

LAND, WATER AND DEVELOPMENT

This essay is going to speak about the module Land, water and development but particularly emphasising a practical case, as it is Spain in the context of the water world crisis.

As we can see in the title of the module we are going to tell about land and water. This liquid is necessary for living creatures, without it our planet would not have life. For us it is very important, constitutes the 70% of our body and we utilize it every day, during all our life. In spite of that we can live with only 5 litres or less than water to the day, generally we need a great deal more water to conserve us healthy, some 50 litres or more to satisfy the personal and the home needs. But in the developed countries, more water is spent: an average from 400 to 500 litres per person daily, quantities that in many occasions is not exaggerated to qualify them like a luxury that turns out to be expensive for us.

Though all the living creatures depend on the water, some need it more than other. In rivers, lakes and wetlands exist a great alive diversity of creatures that only are able to find where the water abounds. The water is not only important for wild life and the domestic consumption. The industry, the agriculture, the production of energy and other many activities need water. Our planet is rich in it, three quarters of its surface are covers by this liquid, but the majority of the living creatures included the humans need sweet water and this is scarcer. It represents only the 1% of the water of our planet; the remainder is salted (96%) or is frozen (3%). Besides, the sweet water is not distributed equally, there are zones where is very abundant and other where is a well extremely scarce one. In our zone, as in all the Mediterranean area, the sweet availability of water is limited.

It is true that the humanity by different motives, since the own natural to the social ones, has certain rights upon the water. However, this should not wander our attention facing the crimes that are occurring in the nature sponsored by different sectors. The way, which should be followed by the governors in these themes, is the search of equilibrium among the development of the different activities and a management more adequate of the natural resources.

This coursework is going to speak about the water crisis that exists along the world, well in the developed world as in the developing world. Maybe there are a lot of differences between those two worlds (especially if we speak in economics terms) but the risks for the nature are more or less the same in both of them. However, the fight against those problems has to come from the developed countries because they are the ones who have more resources. We have to keep in mind that developing countries may have other priorities due to their economic problems. But it is job of the developed countries to warn to that other countries about the dangers for the nature of one extreme economic development because they have already suffered the consequences of that during the XX century.

The three keywords for the world water crisis are: dams, ecosystem protections and irrigation. Those problems are well know in Spain that suffers them many years ago and it seems that the situation is not going to be much better. One of the laws affects directly to the water is the national hydrologic plan (Plan Hidrológico Nacional). But we are going to mention it later. Now we will speak about the situation of dams, ecosystem protections and irrigation.

DAMS

Spain has an old tradition in construction of dams. Even today there are two First Century Roman dams in use (Cornalbo and Proserpina). But even with this tradition, the main period of construction really took place in the 1950's and 1960's, during which time the total storage capacity of Spanish dams rose from 6,000 to 37,000Hm³. Nowadays there are 133 dams (including lateral dykes) with a total storage capacity of about

54–56,000Hm³. Not only were more dams built during this twenty year period, but their water storage capacity also increased simultaneously. Today, 98% of the total capacity is stored within the 300 dams whose individual capacity is larger than 10Hm³.

However, dam building has also some problems. First of all, dams are big infrastructures and their construction has some risks. But here we are going to speak about environmental troubles with dams. Dam construction produces, inevitably, some environmental impacts of a very varied nature, some of a temporary character: excavations, noises, dusts, residues, etc. and others of permanent character such as the flooding of the reservoir, the barrier effect for certain species and, definitively, a variation of the flow regime of the river which produces several variations of the ecosystems .

The construction of a dam has effects in the community of fish through the changes that are produced in the habitat (splits abiotic) and in the remainder of communities (splits biotic of the ecosystem). At any rate, the main causes of disappearance of the native fish in the reservoirs are: the lack of oxygen and inadequate temperature, the decrease of the diversity of habitats, the loss of places of put and the disappearance of refuge against the depredators.

The alteration of the regime of flow which produces any exploitation of the waters and the environmental effects which it involves should be limited by way of the establishment of minimum volumes of flow and reserving storage in the reservoirs for this purpose.

The Hydrological Plans of the basin, actually in force in Spain, fix in the majority of the cases minimum flows, which usually is about the 10% of the mean annual inflow. Furthermore, in all of them the necessity is raised of carrying out specific studies on stretches of river in order to determine exactly these minimum flows.

ECOSYSTEM PROTECTIONS

This theme is quite complicated because always the Spanish ecosystems have suffered important attacks, and also the most important ones like Lagunas de Ruidera Tablas de Daimiel, but they are only a couple of examples.

