

Role of Water Resources in the Modern World



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Abstract The problems of water use and water availability have a long history. For thousands of years, the people had used water in agriculture and for satisfying their own needs, while in the recent centuries the water supply of industry has been added here. However, beginning from the mid-twentieth century, the use, distribution, and reproduction of water resources have acquired special relevance. The quickly growing world population, industry development, and expanding agricultural lands have led to the water deficit which is increasing with every passing year. The water demand runs ahead of the population growth rate.

Many international organizations and individual states exerted enormous efforts to find the way to cope with this issue but so far without success. In the recent decades this has led to the growth of interstate contradictions of interests which gave rise to international instability and even to conflicts. This issue is so acute that the conflicting parties fail to find compromise. It means that in the nearest decades, we may witness the revival of “water wars” which will affect enormously the political map of the world.

Keywords Conflicts, Ecology, Struggle for water, Water resources, World politics

1 Introduction

For many centuries the water resources determined the places where people choose to live. The water resources and the geography of their distribution over the planet and their volumes available to a man have also governed the industrial and agricultural development. However, in the recent century, the role of water availability in the life of individual states and in interstate relations has been growing. The increase of water use has enhanced competition for this strategic resource. This factor has become crucial for international relations in different world regions, in particular those with transboundary rivers. They turned from purely geographical objects into the factor of the world politics. The political importance of water resources has gradually urged to address not only hydrological and environmental issues but also their management, protection, and regulation. As a result, the access to water has acquired political dimensions, and the water resources use and distribution – the international scale (Fig. 1).

In the recent decade, the water resources have become a key factor in development of agriculture, power engineering, industry, and meeting the household needs. But with every passing year, the attainment of this goal becomes more difficult as a considerable part of the world population has a limited access to water resources. As a result of the population growth global-wise, increase of resources use, and destruction of natural ecosystems, by the beginning of the twenty-first century, the water of the drinking and technical quality has become one of the most essential resources required not only for globalizing economy, but even for mankind survival. If in the

Fig. 1 A limited water resources (<https://proprights.org/blog/phony-water-crisis-continues-legislative-style-hirst-heist-rolls>)



recent decade each inhabitant of the planet is apportioned around 750 m^3 of freshwater per year, then by 2050 this figure will drop to 450 m^3 of water [1]. It should be remembered that the permanent population growth entails the increasing water demand and extension of economic activities as well as additional energy requirement [2].

The main source of water supply is rivers where the process of water renewal goes on most actively. Surface waters account for up to 70% of the total water use. At the same time, still more attention has been focused on groundwaters which are better protected against pollution and are often the most reliable and pure source of drinking water. According to different estimates, groundwaters are of crucial significance for the life and food security for around 10% of the population living mostly in Asia and Africa.

The interest to these resources is constantly growing which has already led to the increase of their use. However, the growing rate of groundwater intake is threatening with their depletion. The formation of groundwaters went on for a long time and their intake growing with each passing year may be disastrous.

2 Water Deficit

The aggravating freshwater deficit has become one of the key global challenges for the mankind in the twenty-first century. Resolution 70/1 “Transforming Our World: The 2030 Agenda for Sustainable Development” [3] says the following: “We recognize that social and economic development depends on the sustainable management of our planet’s natural resources. <...>We are therefore determined to conserve and sustainably use oceans and seas, fresh water resources. <...>We are also determined <...>to tackle water scarcity and water pollution <...>” [3]. The



Fig. 2 Water resources deficit (<https://econet.ua/articles/7599-ogromnye-zapasy-podzemyh-vod-obnaruzheny-v-stradayuschey-ot-vechnoy-zasuhi-kenii>)

wider access to freshwater resource and improvement of sanitary conditions are included into 17 main UN Sustainable Development Goals (Fig. 2).

According to initial assessments of the World Bank, by 2030 it will be required over \$1.7 trillion to ensure the overall access to drinking water without damaging the sources. The Report of the World Bank published in May 2016 confirms that the water deficit aggravated by climate changes may cost individual regions to 6% of their GDP, stir up migration, and cause conflicts [4].

On the other hand, the countries have failed to develop the optimal “form” of the water problem solution. By the early twenty-first century, over 3,600 agreements were signed on various aspects of international water use and nearly 150 of them in the late twentieth to early twenty-first centuries. This demonstrates the availability of a critical approach to addressing the issues of joint water use [5].

