

2.1 SPORT AND LEISURE TIME

There are a large number of sports that involve the water. Here we present the most popular in the countries involved in the project.

SWIMMING

The recreational activity of swimming has been recorded since prehistoric times. Although humans have been swimming for thousands of years, swimming only became a competitive sport in the early



1800s. Today, swimming is the third most-watched sport in the Olympic Games. In 1828, the first indoor swimming pool, St George's Baths was opened to the public. Competitive swimming became popular in the nineteenth century. Swimming is an event at the Summer Olympic Games, where male and female athletes compete in 16 of the recognized events each. Olympic events are held in a 50-meter pool, called a long course pool. In competitive swimming, four major styles have been established.

Butterfly (fly)

Backstroke (back)

Breaststroke (breast)

Freestyle (free)

In open water swimming, where the events are swum in a body of open water (lake or sea), there are also 5 km, 10 km and 25 km events for men and women.

SYNCHRONIZED SWIMMING

It is a hybrid form of swimming, dance and gymnastics, consisting of swimmers (either solos, duets, trios, combos, or teams) performing a synchronized



routine of elaborate moves in the water, accompanied by music. Competitors show off their strength, flexibility, and aerobic endurance required to performing difficult routines. Swimmers perform two routines for the judges, one technical and one free, as well as age group routines and figures. The origin - in 1933 & 1934, Katherine Whitney Curtis organized a show, "The Kay Curtis Modern Mermaids," for the World Exhibition in Chicago.

WATER POLO

The history of water polo as a team sport began as a demonstration of strength and swimming skill in late 19th century England and Scotland, where water sports and racing exhibitions were a feature of county fairs and festivals. Men's water polo



was among the first team sports introduced at the modern Olympic games in 1900. Water polo is now popular in many countries around the world, notably Europe (particularly in Serbia, Russia, Croatia, Italy, Montenegro, Greece and Hungary), the United States, Canada and Australia. The present-day game involves teams of seven players (plus up to six substitutes), with a water polo ball similar in size to a soccer ball but constructed of waterproof nylon. There are seven players from each team (six field players and a goalkeeper) are allowed in the playing area of the pool during game play. The two opposing teams must wear caps which contrast: with both (or either) goalkeeper cap color, with the other team's cap color and with the ball color.

The layout of a water polo pool showing the 2m and 5m markings (red and yellow), the half-way line (marked in white), a goal at either end and the length and width of the pool. Minimum water depth must be at least 1.8 meters (6 feet). The goals are 3 meters wide and 90 centimeters high. Water polo balls are generally yellow and of varying size and weight for juniors, women and men. The middle of the pool is designated by a white line. Before 2005, the pool was divided by 7 and 4 meter lines (distance out from the goal line).

ROWING



It is a sport with origins back to Ancient Egyptian times. It is based on propelling a boat (racing shell) on water using oars. By pushing against the water with an oar, a force is generated to move the boat. Modern rowing as a competitive sport

can be traced to the early 18th century when races were held between professional watermen on the River Thames in London, United Kingdom. Rowing is one of the oldest Olympic sports and has been competed since 1900. Women's rowing was added to the Olympic programme in 1976. There are two forms of rowing:

In sweep or sweep-oar rowing - each rower has one oar, held with both hands. This is generally done in pairs, fours, and eights.

In sculling each rower has two oars (or sculls), one in each hand.

DIVING

Diving is the sport of jumping or falling into water from a platform or springboard, sometimes while performing acrobatics. Diving is an internationally recognized sport that is a part of the Olympic Games.



Although diving has been a popular pastime across the world since ancient times, the first modern diving competitions were held in England in the 1880s. Plain diving was first introduced into the Olympics at the 1904 event. The 1908 Olympics in London added 'fancy diving' and introduced elastic boards rather than fixed platforms. Most diving competitions consist of three disciplines: 1 m and 3 m springboards, and the platform. Synchronized diving was adopted as an Olympic sport in 2000. Two divers form a team and perform dives simultaneously.

WATER SKI



Water skiing is a sport which you are towed by a motorboat while you are sliding on one or two ski. Water skiing came about on June 28, 1922 when eighteen-year-old Ralph Samuelson, proposed the idea that if you could ski

on snow, then you could ski on water. Ralph first attempted water skiing on Lake Pepin in Lake City, Minnesota, towed by his brother Ben. The competitions are in three groups: slalom; jumps; tricks. In slalom you use only one ski and you have to go round zigzagged between 25 buoys. In the discipline jumps after you reinforce you should jump from the ramp and try to make as long as you can distance before falling down. And the last discipline is the tricks. This discipline includes driving on only one led while you are holding the rope with one arm. The newly record for water skiing on hands was set by an Englishman Wayne Kerals on September 1, 2013. He has passed nearly one kilometer /900.99 m/ on the lake Petersbarg in Illinois.

SURFING

Surfing is one of the most popular and extreme sports in the world. It is a blend of total athleticism and the comprehension of the beauty



and the power of the nature. For centuries, surfing was a central part of ancient Polynesian culture. Surfing is also one of the few sports that create its own culture and lifestyle. This sport includes several things that are important. The first one is that you need a board, the second is that you must be very concentrated and the third is that you should be trained for this type of sport, because it is too dangerous to practice it.

Three major subdivisions within standing-up surfing are long boarding, short boarding, and stand up paddle surfing, and these three have several major differences, including the board design and length, the riding style, and the kind of wave that is ridden.

SAILING

Sailing is a technique for moving the wind with sailing ship, sailing yacht, sailing boat, windsurf or kitesurf on water, sailing away on land or sailing sled on ice. Sailing is called the sport.



Sailing is a sport in all developed countries such competitions are held in different classes popular in region of the globe. The movement of the wind is not just water, there boats there Ice boat (on ice), there are wheels on sand or other flat surface.

Sailboat racing generally fits into one of two categories:

Class - where all the boats are substantially similar, and the first boat to finish wins.

Handicap - where boats of different types sail against each other and are scored based on their handicaps which are calculated either before the start or after the finish. The two most common handicap systems are the IRC and the Portsmouth Yardstick, while the Performance Handicap Racing Fleet (PHRF) is very common in the U.S.A.

DURING THE WINTER WE PRACTICE WATER SPORTS TOO - BUT USING THE OTHER TYPE OF THE WATER - THE SNOW!

SKIING

Skiing is a recreational activity and competitive winter sport in which the participant uses skis to glide on snow. Many types of competitive skiing events are recognized by the International



Olympic Committee and the International Ski Federation. There are several types of skiing: **Nordic skiing** - The Nordic disciplines include cross-country skiing and ski jumping, which share in common the use of bindings that attach at the toes of the skier's boots but not at the heels. Cross-country skiing may be practiced on groomed trails or in undeveloped backcountry areas.

Alpine - Also called downhill skiing, alpine skiing typically takes place on a piste at a ski resort. It is characterized by fixed-heel bindings that attach at both the toe and the heel of the skier's boot. Because it is difficult to walk in alpine equipment, ski lifts including chairlifts bring skiers up the slope. Backcountry skiing can be accessed by helicopter or snowcat. Facilities at resorts can include night skiing, après-ski, and glade skiing under the supervision of the ski patrol and the ski school. Alpine skiing branched off from the older Nordic skiing around the 1920s, when the advent of ski lifts meant that it was not necessary to walk any longer. Alpine equipment specialized to where it can only be used with the help of lifts.

Telemark - Telemark skiing is a ski turning technique and FIS-sanctioned discipline. It is named after the Telemark region of Norway. Using equipment similar to nordic skiing, the ski bindings having the ski boot attached only at the toe.

Alexis Pinturault is a French World Cup alpine ski racer and Olympic medalist.

BIATLON

The biathlon was born in the XIX century in Norway. It spreads fast in other Scandinavian countries, after that in central Europe - Czech, Poland, Russia, Germany and etc. The first competition, registered on a paper was organized in 1767, near the Norway and Sweden border.



Ekaterina Dafovska

In the beginning of 21st century 56 countries became members in IBU. Over 31 countries participated in the World Cup and over 40 countries participated in the World Primacy and the Olympic games.

Right now in the Biathlon there are 7 disciplines:

- Individual start
- Sprint
- Chase
- Mixed relay
- Relay
- Mass start
- Team race

SNOWBOARD

As a sport the snowboard is very popular all over the world. It is one of the most dangerous sports because it includes a lot of skills which are important during the snowboarding. It is a winter sport. It is not for everyone. You must practice it a long time before to get on the board. Here in Bulgaria is suitable for this kind of sport because our areas are mainly with mountains. Many tourists every year are here to celebrate and explore our places for snowboarding, for example: Pamporovo, Vitosha, Bansko and Borovets. They



are available for everyone who wants to practice this sport. We have famous Bulgarian snowboarders like: Viktor Jekov, Aleksandra Jekova, Ivan Ranchev and many others who win every year: silver, bronze and gold medals for Bulgaria. This sport lifts you up face to face with your fears and makes you brave and gives you a chance to be above your abilities. When you are on the board you must be careful because the slopes in the mountains are awful and we can get an accident. The bad things happen very quickly. Usually winter sports are very expensive in nowadays, but not everyone likes to play football or basketball or other popular sports. Sometimes by changing the way of one sport to another, you can realise that you can find a lot new ways how to lose a few kilos and have some fun...

BOBSLEIGH

Bobsleigh is a winter sport performed in icy chute with special sleds (which have the same name) for two or four players. At the beginning the track is straight, but gradually turns into ice chute with raised edges of bends. A sled designed for four contestants weighs 630 kg and that for two players 385 kg. Each carriage has four steel skates, the front two of which are controlled by



steering wheel. Times descent are measured to within one thousandth of a second. According to a legend like sport bobsleigh appeared in 1888 in St. Moritz, Switzerland, where English tourists join two skis to slide

on snow hill. Bobsledding is dominated by the British in the early years of development. From 1928 to 1956 dominated by athletes from the US, but by then the European Alpine nations take the championship. The most successful nations in the 21st century are Switzerland and Germany. The Swiss have won more medals in Olympic Games, World and European championships than any other country.

FIGURE SKATING

Figure skating is a sport and activity in which individuals, duos, or groups perform on figure skates on ice. It was the first winter sport included in the Olympics, in 1908. The four Olympic disciplines are men's singles, ladies' singles, pair skating, and ice dancing. Non-Olympic disciplines include synchronized skating and four skating. In senior-level competition, skaters generally perform two programs (short and long) which, depending on the discipline, may include spins, jumps, moves in the field, lifts, throw jumps, death spirals, and other elements or moves.

- **Singles competition for men and women** (who are referred to as "ladies" in ISU rulebooks), where individual skaters perform jumps, spins, step



sequences, spirals, and other elements in their programs.

- **Pair skating teams consist of a woman and a man.** Pairs perform elements specific to the discipline such as throw jumps, in which the man 'throws' the woman into a jump; lifts, in which the woman is held above the man's head in one of various grips and positions; pair spins, in which both skaters spin together about a common axis; death spirals; and other elements such as side-by-side jumps and spins in unison.

- **Ice dancing is again for couples consisting of a woman and a man skating together.** Ice dance differs from pairs in focusing on intricate footwork performed in close dance holds, in time with the music. Ice dance lifts must not go above the shoulder.

Famous Bulgarian skaters: Albena Denkova and Maxim Stavisky /at the photo/, Sonia Radeva

Famous French skaters: Philip Kandeloro

SHORT TRACK SPEED SKATING

Short track speed skating is a form of competitive ice speed skating. In competitions, multiple skaters skate on an oval ice track with a circumference of 111.12 m. The rink itself is 60m by 30m, short track competitions are held either as all-points meets,



where skaters are seeded based only on their times for a standard distance (usually the 500m), or an age class, where people are seeded by age and gender.

