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Research Paper

Waters, ecosystem conservation and sustainable development of developing countries

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Tarik Kupusović[1]* and Mehmed Cero[2]

[1]Hydro-Engineering Institute Sarajevo, Bosnia and Herzegovina.
[2]Federal Ministry of Environment and Tourism, Bosnia and Herzegovina.

*Corresponding author. E-mail: tarik.kupusovic@heis.ba.

ABSTRACT

Waters are becoming more and more limiting factors of development, both in developed and non-developed countries. Waters are as natural resources that are renewable, but many factors of development, including climate changes, brought about lack of water in time and areas when and where they are most needed. World Economic Forum in Davos in the last 6 years consecutively ranked water availability among the three top risks. EU Water Framework Directive (WFD) has been set up for a better water management for their sustainable use, both for people and civilization, and for ecosystems and their services, but, very frequently, it is realized and implemented in practice only as a water protection plan, or natural ecosystem restoration and conservation measures. Wetland protection, UNEP's "International Water Quality Guidelines for Ecosystems" and Water Management Plans with Priority Actions Measures arose as implementation of the WFD and are all examples of how this "naturalistic" approach has the tendency to make the rich even richer, and poor to become even more poor, by limiting development. That is the reason why we have to find "civilized", or "civilized, environmentally accessible and friendly" solutions, hence, solutions for the benefit of all –poor people and ecosystems, and of course rich people. Sustainable and stable economic development, but for the poor is still time based on the available and renewable natural resources (not yet a full "circular economy"). Viable water uses for various purposes could help. Developing countries should wisely use their natural resources, and in this way commence to catch up developed countries in infrastructure development and quality of life.

Key words: Waters, ecosystems, water use, developing countries, developed countries.

INTRODUCTION

Water is crucial for the well-being of all humans, than for economy, food security, and environment. Water scarcity, pollution of fresh water sources and the effects of more frequent and intense floods and droughts can have severe societal and economic impacts. To prevent these risks, massive investment in developing countries into basic infrastructure of civilization, including innovative solutions in comparison to rich societies are essential. But, poor societies and countries are not in position to invest much into these basic needs. As such, massive improvement of population's quality of life and living environment remains much lengthened objective.

In fact, modern developed societies have surrounded itself with various infrastructures and networks: drinking water supply, electricity, gas, telecommunications, roads and rail, water defenses and drainage and sanitation, etc. Some exist to protect people from nature, while others are designed to make people's lives more pleasant and convenient.

Freshwater is the most important resource for humankind,

cross-cutting all social, economic and environmental activities. It is necessary for all life on our planet and an enabling or limiting factor for any social or technological development, a possible source of welfare or misery, and a reason for cooperation or conflict (UNESCO, 2013). All economic sectors need water for their activities. World Economic Forum in Davos last 6 years consecutively ranked water availability among three top risks (WEF; Davos 2017). Agriculture, industry and most forms of energy production are not serviceable if water is not available.

EU water policy presently focuses on protecting water resources. The EU Water Framework Directive (WFD) is designed to protect European waters, achieve good ecological status and enable sustainable use. But, the Water use index (or the Water exploitation index –"WEI", now in development "WEI+": Each water use, except hydropower), as the percentage of mean annual total abstraction of freshwater to the mean annual total renewable freshwater resource at the country level, in developed countries is around 15 to 40%: Spain (34%), Belgium, (30%), Poland and Germany (18%), France (16%) and in developing countries it is between 0.5 and 5%: Slovenia (3.6%), Serbia (2.4%), Croatia (0.6%); Bosnia and Herzegovina (0.5%) and Montenegro around (0.2 to 0.6%) and probably the same for Kosovo, which may be a little higher for Macedonia and Albania due to irrigation (EEA, EUROSTAT– Figure 1) (EEA and EUROSAT 2017) and home calculations from the drafts of respective Water Management Plans in 2017.

Among the other factors, it is obvious that developed countries became developed with the smart use of their waters. Of course, in the past, it was not always sustainable, but the rich can now pay for the adaptations and some restorations. Poor countries, even in Europe, are poor, because, among the other factors, they are not organized and have no wise policy for the sustainable use of their available renewable resources. In Austria, for example, there are about 5.000 small hydro-power plants (3/4 of available potential), and in Bosnia and Herzegovina only 66, (with 20 in construction and with practically negligible use of potential (USAID and GIZ, 2017). Only 100 years ago, these (Austria and Bosnia) were one country.

