues for whole Ukraine;
- develop a legislative and regulatory frameworks of implementation of Water and Sanitation Safety Plans, which should become an working tools for water utilities as recommended by WHO and the Meeting of the Parties to the Protocol on water and health, now Water and Sanitation Safety Plans are working

tool of water operators (utilities) and a monitoring tool of regulators of water sector in Europe and in the United States;

- stimulate water utilities to save energy and resources and to develop and implement planning tools for drinking water safety on consumer' tap and for sanitation safety;
- review the State targeted water programs (including "Drinking water of Ukraine", "Program of water economy development up to 2021") in respect to SDG # 6, its targets and indicators; to identify priority areas and measures with allocation of the State Budget financing and using the co-financing mechanism.

Water and food security nexus

Under global climate change, that has particularly acute trend in Ukraine during last 10 years, the conditions of farming in most regions of Ukraine are worsening due to naturally increasing water scarcity. In these circumstances the sustainable agriculture is impossible without taking measures of artificial regulation of water regime of soils. Current use of the existing potential of reclaimed land is extremely insufficient. There is a considerable reduction of the area of the really irrigated lands as well as drained lands with water regime control. Today less than 500 thousand hectares of irrigated land are actually irrigated and bilateral regulation is used only on 158 thousand hectares of drained lands.

Today it is an actual needs to develop the resource-saving irrigation and water regulation technologies, to upgrade the hydromelioration infrastructures and water regulation facilities for meeting the modern economic and environmental requirements, to reduce water losses from ameliorative channels, and to provide justification of species, sorts and crop rotation structure to ensure the necessary level of productivity and profitability of reclaimed lands under climate change.

The task on rehabilitation of an effective environmentally sound usage of the reclaimed lands capacity, especially irrigated lands, should be a priority direction of overall development policy and particularly of the agrosector development in Ukraine. The development and approval of the National strategy on restoration

and development of irrigation and drainage systems are an important step towards the implementation of this difficult task. The government of Ukraine should define the strategic development of land reclamation in Ukraine, taking into account the priority of ensuring water availability for domestic needs of food production and determining the appropriate level of additional water use for export food production.

It is scientifically proved that available water resources can ensure the development of irrigation on the area of 2.5–3.0 million hectares. The increasing areas of arid conditions (with deficit of moisture) within the country may need irrigation as strategic interventions to reduce the risk of drought for agro sector on larger areas. It will require broader usage of mineralized water for irrigation, usage of local surface and ground water, and reuse of treated wastewater.

Development of irrigation is a necessary precondition to achieve the annual grain production level of 80 million tons and, consequently, to sustain grain production at this level as one of the food security components.

The urgent measures have to be focused on reduction of unproductive water losses by increasing efficiency of irrigation canals and systems, as well as by changing the cropping pattern towards drought-resistant crops. A resource saving in irrigated agriculture needs a transition to economic innovative methods of management and

use the newest water and energy saving irrigation methods – drop irrigation and low-pressure sprinkling.

The development of agricultural sector with growth of water demands for manufacturing processes requires improvement of water metering and the reporting (data collection order) on water resources using in agrosector, including livestock and fisheries; automation of direct water metering on reclamation systems. Moreover, management of water demands of water users/consumers and ecosystems is important for sustainable (environmentally safe, economically efficient) water management within river basin.



Water and energy security nexus

The modern formulation of water security cannot be defined without participation and common understanding by all major water users and consumers, other stakeholders, that water is a limited resource in Ukraine because of unequal natural distribution of water (surface and groundwater) resources across the country territory and between seasons of the year, as well as because of limited access to water due to the improper water management.

The energy sector is a major consumer of fresh water, and traditional energy production by thermopower plants or nuclear power plants (TPP or NPP) is water highly consuming technology. In 2015 TPPs used for own needs 2400 million cubic meters of water, NPPs – 327,8 million cubic meters, 106,043.33 million cubic meters of water passed through hydropower turbines (the Dnipro river runoff in dry year is near 30,000 million cubic meters). These figures show the important role of water for the energy sector functioning.

The river flow regulation and water recycling systems are applied to supply water for energy sector. Usually in Ukraine the large and medium rivers flows are regulated for this purpose. Only in Dnipro River Basin 466 reservoirs with regulation volume almost 46,000 million cubic meters were built. The regulation of the major watercourses of Ukraine gave the possibility to redistribute the flow and meet the needs of water users, as a result of it these rivers are now heavily modified water bodies of bad ecological potential and low self-purification capacity. That is proved by a lack of any tangible improvement of water quality in the Dniepro River or other rivers despite a significant reduction in water intake (more than 3 times decline over past 25

years: from 30 km³ in 1990 to < 9.7 km³ in 2015) and wastewater discharges (from 18 km³ in 1990 to 5.3 km³ in 2015) by various sectors of the economy.