ICE HOCKEY

Ice hockey is a contact team sport played on ice, usually a rink, in which two teams of six skaters use their sticks to shoot a vulcanized rubber puck into their opponent's net to score points. Professional hockey has existed since the early 20th century. By 1902, the Western Pennsylvania Hockey League was the first to employ professionals. The league joined with teams in Michigan and Ontario to form the first fully professional league. The three major rules of play in ice hockey that limit the movement of the puck: "offside", "icing", and the puck going out of play. Ice hockey has been played at the Winter Olympics since 1924.

Ice hockey is one of the fastest growing women's sports in the world, with the number of participants increasing 350 percent in the last 10 years.



WATER AND LEISURE TIME SURFING



Surfing is a water sport in which you ride forward down the moving wave, which is usually carrying the surfer towards the shore. Waves suitable for surfing are primarily found in the ocean, but can also be found in lakes or rivers in the form of a standing wave. For centuries, surfing was a central part of ancient Polynesian culture. One variety of stand-up surfing is paddle surfing. Another prominent form of surfing is body surfing, when a surfer rides a wave on a body board, either lying on their belly, drop knee, or sometimes even standing up on a body board. Famous locations in Europe: Costa da Caparica (Almada, Portugal), Supertubos (Peniche, Portugal), Nazaré (Portugal) and etc.

SCUBA DIVING

Scuba diving is a form of underwater diving in which a diver uses a self-contained underwater breathing apparatus (scuba) to breathe underwater.

Diving under water with air entrapment is known since antiquity.

It is used in the collection of shells, pearls, corals and other underwater treasures.



The first diving suits of leather that

allow descent to 18 meters were developed in France and England.

Scuba diving and diving may be amateur or professional, but both require preparation, training and license required.

RECREATIONAL FISHING

Recreational fishing, also called sport fishing, is fishing for pleasure or competition. The early evolution of fishing as recreation is not clear. For example, there is anecdotal evidence for fly fishing in Japan as early as the ninth century BC. Recreational fishing techniques include hand gathering, spearfishing, netting, angling and trapping. Recreational fishing has conventions, rules, licensing restrictions and laws that limit the way in which fish may be caught. Recreational fishing competitions (tournaments) are a recent innovation in which fishermen compete for prizes based on the total weight of a given species of fish caught within a predetermined time.



RAFTING



Rafting and white water rafting are recreational outdoor activities which use an inflatable raft to navigate a river. The development of this activity as a leisure sport has become popular since the mid-1970s, evolving from individuals paddling 10 feet (3.0 m) rafts with double-bladed paddles to multi-person rafts propelled by single-bladed paddles and steered by a tour guide at the stern. It is considered an extreme sport, and can be fatal. There are two main techniques:

Punching - Rafts carry great momentum, and on rivers hydraulics that are dodged by canoes and kayaks are often punched by rafts. This involves the rafting crew paddling the raft to give it enough speed to push through the hydraulic without getting stopped.

High siding - If a raft is caught in a hydraulic it will often quickly go sideways. In order to stop the raft flipping on its inside edge, the rafters can climb to the side of the raft furthest downstream, which will also be the side of the raft highest in the air leading to its name. In this position the rafters may be able to use the draw stroke to pull the raft out of the head.

WATER AEROBICS

While similar to land aerobics, in that it focuses on cardiac training, water aerobics differs in that it adds the component of water resistance and buoyancy. Although heart rate



does not increase as much as in land-based aerobics, the heart is working just as hard and underwater exercise actually pumps more blood to the heart. Exercising in the water is not only aerobic, but also strength-training oriented

due to the water resistance. Moving your body through the water creates a resistance that will activate muscle groups.

SPA

A spa is a location where mineral-rich spring water (and sometimes sea water) is used to give medicinal baths. The belief in the curative powers of mineral waters goes back to prehistoric times. Many people around the world believed that bathing in a particular spring, well, or river resulted in physical and spiritual purification. Such practices have been popular worldwide, but are especially widespread in Europe and Japan. The term is derived from the name of the town of Spa, Belgium, whose name is known back to Roman times, when the location was called *Aquae Spadanae*.



2.2 WATER AND TOURISM

Water and tourism are two words closely related because tourism is really important for the economy in a country. Tourism without water isn't possible.

GLOBAL DAY OF TOURISM AND WATER

To understand the importance of tourism and water we have to travel in time to the 27th September 2013 (World Tourism Day). In this important date everybody talked about the importance of water and tourism. The slogan of this important date was "Tourism and water: Protecting Our Common Future". At the same time, in the International Year of Cooperation in the Water Sphere, different agents asked to try to protect water more.

Why is water attractive?

We have always been attracted to water, maybe because of the idea of being able to enclose in a pool something as uncontrollable as water; or maybe because of the simple fact of living in the blue planet. With water you can do different activities which everybody likes. To do these activities we go to a lot of beaches or swimming pools, which are, maybe, the most visited places in summer. It's healthy to practice some water sports like swimming (it's nice for the back) or another water sports like water polo, surfing underwater exploration... (snorkeling / scuba diving)



FIRST TYPES OF TOURISM RELATED TO WATER

Water was more usually used to treat diseases and not to enjoy. People preferred health tourism. For example, in the thermal spas and the thalassotherapy centres in Galicia (Spain) they use water for treatment; they offer specific methods to cure different diseases.



Natural hot baths in Galicia.



Swimming in the sea is another usual activity which most of people like.

Cruises as a way to enjoy your holidays started in 1835 when the newspaper "Shetland Journal" published an advert to travel to visit Scotland, Iceland, and the Faeroe Islands on a boat. The "Peninsular Navigation Company was created at that



time, later it was named P&O, and the famous “Cunard Line”, which was created in 1840 by Samuel Cunard. In these years cruises weren’t really important for tourism. The ships built at that time were used to transport people between Europe and America. When the planes appeared a lot of ships were adapted to become cruises and other boats had to be destroyed because the “liners” divided people in some classes and hosted them in different types of cabins. The cheaper cabins were a “bedroom” and the traveller had to share it with other 28 people. This type of cabin wasn’t the appropriate for the new travellers and the changes were really expensive. There were other ships which didn’t have a bathroom in the cabins and they had common bathrooms. These ships were soon remodelled to give the travellers more privacy. Today we’ve got about 280 companies which offer sea or river cruises with more than 30.000 cruises to 2.000 destinies.

WATER AND TOURISM NOWADAYS

Tourism for Sun and Beach

In a list of the best beaches of the world made by the magazine “National Geographic” we can find the beach Palombaggia in Corsica (France).



There are cities with big beaches like Tsarevo (in the south part of the Black Sea). In the Natural Park of Strandzhawe we can find some interesting routes and in them, tourists can learn about the history of the animals and plants of the area. The rivers around Tsarevo are full of fish and it is really common to see fishers in the bridges or on the banks of the rivers.



Cruisers

The Norwegian “Escape” is the biggest boat of the Norwegian Cruise Lines fleet. Its most popular route is going to be the route of the West Caribbean. This route starts in Miami.



Aquatic Parks

A really cool aquatic park is the “Wet’n Wild Water World” in Australia. It has got some water-slides which are 12 meters high and you slide at 60 km/h.



Water sports and adventure sports:

The most important of these sports is swimming. Michael Phelps is one of the best swimmers in history. Another important sport is kayaking; that you can practice it in the sea or in a river.



A sport, which is highly practiced and everybody knows it, is surfing.



Water isn't only in liquid state so we find water in solid state when we're practising skiing or snowboarding.



Water and Health

Now we like the healthy tourism more, going to spas and enjoying the tranquility of the water...

We love spa cities like, for example, Karlovy Vary (to the west of Prague), which are cities full of history. Karlovy Vary is a little city and a historical and touristic zone near a river where we find the thermal sources at a temperature of 72° C.



Deltas

The Danube Delta is in Romania and it has a wild ecosystem, unique in Europe. The zone has been declared a global reserve by UNESCO.



Islands:

We find islands in cities like for example Île de la Cité in the Seine, (Paris). Notre-Dame cathedral one of the biggest cathedrals in Europe is in the southeast of the island.



The islands are famous for their beaches and for being great places for relaxing and having fun. Mykonos, in Greece, is a clear example. It's a little island, but very famous around the world for its beaches and funny time.

Near Mykonos we can find Santorini, one of the most visited islands in Greece, but on its deep blue seas we can also find the big islands of Crete, Rhodes or Zakynthos, near Pyrgos.

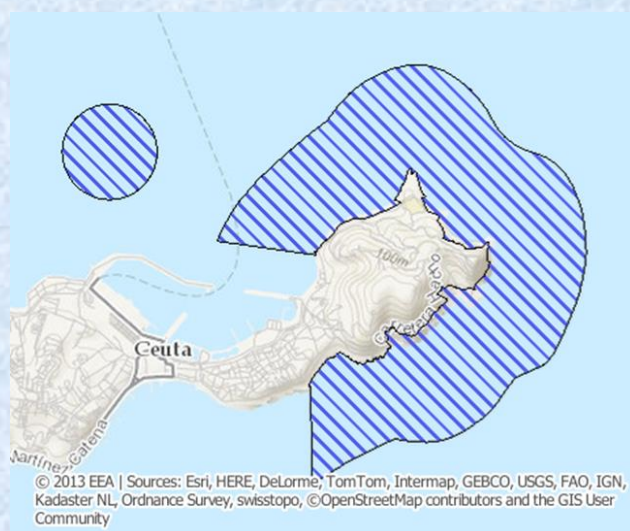


ECONOMIC AND SOCIAL EFFECTS ON THE DEVELOPMENT OF WATER TOURISM

This kind of tourism is related to water, creates a lot of jobs and money because many people want to relax and have a good time near water. Also, there are cities which have grown thanks to its beaches, for example Benidorm in Spain. The main problem of touristic towns is that they are full of tourists and they are not a very good place to live.

THE NEED TO PROTECT NATURAL SPACES

In Spain there are many protected places. The Maritime Zone of Monte Hacho is one of them.



It is important to protect places to ensure the biodiversity of the planet. In the future, if we don't protect places we will destroy species.

WATER TOURISM AND TRANSPORT IN SPAIN

Tourism

The water in Spain is very important because it is a very important source of economic development, since our country is a peninsula, which means that it is practically surrounded by water.

It has about 800km of coast you can choose and there is good weather which attracts foreigners.

Tourism impacts

<u>Favorable economics</u> <ul style="list-style-type: none">-Creation of employment.-Compensates the Spanish balance of payment deficits.-The arrival of tourists forces to create infrastructures that generally stimulate the economy.-Creates multiplier effects (estate sector, for example).-Stimulates local developments.	<u>Unfavorable economics</u> <ul style="list-style-type: none">-Tourism pulls prices and generates inflation. This is especially noticeable in the hotel and catering sectors.-Seasonality is a drawback for companies and for employment (this last, precarious and seasonal). However, tourist offers for the elderly and other solutions associated with the timeshare (or system of use of apartments) are making seasonality decrease.-Major operators are foreigners and a good part of the business is taken to their countries of origin.-The prevailing model of tourism generates territorial imbalances: 85% of the tourists choose the Islands or the Mediterranean coast as destination.
<u>Favorable demographics</u> <ul style="list-style-type: none">-At touristic places the active population grows and its population is rejuvenated.-The migration rate is positive.	<u>Unfavorable demographics</u> <ul style="list-style-type: none">- Many people see the mass immigration in the tourist places as an inconvenient.
<u>Favorable socio-cultural</u> <ul style="list-style-type: none">-In the tourist areas it is promoted the exchange of behaviors, habits and ideas,	<u>Unfavorable socio-cultural</u> <ul style="list-style-type: none">-It could be a danger of acculturation (loss of identity in the benefit of the

stimulating intercultural respect and tolerance, as well as the learning of languages.

