



# The Real Cost of the transfers

*Analysis and socio-economic assessment of the Ebro transfers included in the Spanish National Hydrological Plan (SNHP). Summary*



## **The Real Cost of the Transfers**

Analysis and socio-economic assessment of the Ebro transfers included in the Spanish National Hydrological Plan, SNHP (Summary)

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## Introduction

**T**he Spanish National Hydrological Plan (SNHP) was passed into law by the Spanish Parliament in July 2001. It consists of two main parts: a new water transfer of 1,050 cubic hectometres per year from the basin of the river Ebro to other river basins in the north, south-east, and south of Spain, as well as a block of 889 public water works affecting all the Spanish river basins which is listed in Appendix 2 of the Law. These two components are being developed in a substantially different way by the Spanish government. One example is that, while a Strategic Environmental Assessment (SEA) was carried out on the Ebro basin in January 2002, an assessment of the totality of the projects in Appendix 2 has not been developed yet. WWF is campaigning against various aspects of the SNHP as we believe it is neither viable nor sustainable in its present design.

The chief objective of the SNHP is the transfer of water from the Ebro Basin to four other river basins in the east of Spain. This project is split into two large transfer projects from the Lower Ebro: the Northern Transfer, which would involve transferring 189 hm<sup>3</sup> to the metropolitan area of Barcelona for urban uses; and the Southern Transfer, which proposes to transfer 861 hm<sup>3</sup> to the Levante region and south-east Spain. Almost 70% of this transfer would be used for agricultural purposes, with 30% being for urban uses.

These water transfers would lead to serious impacts for the river Ebro, including the complete disappearance of the Ebro Delta (designated as a Natura 2000 zone and Ramsar site, it is the third most important wetland in Spain with a significant importance at a European level), as indicated in a recent report of the Ramsar Convention on Wetlands<sup>1</sup> and other studies<sup>2</sup>. New dams will also need to be constructed in the High Pyrenees mountains to regulate the water flow of the Ebro which will lead to serious environmental and social impacts.

The SNHP uses various economic arguments in support of a water management based on

supply, via the construction of reservoirs and water transfers. It quickly rules out other alternatives such as demand management or water conservation, leaving them in the shade. One clear example of this is the Ebro Transfer, the economic inefficiency of which has been demonstrated by WWF in this socio-economic study.

This document summarises the results of a study<sup>3</sup> carried out by the University of Zaragoza for WWF, and shows the mistakes in the economic calculations with which the Spanish government tries to justify the feasibility of the Ebro transfer. It also indicates the existence of more economical alternatives. This document is split into the following sections:

1. Evaluation of regional imbalances.
2. Cost-benefit Analysis, contrasted with the analysis of the Spanish government.
3. Alternatives, based on a coherent strategy towards a Sustainable Development.

## 1. The SNHP policy of water transfers increases regional imbalances

WWF asserts that the Ebro transfer will have a negative effect on the areas supplying the water, which already have a much lower socio-economic level than the areas which would receive the water. This is contrary to the government's figures. The Spanish government's analysis hides this reality under three basic errors:

- It does not take into account the river basin perspective (ignoring Aragon and other autonomous communities in the analysis),
- It offers superficial data for the autonomous communities rather than looking more closely at a local level,
- It uses misleading socio-economic indicators.

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<sup>1</sup> Complete report: [http://ramsar.org/ram\\_rpt\\_43s.htm](http://ramsar.org/ram_rpt_43s.htm); English summary: [http://ramsar.org/ram\\_rpt\\_43e\\_summ.htm](http://ramsar.org/ram_rpt_43e_summ.htm)

<sup>2</sup> Arrojo Agudo, Pedro: "Discussing the SNHP". Bakeaz-Foundation for a New Water Culture. Bilbao. 2001. Specifically about the Delta: Ibañez, Carles ; Prat, Narcis ; Canicio, Antoni and Curcó, Antoni: "The Ebro Delta, a threatened system". Bakeaz-Coagret. 1999.