Water scarcity directly affects the social and economic development of the countries and individual regions resulting in worsening of the sanitary-epidemiological situation. Lack of water resources or their permanent insufficiency may provoke the spread of diseases and epidemic. Pollution of drinking water sources, unsatisfactory living conditions of the people, rather frequent and long-time droughts, and insufficiency of water resources for agriculture may stir up social strain. These factors contribute to formation of a conflict potential in water supply and water use. Two decades ago in 1999 at the G8 Summit in Schwerin (Germany) (Russia became the member of G8 in 1997) at the environment ministerial meeting, it was stressed that the deteriorating ecological condition of natural resources and their scarcity may give rise to conflicts among states.

3 Demographic Dimension

In the past century, the population on the planet was permanently growing. In the twentieth century, the world’s population has increased 3.7-fold [6]. The world’s freshwater consumption reached 10 km³ per day which is equal to the annual extraction of all kinds of mineral resources. Freshwater is the main and essential component of the natural environment and ecological equilibrium; it is used in all spheres of life activities of a man and society.

The pace of the world population growth is expected to be 0.9% per year on the average. It will increase from 7.6 billion in 2018 to 9 billion by 2040–2050. The population growth on the Earth entails the growing food consumption and, accordingly, the development of agriculture. The energy demand also requires ever-growing volumes of water resources [7].

The greatest population growth is expected in Latin America, Africa, and South-east Asia. These are the regions where in the recent decade the increase of freshwater deficit was witnessed (Fig. 3). By 2050 only a part of the world population will have access to water without any limitations, while the rest will have restricted access to water or will face practically unresolved problems due to water scarcity.

4 Struggle for Water

The whole history of mankind was fraught with struggle for resources. It was the main driving force determining the world order. In different periods of the society, development such resources as land, gold, forest, etc. played different roles. In the past century, these are energy resources – oil and natural gas. The main feature about

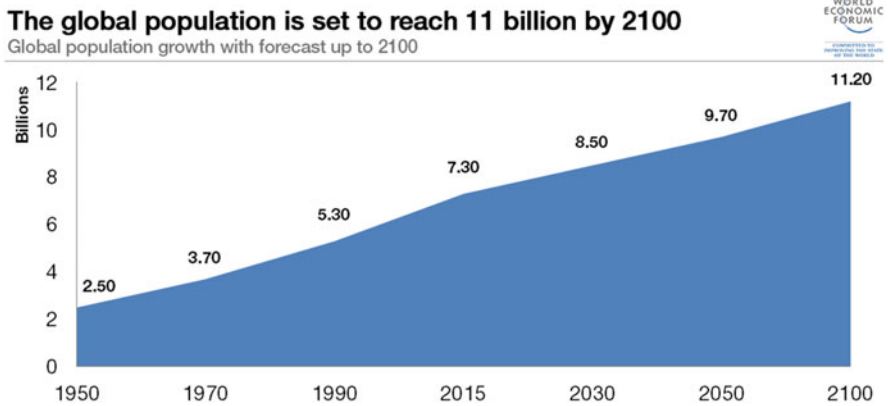


Fig. 3 The global population growth (<https://www.weforum.org/agenda/2015/10/countries-growing-fastest-11-billion/>). Source: United Nations

these resources is that they are not renewable. Not far is the time when they will be exhausted, the so-called pipe-end strategy. The tough and, at times, even bloody struggle (like in Iraq) is conducted not for where the oil reserves are greater but for where they will last longer.

During the long history of mankind, water was the cause of many conflicts. In the past 500 years “water weapon” was used on five continents from direct destruction of large waterworks to imposing a water diktat as a radical means to press on the opposite party [8]. In other words, water is not only the source of life but also a trump card in political games.

The second half of the twentieth century was distinguished by aggravation of the water supply issues. The water deficit is formed mainly due to the enhanced discrepancy between a quick growth of water use and the available water resources that have remained practically unchanged through the year. The accelerated growth of water use is connected with the unprecedented boost of the world economy and, quite recently, with the escalating food crisis witnessed in many world countries. It may be said that the ratio between the available water resources and the constantly growing water demand has become critical. That is why in April 2000, Kofi Annan, that time UN General Secretary, said that the “water issue” became one of the priority problems for the mankind to face in the twenty-first century [9]. Preserving the available water resources and searching for new water sources are among the most burning issues in the twenty-first century [10]. For this reason many in the West have named the new century the “century of water,” while the hardened pessimists even the “century of water wars.” As Sandra Postel, the US expert, wrote “Forget about oil. The just division of freshwater creates the no less explosive and far-going political puzzle than the global climate change” [11].