Paradoxically, the arrival of tourists may lead to an over-nationalism..

foreign).

Favorable ecologic

-It can help to preserve our natural resources and rehabilitate the historic centers of cities with historic-artistic interest.

-The idea of a sustainable tourism has considerably grown.

Unfavorable ecologic

-Conflicts over land uses: favor the tourist settlement against the agricultural use of lands.

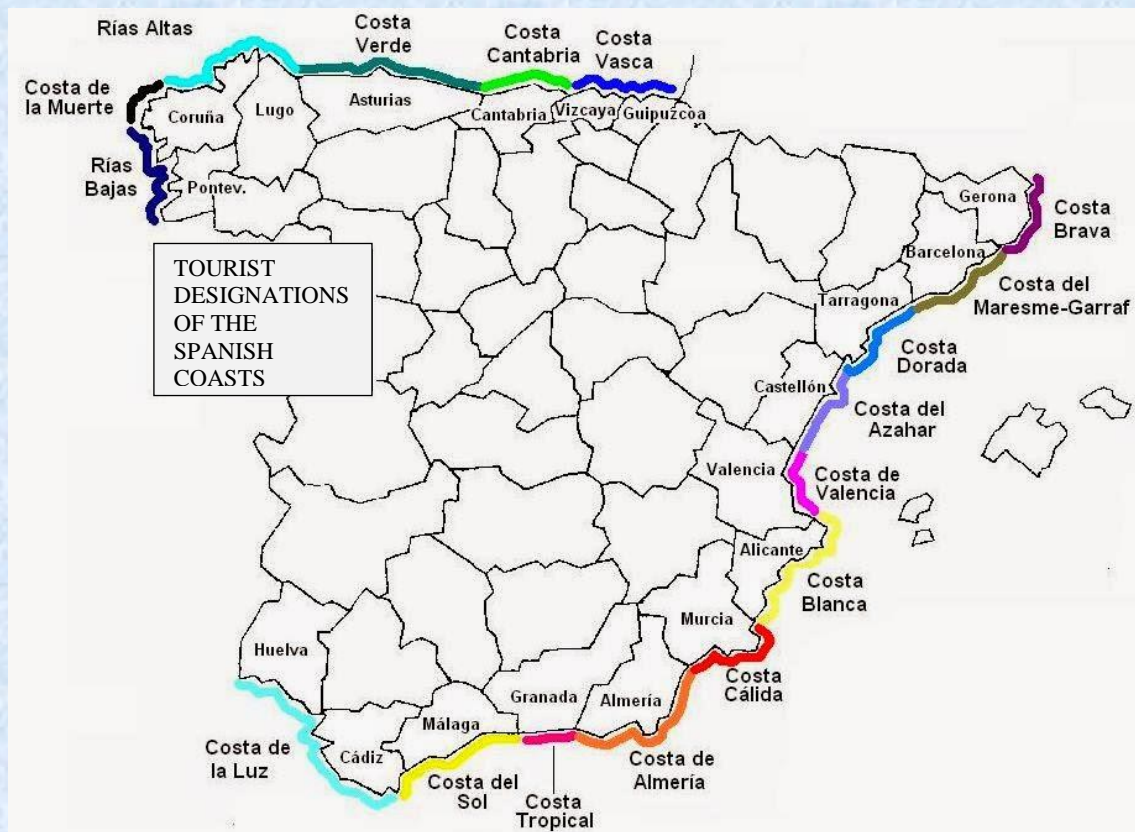
-Alteration of the landscape: massive developments on the beach front with the consequent environmental impact.

-Uncontrolled waste discharges.

-Waste of water and energy resources.

- Noise pollution (mega clubs, which are the night alternative to the daytime beach).

Outstanding coastal vacation areas



Maritime transport

Between all types of transport the maritime one represents a 0,4% passenger and a 10,8% of freight transport.

The costs of sea-freight transport are not very high (massive merchandise or large volume containers); however, trade is usually made by foreign companies.

All the boats that have to go towards the Mediterranean Sea or go out to the Atlantic Ocean, have to go through the Strait of Gibraltar.

Maritime transport has as an advantage that it is the one with more carrying capacity to be transported. But its inconvenient is that it is very slow.

Spain ports



Ports for passenger traffic

- Routes connecting Africa with Europe: Algeciras, Ceuta and Melilla.
- Tourist traffic: Balearic and Canary Islands.
- Tourism: Barcelona and others.

Ports for merchandise traffic

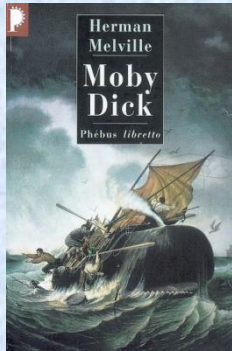
- Liquid merchandise: Algeciras, Bilbao, Tarragona, Sta. Cruz de Tenerife, La Coruña, Malaga, Cartagena, Huelva and Castellón.
- Coal and minerals: Gijón, Tarragona, Ferrol, Huelva.
- General merchandise (containers): Algeciras, Barcelona, Valencia, Las Palmas and Bilbao.

2.3 WATER IN ART

A theme is the central idea explored by an artistic work. John Gardner puts it this way: "By theme here we mean not a message -- a word no good artist likes applied to his work -- but the general subject". From ancient times, in Western culture and worldwide, nature has been an enduring theme in the arts. Water themes in art are the most attractive aspects if we refer to literature, plastic domain or others. In ancient and modern art, water was often represented by stylized curvilinear forms, such as the spiral (as evidenced by the Minoans of Crete) or a horizontal zigzag (as found in the art of ancient Egypt). In the famed eleventh-century Bayeux Tapestry, the English Channel is represented by embroidered wavy black lines. Distinctive indigenous art components include "Oceanic Arts," that is, the visual arts of the southern and northwestern Pacific Islands.

Rivers, lakes, and seas were once the great highways of the world, and much art shows water as a backdrop to everyday life. Royal barges are painted on the walls of Egyptian tombs dating to 1360 B.C. Ships and ports appear on medieval manuscripts and Renaissance frescoes. The brilliant Renaissance painter, sculptor, and inventor Leonardo da Vinci (1452-1519) was fascinated by water, which he described as "vetturale di natura" (the vehicle of nature). He drew it in detail, studied it closely, was in awe of its power (he had witnessed terrible floods and storms), and designed complex canal systems and locks.

WATER IN LITERATURE

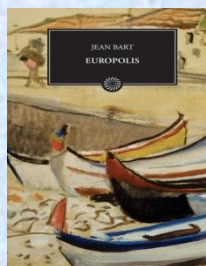


Literature is the grand repository of our dreams and desires and fears, of our longing for meaning and justice and redemption, of our yearning for intimacy and community and solitude, of our unquenchable pursuit of beauty. The great aim of literature is to render in words the nobility and majesty of life. That images of water should play such a prominent and recurrent role as a metaphor in literature is hardly surprising, given the essential place of water in life itself. Western literature was launched upon the waters. *The Odyssey* (together with *The Iliad*, epic Greek poems attributed to Homer, 7th century B.C.) details the hero Odysseus's perilous 10-year return across the sea from Troy. Centuries later, arguably the first English novel, Daniel Defoe's *Life and Strange Surprising Adventures of Robinson Crusoe* (1719), vividly relates the life of a man marooned on a desert island, and thus the spectre of the everpresent ocean. Other notable English-language literary works with a water focus include Samuel Taylor Coleridge's (1772–1834) apprehensive ballad, "The Rime of the Ancient Mariner." The English translation of the French writer Jules Verne's (1828–1905) *Twenty Thousand Leagues Under the Sea* had enormous popular appeal and anticipated many twentieth-century underwater technological and scientific achievements. Herman Melville (1819–1891) wrote several popular romances of life at sea before creating his symbolic and philosophical masterpiece *Moby-Dick* (1851) about an obsessive whaler's hunt for a great white whale. Mark Twain's (1835–1910) boyhood on the Mississippi River laid the groundwork for what has been called the first modern American novel, *The Adventures of Huckleberry Finn* (1884). This classic work centered on the adventures of a boy and a runaway slave who rafted down the Mississippi.

The contemporary writers adopted the theme of water in their works and explore and challenge our relationship with the water

environment include Henry David Thoreau's (1817–1862) journal of close observation, *Walden, or a Life in the Woods* (1854), Henry Beston- *The Outermost House* (1928), Aldo Leopold, *Sand County Almanac* (1949), John Graves's *Goodbye to a River* (1960), Wallace Stegner's *The Sound of Mountain Water* (1969), Annie Dillard's *Pilgrim at Tinker Creek* (1974), and Ann Zwinger's *Run, River, Run: A Naturalist's Journey Down One of the Great Rivers of the West* (1975).

In the Romanian literature, Jean Bart was best known for his water inspired works: *Jurnal de bord*, 1901, *În Deltă...*, 1925, *Peste Ocean - Note dintr-o călătorie în America de Nord*, 1926, *Schițe marine din lumea porturilor*, 1928, *O corabie românească. Nava-școală bricul "Mircea"*, 1931, *Pe drumuri de apă*, 1931. Here's how Jean Bart briefly describes the essence of life port – Sulina in the novel *Europolis* (1933): "However, this small port cosmopolitan life is original and interesting. (...) There is a colony life. Levantine trade attracts adventurers from all tribes, who travel here to fish in the troubled waters of the Danube, a mosaic of races: all nations, all types and languages; the small world of the institution - Europe in miniature - with props, scenes and protocol has a separate life; it is closed, impermeable perfectly sealed and the Commission shall keep it away, hiding under the guise of the weak contact with exaggerated politeness indigenous crowd, which is within the provisional landed here, to the gate of the East. "



Also, Mihai Eminescu's poetry is defined as a specific expression of the mode of creation typical of the last great European romantic. It is true, of course, that, with Eminescu, European Romanticism entered its final phase in southeast Europe as well. Space and time both acquire deep emotional colouring in Eminescu's poetry. At any rate, the universe pictured by him is

one of the weirdest. The ideal imaginary space built by Eminescu implies a felicitous union of the protecting vegetation of the forest and of the water spring:

Come to the forest spring where wavelets

Trembling over the pebbles glide

And the dropping willow branches

Its secluded threshold hide

(Longing)

In this sheltering space provided by the forest pool, deep blue (lacul codrilor, albastru) the writer imagines the sacred ceremonial of love. In a small space, a boat stands for the perfect romantic retreat:

And hand in hand we leap aboard,

Charmed by the water's tiny childe;

The rudder strings slip from my grasp,

The oars into the water slide.

(The Forest Pool)



The model for romantic writers was Victor Hugo, one of the greatest romantic writers of France. A versatile and freethinking personality, he gave a huge impulse to the Romantic Movement as he made his immense contribution to French literature and culture, as a novelist, a dramatist, and a poet. The genius of Hugo lies in the fact that he gained both literary acclaim as well as public adulation for his enormously popular novels and his



intensely lyrical poetry that was characterised by 'powerful sounds and rhythms'. From 1834 to 1837, Victor Hugo travelled around Normandy, exploring and sketching the region's historic monuments and buildings, wood

landscapes and the river Seine. The stretch of the Seine between Paris and Le Havre was featured in some of his novels, including *Les Misérables*. Here is the image of the ocean in the text *Old ocean* ("J'étais seul près des flots.")