Political and intellectual elite, administration and even non-governmental organizations in developing countries are trying to just "copy" the present analog activities in developed countries, but with a lot of corruption (from both, or all sides). Rich countries and many international financial institutions and organizations are now helping non-developed societies to preserve their pristine and unaffected natural resources for their sustainable future, but consequently the result is that undeveloped remained undeveloped, and already developed have their sustainable future.

This article is trying to explain and argue previous quotations and to stimulate intellectual – technical and not-technical elite in the (European) countries in transition and development for the promotion of wise freshwaters use as their most precious renewable resource for sustainable development.

WATER FRAMEWORK DIRECTIVE AND FLOOD DIRECTIVE

The Water Framework Directive (2000/60/EC, WFD), adopted in 2000, is arguably the most ambitious piece of European Union (EU) legislation in the field of water. The directive defines a general framework for integrated river basin management in Europe with a view to achieving "good water status" by 2015, and consecutively in the next 6 years cycles.

The purpose of the directive is to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It will ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status'.

WFD is based on the idea that modern water management needs to take account of ecological, economic (including pricing) and social functions throughout the entire river basin. Water pricing is one of the measures used to reduce water demand. Therefore, the WFD is designed to protect European waters, achieve good ecological status and enable sustainable use. To meet these objectives, it stipulates that water must be managed at river basin – hydrological, rather than administrative scales, the involvement of non-state actors, various economic principles as reflected in tools such as cost-effectiveness analysis, and a common strategy to support EU member states implementing the directive. EU neighbors shearing same river basins and candidates for member states are voluntarily included.

The WFD planning process consists of eight steps: assessment of water status, characterization of physical and societal pressures on water bodies, designation of artificial and heavily modified water bodies, determination of water bodies at risk, revision of an existing River Basin Management Plan, adoption of a programme of measures to specify concrete actions, implementation of those two documents, monitoring, and review. This sequence of activities is to be repeated every six years.

Since 2000, some new factors, such as accelerating climate change and the economic crisis, have come into play in EU. In the coming years, climate change will pose a major challenge for water management across the EU. It is likely to bring:

- Lower rainfall and higher summer temperatures in the south, putting stress on scarce resources;
- More rain and a higher flood risk in the north. Floods are already becoming increasingly frequent: since 1990, 259 major river floods have been reported and 165 of them since 2000 (EU FWD and FD, 2017).

