

Potential strategies for the Guadamar Green Corridor and their relationship with sustainable agriculture

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Introduction

The example given in the present paper describes a case study, which was developed as a response to a regulation and control strategy for agricultural systems in relation to a potential Green Corridor along the Guadamar river. This project originated in a recent environmental incident in Andalucía and follows the design of an ecological corridor between the Sierra Morena mountains and the Doñana coastal area.

In the spring of 1998, a waste retention wall at a pyrites mine in the foothills of the Sierra Morena broke, emptying about five Mm³ of sludge and water, contaminated with heavy metals into the Agrío and Guadamar rivers. These two rivers, especially the latter, are essential elements in the hydrological structure of the Doñana National Park. There was a major impact on public opinion especially in relation to conservation groups. The disaster made national headline news, eg. in the daily newspaper El País, for more than a month after the incident.

At first, attention was focused on the possible consequences for the preservation of the ecosystems that make up the Doñana National Park. However, a few weeks later the consequences of the disaster became polarised, around the perpetual dilemma of development versus conservation. This conflict remains to be resolved, especially in situations such as those currently experienced by the inhabitants of the riverside municipalities. Such polarisation represents the balance between the consequences of the spill in relation to protected areas and natural ecosystems, but also to its impact on agricultural production between the source of the river and elsewhere in the Guadamar Valley. The reservoir collapse was the result of mining, but effected agriculture and environment along the river corridor.

Despite the special ecological significance of the Doñana region, two groups essential to the understanding of the social and economic repercussions of the spill did not become involved at the outset. These groups were the miners of the villages situated in the foothills of the Sierra Morena, and the farmers close to the river whose land was inundated with toxic waste. This lack of contact suggests that there was not only a lack of awareness of the situation, but also an underestimation of the significance of the pollution to riverside ecosystems. These problems led to the initiation of the Green Corridor Project for the promotion of environmental regeneration. This project requires close collaboration between landowners and aims to encourage sustainable agricultural production close to the river.

The document for the setting up of the Guadiamar Green Corridor Strategy, involves proposals which reflect the role of the river basin as a natural link between two separate regions; that of the Sierra and that of the coastal marshes. These proposals will not be successful unless two essential prerequisites are met:

- (a) recognition and identification of the processes of degradation in the catchment; which is currently in a poor ecological condition
- (b) integration between ecological restoration and environmental conservation programs in the catchment as well as the encouragement of sustainable development of the populated areas.

Agricultural crops and cattle farms use most of the land in the catchment. These activities are therefore central to the business and employment structures of the active population. There is also a limited service sector. Any conservation proposal must therefore take into account economic factors and be aware of the dynamics of agriculture practices, as well as the political decision to create the Green Corridor. These are considered in the next section.

Problems detected in relation to agricultural practices

The floodplain of the Guadiamar river affected by the spill, was formerly occupied by a patchwork of agricultural crops. The sludge polluted olive groves, wheat and sunflower fields, as well as gardens. The work of removing the sludge destroyed all the natural vegetation and crops adjacent to the river as well as some tree species. Each farmer was paid compensation for the loss of crops by the Swedish company responsible for the pyrites mine and the tailings reservoir.

At first there was a rapid response to control the effects of the pollution from the mine, both beside the river and in the catchment to minimise the effect on agricultural crops. However, because the main objective was the restoration of the damaged ecosystems, it was also necessary to analyse and report on the levels of contamination of soil and water as well as plants and other organisms. The topsoil removal was to avoid influencing the international market for agricultural products from the affected area. After the removal of the crops, there was complete cessation of agriculture in the affected area, involving both the sowing of new crops and grazing. The two zones involved are therefore the polluted strip by the river and the wider area which will remain in agricultural use in future years.

The proposal for the creation of a Green Corridor introduced a further new idea, because it was necessary to purchase, or expropriate where necessary, the agricultural land belonging to local owners. The Junta de Andalucía (the administrative body responsible) has assigned nearly a quarter of the initial investment to the acquisition of the farms in the polluted zone, expropriating them where necessary. The *Confederación Hidrográfica del Guadalquivir*, which is the administrative organisation for the Guadiamar catchment area, has contributed to the process of expropriation in areas under its control.

Agricultural activity has been affected by the disaster in three main ways:

- (a) loss of the 1998 spring and autumn crops
- (b) cessation of all agricultural and pastoral activities
- (c) voluntary or forced acquisition of rural properties.