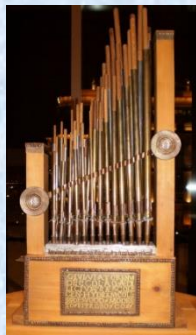
*I stood by the waves, while the stars soared in sight,
Not a cloud specked the sky, not a sail shimmered bright;
Scenes beyond this dim world were revealed to mine eye;
And the woods, and the hills, and all nature around,
Seem'd to question with moody, mysterious sound,
The waves, and the pure stars on high.
And the clear constellations, that infinite throng,
While thousand rich harmonies swelled in their song,
Replying, bowed meekly their diamond-blaze –
And the blue waves, which nothing may bind or arrest,
Chorus'd forth, as they stooped the white foam of their crest
"Creator! we bless thee and praise!"*

So, the romantic literature attains the status of aquatic element as a main topic of the artwork: the American writer Edgar Allan Poe (in the poem *The City in the Sea*), the French Lamartine (in the poem *Le Lac*), Victor Hugo (in the poem *Eclaircie*) or the English John Keats (in the sonnets *On the Sea* , *To the Nile*)

WATER AND MUSIC

Water has had surprising prominence in the musical world. It has served as a tool, as inspiration, and even as a performing venue. Water inspired the Musical Tools. The Hydraulis, or Water Organ, was a musical

instrument that produced sound using pressure generated by falling water as the energy source. Water Drums exist in various cultures. The native populations of the Americas constructed a drum within a drum, with the inner instrument being filled with various amounts of water to affect the timbre of the sound. In some areas in Africa and New Guinea, hollow gourds were placed in larger vessels and struck. Water Gong is the name attached to a modern use of traditional gongs and tam-tams. The instrument was struck and then lowered into a tub of water which lowered the pitch. Likewise, it could be struck while suspended in water, and then removed to raise the pitch.



Water has served composers as musical inspiration for a number of reasons: as the backdrop for opera and musical theater, as an image to be represented in musical sound, as a source of natural sound to be imitated in music, and as a cultural icon. Water-inspired classic compositions include works such as Debussy's *La Mer*, Ravel's *Jeux d'eau*, Mendelssohn's *Calm Sea and Prosperous Voyage* and *Hebrides Overture*, Wagner's *Tristan und Isolde*, and Handel's *Water Music*. Traditional folk music often addresses water-related themes, whether the story telling vehicle is a sea shanty, a minstrel tune, or a ballad. Also, there are many musical works inspired by water. Frederic Chopin, *Prelude, op. 28, no. 15, The Raindrop*, Claude Debussy, *La cathédral englouté, La Mer, Reflets de l'eau*, Ferde Grofe, *Mississippi Suite*, Jacques Ibert, *Escales*, Todd Levin, *Swirl*, Maurice Ravel, *Jeux d'eau*, Ottorino Respighi, *Fountains of Rome*, Richard Rodgers, *Victory at Sea*, Giacchino Rossini, *Overture to William Tell*, Camille Saint-Saëns, "Aquarium" from *Carnival of the Animals*, Virgil Thomson, *Suite from "The River"*, Ralph Vaughan Williams, *Sea Symphony*, Antonio Vivaldi, 2

concerti, RV 253 and 433, "La Tempesta di mare". We know that the music imitates the sounds of water in other works: Ludwig van Beethoven, Symphony No. 6, movement 4 "The Thunderstorm", Jonathan Green, Symphony No. 3, movement 4 "Water", and is also a cultural icon in Bedřich Smetana's work, "The Moldau" from *Ma Vlast* (My Country). Throughout history, composers have been asked to write music to be "played upon the water." Venetian musicians composed much brass music for barges.

The most celebrated piece of such music was composed in England, by Handel, for a 1717 party for *George I upon the Thames*.

George Enescu known in France as Georges Enesco, (19 August 1881 – 4 May 1955) was a Romanian composer, violinist, pianist, conductor, and teacher, regarded as one of the greatest composers of the 20th century and Romania's most important musician. He used the theme of water in



his work in the maturity period when water appears as a central element. A third stage of full maturity, deeply marked by the catastrophic moments of the two world wars, comprises four papers in which the presence of aquatic element can be identified: *Vox maris* poem, op. 31 (dates back to the period 1925-1929), *Picture Creek* in the 3rd Suite for orchestra "village", op. 27 (1938), *Paintings* "creek in back of the garden" and "The Tempest the night out" 3rd suite "Impressions from childhood", *Symphony*.

Pablo Casals described Enescu as "*the greatest musical phenomenon since Mozart*" [17] and "*one of the greatest geniuses of modern music*". Queen Marie of Romania wrote in her memoirs that "*in George Enescu's compositions there was real gold*". Yehudi Menuhin, Enescu's most famous pupil, once said about his teacher: "*He will remain for me the absoluteness through which I judge others. [...] Enescu gave me the light that has guided my entire existence.*"

WATER AND PAINTING

In the visual arts, a theme is a broad idea or a message conveyed by a work, such as a performance, a painting, or a motion picture. This message is usually about life, society or human nature.



Themes are the fundamental and often universal ideas explored in a work. Themes are usually implied rather than explicitly stated. Deep thematic content is not required in a visual work; however, some observers

would say that all visual work inherently projects some kind of outlook on life that can be taken as a theme, regardless of whether or not this is the intent of the author- J.M.W. Turner – paintings such as *Fisherman at Sea Fishing Fleet* , *The Grand Canal - Venice* , *Slave Ship*, *The Evening of the Deluge* are some examples on which many famous artists facets of water exerted a strong fascination.

Impressionism is a 19th-century art movement that originated with a group of Paris-based artists. Their independent exhibitions brought them to prominence during the 1870s and 1880s, inspite of harsh opposition from the conventional art community in France. The name of the style derives from the title of a Claude Monet work, *Impression, soleil levant* (*Impression, Sunrise*).



The *Water Lilies* is a painting by impressionist Claude Monet painted during his series called *Water Lilies*. The painting depicts a scene in a French pond

showing light reflecting off the water with Water Lilies on the surface. It was painted in 1919 and as of 2012 is on display in New York's Metropolitan Museum of Art.



Marine art or maritime art is any form of figurative art (that is, painting, drawing, printmaking and sculpture) that portrays or draws its main inspiration from the sea. Maritime painting is a genre that depicts ships and



the sea - a genre particularly strong from the 17th to 19th centuries. In practice the term often covers art showing shipping on rivers and estuaries, beach scenes and all art showing boats, without any rigid

distinction - for practical reasons subjects that can be drawn or painted from dry land in fact feature strongly in the genre. Ioannis Altamouras (Ιωάννης Αλταμούρας) (Florence or Naples, 1852 - Spetses, 1878) was an outstanding Greek painter of the 19th century famous for his paintings of seascapes.



Antoni Gaudí was a Spanish Catalan architect from Reus and the best known practitioner of Catalan Modernism. Gaudí's works reflect an individualized and distinctive style. One of Gaudí's largest and most striking works is the Casa Batlló (1904–1906) with a sandstone façade and water-inspired lines.

Viktor Barvitius (March 28, 1834 - June 9, 1902 in Prague) was a Czech painter, representative of modern realism who used the theme of water in his paintings.

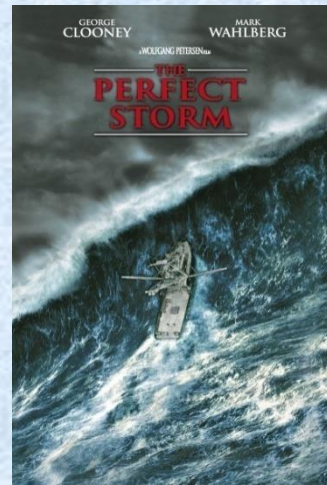


Radi Nedelchev (Bulgarian: Ради Неделчев) (born April 1, 1938) is a Bulgarian artist best known as a painter of naive art. His paintings depict mostly landscapes, village life and festivals. He surprised an aquatic element in some of his paintings. Here's one of those creations.



WATER AND FILM

In the movies, water has been a threatening environment, including one that shelters "hostile" creatures. Examples include the shark attacks in *Jaws*, the river itself in *Deliverance*, and the ocean in the fact-based *The Perfect Storm*. Water has been the setting for a post-apocalyptic world (*Waterworld*) or an other worldly encounter (*The Abyss*). Conversely, particularly in family films, the welfare of a marine animal may be the central focus, as in *Free Willy*, *Orca*, and *Tarka the Otter*. Conservation of the water environment also may be a central theme, as in *Turtle Diary* and *When the Whales Came*. Fine art and film may come together, such as with the acclaimed 2000 documentary, *Rivers and Tides*, which celebrates the art of Andy Goldsworthy.



In conclusion, like water itself, the arts are not fixed, but fluid and constantly evolving and responding to change. The arts are also an ideal means by which humans explore, understand, communicate and challenge their culture, values, and ethics. The response to art may have philosophical, ecological, social, or political implications upon how societies and individuals live as an integral part of this water planet.

2.4 Water in transports and political issues

Introduction

Water is everywhere; navigable rivers and lakes, lively commercial ports, much frequented water roads for the transport of people as well as of goods worldwide reveal the key role of water in transports.

Seafaring and commerce

Commerce plays a great role in the development of the global economy. Sea transports are the safest and the most cost-effective solution for cargo transport as well as the environmentally-friendliest, since big CO₂ quantities are not emitted in the atmosphere.

The cargo capacity and the general capacity of a port are estimated with the TEU unit (Twenty-foot Equivalent Units).



Greece is found among the biggest seagoing leaders in the world and has been playing major role in sea transports, especially during the last three decades. Despite business challenges and the risks, Greek sea entrepreneurship holds a leading position in the global economy. Since 2000 the bonds between the Greek seafaring and the domestic economy have been importantly reinforced, by the approximately 1200 maritime companies that exist in Greece.

Big ports

Rotterdam, The Netherlands



This Dutch port used to be the biggest in the world, before being surpassed by Shanghai and Singapore some years ago. Rotterdam is a gateway for the import of transatlantic-and not only goods- in Europe. Its most

important activities are the petrochemical industry and the commercial transshipment of many cargo types. Moreover, it is an important transit station for the transport of raw materials and further goods between Europe and other parts of the world.

Amsterdam, The Netherlands



Amsterdam was established at the end of the 12th century as a small fishing village alongside the banks of the Amstel River, after which it was actually named and which is its still the economic and cultural centre of the country.

The city has one of the biggest historical centers in Europe, dating back to 17th century, the so-called Golden Era of the Netherlands, of which it was the focal point. During that period, a series of concentric semicircular canals, the well-known “grachtens”, were constructed around the center of the older city and they still form a characteristic of the appearance of the city center.

Antwerp, Belgium



Antwerp was an economically as well as culturally important city for the states of Benelux and one of the biggest European ports. After the Second World War the big community of Hassid Jews controlled the commerce of diamonds, an important commercial activity

in the city, which happens to be one of international centers of that sector.

Marseille, France



Marseille is the most important city-port in France and also an important European port. It is located in the bay of Lyon, west Mediterranean. Since 1962 it has become the biggest gateway for immigrants in Europe, since at least

1.000.000 immigrants, especially from Algeria, have entered its port.

Nowadays, the new port, constructed vertically to the old one, has a leading position in the economy of Marseille and it is the most important commercial and shipping center of the Mediterranean with 100.000.000 tons of products being transported annually. It mostly imports petroleum, fruit, oil and leather and it exports wine, drinks and food products.

Le Havre, France

Le Havre is a city-port in northern France and specifically in the coasts of the English Channel, in Normandy, at the right bank of the mouth of the Seine. It is the second biggest port in France, after Marseille on the south and it has channels that are 24 kilometers long. The city used to be called the "Gate to

the Ocean". The development and the history of the city go hand in hand with its existence as a port in the strategic area of the English Channel Sea. During the 12th century, Le Havre started developing thanks to commerce from the West Indies, which started thriving together with the domestic and the European commerce.