5 Regional Water Geopolitics

The problem of water supply bears the imprint of the past historical development of individual countries and whole regions. About half of the world population lives on the banks of ten major rivers which, according to assessments of the World Wide Fund for Nature, are in a critical state [12]. These are La Plata, Danube, Rio Grande, Ganges, Murray-Darling, Indus, Nile, Yangtze, Mekong, and Euphrates. Around 41% of the population living in the basins of these rivers suffer from water scarcity caused mainly by large-scale dam construction, excessive water intake, climate changes, aggressive intrusion of alien plants and animals into river basins, and excessive fishing. According to the US estimates [12], out of 227 major world rivers, 60% have too many dams and canals which lead to degradation of ecological systems. And, finally, the water availability has acquired in many countries the national security dimensions.

Limited water resources of river basins give rise to rivalry in the strategy of economic development of different countries. Taking into consideration the lawful economic interests of individual countries, it is quite possible that conflicts

concerning water sharing may arise among them. At the same time the conflicts related to access to quality water between the upstream and downstream countries in river basins are also highly probable. In some cases, the water may be required for such alternative uses as irrigation and hydropower engineering.

In many countries the water deficit and the negative impact of economic activities on the natural environment may provoke conflicts, too. It is meant here that many water issues have clear-cut international dimensions.

At joint water use, the difficulties with managing river basins lead to the conflicts at various hierarchic levels, both interstate and interregional. It should be remembered here that the technology upgrade and the growing water deficit contribute in a large measure to stirring such conflicts. In addition, the traditional water use and water management practices and other factors impede cooperation development on such rivers.

According to different estimates, currently over one billion people in the world have no adequate access to water resources, and in 15–20 years, up to 50% of the world population may suffer from water scarcity. By 2025 around three billion people will live in the countries with water deficit. According to UN estimates [13], by 2050 two-thirds of the population on our planet will face water deficit. It should be remembered here that the global climate changes may swing the arrow of “balances” to aggravating the situation.

Already now the strenuous situation with water reserves and their use is observed in many world regions. Only in the recent half century there were more than 500 disputes over water in the world. Nearly 40 countries located in the arid zones face water deficit, and they depend greatly on water coming from outside.

The water resources are becoming more and more often the internationally traded commodity which cost may exceed already in the twenty-first century the cost of hydrocarbons – oil and natural gas. And this may happen already in the nearest decades having intensified rivalry among individual states for access to and control of water resources.

Still back in the 1980s, the US secret services identified at least ten regions in the world where wars could have been detonated due to depletion of water resources. These are, first of all, Near East and Arabian Peninsula. Former US President adviser on water resources J. Starr said that “soon water security will go abreast with military security in the corridors of military departments” [10]. Such events were presented most vividly in the BBC TV serial “Water Wars” showing most “hot” water points on the planet: US West, Near East, and Aral and Circum-Aral area in Central Asia. This film created the impression that Near East would be the first world region to face in the next decades the “water crisis.”

We can soon witness the toughening struggle for water between China and India, between Egypt and Ethiopia, and between Angola and Namibia. And it is not accidental that the book “Resource Wars” of Michael T. Klare published in 2001 in the USA has a subtitle “The New Landscape of Global Conflict” [9]. Covering the oil and gas conflicts from the Persian Gulf to the Caspian, the author also considers the water conflicts in the basins of the Nile, Tigris, Euphrates, Jordan, and Indus rivers.

The impending threat of war over sharing water resources of the Euphrates, Tigris, Jordan, and Nile rivers has occurred more than once in the recent decades. The last event was in early 2008 when Syria and Turkey, not for the first time, came into clash over freshwater sources. According to the Arab daily *Asharq al-Awsat*, Damask claimed the increase of water intake for its needs from the Euphrates River. Ankara denied this claim in view of its own dependence on the Euphrates which is one of the main sources providing water to its arid territories.

As UN General Secretary Ban Ki-moon noted, the military actions burst out in the Darfur Province of Sudan during drought when “food and water ceased to be available to all for the first time.” Here is another example. In 2006 in Sri Lanka, the armed conflict arose over the access to a reservoir supplying water to over 60,000 Sinhalese people. The leadership of the movement Liberation Tigers of Tamil Eelam accused the government of unequal access to water and seized the reservoir. The bloody battle lasting for several days took a toll of over 1,000 people. This event with the reservoir gave rise to initiating the wide-scale military actions.