The future co-ordination of sustainable agricultural practices in the vicinity of the Corridor must involve all those activities.

Description of the agricultural activities of the catchment

The linear nature of the catchment results in a natural link between the ecosystems of the Sierra and the coastal region. It means that there is a wide variety of agricultural practices throughout the catchment, including the following types:

- (a) grazing land and extensive cattle rearing in the north
- (b) cereals and industrial crops production in the flatlands (*Campiña*), largely without irrigation
- (c) small market gardens and citrus orchards
- (d) olive groves and vineyards
- (e) small areas of industrial crops under irrigation, and rice in the south.

The study area covers the wider river basin and extends its influence into the adjacent land. It is therefore possible to summarise the following features:

- (a) the river valley utilised for the collection of water for irrigation or for the discharge of wastes from cattle rearing and agribusiness activities. Its "development" would lead also to its inclusion into the edge of the mountain exploitations
- (b) the natural vegetation has virtually disappeared from the riverside and remains confined to scattered patches. Instead intensive irrigation activity has extended agriculture to parts where sediment is deposited
- (c) the dominant land use here is orchards of citrus or other fruits such as nectarines
- (d) the land dedicated to annual crops, eg. wheat or sunflower on the flat stretches, alternating with olive groves and vineyards in areas of more irregular ground
- (e) the classical horticultural activity occurs in small patches adjacent to towns, and is orientated primarily to home consumption, with some sales to local markets. Fragmentation of ownership of these patches and their position in the urban periphery results in complex landscape mixtures of agrarian, residential and industrial uses.

The land use, as assessed before the spillage, is characteristically Mediterranean and the area for conservation objectives is similar to other delta areas in southern Europe. Where land has been abandoned but it has been possible to introduce new practices, this has been done at the cost of contravening fundamental agronomical priorities.

The north-south axis of the catchment will be followed so that agriculture and environmental problems can be identified. There are three broad zones:

- (a) The upper section of the catchment is characterised by abandonment and marginalisation in many of the mountain holdings. A disease of pigs led to emigration

and to problems of some forests of *Quercus ilex* (holm oak) and *Castanea sativa* (sweet chestnut) which were formerly grazed by pigs. At the same time new land uses related to the introduction of olives began to appear.

The recent reintroduction of cattle grazing and establishment of tourism should have beneficial effects in this zone.

- (b) The second zone is the flatlands (*Campiña*) which extend from the edge of the mining zone to the central area of intensive cropping under irrigation. In this zone, the trend over the past decades has been for agricultural modernisation and mechanisation, in order to extend the cultivation of herbaceous crops such as sunflowers and cereals at the expense of olive groves. The latter are now restricted to the steepest land which was the most difficult to mechanise. European Union (EU) support mechanisms have encouraged the maintenance of the olive groves and there has been an improvement in terms of productivity, contravening in most cases landscape conservation.

A recent development has been the gradual introduction near the river of citrus and other fruits, eg. nectarines and peaches that require irrigation. This has been possible only on holdings in the flat areas where previously herbaceous crops were present because of the availability of water for irrigation. This pattern follows the model of other agribusiness in the Guadalquivir Valley, including the eastern Andalusian coastal plains. Such introduction of irrigated fruit is related to the decline of profitability of traditional crops, eg. wheat, maize, sunflowers and cotton.

- (c) The third zone occupies the lower section of the valley, which originally consisted of olive groves, vineyards and small market gardens. This zone shows a different trend because the former uses have declined, whereas local markets maintained the market gardens. However, EU policy measures have halted the decline in the production of olives and have revitalised the sector, although not as much as elsewhere in Andalusia. The negative aspect of this crop lies in the increased dumping of a dark fetid liquid (*alpechín*), resulting from the industrial production of olive oil. Regular analyses of fresh waters have identified this substance in a subsidiary river of the Guadiamar, and it remains a cause for concern.

Vineyards are in decline, because of EU policy, as well as from competition from adjacent more favourable regions. Family market gardens were also declining before the disaster and have now been affected by concerns relating to contamination.

