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NATURAL RESOURCES AND ENERGY

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Abstract: *Renewable energy resources or the energy income, comprises those resources which are being continuously renewed by the presence of tidal forces, wind, falling water, thermal gradients in the ocean, geothermal heat, direct solar input, the generation of vegetable and animal matter and so on. Energy capital or non-renewable energy resources, refers primarily to fossil fuels, which were deposited in earth's crust hundreds of millions of years ago or to radioactive minerals, which were present when the planet was formed. When such materials are mined, the quantity of energy capital is reduced. Actually, the fossil fuels are being replaced in nature, but at a rate which is so slow on a time scale of human development, as to be insignificant.*
Key words: *resources, energy, renewable*

1. INTRODUCTION

It is recognized that the Earth has a limited capacity to meet the growing demand for natural resources and to absorb the destructive effects of their use. Climate change, soil erosion, desertification phenomenon, soil, water and air pollution, reduction of the area of tropical forest systems and wetlands, the extinction or decline of a large number of species of terrestrial and aquatic plants and animals, accelerated depletion of non-renewable resources, began to have negative effects, measurable, on socio-economic development and quality of people's lives in vast areas of the planet.

The concept of sustainable development is built on the premise that human civilization is a subsystem of the ecosphere and is dependent on material and energy flows, on its stability and capacity for self-regulation. Public policies that are developed on this assumption, such as the National Strategy for Sustainable Development of Romania, follow to restore and maintain a rational balance, on a long-term, between economic development and integrity of the natural environment in forms understood and accepted by society. [7]

2. CONTENT

2.1. Sources of primary energy

The sources of primary energy available to mankind have often been categorized as either renewable or non-renewable. It might also be thought in terms of the description adopted by Putnam (1953), who used the phrases "energy income" and "energy capital".

The currently available sources of energy are listed as renewable or nonrenewable. [1]

Renewable energy resources

Energy income or renewable energy resources, comprises those resources which are being continuously renewed by of the presence of tidal forces, wind, falling water, thermal gradients in the ocean, geothermal heat, direct solar input, the generation of vegetable and animal matter and so on.

Non-renewable energy resources

Energy capital or non-renewable energy resources, refers primarily to fossil fuels, which were deposited in earth's crust hundreds of millions of years ago or to radioactive minerals, which were present when the planet was formed. When such materials are mined, the quantity of energy capital is reduced. Actually, the fossil fuels are being replaced in nature, but at a rate which is so slow on a time scale of human development, as to be insignificant.

Different sources such as oil, natural gas and coal can be considered nonrenewable in the practical sense. The radioactive fuels uranium and thorium are not being replenished either.

2.2. Energy use Oil

Between 1985-1997, the primary energy source in the countries in the EEA has been oil. Coal was the second most important fuel in the 1980s, but has been displaced by gas since 1992. Gas consumption increased from 16 % in 1985 to 21 % in 1997.

General energy policy in the EU is based on three "pillars" or basic aims: overall competitiveness, security of supply and protection of the environment (European Commission, 1995). Of key importance to the last objective is to achieve internationally agreed targets for greenhouse gas emissions and air pollutants; energy use is responsible for most of the main emissions for which targets have been agreed.

RENEWABLE (ENERGY INCOME)	**NONRENEWABLE (ENERGY CAPITAL)**
Hydroelectric energy Tidal forces Geotermal heat Biomass (wood, animal refuse, vegetable matter, etc.) Wind Solar input Ocean heat	Crude oil Natural gas Coal Nuclear fission Synthetic oil (from oil sands and oil shales)

Table 1. Available energy sources

Nuclear power

In 1997, nuclear power increased to almost 15% of gross inland energy consumption. Renewable energy sources contributed just over 6% (5.8% in the EU) in 1997. [4]

Renewable energy growth

Due to the small starting base, the contribution of `high-profile' renewable (wind and solar) to the energy supply is marginal. However, there has been significant growth in many EEA member countries. Growth in the use of wind power and solar heat has been strong, in relative terms, in Germany, Denmark and Greece as a result of public and private interest in developing wind power in Germany and Denmark, and solar water heaters in Greece. [3]

Electricity sector

In 1996, 48% of the electricity in EEA member countries was generated by thermal power (mainly using fossil fuels), 34% by nuclear power and the remainder by hydro and wind power (mostly hydro).