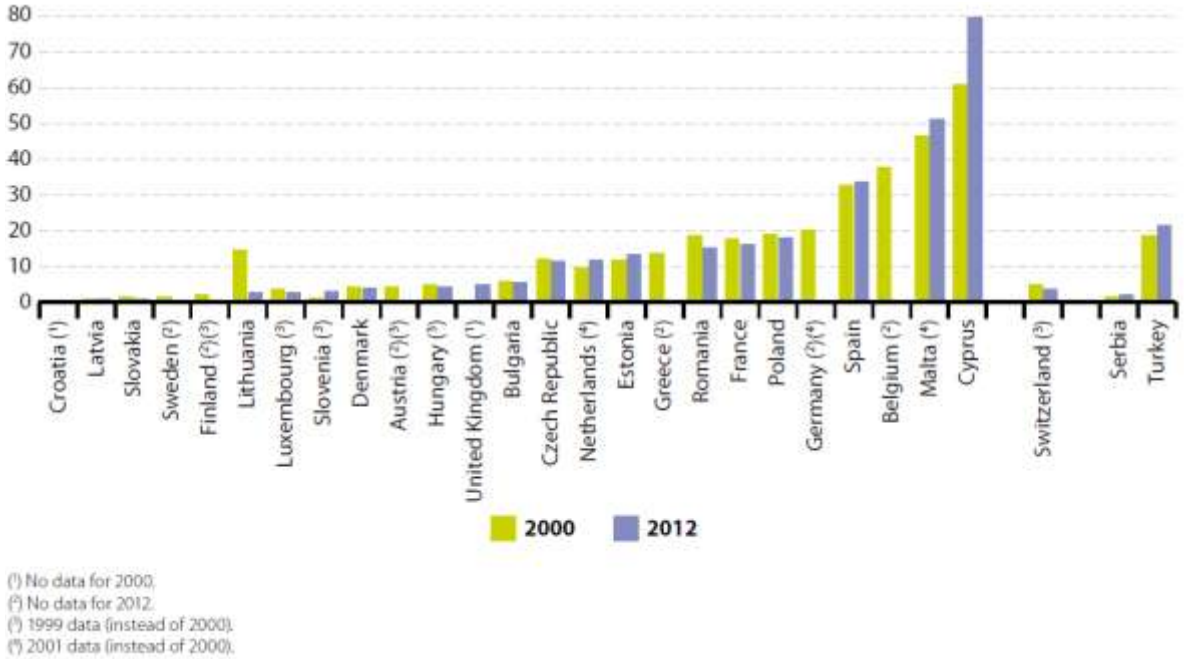

Figure 1: Water exploitation index (EUROSTAT, Last accessed: 17.5.17).

Another very important piece of EU Water legislation is Floods Directive (2007/60/EC, FD) on the assessment and management of flood risks entered into force in 2007. This directive requires member states to assess if all water courses and coast lines are at risk from flooding so as to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.

The Floods Directive adopts a new, proactive approach, requiring member states to prepare preliminary flood risk assessments for all river basin districts by 2011, followed up in 2013 by flood hazard maps. By 2015, Member States should have flood risk management plans and ready to link into the next cycle of River Basin Management Plans (RBMPs, 2016 to 2021).

Additionally, within RBMPs, member states are required to protect existing water bodies from deterioration. For surface waters, the assessment of the status is based on a measurement scale that rates biological and hydro-morphological characteristics as high, good, moderate, poor and bad and chemical characteristics as good and fail. The directive thus breaks new ground by complementing chemical water quality assessments with the more general assessment of ecological quality. In particular, a surface water body is of good quality if there are only minor departures from the quality of pristine water bodies with minimal anthropogenic impact. Groundwater is classified as good or poor based on its chemical and quantitative status. Artificial or heavily modified water bodies such as canals are to achieve at least good ecological potential, which is as close as possible to good status. The achievement of the 2015 water policy goals may be delayed up to 2027 or even lowered to a less stringent objective under reference to natural conditions, technical feasibility, or disproportionate costs.

Therefore, EU water policy focuses on protecting water resources and water in the case of floods. Water protection is very reasonable, in fact a very much needed action, because clean water became a limiting factor of development. EU, or at least developed EU countries use plenty of their waters for industry and hydro-power, agriculture and water supply and navigation etc. They do not need promotion of water use, because they already have developed water use and are already developed as countries and societies. But, the question is what about non-developed countries? What is their pathway for development? Who will organize and promote sustainable use of massively non-used waters in these countries? How do they go about it?

INTERNATIONAL WATER QUALITY GUIDELINES FOR ECOSYSTEMS

The guidelines – in full International Water Quality Guidelines for Ecosystems (UNEP, 2016) are advisory in nature and provide a basis for both those without any water guidelines and those with guidelines can identify areas to improve for better ecosystem integrity. Water quality, quantity and physical habitats and connectivity are

considered for preservation of ecosystems. They provide a base for setting national water quality policy and implementation.

As a result, the document is excellent, really "very, very excellent", but after some citations there will be some comments as to whether ecosystem functions and/or ecosystem services provided by a river or a lake remain intact or are being sustainably restored and is ultimately a political, preferably a multi-stakeholder decision". This means, where the nature is "intact", do not touch, and where the nature (water) is "non-intact", restore. "Non-intact" was only before the first man Adam (or Adem), or the first civilizations and they were formed on waters, with waters and accompanied by waters – just by their (sustainable or non-sustainable) uses (agriculture, transport, water supply and sewerage). Therefore, this "stipulation" is idealistic and "non-doable", in essence, it is a total disadvantage for undeveloped countries in transition.

Developed countries are developed because, among the other things, they had used and now use their natural resources. Their sustainable usages have to correct now a little, for example, renovate old hydro-power plants. Non-developed countries have to save their wetlands, flood areas and natural beauties. Tourism development is an only "hollow story" without roads, hotels, restaurants and other tourists infrastructure and people with small, but widely developed businesses, while tourism in "natural" environment is just for adventurers, not a serious and any profitable business. As such intellectuals in developing countries have to find compromise - environmentally, economically and socially sustainable development solutions. Without that, there will be a beautiful, intact nature, including waters, but without people, and a few very miserable, dirty and over habited cities, in which lives pauperism and poverty. Comfortable urbanization is possible only with some level of development, with populations able to pay for the good urban services.