The examples of struggle for water resources are many. Much was spoken about the need of developing the mutually beneficial cooperation in this sphere that would not only cool the conflict relations among the countries, but would help working out the effective mechanism of water sharing. But this issue remains unsolved so far.

6 Near East Water Dominoes

The water deficit situation is most strenuous in such world region as Near East (Fig. 4). All countries of this region locate in harshly arid conditions where water reserves are very scarce. Deserts cover about 60% of the territory of Israel, 70% of Syria, 85% of Jordan, and 90% of Egypt. And the areas with the highest water intake and the highest population density locate along rivers.

The largest river systems in this region are transboundary rivers of Tigris and Euphrates with their tributaries. Running across three countries – Turkey, Syria and Iraq – they make the key economic and geostrategic resources for development of these countries, being, at the same time, the “apple of discord.”

Water deficit in Near East has been felt most acutely in the recent decades. In fact, not only history, but the present time abounds in cases showing vividly that the struggle for water, for access to water causes if not armed conflicts, but, at least, the tension in interstate relations. Of special importance now is not availability of water as it is, but more on the control of its sources as the main rivers of this region – the Nile, the Tigris, the Euphrates, and the Jordan are transboundary. The conflicts between Israel and Arabian states; between Israel, Syria and Jordan over water intake from the Jordan and Yarmuk rivers; between Egypt and Sudan; between Turkey, Syria and Iraq may be also listed as examples.

The other example is Saudi Arabia, Kuwait, and UAE where the only source of water is the waters from the Persian Gulf after their desalination at special plants. As Foreign Minister of Kuwait Sheikh Muhammad al-Sabakh said in one of his



Fig. 4 The Near East (<https://www.gtreview.com/news/mena/taylor-dejongh-appointed-as-advisor-on-saudi-projects/>)

interviews: “The Gulf is the only source of water. If there is a nuclear disaster in the Persian Gulf (meaning accidents on nuclear facilities in Iran) we will have no water to drink. We will be left without water” [12].

Water issues urge to look differently on some conflicts, for example, the Arab-Israeli wars. The Golan Heights in Syria occupied by Israel is where the Jordan River, the main source of water for Israel, originates. By occupying the Palestine territories, Israel is seeking to control groundwaters available in significant quantity within ancient Palestine. And this is quite understandable as 95% of the Israeli territory locates in arid regions and more than 60% of its territory is covered by the Negev Desert. Water resources in the country are very scarce and are formed mainly by atmospheric precipitations. In the period from 1989 through 2005 the average precipitations accounted for 6 billion m³, of which 60–70% were lost to evaporation soon after rainfalls and at least 5% ran along river channels to the Mediterranean (mostly in winter). Of the remaining 25% of water that seeps into soil the great quantity also gets into the sea with groundwater flow. Accordingly, the access to water is critical for development of this state [14].

It should be noted that the religious issues are often used as a disguise of struggle for water, including with the use of military forces. The same picture becomes visible if we compare the religious and interethnic conflicts with rivalry for hydrocarbons that occurred in the past century.

The Euphrates is the historical river on the banks of which one of the oldest civilizations had appeared. The watershed area of the Euphrates is about 580,000 km², which is shared by Iraq (49% of the area), Turkey (21%), Syria



Fig. 5 Tigris and Euphrates rivers (<https://www.pinterest.fr/pin/611715561863566996/>)

(17%), and Saudi Arabia (13%). Originating in Turkey, this river crosses Syria and Iraq and after confluence with the Tigris brings its waters further to the Persian Gulf. The Euphrates has different significance for each of these countries. Until recently Turkey that is rich in water resources has used the Euphrates water insignificantly. For Syria the Euphrates is practically the only source of drinking and agricultural water supply. Iraq, apart from the Euphrates, has the Tigris River which compensates to a certain extent the importance of the Euphrates.