<sup>3</sup> The complete study, 130 pages, available in Spanish at [www.wwf.es](http://www.wwf.es)

In this way, the government considers Catalonia (including the Lower Ebro and its delta, which will experience a reduction in water flow) to be the only region negatively affected by the plan, but also states that the socio-economic level of this region is higher than that of the regions which will receive the transfer. However, as indicated in the hydraulic systems chapter of the SNHP, the flow regulation of the Ebro will be carried out all along the river basin, and especially with the six new dams proposed in the Aragonese Pyrenees. Therefore, it is necessary to explain that Aragon is a much poorer region than the Spanish Levante (south-east coast).

The government also takes the Autonomous Communities as their regional reference and avoids analysing the imbalances within each Community. A more rigorous study shows that the Lower Ebro area is one of the poorest parts of Catalonia while the Levante coastline – the area to receive the water – is much wealthier than other parts of the Valencia, Alicante, Murcia and Almeria regions. The government's analysis loses its credibility once we look at these details.

Hence, the regions which will suffer a negative impact will be the Central Pyrenees in Aragon and the Lower Ebro in the south of Catalonia, the areas which will lose the water. The areas which will benefit from receiving the transfer will be the metropolitan area of Barcelona and the coastal

areas of Valencia, Murcia, Almeria and the Murcia-Alicante plateau.

The government's own choice of indicators offers a false picture of the affected regions. The Available Family Income – used by the government to demonstrate the “wealth” of the Ebro region – does not take into account population questions or the high percentage (32%) of black economy employment which occurs in Murcia and Almeria. The real picture of the regions giving the water can be seen by their depopulation (4 – 9 inhab/km<sup>2</sup> in the Aragon Pyrenees) and poor industrial development, as can be seen in the amount of owned vehicles, for example.

On the other hand, the areas to receive the transfer have a prosperous economy and a population density which ranges from 140 inhab/km<sup>2</sup> on the Murcian coastline to 570 inhab/km<sup>2</sup> in the Valencia region, as well as levels of consumption and growth far above the national average.