Traditional approaches to water quality assessment, based primarily on physical and chemical parameters may be sufficient to ensure that some societal values for freshwater are met (for example, drinking water standards), these are unlikely to be sufficient to ensure and monitor whether societal goals of ecological sustainability are being achieved. The concept of ecosystems health is based on the principle that a healthy ecosystem is one that has intact structures and functions naturally.

Health, structure and natural functionality of an ecosystem is more important than drinking water. Standards for human drinkable water are not enough for the health of an ecosystem. "Healthy ecosystems, untouched structure and natural functionality" is possible only and absolutely without people; people have to be responsible for, and to the nature, other people and society, and to the other creatures – all lives, as to the unlived nature, from which one living depends. Therefore, it has to be searched and found, "civilized" and "civilized, environmentally friendly" solutions, thus solutions for the benefit of the lives of all – people and ecosystems.

Hence, in these guidelines for ecosystems, everything is exclusively naturalistic, but, in fact, for the benefit of rich people to become even more rich, and that the poor remain poor and become still poorer. Additionally, benefits should have only the ecosystems, not the people living within these systems.

CONVENTION ON WETLANDS

In the foreword of the book "The Ramsar Convention on Wetlands: its History and Development", published by Ramsar Convention Bureau (2017), it is written: "Since prehistoric times the relations between Man and Wetlands have been marked by conflict. Wetlands were considered disastrous realms, sources of disease and obstacles to any form of positive development. People who lived in them were held in contempt as pariahs. The fact that many of the most advanced human civilizations developed within or in immediate proximity to wetlands is thus quite astonishing. Mesopotamia, the Nile delta in Egypt, Alexander's Macedonia in the Axios marshes, Rome by the Pontine Marshes, the Netherlands, London and the German Hanseatic towns situated in the flood plains of vast deltas are but a few examples. In distant continents the Mekong delta, marshes in Central Mexico, and the inner Niger delta in Mali should be mentioned. It would be an interesting task for ecology-oriented cultural heritage historians to study the possible cause and effect connections between advanced civilizations and wetlands. One can guess that the latter's extraordinary biodiversity and natural productivity played an important role. Nonetheless, throughout the existence of human history, wetlands have remained in disrepute. Drainage and reclamation have always been considered civilized actions. Thus, over thousands of years, and especially over the past few centuries and far into the twentieth century, most and the vastest wetlands have disappeared". And, "the great importance of wetlands for the conservation of the natural environment has gradually become known only over the past decades. Ornithologists were the first to support wetland conservation, because they wished to maintain the diversity of migratory waterfowl. Thus, the proposal for an international treaty to conserve wetlands first emanated from ornithological circles. In the meantime, it became more and more recognized that wetlands have a far greater importance for ground water protection, regulation of the water cycle, water storage and water purification and as an ecological basis for many forms of life, especially for fish.

In the Third World, the entire population depends essentially upon wetlands. Thousands of millions, probably hundreds of thousands of millions of dollars, are spent each year in the industrialized world in order to restore the hydrological and biological functions - functions which

would be free of charge if wet-lands had been conserved. Ground water protection and water purification measures, in particular, swallowed enormous sums. The re-establishment of formerly drained wetlands is therefore becoming more and more discussed. This is often considered an "expensive joke", but actually it is a very wise step towards a better economy in the future. This book bears witness to that. Yet, the treaty will have to adapt itself continually in order to do justice to the wetlands' vital importance in today's world" and later on in Europe or in Japan, about 50% of the human population lives on (former) floodplains".

Rich societies can now pay for the adaptations on new environmental request for water use and some (minor) restorations. But, for example the Netherland, England, or Germany, or Austria will never restore their wetlands from hundred or several hundred years ago, because it is obviously not appropriate and not an option. Estuary of Neretva, will never be restored as a wetland, because 70,000 people are living from advanced agriculture, And, just one hundred years ago, there were no more than a few thousand people, who lived within and from natural resources, but in a wetland.