Hamburg, Germany

Located in one of the northernmost parts in Europe, really close to Denmark, as well as to the Baltic and the North Sea, Hamburg is the biggest port in Germany and the third biggest port in Europe after Rotterdam and Antwerp.

Almost 13.000 ships from the whole world enter this port every year. From the cruise ships' terminal to the warehouses of the historic Speicherstadt and from the boarding



bridges to the modern container port, here one can feel the air of freedom as well as the air of the remote countries. During a lugger tour or a visit to the legendary ships-museums, visitors can experience the reasons why Hamburg is also called the "Gate to the World". It is indicative that during the period from 1850 to 1939 almost 5 million of European immigrants started their journey from Hamburg to the "New World".

Bremen, Germany

Bremen (meaning the port of Germany- "Bremerhaven") is a city lengthwise the Weser, opposite Norderham city. Although it is a relatively new city, it has a long history as a commercial port and nowadays it is one of the most important German ports. More than 1.350.000 cars are imported or exported every year through Bremerhaven and it is actually the port that imports and exports more cars than any other city in Europe, apart from Rotterdam.

Piraeus, Greece

In the biggest port in Greece the passengers that were transported in 2014 were more than 18 million, according to the passenger, vehicle and cargo traffic data demonstrated by the administration of the Piraeus Port Authority S.A.



Specifically, 18.635.495 passengers, 2.534.893 vehicles, 3.585.155 containers and 359.665 cars were transferred through the port of Piraeus. According to the Piraeus Port Authority S.A., compared to 2013 and the previous years, there is an increase by almost 1 million passengers as well as an increase in containers, mostly due to the contractual obligations of the Piraeus Container Terminal S.A. based on the grant contract.

Novorossiysk, Russia

It is the biggest port in the Black Sea and an industrial city based on the production of steel and metal products as well as on the food industry. The commercial port of Novorossiysk serves the Russian sea commerce activity with other areas such as Asia, Middle East, Africa, the Mediterranean and South America. It is the busiest oil port in the Black Sea and the ending of the oil pipeline from the Tengiz Field to west Kazakhstan.

Shanghai, China

Shanghai is the biggest port as well as the biggest city in China. It plays a major role in the modern economy of China and it is also one of its most important cultural, commercial, economic and industrial centers. Since 2000 it has steadily had the first position in transferring merchandise worldwide.



Singapore

Connected to more than 600 ports in almost 120 countries, the port of Singapore is one of the busiest seafaring centers in the world and thus it is often called the gate to Asia. It competes with many other big ports in the wider area, such as the ports of Shanghai, Hong Kong and Schenzhen in China and Busan in South Korea. At the container terminal of the port of Singapore a daily average of 60 container ships of all sizes enter the port and 91.000 containers are trafficked almost 6% out of which end their voyage at Singapore and the rest are dispatched to their destinations in the whole world.



Water transport in anhydrous Greek islands

The water shortage problems that are observed every summer in the Aegean islands are dealt with by water transport with water tanker ships. According to the General Secretariat of the Aegean and Island Policy, water will be transported to Agathonisi, Leipsoi, Leros, Kastelorizo, Patmos, Amorgos, Donousa, Irakleia, Kimolos, Koufonisia and Schinoussa throughout the whole summer and autumn. In August as well as in September water will be also transported to Mykonos that is expecting great numbers of tourists. The cost for the water transport to islands that are facing a water shortage problem is estimated at 3 million Euros.

Navigable Rivers

The Danube

The Danube is navigable for transoceanic ships from the Black Sea to Romania and up to Bavaria for riverboats. Since 1992, when the channel of the Rhine, the main and the Danube was completed, the river has been a part of a European water road from Rotterdam to the North Sea up to Sulina city in the Black Sea. In 1994 the Danube was declared one of the 10 European transport roads, to central and east Europe. The quantity of goods transported to the Danube was increased at 100 million tons in 1987.

The Nile

It is almost 6.650 km long and it drains an estimated area of 3.349.000 square km. Its basin occupies parts of Tanzania, Burundi, Rwanda, Zaire, Kenya, Uganda, Ethiopia, the biggest part of Sudan and the cultivable part of Egypt. Every day, there are many organized cruises along the length of the Nile and many traditional boats that travel there. The Nile is the cheapest means of transporting people and goods in Egypt.

Water and political issues

Introduction

Worrying phenomena as far as water management is concerned have been observed worldwide during the past few years. On the one hand, the development of the scientific and technological achievements has softened the problem, but on the other hand the modern need of the increasing population across the world render the issue of water management as crucial as ever.

Europe

Russia

The pollution in the Volga, Russia, has eradicated the caviar industry and has thus caused a great economic disaster. The economy of Finland is also threatened by the water management in Russia. The Finnish are willing to offer financial backing for the demolition of a dam in Leningrad in order to protect fish farming in the Baltic Sea. That will allow the river to bring new nutrients from the shore in order to increase fish in the Baltic Sea again.



Picture of the Volga in Nizhny Novgorod Oblast

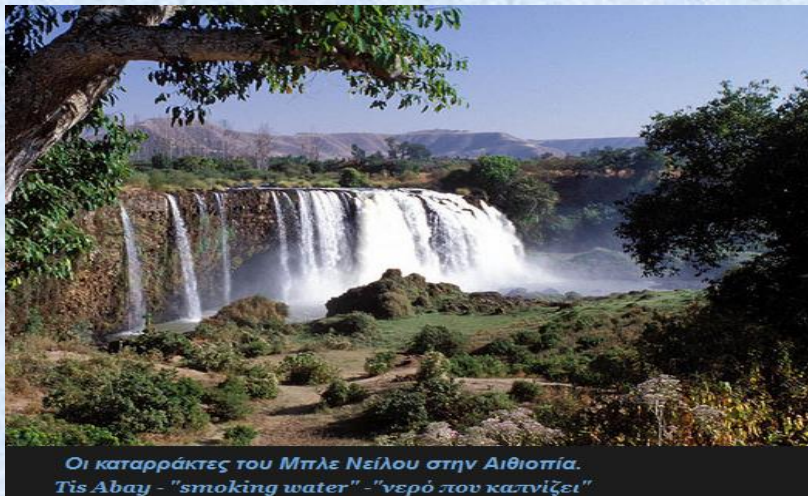
Africa

Africa includes 19 out of the 25 countries in the world that do not have access to clean water. Nile is the biggest source of the valuable- for this country- water and therefore the claims concerning its water management are extremely intense.

The Nile is the longest river in Africa as well as worldwide. It springs south of the Equator and flowing towards the North through northeast Africa,

it empties into the Mediterranean Sea. It is almost 6.648 km long and it drains an area of almost 3.349.000 km²

The drainage basin of the Nile is a geopolitical area of great importance, as in the anhydrous –because of the Sahara- area of North Africa the Nile waters a huge area of approximately 3.5 million square kilometres, almost 10% of the whole continent. That valuable drainage basin does not limit itself to the countries flowed through by the river, like Burundi-where the most remote spring of the White Nile comes from, Uganda with its huge springs and Victoria Lake, Sudan and Egypt.



Ethiopia, which controls the 80% of the waters that supply the flow of the Nile, is planning to engage a bigger quantity of water; this is also the case for Sudan. Such an action would reduce the water quantity that is available in Egypt that is already facing water shortage problems and it is utterly dependent on the Nile. Moreover, it is expected that only in the next three decades the population of Egypt will be more than one hundred million and this is why the tension among "thirsty countries" will increase.

Another typical example is that of the dispute between Angola and Namibia in 1981-1982, where a series of dams but mostly central waterworks' pipeline systems were strategic targets of both countries resulting in big conflicts and human victims on both sides. The case of the valley of the Omo River in Ethiopia is another typical one. For many years, many of its local tribes have been at war because of their conflict concerning the access to the

little water of the area. In early 2006, at least 12 people were killed and more than 20 were injured in conflicts between the members of Marechen and Matzeretin groups

Asia

Middle East

The war between Israel and the Arabs is not only religious or territory. Water has always been of strategic importance during the long-lasting enmity of the countries that share the drainage basin of the Jordan River.



More specifically, the Jordan River is the only natural border among Syria, Jordan and Israel, and its springs are in South Syria; so the creation of settlements in vital areas with underground water resources is rather reasonable.

The cause of the dispute between Palestine and Israel, concerning water, seems to have been created in the middle of the 1960's. It was then when Israel decided to react to the diversion of the Jordan River that was being planned. According to military historians the Arab-Israeli Six Day War in 1967 is considered the "first big water war". Israel conducted the war based on a "hydrologic plan". It conquered territories that supply it with the 90% of its overall needs for water and it also possesses the territory with half the water resources in the area.

The water supply problem appeared again during the discussions with Syria concerning the liberation of the Golan Heights, which are the main source of drinking water in the area. The Syrian- Israeli conflict on water arose in a wider context of discussions for the departure of the Israeli troops from the area.

The situation of the relationships between Israel and Lebanon is similar. Any possible discussion concerning the departure of the forces of Tel

Aviv from the occupied zone of south Lebanon collides with the issue of the water management of the Litani River.

The water table near the Yarkon- Taninim River, which is located in the occupied Palestinian territory, has also been a constant cause of tension between Palestinian and Israeli homesteaders in the same long-suffering area.

Turkey

Apart from the Jordan River, the conflict over the waters of the Tigris River and the Euphrates River among Syria, Turkey and Iraq is also very worrying. In that “Eden Garden” the first agricultural civilizations of Asia were developed and it is also where the first wars over water began, since various conquerors used to come here for the water and the fertile land that it used to irrigate.

In 1992 the Atatürk Dam was constructed in Turkey and it is the biggest of the 22 dams that were constructed by the Turkish nation at the Tigris and the Euphrates, and the fifth biggest of its kind worldwide; it is 184 meters high and 1800 meters long. The flow of the river in the Euphrates decreased very fast. With those irrigating works, Turkey can control the flow of the two rivers and captivate Iraq and Syria in a «hydraulic» way.

Additionally, with the South-eastern Anatolia Project - GAP the water of the two rivers will be held within Turkey to a great extent.



Pict. Iisu dam in the Tigris River

Until 2025, if those three nations do not come to an agreement on the flow control of the two rivers, Turkey will reduce the water flow towards Syria by 40% and by 80% towards Iraq respectively. In that case one should take into consideration that Turkey is currently using about 80% of the water it consumes for agriculture. That will allow it to gradually double the irrigable land and expand its agricultural economy. Consequently, the aftereffects on Syria and Iraq will be immediate since 95% of the water used comes from the Tigris and the Euphrates. The problem will get worse in combination with the fact that Syria and Iraq demonstrate an increase in population by almost 3.5%.

Because of the Turkish hydropolitics¹ there has also been a concern in Cyprus. According to Christos Iakovou, Director of the Cyprus Studies Centre (Fileleftheros, 4/3/2015), the decision of the Turkish government on the construction of an undersea pipe for transferring water from Turkey to Cyprus should not be read as a decision of the Turkish Ministry of Forestry and Water Affairs, in order to solve the water problem in the occupied areas, but as a decision that forms part of the general strategic target-setting of Turkey concerning the Cyprus dispute. Ankara may call the project “the pipeline of peace”, however the cynic phrasing of the Turk Minister of Forestry and Water Affairs, which calls it “the umbilical cord” that will relate Turkey to the occupied areas, is the strategic bottom line of the Turkish project.