In the recent decades, the problem connected with enhanced development of the Euphrates energy potential in Turkey has appeared (Fig. 5). The acute rivalry for the Euphrates waters started more than two decades ago. In 1983 Turkey prepared the master plan for development of the most backward provinces in southeastern Anatolia where 40% of all cultivable lands locate. This plan assumed the integrated use of upstream water of the Tigris and Euphrates rivers for development of irrigation and hydropower engineering. It included 13 major projects on construction of 22 dams (7 dams on the Euphrates), 19 large hydropower plants, and irrigation of 1.7 million ha of semiarid lands. In the future the implementation of these projects will help increasing electricity generation to 27 billion kWh per year. At the beginning of construction, this project cost was US \$32 billion. This plan which goal was to control water resources was considered by Turkey as the main element of future security and might of the state. By controlling the water flow to the

downstream countries (Syria and Iraq), Turkey could acquire levers to influence the policy of these countries. The Turkish government also expected to sell the additionally received agricultural produce to the countries of Europe and Near East and obtain dozen billion dollar worth profits. Regulation of the river flow in the Turkish territory resulted in a sharp reduction of runoff going to Syria and Syria constructed the As-Saura Dam and Assad Reservoir on the Euphrates to create water reserves for supply of its agriculture.

Syria and Iraq expressed their concern that the construction of dams in Turkey would “rob” them of 40–90% of the Euphrates flow. In 1987 Syria and Turkey reached an agreement about the use of the Euphrates river flow according to which Turkey had to ensure the passage of 500–850 m³/s of water per year to the Syrian territory. But the Arab press had criticized sharply Turkey accusing it of cutting the water supply to neighbor countries for exerting political pressure on them. The Turkish officials refuted such statements.

The relationships among the countries of this region were aggravated in 1989 when the severe drought occurred as a result of which the water level in the Euphrates had dropped significantly. This drought affected the economics of Turkey, but it was still more disastrous for Syria where the water and electricity supply in Damask, Aleppo, and some other cities had reduced significantly.

In the early 1990s, Syria and Iraq had new concerns this time about construction of the Ataturk Dam in Turkey which would take the greater part of the Euphrates flow for irrigation of lands in the Urfa Plain. The apprehensions appeared after in January 1990 Turkey blocked the Euphrates for filling the reservoir. The Ataturk dam which construction was started in 1984 is 179 m high and 15 m wide. This is the largest dam built on the Euphrates and its tributaries in their upper reaches. It will provide irrigation of 874 thou ha of lands and generate 8.1 billion kWh of electricity.

For many decades the countries of this region had made attempts to arrange about sharing of water resources and to develop the mechanisms for settling the arising disputes. However, there were only declarations. As a result, Turkey demonstrates its “water muscles” by implementing its most ambitious water engineering project, thus, controlling water flow to the downstream Arab states.

In order to mitigate somehow the contradictions among states, Turkey proposed the Peace Pipeline Project envisaging construction of a large water conduit to deliver waters of the Ceyhan and Seyhan rivers to arid countries of Near East – Syria, Jordan, Israel, and Persian Gulf countries. There were also negotiations about signing an agreement with Israel for 20 years for selling to this country 50 million m³ of freshwater per year. And despite very long negotiations, the agreement on water export had been attained.

The principle of “water dominos” has affected also the plans of Iraq which locating in the lower reaches had suffered the water deficit to a much greater extent. During the USSR times, the Russian specialists invited by the Iraqi government took part in construction of the large hydraulic complex Tartar on the Tigris River with the reservoir accumulating 69% (105 km³) of the total water flow received in the country.

Prior to the Kuwait crisis, there were plans in Iraq to invest over US \$300 million into projects on construction of flood control structures, power-generating facilities, reservoirs, and irrigation systems on this river for control of the Tigris flow.

The Nile water sharing has been for long the subject of disputes between Egypt and Sudan to which other countries located in the Nile basin may join in the future, such as Ethiopia, Tanzania, Kenya, and Uganda [15, 16]. The bilateral and multi-lateral arrangements and agreements existing among the countries in this region envisage mainly the actions on transfer of water from water-rich to water-deficit regions and its desalination. In the early 1990s, the water issue sparked the conflict on the Nile River. The growing population in Egypt, Sudan, and Ethiopia that depend on water supply from this river sharpened the rivalry for water.

Egypt is one of the most densely populated Arab states. It locates in the Nile delta and practically has no levers to influence the actions of eight upstream countries. Former UN Secretary General B. Gali noted still in the 1950s that “the national security of Egypt is connected with water resources” [12]. That time it was decided to concentrate efforts on year-round irrigation, and these efforts were crowned with construction of the Aswan High Dam that ensured guaranteed water supply for irrigation of agricultural lands. As it was arranged with Sudan, Egypt could take 7.5 km³ of Nile water in addition to the right to water intake of 48 km³ of water. Accordingly, Egypt was entitled to the guaranteed water intake of around 55.5 km³ per year from the Nile.