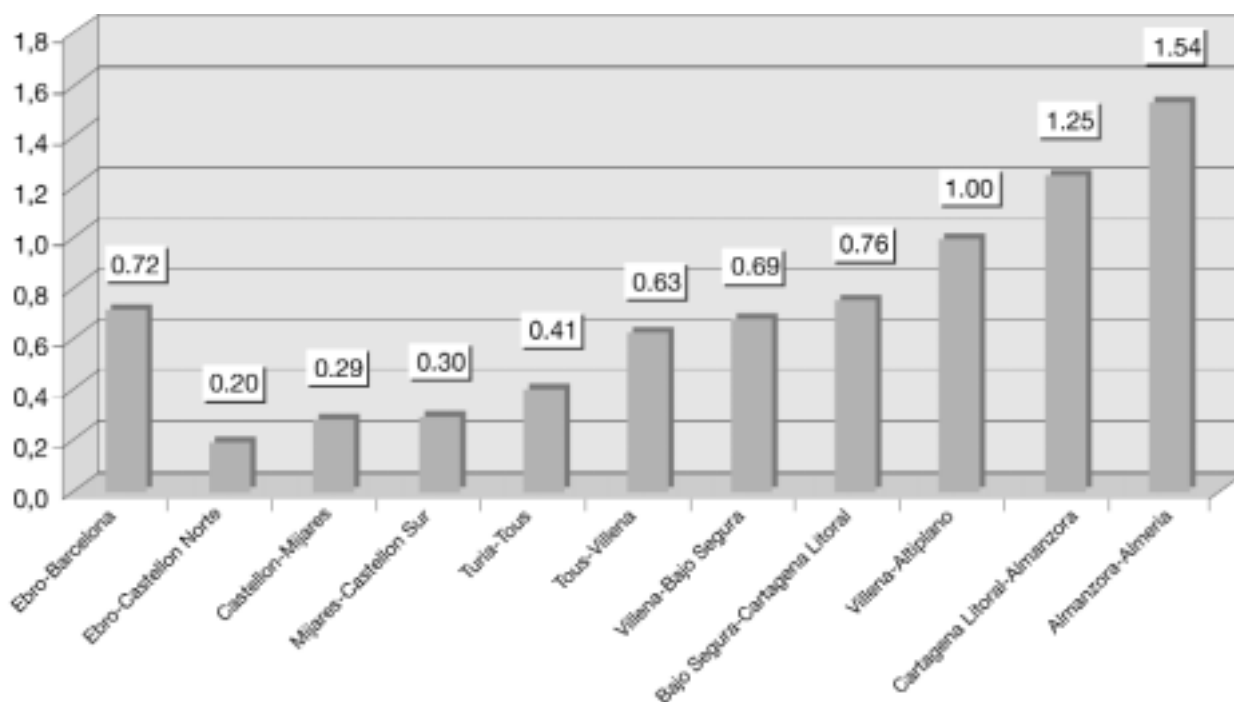
## 2. Cost-Benefit Analysis

### 2.1 Costs

The present study sets the final cost for the average price of water at 0.7384 €/m<sup>3</sup> as explained in Table I<sup>4</sup>. *(text on next page)*



Map of the Ebro transfers included in the SNHP.



Graph 1: Water costs (€/m³) per transfer sections Barcelona-Ebro-Jucar-Segura-Almeria.

This price would rise to 0.84€ if probable budgetary deviations were taken into account.

The government has made the following mistakes and imprecise estimates in its cost analysis:

- Lack of rigour in budgeting:
- Costs due to climate change.
- Economic evaluation of the energy costs.

- Costs due to poor quality of the transferred water.
- Increase in unit costs due to losses in transport and progressive increases in demand.
- Section costs.

We will now analyse these questions in more detail.

Costs	Increase in price / m³
Cost calculated by the government	0.31€
Investments not budgeted for	0.02€
Evaluation of energy costs	0.025€
Amortisation adjustment (6%)	0.0213€
Costs due to climate change (29%)	0.1091€
Errors due to urban demands (26%)	0.123€
Costs due to transport losses (8%)	0.05€
Cost of treatment	0.08€
<b>Final price of the water</b>	<b>0.7384€</b>

Table I. Average costs of the water cubic meter, according to this study

<sup>4</sup>Some increases are basic and should be accounted for as a quantity which affects the basic m³: regulation costs, energy costs. Other increases are proportional to the quantity of water and should be accounted for as a % of the base cost: readjustment of the amortisation and loss of flow due to climate change, losses in transport and progressive demand increases. Finally, the cost increase for urban water because of quality problems, is added in absolute terms (if it is treated before transferring, it should be included in the base costs)

## Lack of rigour in budgeting

The Spanish government does not take into account the costs of the building works which will be necessary for the regulation (dams) and the network to distribute water from the central origin of the transfers to the demand areas. The building works would cause the average cost to increase by at least 0.02€/m<sup>3</sup>. An estimate of the cost increase due to distribution (both for amortisation of the infrastructures and for management) is more difficult to obtain as the exact activities to be carried out are not known. However, we can be sure that these costs will not be less than 0.03€/m<sup>3</sup>.

With regards to adjusting the amortisation periods, the government simplifies matters, taking a period of 50 years for all the investments included in the Ebro transfer at a total cost of 3,256,120,481€. This technique, especially for many of the lesser works which could normally be amortised over 20 years, lengthens the amortisation period and reduces, apparently, the price of the water.

However, a deeper analysis of the amortisation periods for different kinds of works offer the following difference between those amortised over 20 years and those over 50:

- Total investments amortised over 50 years: 2,538,120,481 €
- Total investments amortised over 20 years: 718,000,000 €

This variation in amortisation periods leads to an increase in unit cost of 6% per cubic metre.