As far as Cyprus is concerned, the pipeline that is being designed will be able to transfer 75 cubic meters of water with the possibility to also transfer

¹ The use of water becomes a power factor for the foreign policy.

electricity. Firstly, the purpose of Ankara is to reinforce the dependency of the occupied areas both by water and electricity. In case the problem is not resolved, that will be translated into an increase of the irrigable land, on the one hand, in order to develop agriculture in the occupied areas, as well as into a cessation of the occupied areas being dependent on the electricity supplying on the part of the Republic of Cyprus. In case it is resolved, though, in the form of a two-zone federation, Turkey will try to take advantage of the water shortage of the Greek constituent state in order to become the basic supplier of water and food as well as of electricity, which will be sold at a low price, to the Greeks. In the long term, according to Cyprus, that will render the constituent Greek state exclusively dependent on Turkey.

Southeast Asia

The Mekong River springs from the area of the Tibetan Plateau, and traversing the Yunnan Province of China, it forms a small part of the boundaries between China and Myanmar, and further on it forms the boundaries between Myanmar and Laos as well as the biggest part of the boundaries between Laos and Thailand. Then, from the area of Laos it flows on through Cambodia and Vietnam, where it flows into the South China Sea. China and Laos have constructed many dams, and Thailand, at the same time, makes its water diversion. All the above deprive valuable water from Cambodia and Vietnam.

For the coordinated use of the water resources of the Mekong and the management of any possible relevant problems, a foreign commission among Laos, Thailand, Cambodia and Vietnam, called the Mekong River Commission (MRC), was created in 1995. China and Myanmar have been participating as “partners in conversations” since 1996.

India

India and Bangladesh lay claim to the Ganges River, without mutual retreats. On the contrary, the exploitation of the Indus River has led India and Pakistan to cooperation, which is not that frequent in the management of the “white gold”. The problem, however, has showed up because of the ever-increasing population of India, as Pakistan possesses the 4/5 of the river. In 1960, a treaty was signed between the two countries and it determines the division of the water of the rivers that spring from Tibet. The Indus River Treaty is a very good agreement, which is about to be terminated in 2025.

America

The **Colorado** River is the main river that flows into the southwest United States and northern Mexico. It is about 2330 km long. The river is a



valuable water source for the agricultural and the urban areas it traverses where few rainfalls exist. The river and its tributaries are controlled by big dams such as the Hoover Dam, reservoirs and aqueducts, and it provides almost 40

million people that live inside as well as outside its drainage basin with water. The river is also used for the generation of hydroelectric energy. That situation is a source of tension and long-lasting negotiations between Mexico and the USA.

The Paraná is the most important river in Argentina, the second longest in South America and one of the biggest in the world. It is formed by the confluence of two rivers, the Grande and the Parnaíba in the southeast

part of Brazil and as it flows towards the south it becomes the boundary between Brazil and Paraguay and then, between Paraguay and Argentina. It finally flows into the river-bay.



In the 60's the longest war over water took place between Brazil and Paraguay took place; it started in 1962 and ended five years later. The main cause was the waters of the Paraná, the claim of which created big war conflicts between the two countries with very adverse consequences and an obvious deterioration in the relationships of the two countries, which lasts up to nowadays.

Moreover, in 1970 the waters of the Paraná were claimed by three countries- Argentina, Brazil and Paraguay, since Argentina considered that the water management of the other two countries caused pollution in the waters of the river it exploited. That resulted in the conflict of the three countries, something particularly rare, since the in the so-far mentioned examples most incidents involve two countries.

2.5 Technical Issues, Industry, Agriculture

Food and agriculture are the largest consumers of water, requiring one hundred times more than we use for personal needs. Up to 70 % of the water we take from rivers and groundwater goes into irrigation, about 10% is used in domestic applications and the rest in industry. Total industrial water use in the world is about 22%, with high-income countries using 59%, and low-income countries using about 8%.

Agriculture

Agriculture is the process of producing food, feed, and fiber by cultivation of certain plants and the raising of domesticated animals. And it is not possible without fresh water. In European Union agriculture took about 80 % of water sources.



Dryland farming is an agricultural technique for non-irrigated cultivation of drylands.

Irrigation makes agriculture possible in areas previously unsuitable for intensive crop production. Irrigation transports water to crops to increase yield, keep crops cool under excessive heat conditions and prevent freezing. The need to irrigate is usually driven by the



necessity to meet the water needs of the crop from year to year. In other situations, irrigation is viewed as insurance against occasional drought. In areas where rainfall is plentiful in most years, irrigation can bring benefits by

reducing risk, meaning that a farmer is better able to control income fluctuation.

Rainfed agriculture is the most common method of agriculture in developing nations. Rainfed agriculture is used to describe farming practises that rely on rainfall for water. It is typical for low-income countries (Africa, Latin America, Asia). 80% of the land farmed around the world is rainfed and it "contributes about 58% to the global food basket".

Some techniques in water management for rainfed agriculture include the use of supplemental irrigation and water harvesting techniques, such as rain catchment systems and weirs or sand dams. These techniques help to provide water to areas where rainfall is inconsistent.



Aquaculture is apart of agriculture too. Raising animals and plants in the water is aquaculture. Practiced since ancient times in many parts of the world, aquaculture embraces such diverse activities as the harvesting and processing of seaweed in Iceland, ponds for growing carps in The Czech Republic, the Spanish and Greek farming of marine fish and seafood, oyster and rainbow trout farming in France etc. Romanian aquaculture is still based on the semi-

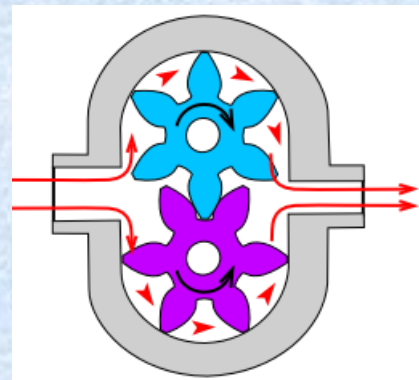


extensive culture of common carp along with the Chinese carps accounting for more than 75 percent of the total production. Bulgaria has fish farming and net cages for trouts too. Aquaculture - or fish farming - will provide close to two thirds of global food fish consumption by 2030.

In agriculture there were always used some water technical systems. The basic were the pumps. Pumps is machines for moving liquids, gases, fluids and oils by mechanical action, main powered with motors. Pumps operate by some mechanism and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, human or animal power. There are many sizes, from microscopic using in medical applications to large industrial pumps.

Gear pumps

This pump is the simplest of the rotary pumps. It consists of two meshed gears that rotate in a closely fitted casing. The tooth spaces trap fluid and force it around the outer periphery. The fluid does not travel back on the meshed part, because the teeth mesh is closed in the centre. Gear pumps are mainly use in the car engine oil pumps and hydraulics. One of the gear is powered by motor, second is not powered.



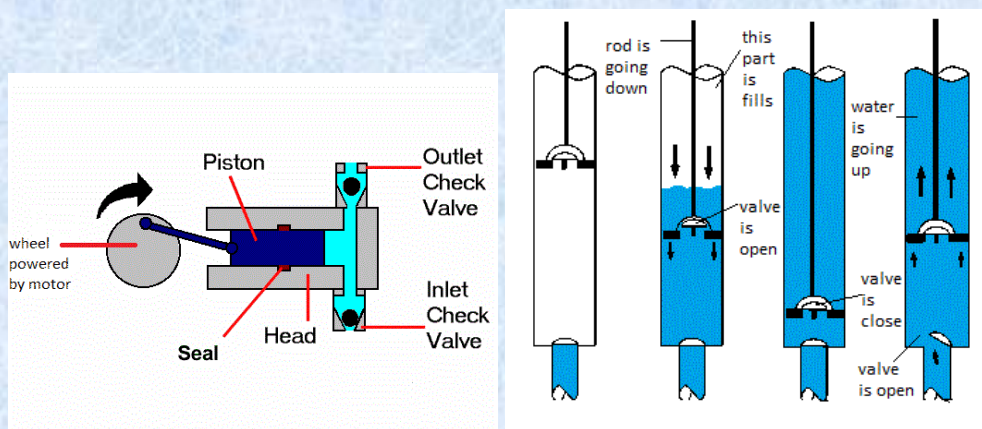
Archimedes screw

It's very simple and old pump, maybe the oldest pump ever used, invented by Archimedes. Archimedes screw is using for the transport water (sand, gravel, mud too) up the hill. This pump was used in Ancient Greece.

Reciprocating pump

Power for reciprocating pump is based on wheel or force rod powered by human hands (simple hand pump) .This type of pumps were commonly used in the Middle Ages. It is often used where a relatively small quantity of

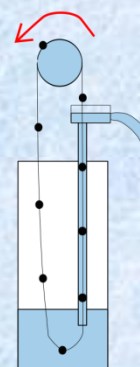
liquids to be handled and where delivery pressure is quite large. In reciprocating pumps, the chamber in which the liquid is trapped, is a stationary cylinder that contains the piston or plunger.



Peristaltic pumps are typically used to pump sterile or aggressive fluids. Some common applications include pumping fluids through an infusion device, aggressive chemicals, high solids slurries and other materials where isolation of the product from the environment is necessary. It is also used in heart-lung machines to circulate blood during a bypass surgery.

Rope pump

A rope pump is a type of pump of which the main or most visible component is a continuous piece of rope, in which the rope is integral in raising water from a well. The rope is spinning, the vessel takes load and spills water to a tank. Maybe you know this pump as a chain or washer pump. It was used by the Chinese after 1000 B.C. In the 1980s Reinder van Tijen, an inventor, created a rope pump and started to give instructions to various communities around the world how to make it from simple available parts using PVC pipes and plastic moldings. He began at Burkina Faso in Africa, continued to Tunisia, Thailand and Gambia among others. In Nicaragua, the technology was rapidly



expanded over the whole country and 25% of the rural population in Nicaragua now use rope pumps. By the end of 2009 more than 4 million people in 20 countries worldwide were using rope pumps for domestic and irrigation water.

Industry

It takes about 20 % of the water use in the world. In industrialized nations, however, industries consume more than half of the water available for human use. Belgium, for example, uses 80% of the water available for industry. The annual water volume used by industry will rise from 752 km³/year in 1995 to an estimated 1,170 km³/year in 2025.

Probably every manufactured product uses water during some part of the production process. Industrial water use includes water used for such purposes as fabricating, processing, washing, diluting, cooling, or transporting a product; incorporating water into a product; or for sanitation needs within the manufacturing facility.

Some industries that use large amounts of water produce such commodities as food, paper, chemicals, refined petroleum, or primary metals. For example for making 1 tonne of paper you need 240 000 litres of water.

Energy and water are linked too. Water generates power and it takes large amounts of energy to clean and deliver water.

Hydro-power (water) is one of the older electricity generating technologies around. Hydropower doesn't pollute the air but construction and work of the dams can affect natural water systems and also affect wildlife and fish population. A small number of countries, including Norway, Canada, Brazil, New Zealand, Paraguay, Venezuela and Switzerland, produce the majority of their electricity through hydropower. Hydroelectric power station transforms the potential energy of water to electricity. It usually consists of a dam, which collects water, and a machine room with turbines and alternators. About 16 %

of global electricity is generated by hydropower (some resources say 19 %) - is the most widely used form of renewable energy. Generating methods: conventional (dammed water), pumped-storage (moving water between two reservoirs: when the electrical demand is low, the electricity is used to pump water into the higher reservoir, and when it's higher, water flows back to the lower reservoir through a turbine, which generates electricity), run of the river, tide.

There are only three hydro stations that have capacity over 10 GW: Three Gorges Dam (China, 22,5 GW), Itaipu Dam (between Brazil and Paraguay, 14 GW) and Guri Dam (Venezuela, 10,2 GW). The fourth one, Xiluodu in China, is under construction.