The figures for the EU are 52% and 35% respectively.

Renewable sources in electricity sector

Austria, Portugal and Sweden have the highest contribution in their electricity generation, while Sweden, France and Italy contribute with the largest share to total EU generation of electricity from renewable energy sources. Hydro power is by far the largest renewable energy source for electricity generation in the EU. Most hydro power is produced in large plants, which can have considerable impacts on ecosystems.

Progress

Significant progress in the production of electricity from wind and solar sources has been made mostly in Denmark and Germany. However, the actual contribution of "green" electricity remains far short of its potential and more could be done in the renewable electricity sector to help reach the EU target of 12% of gross inland energy consumption produced by renewable energies.

2.3. Water

Water is the most abundant chemical component within the biosphere. Almost all life on earth, including man's, uses water as the basic medium of metabolic functioning. The removal and dilution of most natural and human-made waters are also accomplished almost entirely by water. In addition, water possesses several unique physical properties that are directly responsible for the evolution of our environment and the life that function within it.

Properties of water

Its ability to conduct (thermal conductivity) and store (heat capacity) heat is unmatched by any other substance.

Solar energy drives vast amounts of water through the biosphere in a closed system known as the hydrologic cycle.

Distribution of water

For practical reasons the amount of water on earth is constant. About 97.2% it is stored in the oceans, another 2.15% is immobilized in icecaps and glaciers and 0.61% exists as groundwater. The remaining small fracture of 1 percent is divided among all other resources, including lakes and rivers. Summarized water`s approximate distribution [2].

Location	Cubic kilometers	Percent of total
Ocean	1 323 000 000	97.2
Saline lakes, seas	104 000	0.008
Icecaps, glaciers	30 500 00	2.15
Groundwater	8 350 000	0.61
Moisture in upper soil	67 000	0.005
Freshwater lakes	125 000	0.009
Rivers (average volume)	1 670	0.0001
Atmosphere	12 900	0.001
Others	357 000	0.028
Total	1 362 000 000	100

Table 2. Summary of global water distribution

Lakes, rivers and groundwater

Without minimizing the importance of oceans, it may be observed that our main concerns currently relate to the fresh water resources that are suitable for drinking and other uses closely associated with human activities. Those include lakes, rivers and a small fraction of groundwater, all of which total less than 0.1 percent of the global water inventory.

Fresh water false sources

Most groundwater is not readily available as a practical resource of fresh water. Glaciers and icecaps are used only infrequently for fresh water supplies and represent a negligible fraction of our practical resource.

Fresh water needs

If it were necessary to rely only on the fixed inventory of fresh water to meet our needs, the supply would be exhausted very quickly. We are able to maintain our present level of fresh water use only because the limited inventory is constantly renewed by the hydrologic cycle. This is crucially important if one is to understand the nature of freshwater resources and how to best utilize them.

The hydrologic cycle

Next picture summarized the basic elements of the hydrologic cycle.

Under favorable meteorological conditions, atmospheric water vapor can precipitate as rain or snow. Some of that which reaches the ground flows over it's surface as streams and lakes. Another portion infiltrates into the soil and moves downward to become part of the groundwater resource.

Water infiltrating downward ultimately accumulates in a region in which soil pores are completely filled with water named the saturated zone. It's upper limit is the surface of an underground stream or lake and it is called the groundwater table. Water in this zones flow toward lower elevations and eventually much of it reache the oceans, either directly by underground travel or by emerging from the ground and flow in surface streams.