As for the budgetary estimates, the SNHP does not foresee any budgetary deviations in the development of the works. However, in August 2002, the government itself admitted a cost increase of about 15% for the transfer. A more detailed analysis of the experience of development of large hydraulic works in Spain over recent decades concludes that a budgetary deviation of at least 30% would be more realistic. This would cause the unit cost to increase by about 20% per m<sup>3</sup>.

## Costs due to climate change

The government's socio-economic study fails to evaluate correctly the effects of the climate change

on the guarantee of transferable water from the Lower Ebro. The government's own prediction for this climate change (-10%), when applied to the flow of the Ebro in the Delta between 1945 and 1995, would lead to failures of this guarantee in 40% of the years.

These problems of supply guarantee will worsen as the effects of the climate change increase, leading to an increase in unit cost of 29%, as the repayments must be based on lower and lower volumes of transferred water.

## Energy costs

The government's calculations of the energy costs confuse a financial analysis with an economic one. They give a value of 0.07€/kWh for energy produced, and 0.03€/kWh for energy used (as they do not discount public subsidies). However, only one value, that of the opportunity cost, should be used for both production and consumption of energy. The unit cost per cubic metre increases by 8% if we correct this error.

## Costs due to poor water quality

At present, the average salinity of the Lower Ebro's water is 1,029 µS/cm, which is above the recommended maximum limits of the European Union for drinking water and agricultural uses (1,000 µS/cm). Furthermore, the government has recently admitted<sup>5</sup> that the new irrigation in the Ebro Valley, proposed in the SNHP, would raise this conductivity to 1,400 µS/cm.

The cost of reducing this salinity in the water destined for urban uses (47% of the transfer) would be 0.18€/m<sup>3</sup>, which would lead to an increase in the average global cost per cubic metre of 0.08 €/m<sup>3</sup>.

## Increase in costs due to progressive increase in demands and transport losses.

The urban-industrial demands of the plan are severely overestimated. Besides this, these demands should be taken as a progressive growth, but the government assumes that the demands predicted for the next 20 years will be supplied from the very first moment.

The government's analysis fails to consider losses (leaks and evaporation) in the transport of

<sup>5</sup> In Appendix C-19 (page112) of "Answers and comments to the observations of the Environment Directorate General of the European Commission (23 May 2002)", sent by the government to the European Commission on 23 July 2002.

the water for over 1,000 km. Correcting these errors raises the average unit cost by 33% as the investments are amortised on the basis of a much lower volume of transferred water than that used by the government.

### 2.1.1 Cost of the water depending on transfer distance

The SNHP includes two large water transfers from the Lower Ebro: the Northern Transfer, which plans to transfer 189 hm<sup>3</sup> to the metropolitan area of Barcelona for urban uses; and the Southern Transfer, which plans to transfer 861 hm<sup>3</sup>. This transfer is composed of 315 hm<sup>3</sup> for the Jucar Basin, 436 hm<sup>3</sup> for the Segura Basin, and 110 hm<sup>3</sup> for Almeria.

Although both projects share the same source, the Lower Ebro, they are completely independent. Nevertheless, the Spanish government presents them as if they were a single project. This is an attempt to disguise the economic irrationality of the Southern Transfer by mixing it with the urban-industrial uses of the Northern Transfer to Barcelona which offers a more acceptable, though still negative, economic balance.