The ecosystem services (ES) framework reveals ecosystems' benefits to society and presents a fundamental natural resource management approach. In the last several decades, it has gained increasing attention from the ecological research community and it recently reached the political agenda. However, does the concept have the capacity to cause institutional change in environmental policy? The answer to this question is "yes", but only in developing and purely dependent countries, definitely not in developed countries. The developed societies and countries have their own, already developed civil and city services and as such, do not need natural ecosystem services except globally, but really paid by the non-developed regions and countries. That is their interest – that non-developed countries save the planet. Yes, they will locally re-establish some wetland, but exclusively for cultural tourism and recreation, as we can see in the centers of many mega poleis, like London, New York, Brussels …, within the central parks and together with Zoo parks. To them it is only economical, not in nature.

CIVILIZED, CIVIL ENGINEERING ENVIRONMENT FRIENDLY APPROACH

Most professionals working in the engineering sector wish to have an impact. They are working not only because it is their job, but because they truly believe in the message they are putting across. They want to help build a better world – from the beginning of the civilization. Professional knowledge and expertise forms the foundation of the engineering work. People will only ask for the engineers' projects or advice if they think that engineers know more about the subject than they do. Professionals also need certain "soft" skills in order to make full use of that knowledge. One must be able to see things from the client's (and wider populations) perspective and understand their actual requirements. But, from the other side, engineers have to integrate traditional knowledge.

Engineers have played a major part in the creation of civilizations' infrastructures. All the problems in the nature and ecosystem services have made men, and they, it means we have to solve the problems ourselves. Engineers and the public are now recognizing problems made in past and engineers have to find and propose rational solutions.

The seventeen Sustainable Development Goals of the United Nations (UN, 2015 [7]) foresee an "Umwertung aller Werte". This term, coined by philosopher Friedrich Nietzsche, translates as the "revaluation of all values". Everything must now change – except the climate, but, climate is now changing. During the last 150 years, human activities mainly in now developed countries have released large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Most of the gases come from burning fossil fuels to produce energy in industry and transport. Civilization have adapted to the stable climate enjoyed since the last ice age, which ended several thousand years ago. A warmer climate bring changes that affect water supplies, agriculture, power and transportation systems, the natural environment, and even people's own health and safety. The hydrological changes will increase flood risk during rain season, whilst low flows during summer will adversely reduce water availability for people, agriculture and industry, ecosystems and inland navigation, etc.

It seems that engineers, especially civil and specifically water engineers must start all over again if the world and specifically undeveloped countries are to meet the development goals. Everyone is entitled to clean water and sanitation (Goal 6) and to sustainable and affordable energy (Goal 7), which entails the rapid transition from fossil fuels to renewable (Goal 11).

For the undeveloped, the key is in a sustainable and rational water use, such that all the societal and economic sectors and natural environment - including ecosystems and their mutual and possible services to the people, have a benefit. Water is, among all the other categories, before all, economically and naturally good.

Objectives, policies, operational legislation and reforms, including specific projects have to conceive technical and economic intelligence in (EU) countries in transition, but without their own corruption. They have to be formulated and harmonized with the general UN (and EU) objectives and world trends on a positive tradition protecting own interests.

CONCLUSION

Freshwater is the most important resource for humankind, cross-cutting all social, economic and environmental

activities. It is necessary for all life on our planet and an enabling or limiting factor for any social or technological development, a possible source of welfare or misery.

EU, UN and other international organizations water policy presently focus on protecting water resources. But, developed countries became developed with the smart use of their waters, of course, in the past not always sustainable, but rich can now pay for the adaptations and some restorations. Poor countries, even in Europe, are poor, because, among the other factors, they are not organized and have no wise policy for the sustainable use of their available natural and renewable resources.

The seventeen Sustainable Development Goals of the United Nations (2015) foresee a "revaluation of all values". Everything must now change, because climate is now changing. The hydrological changes will increase flood risk during rainy season, whilst low flows during the dry season will adversely reduce water availability for people, agriculture and industry, inland navigation and ecosystems, etc.

It seems that engineers, especially civil and specifically water engineers must start all over again if undeveloped countries are to meet the development goals. Everyone is entitled to clean water and sanitation and to sustainable and affordable energy, which entails the rapid transition from fossil fuels to renewable. That is the chance for the undeveloped countries. The key is in sustainable and rational water use, so that all societies, sectors and natural environment, including ecosystems, have a benefit. Water is, among all the other categories, before all, economically good.

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