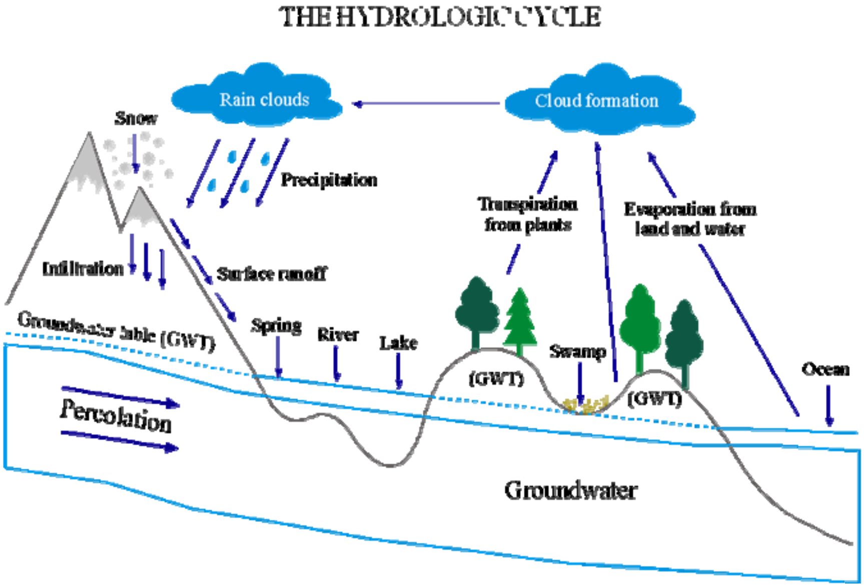

Fig. 1. The hydrologic cycle

Precipitation categories

Precipitation reaching the earth's surface may be divided into two broad categories: (1) that which runs off over the land into streams and lakes and (2) that which infiltrates into the ground. Many factors influence the division of rainfall between surface runoff and infiltration. Infiltration is enhanced by an increase in soil porosity, flatter slopes of terrain, lower rainfall intensity and land use practices that delay the overland passage of water into streams.

External influences

Infiltration is also influenced by temperature, extent and types of vegetation, forestation practices and several other factors. Water infiltrates into the "aquifer", which is an underground stratum capable of containing and transmitting water. In its upper region, interstices between soil particles are not saturated and the water moves downward under the influence of gravity.

Groundwater

The water passing downward finally reaches an aquifer zone in which the interstices are filled with water, making the soil saturated. This is referred to as the "zone of saturation", its surface is called the "groundwater table" and its elevation may be located by noting the level at which water stands in a well penetrating the aquifer at that location.

Saturated zone movement

Movement of water in the saturated zone is predominantly horizontal because further migration downward is inhibited by the saturated soil and the water below. The groundwater table, may be viewed as the surface of an underground stream or lake.

Below groundwater table

The behavior of water below the groundwater table is similar hydraulically to that in above ground lakes and streams it flows from higher elevations to lower ones, under the influence of gravity. Energy losses as water passes through soil cause the groundwater table to slope in the direction of flow, as does the surface of a river flowing from uplands to the ocean.

Low speed

Because resistance to flow through the small channels between soil particles is relatively high, water movement is generally much slower and the slope of the groundwater table may be much steeper than normally observed with surface streams.

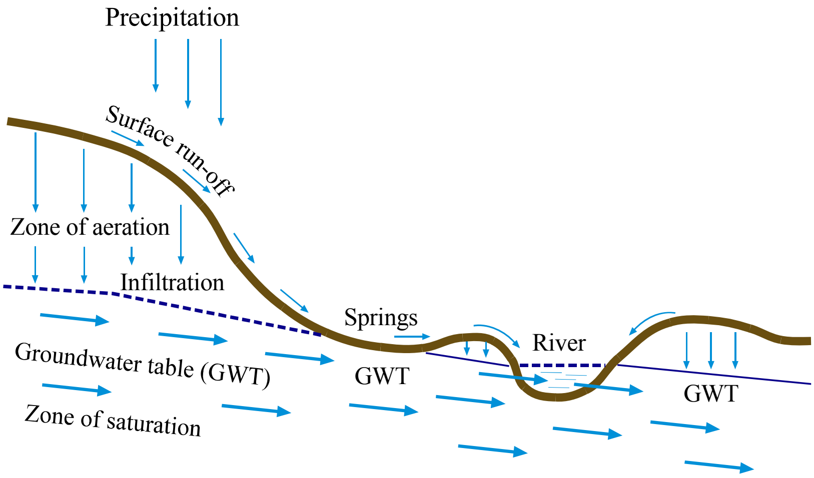

Fig. 2. Section through a groundwater aquifer

Porous soils

Flows into and out of porous soils may greatly increase effective storage volumes by exchanges between a surface reservoir and an adjoining aquifer. Also interchange between groundwater and surface water helps maintain relatively constant water levels in lakes during wet and dry seasons. Furthermore, transfers from aquifers into streams are responsible for maintaining their flows during dry periods.

