Bulletin of the *Transilvania* University of Braşov • Vol. 5 (54) - 2012
Series 1: Special Issue No. 1

ENVIRONMENT, DRINKING WATER AND FOOTPRINTS

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Abstract: *That mankind exerts pressure on the biosphere, the consumption is measured by various indicators such as ecological footprint, carbon footprint, water footprint or footprint nitrogen. These indicators are designed to increase warns overly mature consumption of resources such as water or excessive exploitation of agricultural lands. Romania has suficinte water resources to avoid being overcome by water stress and farmland have the ability to support a more sustained them. The danger posed by global warming, we must always remember that water resources are limited and can be affected by uncontrolled exploitation.*

Key words: *water footprint, ecological, footprint, virtual water, blue water footprint, , green water footprint, grey water footprint*

1. Introduction

European research and innovation efforts are set to receive a significant increase in funding, with the announcement of the largest set ever call set under the European Union - Seventh (FP7). Totaling 8.1 billion euros, projects financed by these calls are open to organizations and businesses in all Member States of the European Union FP7 Partner States and eligible countries in particular.

In discussions about the environment, very often, it refers to "ecological footprint" to "carbon footprint" and "water footprint", four important indicators of human pressure on nature.[7]

2. Ecological Footprint

Global ecological footprint concept was used first time in 1992 by Canadian ecologist William Rees of the University of British Columbia.

The Ecological Footprint is an objective indicator expressing synthetic pressure exerted by the consumer where humanity on the biosphere. In creating global ecological footprint, a large percentage were: agricultural areas, marine fishing areas, the areas occupied by industrial buildings, facilities infrastructure, human settlements in urban and rural areas for storage and neutralization of waste and storage areas for extraction of minerals or hydrocarbons and recently deforested areas reforested, etc.

Ecological footprint is calculated by dividing the human consumption of natural resources in the earth's capacity to regenerate and expressed in global hectares (hag).

From this perspective, currently the world are available 1.8 hag/person. But every European uses 4.9 hag and a North American, twice more than in Europe. But this is possible only by reducing the availability

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of consumption of the inhabitants of other continents.[9]

3. Nitrogen Footprint

The human creation of reactive nitrogen (all nitrogen species except N_2) by food and energy production has profound beneficial and detrimental impacts on people and the environment. Agricultural uses, including both food production and consumption, contribute the most reactive nitrogen to the environment. The main beneficial impact of the agricultural use of reactive nitrogen is the food produced by nitrogen fertilizer and human-enhanced biological nitrogen fixation. These two processes provide the nitrogen to sustain about half of the world's population. The detrimental impacts result because a large fraction of the nitrogen used in food and biofuel production, and all of the nitrogen used in non-biofuel (i.e. non-agricultural) energy production, are lost to the environment. Of the nitrogen used to produce food, about 80% is lost before consumption, and the remainder is lost after consumption as human waste.[6]

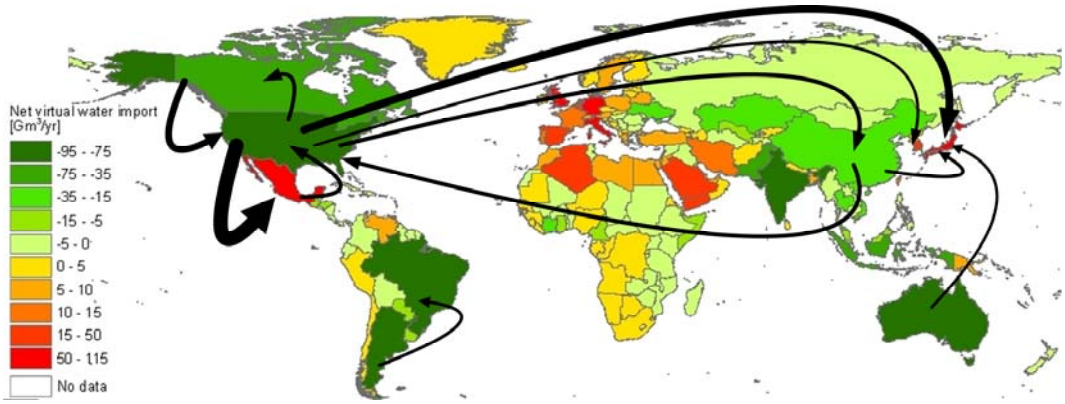


Fig. 3. *Virtual water balance per country and direction of gross virtual water flows related to trade in agricultural and industrial products over the period 1996-2005. Only the biggest gross flows (> 15 Gm³/yr) are shown; the fatter the arrow, the bigger the virtual water flow.*