Nowadays, like I said before, some important ecosystem are in danger because of the Plan Hidrológico Nacional that plans to construct some hydrologic works like dams, diversions, etc. If this plans are approved by the politicians some of the last ecosystems from pyrenees will disappeared forever. Like an example we will give the Tablas de Daimiel case:

Tablas de Daimiel

The Tablas de Daimiel are one of the most peculiar geographical accidents in the landscape of La Mancha, southern Spain. The geomorphological and hydrological conditions that come together in the High Basin of the River Guadiana give rise to a network of small lakes and areas flooded by the overflowing of the Rivers Guadiana, Gigüela, Riansares and Záncara. The resulting wetland area is included in Category A – exceptional interest – in the Catalogue of important wetland areas in Europe, as a habitat for the conservation of European and North African aquatic birds.

However, this zone was changed from dry farms to irrigation ones. The expansion of irrigated land on the plains of La Mancha was made possible by the use of groundwater and the building of wells and infrastructure by farmers, on an individual basis. The use of water from the Western La Mancha Aquifer 'nº 23', with an area of 5,000 km² in the centre of La Mancha, was particularly significant. Until the middle of the 1970s the aquifer could be regarded as being in surplus. Between 1980 and 1987 the rhythm of drillings and extractions accelerated, influenced by several factors:

- The good returns from irrigated land compared to dry land increased the number of farms switching to irrigated cropping;
- Public subsidies were available for irrigation machinery and infrastructure;
- A new Water Act had been proposed (eventually passed in 1985) which would limit the number of wells in the area;
- There was a view locally that the water should be exploited before supplies dried up.

But finally the exploitation was excessive and the water which was the base of all the ecosystems started to be scarce. The government tried to stop this dynamic but it was too late and the small lakes system started to disappear. After this situation now there are different plans to try to restore the old ecosystem.

IRRIGATION

The titled report general Evaluation of the sweet resources of water of the world published on 1997 by several organizations of the ONU indicates that among 1900 and 1995 the extraction of water in the world has multiplied more than six times and has surpassed the double of the rate of growth of the population. The 70% of the water extracted is dedicated to irrigation and this use was increased in a 60% since 1960. At present 460 million persons live in countries where register strong pressures upon water resources and is esteemed that for the year 2025 two thirds of the world population can be faced to the shortage.

With all the shortage of water is, obviously, a relative concept. The precise quantity of water to obtain some specific variable services, in function of the efficiency with which be utilized. For example, in the paper paste production is utilized now less water than in the past, showing that the technological changes open a margin for the efficiency, although this does not be used to being free.

The overall environmental sustainability, and precise environmental impact of irrigation depend on local water availability and other water uses, on the historical background of how irrigation systems have developed and on the particular characteristics of the irrigation practices used. There is a wide variety of types of irrigation in use in Europe, which have been practised for very different lengths of time in varying climatic and economic circumstances. Thus it is to be expected that the environmental impacts will also be highly variable by country and by region. Spain is not a exception, irrigation areas have been very important along history in the country. We can find some roman files saying the importance of this resource.

However, it was since the second part of XX century when irrigation in Spain started a new dynamics. After Spanish civil war, the country was plunged in the poverty and the international, economic,...isolation in what the country was, did not help to recover the situation. But since fifty's Franco's government started a new politic epoch with border's opening. A couple of deals were signed with USA, Spain joined United Nations, population started to grow up quickly, With this situation, Franco decided that Spain needed a bigger supply of energy for the industry and more water to grow crops. So the first consequence was that many dams were built in this period of time. It is very famous Franco's view inaugurating a new dam. At the same time, the irrigation area in Spain increased. In those days, experts did not think about the consequences of damming rivers, increase irrigation area, etc Apart of the dams, there was another method for get water, exploitation of aquifers.

The main types of environmental impact from irrigation in Spain are:

- Pollution of water and aquatic ecosystems from nutrients and pesticides due to the agricultural

intensification that is facilitated by irrigation, sometimes exacerbated by increased use of agro-chemicals when crops are grown in conditions not otherwise well suited to their cultivation.

- Damage by abstraction of irrigation water. When water is withdrawn from groundwater tables or from rivers, lakes or springs for use in irrigation, the reduction in the quantity of water which remains can have detrimental effects upon the physical and chemical characteristics of these sources and upon the biodiversity associated with them. Aquatic and wetland species may suffer as a result of the drying out of wetlands, or lowered flow and increased temperature in rivers, as a result of abstraction for irrigation.

Groundwater abstractions, if they exceed the natural recharge rates of the aquifers concerned, can lower water tables and thereby reduce flows into wetlands and rivers. Surface water abstractions from rivers or springs can reduce the volume and increase the variability of flow rates (ie leading to more marked 'peaks' and 'troughs' with reduced ability to buffer seasonal changes in water supplies). This can increase flooding risks and threaten wildlife due to drying-out, water temperature rises or reduced dilution of potentially harmful contaminants. The seasonality of irrigation water demand, which is usually highest in the summer months, coincides with the period when water flow in rivers tends also to be lowest. The resulting effects can be to disrupt aquatic and wetland ecosystems and to threaten the survival of rare species. In the case of peatland fens and bogs, dessication can lead to peat fires which can wipe out large areas of habitat, irreversibly.