Groundwater consistence

The slow movement and long storage in groundwater systems makes them far more consistent in quantity and quality than surface water systems. Extended contact between water and soil makes chemical quality of a groundwater relatively constant with time, although there may be radical differences from place to place because of soil characteristics and chemicals that may dissolve in the water.

Groundwater supplies

Groundwater supplies are difficult to locate, evaluate and present special problems in predicting available water quantities and qualities. Generally, they are higher in mineral content than surface water and are more constant in quantity, quality and temperature.

Pollution elimination

Because of restricted movement, its respond more slowly to pollution, often requiring years for pollutants to travel through aquifers to points of use. An important corollary is that once pollution has reached the point of use, the slow movement of water may require a very long time to clear the aquifer after cessation of pollution.

Infrequent use

Because of difficulties in locating, evaluating and developing large groundwater supplies, they are used relatively infrequently. On the other hand, great numbers of well supplies are used for individual homes and small communities. In that type of application, well supplies usually are desirable because they require little or no treatment, other than the relatively long time of travel and filtration due to the passage through the soil.

Groundwater are derived originally from precipitation and surface waters, so there often are many similarities in chemical content between groundwater and surface water. However, passage through the ground and contact with soils for long periods sometimes may alter the chemical, physical and biological characteristics radically.

Ions removed and added

On the other hand, the slow movement increases the opportunities for contacting and dissolving chemicals present in the soils and biological or physical-chemical reactions may either reduce or increase the concentrations of various constituents. This may have good or bad effects on water quality, depending on what ions are removed or added.

Groundwater variability

Because of large storage volumes and long retention times, groundwater exhibit less variability of quality with time than do surface waters, even lakes. They tend to be much more uniform in temperature, chemical characteristics and biological content. Filtration through soil usually removes essentially all of the suspended matter, including organisms, instead the mineral content of groundwater is usually higher than surface water in the same region.

Rain and other precipitation

At the instant of formation, precipitation is very pure because it has its origin in a massive solar distillation process - the hydrologic cycle. However, purity of the water deteriorates rapidly as the falling rain or snow accumulates dissolved chemicals and particles from the atmosphere.

Purge mechanisms

This "scrubbing" action is the major mechanism by which our atmosphere is purged of materials that otherwise could accumulate to deadly concentrations. Examples of particles picked up include ash from volcanic eruptions, fires, power generation and other industrial operations.

Other purge mechanisms

Dust swept into the atmosphere by wind action, aerosols produced in ocean surf, manufacturing processes and wastewater treatment plants. Some serve as nuclei for the formation of raindrops and others are entrained by the rain or snow during its fall.

Dissolved gases

Dissolved gases in rainwater include some of each gas present in the atmosphere, including oxygen, nitrogen, carbon dioxide, sulfur dioxide and nitrogen oxides. The last two are of special interest today because they are primarily responsible of the phenomenon "acid rain".

Sulfur and nitrogen oxides

Increased combustion of fossil fuels has resulted in large increases in amounts of sulphur dioxide and nitrogen oxides released to the atmosphere in many areas. Subsequent reactions between those gases and water increase the acidity of rainfall significantly and can result on chemical attacks on buildings exposed to the acid rain. Also, harmful effects to the vegetation have been observed.

River waters

River waters are composed of surface runoff and groundwater witch flow into streams. The constituents of stream water include:

- all precipitation;
- materials added by land erosion and solution of chemicals during travel over and through the soil.

Of course, constituents are also added through human activities. These may originate in point-source discharges of waste waters or increased contributions from non-point-sources because of changes in land use patterns.

Dissolved solids

Dissolved solids represent an important category of constituents in stream waters and include organic compounds, gases and inorganic chemicals.

They enter river waters in precipitation, through dissolution of soil constituents, in wastewater discharges from point sources and in non-point-source discharges.

Suspended solids

Suspended solids are also important constituents of stream flows. They enter water as particles removed from the atmosphere during precipitation, from erosion of land during surface runoff, through scouring of channels during high stream flows and in wastewater discharges.

Lakes

Inputs to lakes include streams, surface runoff, groundwater inflows and precipitation that enter the lake directly. Many chemical characteristics of lake waters are similar to those of the streams feeding them, but additional factors may influence the water quality significantly, as turbidity in the lake.

Reduced turbidity and relatively long retention times in lakes encourage the growth of some types of aquatic organisms.