Mekonnen, M.M. and Hoekstra, A.Y. (2011) National water footprint accounts: the green, blue and grey water footprint of production and consumption, Value of Water Research Report Series No. 50, UNESCO-IHE, Delft, the Netherlands.

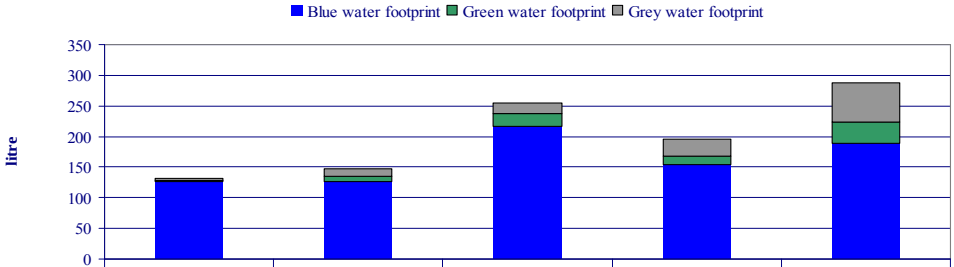
4. Carbon Footprint

Carbon footprint is defined as the sum of all emissions of greenhouse gases expressed in equivalent tons of carbon dioxide (CO2) produced to support the direct and indirect human activities within a given time, usually one year.

A carbon footprint is composed of two parts, a primary and secondary footprint. The primary footprint is the sum of the direct carbon dioxide emissions of burning of fossil fuels, like domestic energy consumption by furnaces and waters heaters, and transportation, like automobiles and airplane travel. The secondary footprint is the sum of indirect emissions associated with the manufacture and breakdown of all products, services and food an individual or business consumes.

5. Water Footprint

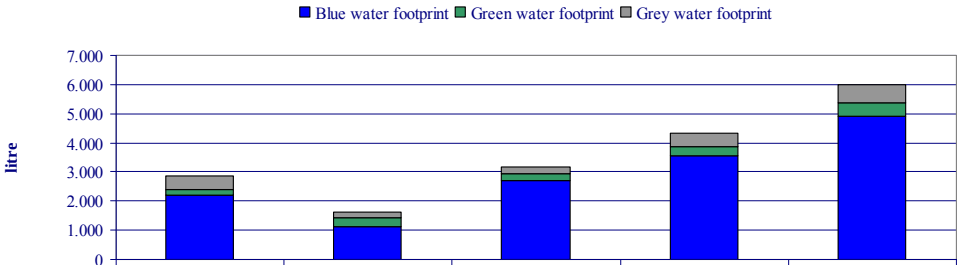
Arjen Y. Hoekstra, professor at the University of Twente (Netherlands), introduced in 2002 a new concept called "water footprint", being complementary indicators mentioned above. Moreover, water footprint, as can be understood and name, studying freshwater consumption (direct and indirect) of a product or service. It can be calculated for a defined group of consumers (a single individual, a family, a village, a city, a province or a state) or producers (public organizations, private companies or economic sectors). It also can be calculated for a single product.



	cup of coffee (125 ml)	Beer (bottle of 500 ml)	Milk (a glass of 250 ml)	Eggs (60 g)	Potato (1 kg)
Grey water footprint	4	13	18	27	63
Green water footprint	1	9	20	14	34
Blue water footprint	127	126	217	155	189

Fig. 4. *Water mark for some important products (with a water consumption of 50 - 500 l / kg) Mekonnen, M.M. and Hoekstra, A.Y. (2011) The green, blue and grey water footprint of crops and derived crop products, Hydrology and Earth System Sciences, 15(5): 1577-1600.*

Water footprint of a product (good or service) is the volume of freshwater used in the production process and measured exactly where it is produced (water footprint account for consumption outside the borders of a state). Water footprint concept is closely related to that of virtual water.