Proposals for agri-environment measures in the Guadiamar Green Corridor

The need for co-ordinated sustainable agricultural practices within the Green Corridor forms part of a wider exercise, termed SITCOVER, (basic recognition, diagnosis and advancement of proposals for the integration within the Guadiamar River Basin by the Green Corridor Project). Now, there is no agriculture within the designated area of the future Green Corridor because the pollution has led to cultivation being prohibited and the subsequent acquisition of the land. However, agrarian activities are still predominant in the surrounding land and it is here that the economy of the municipalities largely now depends. The proposal for the creation of a Green Corridor must therefore integrate all the agricultural activities present throughout the catchment. The participation and involvement

of the population that inhabits the surrounding municipalities is also essential. This interdependence is therefore central to policy determination and forms the primary basis of the present paper.

Within the Green Corridor, the principal factors are soil capacity, changes in land use, agricultural practices and the extent of agribusiness activities. The spillage of toxic sludge has made the relationships between these factors clear because of the absence of physical barriers between the component land parcels and their functional interdependence. The recognition of these connections must be central to the proposal for the sustainable development strategy within the Green Corridor.

The strategies for putting into action practices that are appropriate agri-environment measures relate to the principal problems identified in relation to agriculture. These include degradation of the landscape, changes in agricultural uses, increases in irrigated land, contamination, soil erosion and disposal of waste from agribusiness. There are also problems of illegal occupation of land in the public water domains above the tailing reservoir. The transformation of the landscape is linked on the one hand to the abandonment of farming, and on the other to intensification, a process present throughout Europe but especially in the Mediterranean region.

The importance of pasture in the landscape and its contribution to environmental sustainability is well known. The combination of land uses in the *Campiña* is not well known elsewhere in Europe. On the one hand, it has a high cultural value within the Mediterranean landscape. Conversely, the replacement of olive groves and vineyards with herbaceous crops and the extension of the land dedicated to olive groves in recent years has environmental consequences. The first proposal for the Green Corridor recognises that the landscape value of the traditional cultural landscapes and emphasises that a balanced plan is required in order to maintain them in conjunction with the remaining highly modified agricultural land.

The second proposal relates to the changes in agriculture within the *Campiña*. These changes are contributing to the degradation of the landscape, especially as they are directed towards intensification. These changes are in line with EU policy measures and involve the progressive loss of profitability of traditional agriculture. Agriculture intensification also affects soils through the application of fertilisers, herbicides, irrigation and the removal of stubble.

The following actions are consistent with sustainable agriculture:

- (a) determination of the agricultural capacity of the soils and its link to erosion
- (b) the rational use of herbicides, pesticides and fertilisers
- (c) the use of crop rotations, including leguminous plants
- (d) the avoidance of intensive irrigation practices as opposed to localised management
- (e) the suppression of illegal practices, eg. stubble burning and *alpechín* dumping.

The proposal for a Green Corridor is to employ coercive measures eg. fines and legislation, in conjunction with voluntary measures involving industrial partners and farmers in order to produce a sustainable strategy for agriculture and the environment. The land above the

reservoir must be included, otherwise the desired outcome will not be achieved and the integrated regeneration of the area will be threatened. Since the workshop described in this volume, a Nature Rescue has been established in January 2001 along the highly polluted area adjacent to the river.

An example of an agri-environment scheme in Spain - the case of water management in La Mancha

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Introduction

The results are presented from two research projects carried out concerning agri-environment problems and policies in the La Mancha which is part of the Castilla-La Mancha region. These projects are:

- (a) regional guidelines to support sustainable agriculture through European Union (EU) agri-environmental programmes (EU Research Project AIR3 CT94-1296)
- (b) a research project involved the conservation and restoration of wetland in the biosphere reserve of La Mancha Húmeda, including hydrological, economic and legal aspects .

Since 1993, La Mancha has been the site of the most important of Spanish's agri-environment schemes in Spain in terms of financial resources, the Income Compensation Scheme (ICS). This scheme aims to reduce irrigation and is popularly known as "the wetland plan".

Description of the region

The La Mancha region is about 8,000 km² and is located in the central part of Castilla-La Mancha, in the south-east of La Meseta, as shown in Figure 1. It is part of the Guadiana river basin. Because the area is so arid, the existence of a number of sizeable wetland areas is noteworthy. The most important are the Tablas de Daimiel; a National Park since 1973 and covered by the RAMSAR Convention. Since 1980 all the wetland areas have been collectively listed as a UNESCO Biosphere Reserve, under the name Mancha Humeda. Traditionally, agricultural activity in the area has relied on vineyards, dryland cereal production and sheep rearing. In terms of the conservation of nature and natural resources, this combination of activities has been particularly favourable.