Advantages are for example low power costs, flexibility, many uses of the reservoir and reduced emissions of greenhouse gases. Some hydroelectric projects are created for specific industrial enterprises, for example aluminium electrolytic plants. However, large reservoirs require a big area, so the ecosystems and seats are flooded; in tropical regions, hydro stations produce a lot of methane, which is a greenhouse gas; dam failures result in huge floods etc.



We choose as an example, Dlouhé Stráně (it means Long Hillsides). It's the most efficient hydroelectric power station in The Czech Republic. Owing to ecological aspects, majority of the station is located in underground. About 40 employees work here; the station is remotely controlled from Prague. In a cavern, which has proportions $87,5 \times 25,5 \times 50$ m, are situated two 24 m high

machines with reverse Francis turbines, which are the biggest in Europe. Beside is another room with transformers and substations. The upper reservoir is located on mountain Dlouhé Stráně 1350 meters above sea level, its capacity is 2,72 km³, its maximal depth is 26 m and its surface is 15,4 ha. The lower reservoir is situated on Divoká Desná river 825 meters above sea level, it has capacity 3,43 km³ and surface 16,3 ha. The upper reservoir is connected to the turbine cavern with two canals (one for each turbine), which are 1547 and 1499 m long and their calibre is 3,6 m. To the lower reservoir is the cavern connected with two tunnels, which are 354 and 390 m long and have calibre 5,2 m. The station was built since 1978. At the beginning of the 80s, the government decided about inhibition of the construction. In 1985, the project was modernised. They decided about completing the construction in 1989; the station started work in 1996.

A water turbine is a rotary engine that converts kinetic and potential energy of water into mechanical work. There are widely used in dams to generate electric power from water kinetic energy. We know e.g. Pelton turbine, Francis turbine and Kaplan turbine which is considered to be the most important one. Viktor Kaplan invented his turbine in our town – Brno. **A steam turbine** is powered by the energy in hot, gaseous steam and works like a cross between a wind turbine and a water turbine. It is often used in power plants to generate electricity too.



Nuclear power plants

Nuclear power plants are ones of the most sophisticated and complex energy systems ever designed. They have extremely long lifetime during which they produce massive amounts of electrical energy by transformation of the binding energy of atomic nucleuses of heavy elements. This happens due to nuclear

fission in nuclear reactors. Enriched Uranium 235 is used as a fuel for this reaction. Water steam is then used for the sole production of electrical energy.

Important parts of regular nuclear power plant

Reactor hall, cooling tower (some people think that smoke comes out of them but it is not true, only water steam comes out of the cooling towers), reactor, pressurizer, steam generator, turbine, generator of electrical energy, the transformation station, secondary circuit capacitor, the pump and of course the primary circuit, the secondary circuit and the cooling circuit.

Nuclear reactor

This is the heart of the power plant. In the nuclear reactor the nuclear fission takes place. The three major objectives of nuclear reactor are: sustain and control the fission reaction, remove heat from the fuel and the reactor itself and to ensure nuclear safety under all circumstances. Important parts of the reactor:

- The reactor vessel: This is the outer boundary of the reactor. It has the side openings for enter and exit of the coolant and for other operations.
- Active zone: The inner part of reactor vessel. Here the fission reaction takes place.
- The fuel: Those are the fuel cartridges made of fuel elements (rods). Those rods are thin tubes which can be over four meters long.
- The controlling organs: Mostly in the form of control rods made of a material strongly absorbing neutrons.
- Neutron moderator: For example water, its purpose is to regulate fission reaction.
- Cooler: Its purpose is to drain the heat from active zone and after that from the reactor itself. For this purpose the water is used.

Nuclear fission

Because of its amazing potential, this reaction can be used for production of thermal energy, which we use in power plants, or either for destructive purposes as Robert



Oppenheimer and Manhattan project showed to us, however, this is a completely different chapter. In nuclear power plants the most common fuel for reaction is enriched uranium 235 and about this reaction we will speak. The process itself is based on fission of atomic nuclei. This happens when incident neutron hits the nucleus. Fission of nucleus follows. During it the nucleus splits into several small pieces which we call fragments and two or three incident neutrons are also emitted. Incident neutrons must be slowed, not fastened, in order to increase probability of crashing with nuclei. Nuclear fission produces massive amounts of energy, much more than we can get from chemical reactions - burning, for example. However, the problem with fission is that it not produces only energy. Reaction itself emits radioactivity as do fragments of it. Radioactivity is contained by the shell of reactor but for the fragments we must build storages.

Control of fission reaction

It is not so important to begin the reaction as to control it, because otherwise the explosion could happen. For the catching of surplus neutrons the moderator and the absorbing rods are used. The rods are either inserted or pulled out of the reactor, depending on the current need.

Replacement of fuel

This happens when the reactor is stopped after 1 or 1.5 years. During it some fuel cartridges are replaced for newer ones, because their inner structure has changed. Instead of uranium 235, in these cartridges we can find nucleuses of fragments that are radioactive. Changing happens under water. Cartridges that contain used fuel must be cooled in a pool near the reactor for several years because they still produce heat. After that they are relocated into interim storage.

Nuclear accidents

Due to dependance of nuclear power plants on human factor (some say for their complexity), several accidents happened in history. Here are the most famous ones:

- Windscale: 1957, Great Britain
- Jaslovske Bohunice A - 1: 22th February 1977, Czechoslovakia
- Three Mile Island: 28th March 1979, USA
- Chernobyl: 26th April 1986, USSR
- Fukushima I: 11 March 2011, Japan

How many and where?

There are currently 437 operating nuclear reactors in 31 countries. Those reactors are producing about 11% of worldwide energy. 70 reactors are under construction in 14 countries. Construction of 183 reactors is planned. The leader in quantity of nuclear power sources are USA (100) followed by France (58), Japan (48) and Russia (33). We have two nuclear power plants in The Czech Republic, The Dukovany and The Temelin. The Czech Republic has six nuclear reactors generating about one-third of its electricity. Greece has no nuclear reactor. Bulgaria has two nuclear reactors generating about one-third of its electricity. Romania has two nuclear reactors generating almost 20 percent of its electricity. Spain has seven nuclear reactors generating

a fifth of its electricity. France derives about 75% of its electricity from nuclear energy, due to a long-standing policy based on energy security. This share is to be reduced to 50% by 2025. Nuclear energy is used to generate around 11% of the world's electricity, with almost no greenhouse gas emissions.

Many countries still cannot afford investment into nuclear energy because construction of nuclear power plant is a really expensive project (even if we do not count corruption) and requires years to complete. On the other hand, the fuel is quite cheap. Here are the largest nuclear power plants sorted by their installed capacity.

1. Kashiwazaki - Kariwa: Japan, 7965 MW
2. Bruce: Canada, 6232 MW
3. Zaporizhia: Ukraine, 6000 MW
4. Hanul: South Korea, 5881 MW
5. Hanbit: South Korea, 5875 MW
6. Gravelines: France, 5706
7. Paluel: France, 5528 MW
8. Cattenom: France, 5448 MW
9. Ōi: Japan, 4710 MW
10. Fukushima Daini: Japan, 4400 MW

Nuclear power debate

Nuclear power has immense potential, however, the question is, can we control it? Society is divided between two camps, each with a different opinion unable to coexist with the another.



For proponents, nuclear energy is a sustainable energy source that reduces carbon emissions and can increase energy security. A nuclear power plant produces virtually no air pollution. For proponents nuclear power is a key to achieve energy independence for most Western countries. Risks of nuclear waste are small and they can be further reduced. Also nuclear safety in Western countries is excellent compared to the rest of the world.

Opponents believe that nuclear power plant poses an enormous threat to its surroundings and that the nuclear energy will never be a sustainable energy source. Other threats than the power plants themselves are the uranium mining, processing and transport and health or environmental damage that come with them. Another argument is that nuclear power plants will always be viable and prioritised targets in any war conflict and of course terrorism will always be a threat to them. Problem with nuclear waste remains still unsolved too.

2.6 New sources of energy

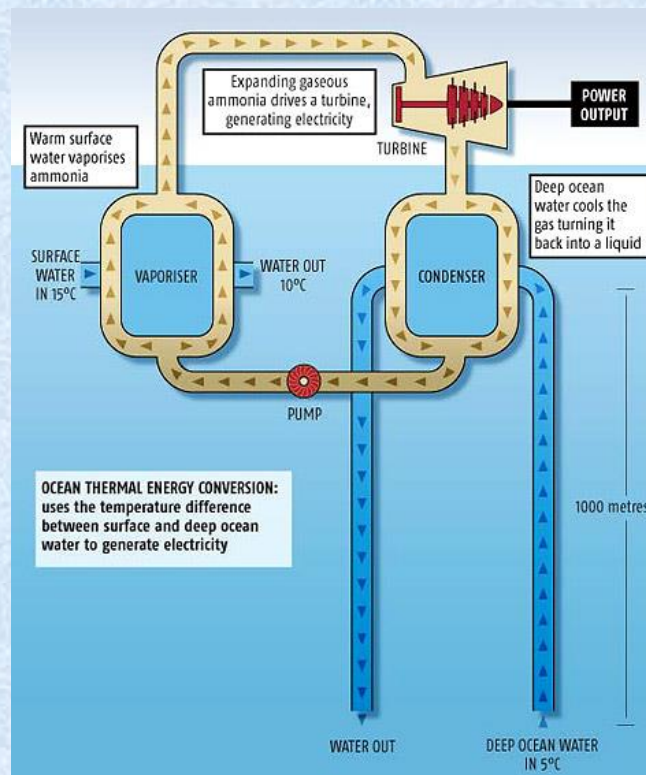
The ocean's thermal energy

Oceanic thermal energy conversion (OTEC) or marethermic energy is a so-called "green" energy. It is produced by exploiting the temperature difference between surface water and Deep Ocean. One common acronym is OTEC, for "oceanic thermal energy conversion." The European Union uses the term hydrothermal energy to mean "energy stored in the form of heat in surface waters."

Due to the area they occupy (80% of the surface of the land), the seas and oceans of the Earth behave like a gigantic solar panel for:

- solar radiation
- wind energy

Although some of this energy dissipates (current, swell, friction, etc.), much of it warms the upper layers of the ocean. Thus, at the surface, thanks to solar energy, the water temperature is high (it can exceed 25 ° C in the tropics) and in the deep, deprived of sunlight, the water is cold (around 2 to 4 ° C). Thus, this temperature difference can be exploited by a thermal machine that needs a heat sink and a heat source for energy production. And thanks to this heat engine one can utilize both water from the depths and the water surface as sources.



<http://seawayblog.blogspot.fr/2008/11/ocean-could-be-source-of-limitless.html>

Jules Verne is generally credited with the idea of using the differences in the sea temperatures to produce electricity. In his book "Twenty Thousand Leagues Under the Sea," he refers to "deep surface waters and oceans to produce electricity" – back in 1869. In the end, it was the French physicist Arsène of Arsonval who first conceptualized putting together the warm waters surface with cold water depth. But in the 1880s, the technology did not yet exist to make a prototype. It was not until 1920, with the depletion of coal reserves and the need to find new primary energy resources, that the French engineer Georges Claude (founder of the Air Liquide company) proposed to build an ETM factory or electricity generation.

Currently the countries that are the most active in researching this field are the United States and Japan. Marethermic production does not involve combustion, and therefore expels no CO₂. Its potential is great, but it is difficult to exploit and implement, and it cannot be implemented in the tropics.

Wave power

Wave energy refers to the generation of electrical energy from the waves. There are various devices that harness this energy. Many systems are currently under review; some are already on the market, but none has reached a stage of maturity.