	Bio-ethanol (from maize, 1 litre)	Bread (from wheat, 1 kg)	Cheese (1 kg)	Chicken Meat (1 kg)	Pork (1 kg)
Grey water footprint	457	177	222	476	599
Green water footprint	200	306	254	303	479
Blue water footprint	2.198	1.126	2.701	3.547	4.910

Fig. 5. *Water mark for some important products (with a water consumption of 1000 - 6000 l/ kg) Mekonnen, M.M. and Hoekstra, A.Y. (2011) The green, blue and grey water footprint of crops and derived crop products, Hydrology and Earth System Sciences, 15(5): 1577-1600.*

The concept was introduced in 1993 by John Anthony Allan, while this study can import virtual water (already in the food composition) as a partial solution to the Middle East unrest about water scarcity. [5]

Virtual water is the volume of freshwater used to produce the product, measured at the place where that product was actually produced. This refers to the amount of water used in the

different stages of the water chain producție.Conținutul a virtual product can also be defined as the volume of water that would be needed to produce the product in the place where the product is consumed (consumption site definition). We recommend using the definition of the place of production and to explicitly state when used instead of consumption. The adjective "virtual" refers to the fact that most of the water used to produce a product that is not contained in the product. Actual water content of products is generally negligible compared to the virtual water content [5].

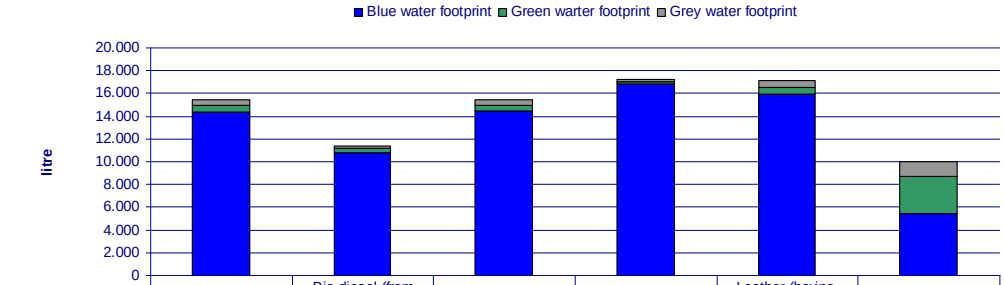
Water footprint of an individual or a community is made up of three components: water footprint blue, green and gray.

Water footprint "blue" is the volume of surface water and groundwater consumed as a result of producing a good or service.

Refers to the consumption of freshwater used and then evaporated or incorporated into a product. Water footprint "green" refers to use rainwater where it falls, for example a sunflower.

Water footprint "gray" water is polluted as a result of producing a good or service or the amount of water required to dilute pollutants and bringing the resulting concentrations at a level that does not exceed the maximum level. As the method of calculation, we take the example of beef, analyzing drinking water for the entire production flow (the water used for obtaining food and water consumed directly by animals). In an industrial system, it takes about three years before the animal is slaughtered to produce 200 kg of beef. [12]

Animal consumed during this period almost 1,300 kg of grain (wheat, oats, barley, corn, peas, soybeans and other grains), 7200 kg of feed (forage, dry hay and other forage), 24 cubic meters of drinking water and household are used 7 cubic meters of water.



	Beef (1 kg)	Bio-diesel (from soybean, 1 litre)	Beef (1 kg)	Chocolate (1 kg)	Leather (bovine, 1 kg)	Cotton (1 kg)
Grey water footprint	462	228	462	172	513	1.300
Green warter footprint	617	342	462	172	684	3.300
Blue water footprint	14.336	10.827	14.490	16.852	15.896	5.400

Fig. 6. *Water mark for some important products (with a water consumption of 8000 - 18000 l / kg) Mekonnen, M.M. and Hoekstra, A.Y. (2011) The green, blue and grey water footprint of crops and derived crop products, Hydrology and Earth System Sciences, 15(5): 1577-1600.*