- Another potentially significant negative impact is where irrigation displaces formerly high natural value ecosystem, such as the dryland steppe agriculture of the central Spanish plateau.
- Salinisation of water (aquifers near the sea) and land. This processes can be caused by a high aquifer exploitation commonly for irrigation.

In overview, the impacts of irrigated agriculture in Spain vary at regional level. Negative impacts upon biodiversity are found in regions with wetlands: Andalucía, Aragon, Castilla La Mancha, Castilla y León, Cataluña and Murcia; and in regions where irrigated farms are adjacent to wetlands. The most common impact is where the irrigation of former dryland areas threatens valuable dryland species. In the case of Castilla y León and Aragón there are significant negative effects upon pseudosteppe bird life. The trends are increasing or stable in each affected region, but mainly increasing overall. Impacts of irrigation upon water pollution, groundwater exhaustion, salinisation and erosion principally affect Andalucía, Murcia, the Balearic Islands, C. Valenciana and the Canaries.

The most common impacts here are eutrophication of water by nutrients, lowered groundwater tables, salinisation by marine intrusion and reduced water flow in rivers. These trends are also increasing. However, in the regions of Asturias, Cantabria, Galicia and País Vasco there are no important negative impacts because of the relative insignificance of irrigation here.

Plan Hidrológico Nacional

Plan Hidrológico Nacional in english National Hydrologic Plan, is a law which pretends to solve definitely water problems that urge on Spain because of its variable climate. We have to keep in mind that not only a kind of climate appears in this country, so depending of what is affecting this zone during a certain period of time, water can be a luxurious element.

Basically the law is based in the thought that in Spain there are some catchments in credit and there are others in deficit. So to try to balance this difference they want to construct dams and channels to transport water from the catchments in credit to the ones in deficit. However, if we see which are the areas in deficit we will notice that they are the ones where the irrigation is more developed.

Water experts in Spain try to convince the politicians that this is not the best solution for water problems. If those regions which are in deficit have a better water management will not be so in deficit as they are. One of the problems is that the irrigation techniques have become old and their efficiency is not as good as it should.

On the other hand, one thesis has calculated that the modernization of water management (not only of irrigation techniques) will earn 30 % of flows, the same quantity of water that will be supply with damming the pyrenees. So keeping in mind these numbers, we don't have to be very clever to see that the best option is the second one, since this one don't suppose any big construction and the environmental damages are considerable less important than if we build some dams. Alternatively we will not mention other problems like economics, social, etc because we have not enough space.

Summary

As a summary say that the main characteristics of the world water crisis appeared in Spain, but the worst thing is that it does not seem that the situation will change because of the politic power that do not accept the new thoughts about water management.

References:

- Baldock, D et al. 2000. *The environmental impacts of irrigation in the European Union*. London. Institute for European Environmental Policy.
- Garcia, E. *Dams in Spain*. A report for World Commission on Dams
- Kroll, A. 2000. *Agricultural water use and sectoral policies in Mediterranean countries*. Sevilla. Institute for prospective technological studies.
- Espinoza, L.E. *Los ríos ibéricos internacionales*. Departamento de Economia e Historia economica. Universidad de Salamanca.
- Arrojo, P. *PLAN HIDROLÓGICO NACIONAL: DEL DESGOBIERNO A LA INSOSTENIBILIDAD*. Departamento de analisis economico. Universidad de Zaragoza.
- Arrojo, P. Análisis del documento de Evaluación Ambiental Estratégica del PHN presentado por el Gobierno Español a la Comisión Europea. Departamento de analisis economico. Universidad de Zaragoza.
- Ibanez Marti, C. *Impacto ambiental de los travases: el caso del Ebro*. Deltebre. SEO/BirdLife.
- Albiac, J; Tapia, J. 2000. *La gestion de la demanda del agua frente a la politica de oferta del trasvase del Ebro*. Documento de trabajo 01 / 2.
- Gomez Orea, D. *Reflexiones entorno al Plan Hidrologico Nacional desde el territorio y medio ambiente*. Universidad Politecnica de Madrid.
- Mairal Buil, G. *El Plan Hidrologico Nacional*. Escuela de Antropologia Social. Universidad de Zaragoza.
- Berga, L. *Benefits and concerns about dams in Spain*. Spanish National Committee on Large Dams SPANCOLD.
- Newson, M. 2000. *Science and sustainability: addressing the world water crisis*. Progress in environmental science.