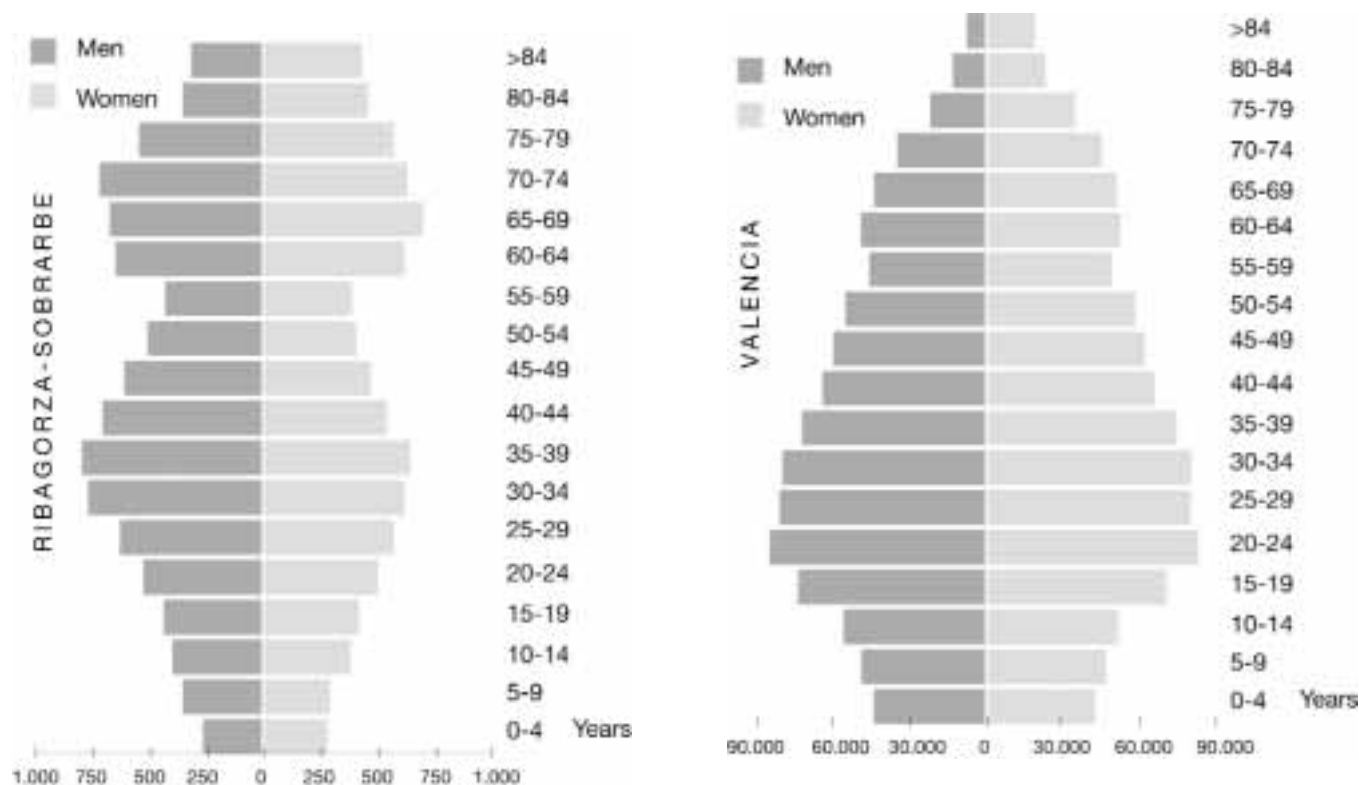
### 2.1.2 Ebro-Barcelona Transfer costs

This water transfer is exclusively for urban-industrial uses. Its amortisation costs will be higher as the proposed 189 hm<sup>3</sup> will not be supplied from the very start of the project, but the volume of the transfer will grow at the same rate as the demand over the first 25 years.

The government's calculations do not take this slow increase in demand into account when they estimate the price and amortisation costs. The WWF study also includes a calculation of 3% for foreseeable losses in the transfer (based on 15% for 1,000 km). It is also necessary to calculate costs for the treatment to improve the poor quality of the water destined for urban uses. This cost is about 0.21€/m<sup>3</sup>, which would raise the cost per cubic metre for this section to 0.57 €/m<sup>3</sup>.