This means that to produce one kilogram of beef takes approximately 6.5 kg of cereals, 36 kg of food and 155 liters of water (for cleaning and drinking). At sowing and harvest until collection that will be eaten by an animal, use an average 15,300 liters of water. Therefore, for 1 kg of beef are used on average 15,500 liters of water. Attention, an

increased beef in Romania and allowed to graze freely water has the same footprint as a mega-farms beef increased industrial gauge USA, because their food is totally different. [7]

Coffee is the most important agricultural product traded globally for its production using plenty of water. In the Netherlands, in order to get a cup of coffee are required 140 liters of water. Annual national consumption of coffee requires 2.6 billion cubic meters of water, the Dutch consume only 2.4% of the overall annual. Overall, the inhabitants of the planet annual need of 110 billion cubic meters of water just to drink coffee (most water is used for plant growth).

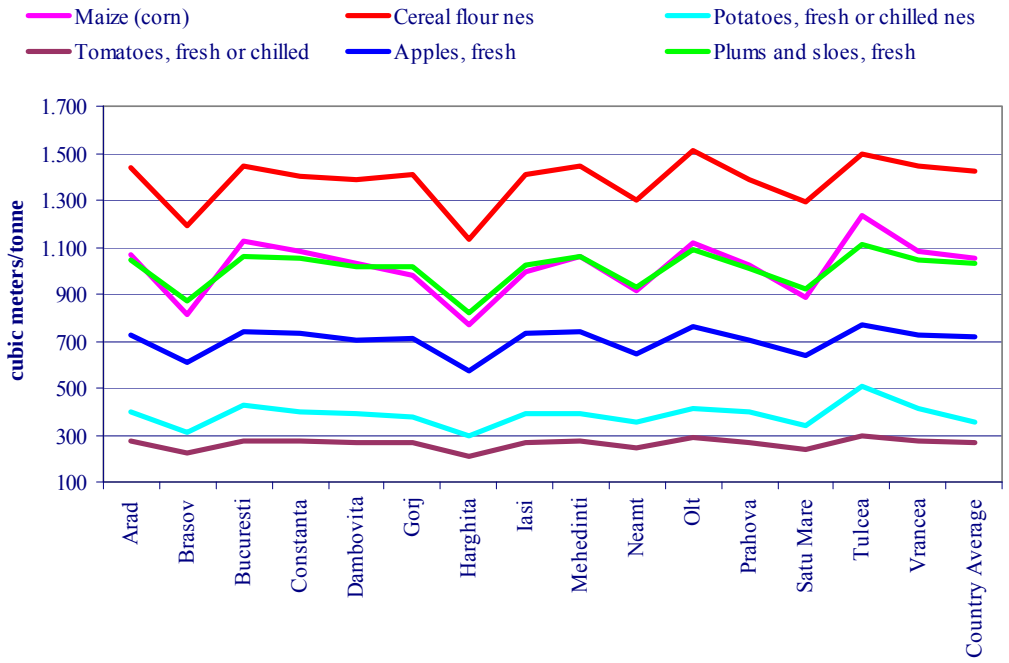


Fig. 7. *Water footprint for agricultural products in different regions of Romania. Value of Water Research Report Series No. 47, UNESCO-IHE, Delft, the Netherlands (2010) and FAOSTAT studies.*

Today, cotton is the most important natural fiber used in textile industries around the world and is the largest non-food crop in the world. It also has a huge impact on countries where it is grown, it is usually arid countries. Alliance Environnement, in a study funded by the European Union, reached the following conclusions when it comes to the impact on water "massive use of pesticides, herbicides, growth inhibitors, a defoliant and fertilizer (200÷600 kg/ha; cotton occupies 2.4% of global agricultural area and accounts for 11% of demand for pesticides and 24% of the insecticides, where 33 of 46 of these products are classified as toxic or very toxic) and and use the cotton monoculture leads to a degradation of groundwater and surface water quality and eutrophication. Since almost 100% of the areas planted with cotton is irrigated and water is used for irrigation often in areas where water is scarce, water use for this purpose increases the level of contamination of other water resources and the degree of interference with associated aquatic eco-systems."