There are several factors that may trigger the water crisis in Near East. First, this is an arid zone with high temperatures and precipitation deficit. Surface waters are represented by small rivers many of which dry out in summer and some large rivers (the Nile, Euphrates, Tigris, and Jordan) crossing vast deserts which do not receive tributaries in many parts and the water from which is intensively taken mostly for agricultural and water supply needs. Second, the thriving population in this region. By the population growth rate, this region takes one of the first lines in the world. Overpopulation is observed mostly in river valleys, for instance, 55% of Egyptian people live on 3% of the country’s territory. There are also states in this region which are in conflict to each other due to historical and socioeconomic factors.

Therefore, Near East is one of the most vulnerable world regions. The struggle for water may lead not only to interstate conflicts but entail general destabilization here.

7 Virtual Water

The sharp rise of water consumption in the twentieth century was connected not only with the growth of the population and increase of its incomes but also with the changed habits of consumption. In many world countries, the growing incomes of the population stimulate the use of meat, poultry, milk, and butter, i.e., the foods which manufacture requires much water. The process called today “the protein revolution” means the changes in habits of whole states and a drastic increase of protein food in a daily ration of people [17]. Such process started in most developed

countries of Asia, Japan and Korea. However, with the economic development of the region it covered still greater number of countries. In 1985 the per capita consumption of meat in China was 20 kg per a year, and in 2011 it was already 53.5 kg [18]. It means that the people of China had wider possibilities to increase food consumption. At the same time, the meat consumption in India did not change due to traditions and religion, although the meat production for export to the Near East countries had increased enormously.

In many world countries, the consumption boom had led to a many-fold increase of water use. The higher living standards proclaimed in many countries had also affected the situation with water resources which had been already apportioned completely.

8 Growing Rivalry

The world is facing the growing rivalry for water resources between agriculture and industry: the latter uses water with much higher value-added cost of the final products. In China such internal rivalry for water resources is most obvious: agriculture accounts for 12% of GDP, while industry for nearly 46.5%. But the agricultural producers prefer not to cut the water consumption but to increase the added value of their products. This explains, in particular, the drastic growth of fruit and vegetable production in China in the recent decade as they have higher value than grain crops. At the same time, it is the industry that is mainly responsible for deterioration of water quality through pollution making water unfit for further use in agriculture. This is the main scourge for the developing countries.

Consequently, high water consumption in agriculture (when water is not returned into a natural cycle) and water intake (when water is returned in a cycle after passing through industrial production or power facilities, but its quality is heavily deteriorated) should be considered in a complex. For sustainable development of territories both indicators should be taken into account: the co-existence of agriculture and industry with high water intake demands the allocation of quotas for water intake and requirements to water treatment. Otherwise the situation may be established which China has to address today: regardless of physical availability of water the level of industrial water pollution is so high that this water cannot be used in agriculture and less so for household needs [19].

Such form of water crisis is rather specific and was incidental of Europe in late nineteenth to mid-twentieth centuries. The international political result of the crisis was signing of bilateral and multilateral agreements dividing the water flow of international rivers, establishment of special ecological commissions and supranational managing bodies. The increase of water intake for industrial needs was not critical by itself. However, the environmental implications threatened the existence of traditional agricultural branches (e.g., fishery in the Rhine) [20].

Currently, due to movement of some industrial productions to Asia, a high level of development, considerable investments into new technologies, and improved

supranational regulation within the European Union, this crisis was overcome to a great extent. It can be said that the crisis had the least effect on international relations as it occurred largely in water abundant regions and the most grave implication of this crisis was heavy deterioration of water quality. The European integration enabled its member-countries to address effectively such contradictions and to develop the most advanced system of international cooperation in the water sphere – the European Water Initiative.

9 Water Security

The hopes for development of water saving technologies and effective water use confronted not only economic issues but also long-term social problems one of which is slow change of mentality of simple water users, mostly rural people, for whom the efficient use of water resources is not the priority issue. This process will require many years. The economic development of the Central Asian region by leading global players is impossible without appropriate legal regulation of the water issue and the more so in case of some large-scale regional conflicts over access to water resources.

Pollution is a transboundary phenomenon. Pollutants get into water sources with surface runoff from the territories of settlements, enterprises, and agricultural lands. The existing water treatment facilities fail to meet the requirements of the formulated goals.