### 2.1.3 Section costs of the Ebro-Jucar-Segura-Almeria Transfer

Regarding the Southern Transfer, which represents about 89% of the planned investment, the



Graph 2: Comparison between the population pyramids of Sobrarbe-Ribagorza and the Valencia region, clearly showing the present imbalance between age groups in the Pyrenees

government offers a single price for the water as a question of “solidarity”. However, this criteria loses credibility as a complete recovery of costs is necessary. It also makes the cost-benefit analysis more difficult to carry out, especially for the furthest destinations.

A modular analysis by zones allows us to determine the costs for each section. We have also taken into account transport losses which, for the longest sections, could be as high as 12% of the transferred volume. Our study also bears in mind the fact that the volume of transferred water destined for urban uses will grow progressively at the same rate as that predicted for demand increase, although in this case the lower proportion of urban uses lessens its impact on the cost.

The calculations of the SNHP fail to include costs such as those of desalinating the transferred water for urban uses, those due to the Climate Change, and other minor costs.

Including the aforementioned concepts, the cost per m<sup>3</sup> for the various sections will give a cost of 0.09€ in Castellon and 1.08€ in Almeria.

## 2.2 Benefits

The government has also committed mistakes and failures of precision in its analysis of the benefits, specifically in the following aspects:

- Over-estimation of urban and industrial demands and their growth rate over time (misusing demographic growth figures)
- Overestimation of the expected profits to be made from the transferred waters in areas of irrigation.
- Evolution of the profitability of glasshouses and their future perspectives
- Errors in the calculation of the Opportunity Value for urban waters.

The SNHP overestimates future demand for urban and industrial uses (36 and 25%) and fails to take into account present population growth rates (in Spain and Barcelona) or possibilities for saving and reuse of water. The economic balance-sheet of the transfer only becomes positive thanks to this increase in urban consumption, which leads WWF to believe that this data has been deliberately manipulated.

Likewise, the government fails to mention the crisis of excess agricultural production in the irri-

gated lands of Murcia and Almeria, or the future revision of the Common Agricultural Policy (2006). These two circumstances could have significant effects on Spanish agriculture and should have been considered in the future scenarios of the plan.

Finally, the positive economic balance-sheet presented by the government in the SNHP is mainly due to an incorrect analysis of the alternatives to the Ebro transfer and the cost difference between the transfer and the cheapest alternative. The SNHP offers a single so-called “opportunity value” for urban waters, assuming that the cheapest alternative is the desalination of sea water (0.81€/m<sup>3</sup>). However, the opportunity<sup>6</sup> value should have been calculated for each section independently by studying the “curve of generated profits”. This study, carried out correctly, gives an average opportunity value for the Mediterranean coast of 0.14€/m<sup>3</sup>.

Correcting this error gives a reduction of 7,000,000,000€ in the profits of the plan, which makes the balance-sheet of the Ebro transfer clearly negative.

Furthermore, this present study has constructed the curves for the real opportunity values for each zone based on calculations of irrigation profitability, possibilities of saving water in urban supplies, options of reusing water, treatment and desalination of brackish water as well as sea water. With relation to the transferable volumes, the average values are shown in *Table II*.

## 2.3 Cost-Benefit economic balance-sheet for the Ebro Transfers

Based on the cost-benefit economic study for the two transfers (north and south) taken together, as the government does, assuming a 50 year term amortisation and 7 years for completion of the works, a discount rate of 4%, and rectifying the mistakes we have pointed out in our study, the cost-benefit balance sheet is totally negative, with a current net value of -3,556,034,000€.

Given this economic situation and bearing in mind the questions about the long-term viability of the water transfer, it seems necessary and appropriate to analyse other alternatives to the transfer.

<sup>6</sup> Based on a comparison of the costs of different options to obtain the water (transfer, desalination, water treatment, water savings, water markets, etc), giving the result of the difference between the cheapest option and the others (such as the transfer, in this case).

	Jucar	Segura-Almeria	Barcelona	TOTAL
Hm <sup>3</sup>	315	546	189	1.050
Opportunity value (mean)	0,04 €/m <sup>3</sup>	0,19 €/m <sup>3</sup>	0,18 €/m <sup>3</sup>	0.14 €/m <sup>3</sup>

Table II. Mean Opportunity Value for each zone.