Water footprint of a cotton shirt shows that 2700 liters of water are used. To obtain

1 kg of cotton fabric as final, 11,000 liters of water are required (as a global average). Therefore, to manufacture a normal shirt with a weight of 250 grams were used 2,700 liters of water. From the total volume of water, 45% is consumed irrigation water from the plant itself, 41% is rainwater evaporated from the surface of the cotton field during growth and 14% dilution water needed wastewater resulting from the use field fertilizers and chemicals in the textile industry. Global annual production of cotton consumed 210 billion cubic meters of water and pollutes 50 billion cubic meters of water.

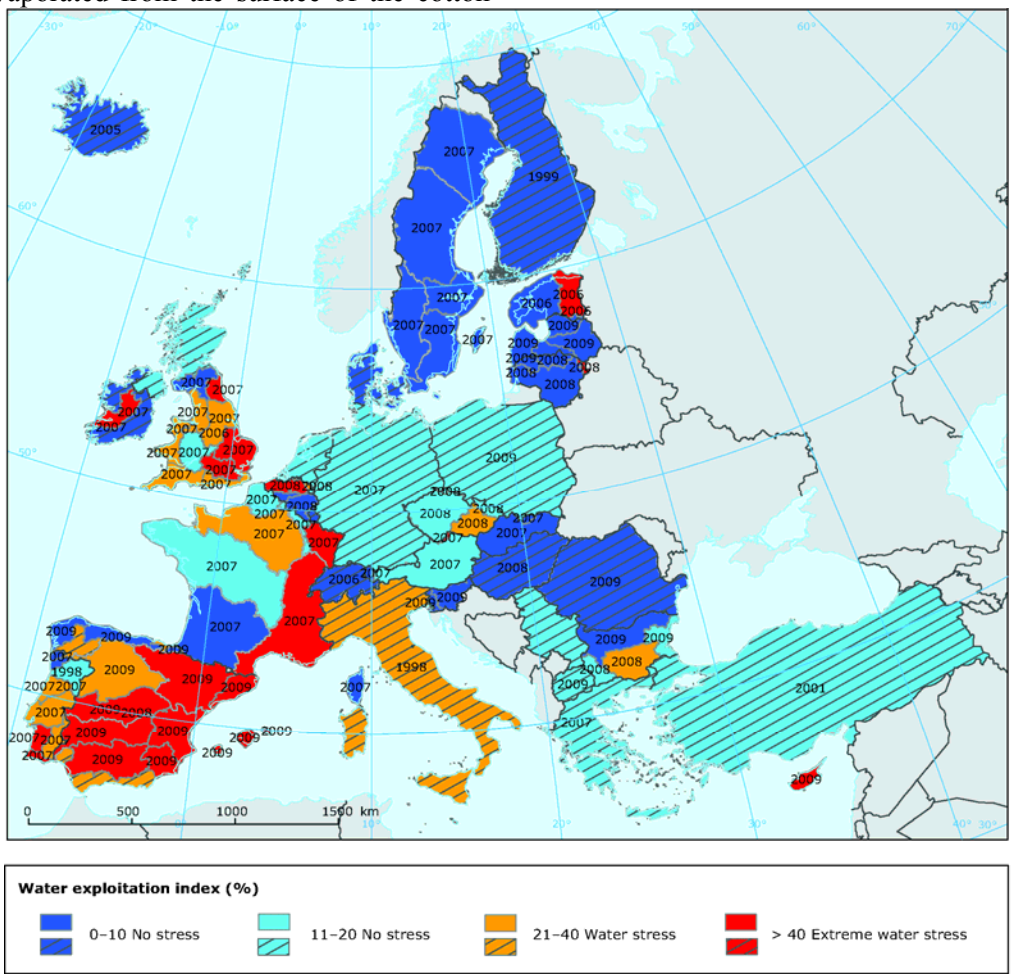


Fig. 8. *Water exploitation index - towards a regionalised approach*
Note: The map shows the maximum current disaggregation with data available from different sources. Further refinement and gap filling for all RBDs are in progress.
Legend: full colour: RBD-level data; shaded: country-level data.
Source: Eurostat JQ IWA: All country-level data; EEA Report No 1/2012.