River flow regulation is accompanied by a number of environmental impacts on water bodies' state. In particular, it's well known that building HPP and hydraulic facilities of various degrees of complexity and purpose are resulted in hydromorphological alterations of rivers (river flow velocity slowdown/interruption, impoundment and hydropeaking, accumulation of significant volumes of sediments, flooding of large areas caused by reservoir bed formation), which lead to water ecosystems' degradation and loss of their self-cleaning ability, substantial contamination of surface waters and affect the qualitative and quantitative state of the biological resources, as well as lead to the waterlogging of the adjacent territories.

Under long-term (over 30 years) trend of warming, increasing droughts' frequency and duration (especially in the last ten years) and declining river flow the issue of regulation of the operational regimes of reservoirs and allocation of accumulated water between population and economic sectors in accordance with the approved priorities becomes increasingly a difficult task. Thus, according to the current operation rules of the reservoirs of the Dnipro cascade, the water allocation priorities are set in the following order: utilities, industry, hydropower, agriculture, fisheries, transport, sanitary and environmental water releases and recreation. In recent dry years, accumulated volume of water in the reservoirs was limited not only for environmental but also for sanitary water releases.



The water releases issue remains a critical one for hydropower. Due to a lack of river runoff especially in the low-flow period, the limits for water use by existing hydropower plants are set on the Dnipro, Dniester and other rivers. To solve such situation the multi-annual flow regulation has to be introduced for water accumulation in reservoirs and distribution. In fact, during low-flow period in 2016 year the limits for water use were applied for hydro power plants.

Energy security of Ukraine is interlinked with sustainable development of water sector, increase of energy efficiency of water infrastructures, including the reduction of electricity consumption for water

pumping, abstraction and transportation for irrigation. It requires replacement of outdated pumps with modern equipment, introduction of optimized operation regime of the equipment and use of alternative energy sources.

The strategic plans of development of the energy sector and its sub-sectors must include the water demands assessment for each of the subsectors and assessment of their impacts on water resources and water security for the other water users within the River Basin, as well as analysis and assessment of water risks for energy security. The energy strategy should take into account and contribute to the achievement of common goal of all water users to achieve and maintain good status of water resources by improving water efficiency of energy production, reducing unproductive consumption and losses of water at all stages of energy production.

Recognizing the importance of hydropower for sustainable functioning of the whole energy sector and the possibility to cover peak loads of the energy system, in 2016 the Ukrainian Government approved a new “Program of hydropower development in Ukraine till 2026”. The Program includes the further construction of HPPs mainly on small and medium rivers of Ukraine. However, the implementation of the Program requires proper environmental impact assessment of new construction on the water ecosystems, development of the regulation of the sanitary and environmental water releases setting for each water body, development of the





legislative regulation to strengthen the responsibility of the central authorities for norms and rules compliance by the building companies involved in the construction of hydropower and hydrotechnical units as for the high environmentally dangerous building. The Environmental impact assessment has to be done for each new hydropower construction project, including mini-HPPs. Each program of energy sector development has to pass through the Strategic environmental assessment.

More over before the development of HPP business plans it is needed to conduct the research and assessment of hydropower potential of the river basin taking into account modern environmental requirements to the construction of hydropower and hydrotechnical facilities, detailed hydrobiological study of the water bodies attractive from the hydropower production point of view. A moratorium on the construction of HPPs on the headwater of rivers and on rivers located in protected areas has to be ensured as the basic environmental requirements, which exist in the EU and must be approved in Ukraine. Each (big and small) HPP has to be equipped with the appropriate fishways for fish migration and to meet the criteria for environmentally safe site.

Now in Ukraine there are about 100 mini-HPPs in operation, which must to comply sustainability criteria: technical security, economical efficiency, ecological safety. However already there is negative experience of violation the environmental requirements and ignoring the interests of other water users at the construction and operation of mini-HPPs. It causes social conflicts, destruction of rivers, degradation of biological resources and aquatic ecosystems.

The thermal and nuclear power plants create significant risks to water security, the plants require significant volumes of water for energy generation, cooling of reactors. The direct-flow cooling systems of Nuclear PPs are of particular concern as it causes the river runoff withdrawal and degradation of water quality (thermal pollution). In dry years, the operation of thermal and nuclear power plants increases significantly a competition for water resource in Ukraine.

The scarcity of water resources in climate change is the bottleneck of the plans of building new reactors and upgrading the existing NPPs. In 2007, during the drought there was a critical issue of a lack of access to water for population and agriculture in the Southern Bug River Basin caused by whole river runoff accumulation in Aleksandrovs'k reservoir to ensure the safe operation of the South Ukrainian nuclear power plant.

In the energy sector development context the river flow and water quality monitoring and forecasting remain relevant tasks for Ukraine. The modern such monitoring system requires a significant increasing the number of observation points and improving their equipment, upgrading the laboratories, automatizing data collection and improving information management, developing new mechanisms of access to information for operative decisions making as well as for water users and stakeholders, including public.

In the future this monitoring system should become a basis of short- and long-term forecasts and assessment of hydropower capacity and its changes in dry or wet years, what will contribute to high quality preparation of strategies and programs of energy sector development.

Rethinking of Water Security for Ukraine



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