### 3. Alternatives to the Ebro transfer

#### 3.1 Alternatives for the transfer to Barcelona for urban-industrial demands

When studying the possible alternatives, it is once again fundamental to carry out a specific study of the present and foreseeable problems, as well as the viable solutions for the areas which would receive the transfer.

WWF proposes the following alternatives to solve the water problems in Barcelona:

- A revision of the expectations for future water demands which have been exaggerated in the SNHP (an increase of 36% in urban demands and 25% in industrial demands) way above what would be realistic predictions (statistical studies offer data which tend to a stable population).
- Improving the average efficiency level for urban water distribution networks from 65% to 85% by modernising networks and improving management. The cost of such a strategy varies from 0.12 to 0.21€/m<sup>3</sup> according to well-documented practical experiences.
- Improving the management of urban-industrial water demand, reducing consumption by 5%.
- The installation of a double network in new urban areas and its progressive expansion as old networks are renewed, would increase the possibilities of re-using waste water from 10% of the present demand to 30% in the future.
- Making better use of aquifers with treatment by nano-filtration and/or inverse osmosis.
- Desalination of sea water would only represent a complementary alternative in extreme cases.

- In some cases, such as dry periods, the option of transferring irrigation water to urban use via a system of interchanging water rights as projected in water laws, would be an alternative to consider, but not always. The “opportunity value” of water would help this situation.

- The introduction of sustainable regional and urban plans putting a halt to urban-tourist growth, which has already overloaded the capacity of the coastal areas.

Using this strategy, the metropolitan area of Barcelona would easily cover its present and future needs at an average cost, based on these sustainable alternative strategies, of 0.18€/m<sup>3</sup>. This is only 45% of the cost of the Ebro-Barcelona Transfer given in the SNHP (0.40€/m<sup>3</sup>), and only 30% of the real cost of the transfer if the necessary treatment and desalination of the Ebro waters were taken into account. This gives us a more realistic cost for the transferred water of 0.61€/m<sup>3</sup>.

#### 3.2 Alternatives for the Jucar Basin: a false deficit

As stated in the “Hydrological Plan of the Jucar Basin”, there are more than 1,000 hm<sup>3</sup> of renewable resources over and above present demands in the group of river basins included in the Jucar territory. In its eagerness to present “deficits” to justify the Ebro Transfer to Murcia, the government has ignored a large part of ground water resources and re-usable return wastes in the SNHP. These waters are, in fact, already meeting significant demands.

Alternative proposals would be the following:

- Improving the poor efficiency (such as the Jucar Ribera with an efficiency of only 38%) via a modernisation plan to reduce agrarian water demands by at least 10%, thus saving 230 hm<sup>3</sup>/year.

- Saving 169 hm<sup>3</sup>/year via the modernisation of urban networks and the optimisation of urban-industrial water management.
- Re-using 65 hm<sup>3</sup>/year.

These proposals add up to 464 hm<sup>3</sup>/year. Likewise, it should be pointed out that 520 hm<sup>3</sup> are currently being used for low-profit irrigation (80,000 ha of crops such as corn, heavily subsidised by the CAP), producing less than 0.09€/m<sup>3</sup> in profits. This offers a broad margin of options for demand management to redistribute these waters, especially during dry periods (via Water Banks or the purchase of water rights).

### 3.3 Alternatives for the South (Segura-Almeria)

In the case of the Segura and Almeria, strategies can and should be developed to modernise urban networks, double the same networks, and re-use urban waste waters as these strategies would lead to a saving of 65 hm<sup>3</sup>. However, this would still be insufficient to solve the problem which has arisen in this area due to the passive irresponsibility of the Administration.