Water footprint of a glass of wine (125 ml) is 120 liters. To 250 ml of beer 75 liters of water are used. For an apple - 70 liters. A bag of chips consume 185 liters, a kilo of rice - 3400 liters, a kilo of tomatoes - 180 liters, 1 kg of sugar refined from sugar cane, 1,500 liters (sugar from sugar beets require less water) and 100 grams of chocolate, 2,400 liters. [8]

Daily water requirement per person is 2 to 4 liters, but rarely think that to ensure minimum caloric needs are required

another 2,000 to 5,000 liters of water. By 2050, the planet will have to endure water agricultural systems that will feed and living conditions for another 2.7 billion people, agriculture already using 70% of the water extracted from aquifers, rivers and lakes. [13]

5. The Future Water World

Water demand in Romania fell by more than half from 1990, shows data of the National Administration "Romanian Waters" (ANAR).

Thus, consumption fell from 20.5 billion cubic meters, as it was in 1990, to 8.45 billion cubic meters, as occurred in 2010.

In 2010, water demand has been fully ensured by maintaining the volume of water in the reservoirs, programs operating under the National Administration "Romanian Waters" volumes which provides water for the population, industry and agriculture.[11]

The downside however was quick to appear. Environmental damage caused immense human created serious problems are only beginning to show their true face: global warming, melting glaciers, ozone depletion, and more recently, depletion of natural water resources.

A new threat. With the tripling of world population, increased consumption of water resources of not less than 6 times. At the same time, it is expected that over the next 15 years, the earth will have 50% more people, which, along with increased urbanization and industrialization of human settlements will have serious consequences on the environment and the lives, says Food and Agriculture Organization of the United Nations (FAO).

Viktor Danilov-Danilyan, professor at the Academy of Sciences of Russia, which deals specifically with this issue, finds it easy to predict from the water crisis will hit the whole world.

It is estimated that it will hit first time Africa, Middle East, South and Southeast Asia. The two most populous countries, China and India will also suffer for lack of water despite natural water reserves they currently hold.

There are also countries that have large amounts of water: Brazil, Russia, Canada and Australia. It is likely that soon, they enter into agreements with the less fortunate, the idea of sharing these reserves.

Rapidly rising population requires increased water consumption, which results in lower reserves on the day. Crisis will trigger, most likely around 2025 ÷ 2020s, about half of the world population will be seriously affected by it. Pollution of water supplies and countless violations of environmental norms merely intensify reductions in water on Earth.

Agriculture is where using largest amount of water, over 70% of global consumption. Council United Nations estimates that more than a few years humanity will need a water volume 17% higher than the current reserves to feed the entire world population.

Industries also fall among the big consumers. A power plant that generates an output of one million kilowatts per cubic meter of water consumed annually, while a nuclear plant generating the same power consumption 1.6 km cube of water a year. To get a ton of steel are required 20 cubic meters of water per ton of paper requires the use of 200 cubic meters of water, and about 5,000 liters of water are used to get just one kilogram of rice.

Modern technology using water pumping systems come to pollute half the drinking water supply, some hundreds of cubic kilometers of water is lost every year.

Lack of water supplies and the expectation disappearance of some of them in subsequent years led to increased tensions between certain countries whose territories are crossed by the same source of water. More than 260 river basins around the

world are shared by two or more countries. In the absence of agreement or institutions to control this situation, disputes often arise between the leaderships of these countries, each trying to impose its vision of control and exploitation of water resources.

Sooner or later, people will learn to appreciate water. Many researchers are already involved in projects aimed at bringing icebergs from the Antarctic Peninsula. Arab Sheikhs invest dollars derived from oil in sea water desalination, which is obtained through a very costistoare technologies. Canada has already begun to use glaciers in Greenland to get drinking water, while China has turned to ice reserves in the Himalayas.