Thermal satisfaction

Thermal satisfaction is caused by the lower density of warm surface waters in the summer and may isolate the lower strata of the lake, preventing reaeration of that water. That can impact severely on water quality for supporting fish and aquatic life that require dissolved oxygen and produce conditions that favor the growth of organisms that develop undesirable tastes and odors in the water.

Oceans

The oceans receive inputs from precipitation, stream flows, groundwater, discharges from point-sources of wastewater and flows from no point-sources. Also, there are direct inputs of constituents from marine volcanic action and other geologic upheavals.

The predominant characteristic of seawater is high salinity, which is based on its content of chloride, sodium and sulphate.

Oceans constituents

The high concentration of constituents in seawater can be attributed partly to volcanic action over geologic ages and partly to continued concentration effects by the hydrologic cycle. Constituents of rivers that flow into the ocean are mostly non-volatile. When water evaporates and returns to the land through the hydrologic cycle, virtually all of the constituents remain behind in the ocean, accumulate with time and slowly increase in concentration.

Real situation

However, the situation is really more complicated than that. Some suspended solids settle, removing them from the water environment. Some colloidal and dissolved solids precipitate through chemical reactions that occur after they arrive in the ocean and also settle to become part of the bottom deposits. Still other constituents may be used in the food chains of the thousands of living organisms in the ocean.

Water use

Beneficial uses for water: the value of water as a resource lies in our ability to use it for a wide diversity of purposes. The beneficial uses of water can be divided into three groups according to whether they involve:

- its withdrawal from the watercourse;
- its use in place without removal;
- the realization of benefits by using the flow characteristics of a stream.

Withdrawal uses involve the removal of water from the resource, its utilization and usually, the return of much of it to the watercourse.

Withdrawal uses

They include water supplies for domestic and other municipal purposes, industrial supplies to remove excess heat and satisfy manufacturing processes needs and water for irrigation.

Other uses

Major beneficial uses that are based on utilisation of stream flow include power production in hydroelectric facilities, transportation and disposal of wastes. Most of the mentioned uses are not controversial. However, some persons and groups question whether waste disposal should be viewed as a legitimate beneficial use because of concern about stream pollution and the belief that wastes discharges to water courses should be stopped alltogether.

Direct measurements

Analytical techniques are now available and make it possible to measure concentrations of most elements in water, for example: calcium, magnesium, sodium, iron, manganese, mercury, and chromium, among others. Their concentrations must be known specifically because they are important in determining the water quality for various purposes.

3. CONCLUSION

The threat of climate change has evidently galvanized most of the world's leaders into making commitments to reduce emissions, with most industrialized countries, the US notably apart, supporting the Kyoto Protocol, which calls for a reduction in greenhouse gas emission by around 5% compared with 1990levels, to be achieved during the period 2008—2012. Within this framework, some countries are opting for larger reductions. The UK, for example, has volunteered to cut carbon dioxide emissions with 20% by 2010. What remains unclear is whether these targets can be reached, what further reductions will be seen as necessary and viable in the future and what role will be played by the various energy options discussed in this article.

As we have seen, the UK government is considering a target of 20% of its electricity from renewables by 2020. Most of the rest of Europe could probably do even better than that. The EU Renewables Directive suggests that some should achieve 20% or more, leaving aside large hydro, by 2010. Interestingly, Scotland is already considering a 30% target for 2020 and it has been suggested that the UK as a whole could also achieve this target [3].

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RESURSELE NATURALE ŞI ENERGIA

Rezumat: Resursele de energie reînnoibile sau energia câştigată, cuprind acele resurse care sunt continuu reînnoibile datorită prezenței forțelor din maree, vântului, cascadelor, gradienților termali din ocean, căldurii geotermale, căldurii solare directe, generarea materiei vegetale şi animale, etc. Capitalul energetic sau resursele pentru energia reînnoibilă, se referă în primul rând la combustibilii minerali depozitați pe pământ cu sute de milioane de ani în urmă sau la mineralele radioactive, care erau prezente când planeta a fost formată. Pe masură ce astfel de materiale au fost exploatate de catre om, cantitatea capitalului energetic de bază a fost redusă. Defapt, în zilele noastre combustibilul mineral se înlocuieste în natura dar, cu o viteză care este atât de mică pe o scală a dezvoltării umane in timp, încât este aproape nesemnificativă.

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