The regional cooperation in water use is held up by the lack of the effective mechanisms for water distribution, water use management, and settlement of conflicts, by the low level of information exchange on water quality and its use. Moreover, the littoral countries make attempts to share the benefits from access to water and not the water proper which complicates the joint use of transboundary rivers. This may be largely attributed to the fact that in conditions of the growing water deficit in the transboundary river basins the countries of the region have to address the problem of satisfying their own needs. As a result, the interests of neighbor countries are ignored. In the absence of the laws regulating this area of relations, the regional countries become free to take unilateral actions and the more so as the water legislation of the Central Asian countries does not contain norms that regulate water saving.

The water resources differ greatly from hydrocarbons. They have some specific features, such as their interrelation in space, lack of borders capable to influence their distribution, and variability of water flow in time depending on the season. As a result, we have practically identical situation when the upstream countries acquire effective levers to press on downstream countries.

10 Conclusions

In many world countries, the available water resources have been already developed. At least this is true of the easily accessible resources. The possibility in the future of obtaining the water resources in some alternative ways is not visible. In any case we do not see the economically feasible ways in the foreseeable future, while the water demand is growing with every passing year.

Technological progress has not decreased the probability of conflicts for water resources. On the contrary, it made their potentially still higher. Water similar to hydrocarbons make the basis of the national security of each state as generation of electricity by thermal, nuclear, and hydropower plants depends on availability of water.

The active use of water to meet the industrial, agricultural, and household-utility needs depletes gradually the world resources and makes countries, both developed and developing, dependent on water resources. According to US estimates, by 2025 the water demand will grow by 22% compared to the present level [21]. In the economic sectors where production is impossible without water, the production growth may slow down.

The main causes of water resources depletion are environment pollution, irrational water use, low-effective land reclamation, and population growth in the countries suffering from water deficit.

Ineffective water use technologies and scales of their application contribute significantly to water pollution and reduce the volumes of water fit for drinking, domestic, agricultural, and industrial use. This is aggravated by the intensive population growth, mostly, in the regions which have always suffered from the scarcity of renewable freshwater resources required for sustainable social and economic development.

There is an opinion that fears about insufficiency of water resources in the future are groundless. As an argument they speak about huge water reserves of Arctic and Antarctic glaciers and also enormous groundwater reserves. However, they do not always consider the economic aspect – the cost of using such water resources and the long-term perspective – the effect of the global climate warming and likely irreversible negative consequences. As is known, the oil reserves in the world are quite sufficient. However, the cost of not easily extracted resources may lead in the future to further growth of their cost for users.

The conflicts in water resource management are stirred often by striving of some water-abundant countries to impose complete national sovereignty over these resources. Water, likewise oil and natural gas, becomes already now the serious factor of interstate relations, the mechanism of influence. In the future, the role of this factor will be growing.

For the countries possessing sufficient water resources the sharing of water among users – neighbor countries – acquires political dimensions. Many water-abundant countries announce that water is a commodity and require certain pay for water from neighboring states.

The uneven distribution of water among countries makes it imperative to deepen integration in water management by diversification of the whole water management complex ensuring sustainable economic growth. The issue of joint use and protection of water resources has become more complicated in view of the demographic, social, and economic pressure on natural resources. Currently, the countries are trying to find the mutually acceptable ways to manage water resources, but so far the results are not impressive. Today we have no effective mechanisms that would regulate the interstate relations concerning water resource use.

The retrospect of failures to control oil prices in the world suggests that the conflicts between producers and users of hydrocarbons being strongly influenced by data on reserves may escalate. The situation with water is much more complicated as water resources are more strongly affected by short-term climate variations.

There is no need to prove that structural imbalance in water resource distribution typical of many countries impede the attainment of political stability and sustainable social and economic development. By the mid-twenty-first century, many countries will have to import water. The struggle for water will be a source of tension and conflicts on the planet. In this context it is necessary to develop the water-saving technologies, both in agriculture and domestic and utility sphere. Facing such challenges, the world community has developed the integrated approach to water resource management. It is quite appropriate that one of the targets of the UN Sustainable Development Goals is to ensure access of people to clear and safe drinking water. This goal states clearly that “water quality is an important component of integrated management of water resources that has not been properly considered until recently” [22].