There are four technologies to recover wave energy:

- Floaters

These consist of a floating articulated structure perpendicular to the waves. This structure consists of steel pipe or pontoons connected by joints containing hydraulic pumps that drive a turbine (power generation).

- Water columns

The sea surface acts as a piston pushing the air through a pipe. This air in turn triggers a turbine to generate electricity. This type of device can be installed at sea or on the coast.

- Breaks system

The wave breaking on an incline is collected at an elevated point, and then water rolls down the incline, drives a turbine, and returns to the sea.

- Underwater oscillating walls

These are rather small devices compared to the size of the waves. They can either vibrate when passing waves or operate a kind of hydraulic cylinder pump.

In terms of implementation, the United Kingdom is a leader in wave power and tidal technologies. They were the first country in the world to launch the marine power generation projects on a commercial scale.

Hydroelectric Energy

Turbines convert the kinetic energy of ocean currents and tidal currents into electricity, just like wind gusts in wind power production. These currents tend to be predictable and strong. Water is around 830 times denser than air, so although these are significantly smaller than wind turbines, they allow comparable production.



The composition of a tidal turbine can differ according to the company that makes it, but in general it consists of:

-A turbine that uses the force of the water to catalyze its rotation, which converts the force into mechanical energy to drive a generator.

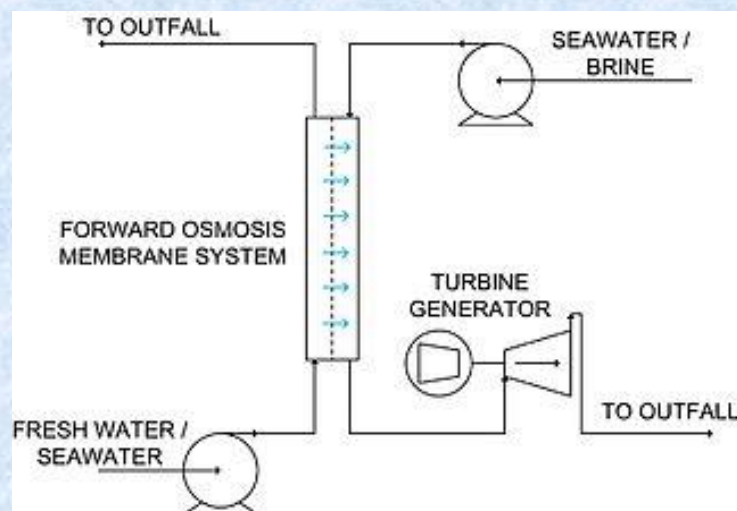
- A generator that converts mechanical energy into electrical energy.
- A float which allows an exchange of more or less water. The height of water trapped in it should be up to the surface waves.
- A stabilizer which allows a rotation of the blades to agree with the current direction.
- A pole or an anchor that moors the turbine to the ground.

Several British and French companies specialize in this field, but tidal technology is still experimental. The investment costs are high relative to the purchase price of electricity, which remains low. This important parameter has deterred investors.

The most advanced projects so far are by Raz Blanchard in Britain and Scotland, and by Fromveur Passage in France.

Osmotic power

Osmotic power refers to the process of using reverse osmosis in order to generate electricity. By definition, osmosis is the diffusion of material when solvent molecules pass through a semi-permeable membrane separating two different solutions.



Therefore, osmotic energy is energy that can be obtained in the vicinity of estuaries (where the fresh river water mixes with salt water from the sea), exploiting the osmosis that occurs where a semipermeable membrane separates two fluids of different salinities.

In principle, this operation is performed in two different ways.

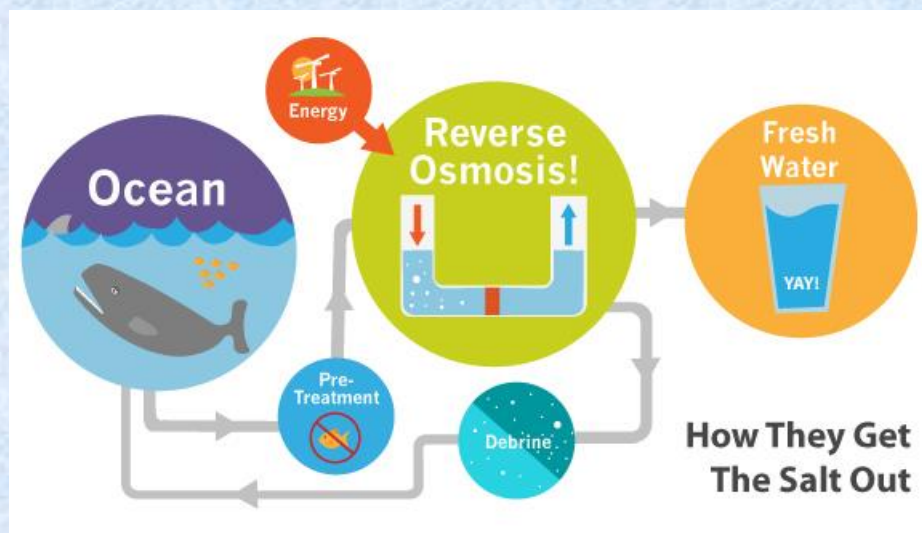
First, if the mass of salt water is greater than that of the fresh water, fresh water becomes briny as the pressure difference strives to remain within its limits (limit theoretical with sea water: 2.7 MPa, 27 bar). The pressure thus created can be used to drive a turbine.

Another possibility is the use of membranes, through which pass one type of ion (positive or negative) and directly produce electricity. In principle, the impact on the environment is null, since the mixing happens naturally.

Countries such as Norway, Korea, the USA, Japan, and the Netherlands are interested in clean energy and especially osmotic power.

Desalination of seawater

Desalination is a process that provides fresh, potable water from brackish, non-potable sea water.



<http://www.thoughtyoumayask.com/picsbtqq/desalination-of-seawater-for-drinking>

Very generally, it is easier and cheaper to find and treat sources of fresh water (surface water such as lakes and rivers or groundwater) than to desalinate sea water. However, in many regions, freshwater sources are unavailable or have become insufficient to support population growth and industrial development.

On the other hand, it is often cost effective to combine the production of fresh water with another activity (such as energy production, as the steam available at the output of the turbines, which is lost in a conventional plant, is reusable in a desalination plant).

Desalination of sea water is an important issue for the future of arid regions. For a production cost as low as about 50 cents per cubic meter in recent estimates, it is possible to solve the problem of a lack of drinking water in many countries.

In Europe, the largest desalination plant is located in Spain - Prat del Llobregat, near Barcelona. It opened in August 2009. It produces 60 million cubic meters of potable water per year. It supplies about 4.5 million people with drinking water. In the case of use for human consumption, the desalination of sea water is today as reliable and inexpensive as recycling wastewater. It even becomes profitable developed countries that have enough water, and in certain situations (eg tourist islands). Therefore, the use of this technique is growing rapidly.

Recovering dew

Dew is the result of atmospheric water condensation into liquid droplets. The phenomenon occurs at night on cold walls and without any energy input.



The potential for condensation depends on local climate and weather. The yields are highly variable. They depend on the state of the air, what the condenser is made out of, and its maximum water recovery ability. Condensers are inclined planes covered with a special film; they collect dew and transport it to a reservoir. It is also possible to use trenches covered with thermal insulation, or the sloping roof of a house. To cause condensation, it is sufficient to cool an area only a few degrees; naturally-cooling coatings have been used.

Dew harvesting is done by equipping surfaces on the ground or on the roof to collect the water droplets formed during the night. The reclaimed water is fit for human consumption.

Such systems have been set up in desert regions where fresh water is most lacking and where it is essential, though production is modest. Devices have been installed in several parts of India, Croatia, Burkina Faso, Morocco, and Israel.

Many hot countries suffer from a complete absence of water. However, the humidity of the air in the atmosphere is sometimes considerable. In these desert regions, the only way to have a little water is by recovering dew from the water vapor. Yields are relatively low, but this water vapor is present everywhere, so it is theoretically possible to have access to this resource over most of the globe.

The populations most impacted by this process are people living in desert areas where rainfall is low or nonexistent.

Smart irrigation

Agriculture is responsible for 70% of water consumption around the world. Reducing the "water footprint" of agriculture is the goal of smart irrigation technology, which automatically brings plants the water and fertilizer they need at the right time.

Smart irrigation limits water consumption. To do this, sensors are implanted in the soil to determine the moisture content. When the soil becomes too dry, an automatic sprinkler system is triggered; when the desired humidity level is reached, watering stops.



Automatic watering was designed to regulate and adjust watering a garden, a plot, or a vegetable garden throughout different times of day and of the year to supply the soil with a sufficient quantity of water. This relies on several devices. The source of supply is the starting point of the irrigation system. Water is supplied by semi-rigid pipes. The choice of sprinklers is based on plant surfaces and irrigation needs. Actuators regulate the distribution of water; they are connected to the controller, which initiates and regulates the watering period. A humidity sensor or electronic rain gauge complete the installation. The first reports on the state of the soil and adjusts accordingly,

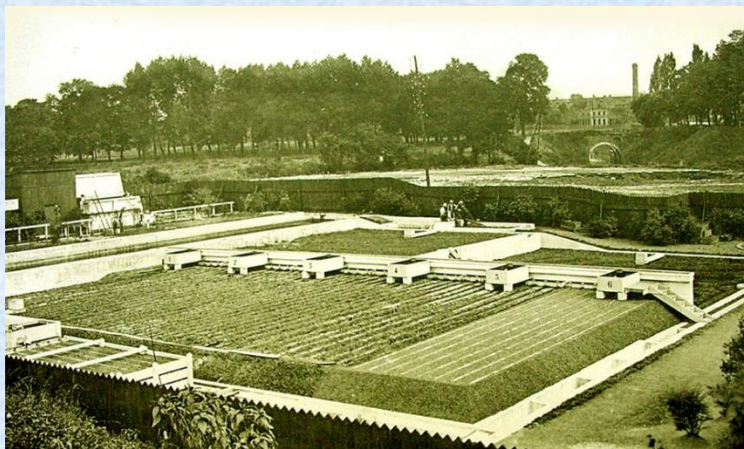
the second interrupts watering when it starts to rain. The entire system can be controlled via a computer or a smartphone.

In Africa, there has been great investment in research to find new technologies for computerized irrigation. Egypt reported that water resource management results in better crop yields. In Tanzania, water use is optimized as it moves through irrigation canals is improved.

Currently under development in Abu Dhabi is a project comparing their current water needs with the water needs met by traditional irrigation systems, and with those met by smart irrigation. The overall objective is to develop sustainable agricultural practices.

“Lagooning”

The lagoon is a water treatment system that uses the natural environmental mechanisms, such as various microbial communities, to purify water.



Purification in stabilization ponds is based on the presence of aerobic bacteria-free cultures and algae. The oxygen required for the bacteria to breathe is produced by plants supported by radiant light.

The lagoon is a slow flow of water in shallow, waterproof basins, in which bacteria breed and natural organisms consume organic matter. The number of pathogens in the water is significantly reduced.

To this extent, the basins are sealed by the introduction of a synthetic geomembrane, or more rarely, by compacted clay.

These waters pass through three successive pools, each about one meter deep. In the first pool, the bacteria consume oxygen and produce CO₂. Heavy particles accumulate on the bottom of the pond in the form of sludge, which after 10 years can be applied to agricultural land.

In the second basin, wastewater is permeated by nutrient salts, sun, and CO₂. Phytoplankton grow and produce oxygen, eliminating harmful bacteria.

Zooplankton develop in the third basin and feed on the phytoplankton produced in the second pool, consuming oxygen. Water clarification can be provided by the introduction of crustaceans to the lagoon.

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