The key to solving this situation involves accepting the problem as a failure to manage the demand of a scarce resource. This means putting an end to the “supply” approach in which a water shortage is taken as a deficit of subsidised infrastructures to provide more water. Shortages are one of the inherent features of any economic good. In this sense, the limits of the availability of this economic good should be laid down using serious, sustainable criteria. This means clarifying, and modifying and revising when necessary, property rights and water user rights. From this point of view, we should:

- Control and put a stop to the process of sinking new wells and transforming land for irrigation purposes.
- Start an independent audit to determine which lands are irregular developments and proceed to their closure.
- Start a revision of present concessions, once current legal rights have been cleared up, bringing up to date water allowances, criteria and priorities.
- Start an ambitious socio-economic programme for the re-conversion of present irrigated lands, similar to the one developed in La Man-

cha, but financed under the new cross-compliance or agro-environmental measures focus proposed by the EU. This would have the objective of eliminating 50,000 ha, or 28%, of present irrigated land. It should be noted that in very few years, 32% of irrigated lands have been taken out of service in La Mancha in agreement with land owners.

- Based on this, a Water Bank would be a positive move to allow for the transfer of property or concession rights between private individuals, from the viewpoint of an Administration managed market. At the same time, the State should recall a broad package of water rights to compensate for present over-use, based on the reconversion plan mentioned above.

It is worth noting that the costs of such a re-conversion programme should be calculated from a global viewpoint of the basin, once illegal irrigation is closed down. For a total of 339 hm<sup>3</sup> (the water needed to compensate for over-development of aquifers according to the SNHP), the mean value would be 0.17€/m<sup>3</sup>. As the average demand for the Basin is 6.176 m<sup>3</sup>/ha, this would mean a cost of 1,060€ for every hectare withdrawn from service. That is to say, it would be worthwhile to consider the negotiated withdrawal of the least profitable hectares, rather than the more profitable ones. The experience gained in La Mancha, restricting more than 30% of irrigated lands at an average cost of 0.15€/m<sup>3</sup> demonstrates the economic and social feasibility of this approach.

In the case of Almeria, the clear recessive tendency of profits in the intensive production of crops under-plastic, which already threatens to develop into a crisis, illustrates the fragility of this spectacular business of recent decades. It is necessary to set up this re-conversion plan with structural reforms. This sector needs such reforms to face a future where competition will doubtlessly be stronger, as agricultural markets are liberalised in the Mediterranean area. It would involve reducing quantity, increasing quality, and improving management based on sustainable criteria.

Finally, it is also necessary that any territorial reorganisation takes into account concepts of sustainability in its projects for urbanising the coastline. The (legal or illegal) proliferation of golf courses and their respective urban developments should be analysed urgently, as they call for a continuous increase in the demand for water, electricity, land and social services.

## Conclusions

The socio-economic analysis of the government is worthless as it ignores or misrepresents many factors so as to obtain a favourable result for the transfer project. The independent analysis we present here shows the excessively negative cost-benefit balance of the Ebro transfer, and a much higher cost for the transferred water than the government estimates.

The government has never studied alternatives to the transfer which, according to this analysis, could supply water at a much lower cost.

WWF considers that the Spanish government should revise and bring up to date their economic study of the Ebro transfer, taking into account the aspects mentioned in this study as part of the requirements for large projects according to regulations of structural funds of the European Union.

Likewise, and with the same end, the government should carry out a detailed analysis of the alternatives to the transfer, including combinations of the alternatives mentioned in this study and considering all possible sources of water in the receiving areas, such as aquifers.

WWF considers that the European Commission should not finance the Ebro transfer as it contradicts the objectives of regional cohesion by only benefiting a few select sectors in the Spanish Levante region and Catalonia, while at the same time, harming poorer areas and promoting unsustainable development.

Given the clearly negative economic balance of the transfer, European funds should be assigned to more sustainable alternatives to improve water management in Spain in line with the Water Framework Directive.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- ✓ conserving the world's biological diversity,
- ✓ ensuring that the use of renewable natural resources is sustainable,
- ✓ promoting the reduction of pollution and wasteful consumption.

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