Water conflicts have become recently a part of the world geopolitical system as they control the essential resource required for viability of the modern industrial and technological society. Water becomes increasingly the crucial factor of modern geopolitics. It is quite possible that with time on the politicians and experts will use such term as “water conduit architecture” similar to natural gas and oil lines [23]. The struggle for water reminds somewhat the history of rivalry for oil and natural gas dividing countries into those who possess this resource and those who import it. The only difference is that in case of oil and natural gas, we can speak about alternative delivery routes or alternative sources, but in case of water, it will be much more complicated and costly. So, in this century, the cost of water which has become the “international commodity” may be compared with or even exceed the cost of hydrocarbons – oil, in particular.

References

1. Orlov AA, Chechevishnikov AL, Chernyavsky SI (2011) Fresh water problem: the global context of the Russian Policy. MGIMI-U, Moscow, p 5
2. Glanz MH (2018) In: Manankova E (ed) Water security in a changing climate. WMO Bulletin World Meteorological Organization, vol 67(1), pp 4–8

3. Official site of the United Nations Organization (2015) [Electronic resource]: resolution was adopted by the General Assembly on September 25. “70/1. Transforming Our World: The 2030 Agenda for Sustainable Development” [adopted by General Assembly on 21.10.2015]. Access regime: <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/291/92/PDF/N1529192.pdf>. Accessed 24 Apr 2018
4. Official site of the World Bank (2018) [Electronic resource]: The World Bank Water Overview dated April 11. [Electronic resource] <http://www.worldbank.org/en/topic/water/overview>. Accessed 24 Apr 2018
5. Official Site of the United National Organization (2018) Electronic resource: The United Nations World Water Development Report 2018. Nature-based solutions for water. <http://unesdoc.unesco.org/images/0026/002614/261424e.pdf>. Accessed 24 Apr 2018
6. Chelishchev NF. The age of human civilization by demographic data. http://new.chronologia.org/polemics/chelishchev_age.php. Accessed 23 Mar 2020
7. Cashirin VV (2015) Right to water. International aspects of water legislation. State Duma Publishers, Moscow, p 15
8. Gleick PH, Heberger M (2012) Gleick PH, Heberger M (eds) Water conflict chronology/the World’s water. Springer Nature Switzerland AG, Cham, pp 175–214
9. Klare MT (2001) Resource wars: the new landscape of global conflict. Henry Holt Publishing House, New York, 289 p
10. Pilnikov B (2002) Results of the UN World Summit on Sustainable Development in Johannesburg. KOMPAS. On September, 18
11. Postel S (1997) Last Oasis. W.W. Norton & Company, New York, 241 p
12. Zhiltzov SS, Zonn IS (2009) Struggle for water. Index Security 14(3):49–61
13. UN: in the middle of the century, more than 5 billion people may face a shortage of drinking water. <https://tass.ru/plus-one/5053775>. Accessed 13 Feb 2020
14. Orlovsky NS, Zonn IS (2018) Water resources of Israel: track record of the development. Post-Soviet Issues 5(1):8–36. <https://doi.org/10.24975/2313-8920-2018-5-1-8-36>
15. Negm AM (ed) (2017) The Nile River. Springer International Publishing AG, Cham, 741 p
16. Negm AM, Abdel-Fattah S (eds) (2019) Grand Ethiopian Renaissance Dam Versus Aswan High Dam. Springer International Publishing AG, Cham. 594 p
17. Food and Agriculture Organization of the United Nations (FAO) (2004) Calorie supply per capita from animal products, FAOSTAT on-line statistical service. <http://apps.fao.org>. FAO, Rome, viewed 5th September
18. <http://chartsbin.com/view/bhy>. Accessed 7 May 2019
19. Jun M, Li N (2006) Tackling China’s water crisis online. September 21. Chinadialogue.net. Accessed 17 Aug 2019
20. Agreement of April 29, 1963 concerning the International Commission for the Protection of the Rhine Against Pollution; Convention on the Protection of the Rhine 1999.; Site of Commission for the Protection of the Rhine – <http://www.iksr.org/>. Accessed 2 June 2019
21. Snezhko E (2007) Following the oil crisis, fresh water shortages threaten to undermine global economic growth https://bin.ua/news/foreign/world/72141-vsled_za_neftianym_krizisom_defitsit_presnoi_vody_grozit_podorvat_mirovoi_ekonomicheskii_rost.html. Accessed 14 Feb 2020
22. <https://www.un.org/ru/sections/issues-depth/water/>. Accessed 17 June 19
23. Krylov AB (2018) Post-soviet states: challenges of development. Vestnik RUDN Int Relat 18 (2):247–258. <https://doi.org/10.22363/2313-0660-2018-18-2-247-258>