The world's water consumption rate is doubling every 20 years, outpacing by two times the rate of population growth. With persistent regional droughts, shifts of the growing population to urban coastal cities, and the water needed for industrial growth, it is projected that by the year 2025 water demand will exceed supply by 56%

Despite being the most common substance on earth, 97% is seawater and unfit for human use. Two thirds of the fresh water is locked up in glaciers leaving only 1% of the earth's water for human consumption; this 1% is increasingly threatened by pollution

It is estimated that 97% of the earth's unfrozen freshwater supply is groundwater

Since 1950 the world population has doubled and water use has tripled

Only 20% of the world population enjoys access to running water; over one billion people in developing countries have inadequate access to water

The average American individual uses 100 to 176 gallons of water per day; in contrast, the average African family uses 5 gallons of water per day

At least 1 billion people must walk 3 hours or more to obtain drinking water; individuals spend more than 200 million hours per day walking to collect water from distant, often polluted sources

The United Nations estimates that by 2025 30% of the world population in 50 countries will face water shortages

The World Health Organization estimates that water related diseases account for 80% of all sicknesses in the developing world and claim approximately 5 million lives each year

If no action is taken to meet basic water needs, as many as 135 million people may die from water-related diseases by 2020

At any given time, half the people in developing countries are suffering from water-related diseases

6. Facts

An American family uses on average 150 liters of water daily. Meanwhile, a family in Africa uses only 15 liters of water per day.

Only 0.007% of all water on Earth can be used by the world population for drinking water.

Price for one cubic meter of desalinated water is above 50 U.S. cents. Israel, United States, Bermuda, Australia, Singapore, China, India and Pakistan are countries that use ocean water desalination systems.

The use of glaciers for drinking water production is not a long term option, many of them will disappear in 20 years due to global warming.

In India, the river Ganges is the only source of drinking water for more than 500 million people.

Sooner or later, people will learn to appreciate water.

7. Conclusions

Water is a resource that must be protected. This means high costs and management is a continuous problem with long-term results.

Currently, fight takes place on two main fronts: on the one hand, we have completed implementation of the Directive "urban waste water" on the other hand, continued to be more effective fight against water pollution.

"Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such."[15]

Three quarters of Europeans are supplied with water from underground sources, 20% of surface waters are at high risk of pollution and 60% of European cities irrational exploit their groundwater resources.

Almost half of the EU population lives in countries suffering from "stress fluid". (We're talking about water stress when water demand exceeds the amount available in a given period or when water use is limited by its poor quality. Briefly involves reducing water stress and degradation of water resources.)

- Water consumption by categories of users: 44% for energy, 24% in agriculture, 21% for household consumption, 11% in industry. Obviously, there are differences in consumption between geographical areas of the continent. In some areas, the agricultural water consumption can be up to 60-80%.

Romania's water resources are relatively poor and unevenly distributed in time and space, as a result of 134.6 billion cubic meters of water, only 40 billion cubic meters of water are used, which hinders economic development.

Therefore, Romania depends very largely on water resources upstream coming from different countries that are not fully used, according to the National Administration "Romanian Waters".

Lack of sufficient water resources are likely to become a limiting factor for economic development, if not promoted a strict policy of rational use of water by stakeholders.

Of the 386 ongoing investment objectives in 2010: 339 are for flood defense works, 37 are targets for water sources and 10 are for the environment.

In 2010 the funds allocated were consumed by the state budget, foreign loans, CEB and Environment Fund, totaling Lei 870,558,855 (equivalent to 200 million euros), which led to complete and receive a number total of 37 investment objectives.[16]

In Romania, water consumption per tonne of product is higher than the European average and the global average. Water footprint of Romanian products is high. Data provided by Romanian Waters National Administration reflects only part of the fingerprint Embossed blue and gray water total. The water used in agriculture in most cases not counted, nor is obtained from the water system. In recent years and probably the next 5 to 10 years industrial production and economy will not use the water level reached in 1990, due to slow economic growth because new technologies consuming fewer resources because of more restrictive legislation and perhaps because public awareness of the risks to future water gullies.

Political struggles in Romania and poor state involvement in recovery and economic recovery led to massive depopulation by leaving the workforce in countries with active and dynamic economy [12], which makes future GDP and does not touch higher values and thus economic pressures on water resources in Romania are not large [2].

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