La Mojana: an Inland Delta in the Magdalena River Basin (Colombia) and the Complexity of Intervening in the Actual Dynamics Without Losing Fish Communities

La Mojana area situation

La Mojana is a region in the north of Colombia, where the main land use is floodplain cropping. Due to floodplains are no longer drained, floods damage crops more often than under previous (indigenous) management systems (Aguilera, 2004). Land management system of indigenous was base on terraces and channels preventing floods. During colonisation people did not maintain these structures resulting in different water dynamics (Ortiz, 2005). Due to increasing peak flows and higher discharge from upstream watershed experienced heavier and longer floods including this floodplain. Previously, those floodplains were flooded for two months per year. Nowadays, mostly in 2010 an 2011, with longer flooding periods, crop losses are a national tragedy (Vega, 2012).

This enormous region of 2.8 million hectares received an average of 7,139 m^3 s^{-1} (Restrepo et al, 2005) of water (combined with sediments) from the main rivers of Colombia (Cesar, Magdalena, Cauca and San Jorge rivers), as is showed in the Figure 1. This inland delta has 950,000 inhabitants and the main land use is agriculture and livestock (DNP, 2011). There are different ecosystems and agro-systems with a high biodiversity: floodplain, marsh, wetland, tropical forest and dry forest. The main ecosystem services of the region are: reproduction and feeding for Magdalena fisheries due to the ecological special conditions (Galvis and Mojica, 2007); and decantation (retention) of sediments, that is less appreciated in general for National Government.

Sediment situation in the Magdalena River and tributaries is critical, as can be seen in figure 2. Magdalena River river has the highest sediment yield of all South American Rivers. Around 550 t km^2 yr^{-1}-Normalized dividing sediment load (ton/yr^{-1}) by drainage areas km^2 (Restrepo et al, 2006a): this is almost 3 times

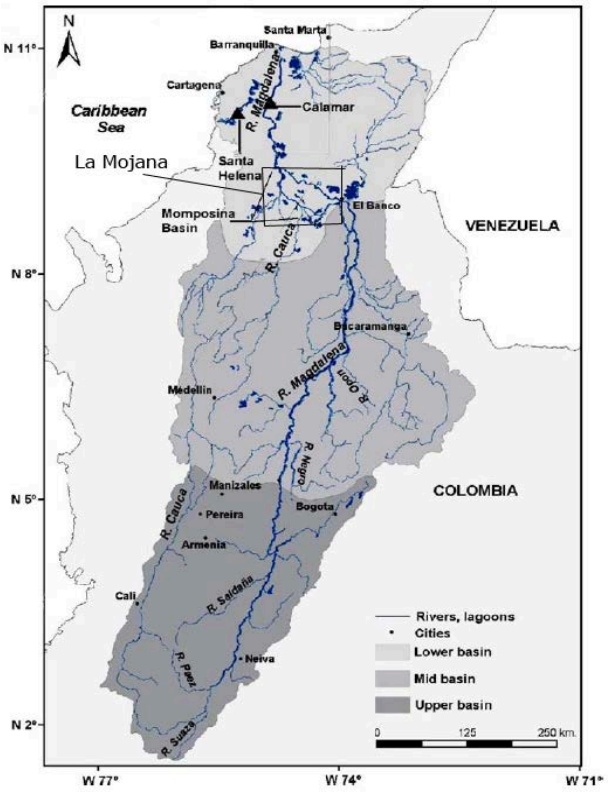

Figure 1. La Mojana location in Colombia. (Restrepo, 2006b)

the Amazon and Orinoco river rate. Drainage area of Magdalena River is 200.000 km^2; four times less than Orinoco catchment and around 30 times less area than Amazon River basin. La Mojana is located in a tectonic depression (Restrepo et al 2005). Studies from Restrepo et al (2005, pg. 69) found sediment retention in this depression of about 14% of the total sediment flow with water.

Due to different causes (i.e. non-sustainable practices in fishing methods -dynamite, net across the river, etc-, habitat loss and high pollution in the water -sediments and chemicals-), fisheries production decreases drastically (Galvis and Mojica, 2007; Marrugo-Negrete et al, 2008). In 1974 production was 80.000 tons/yr and in 1999 it had decreased to less than 10.000 ton/yr (Galvis and Mojica, 2007); Figure 3 shows this decreasing trend. These values show a negative rate of 8% of less production each year. As far of this trend continues, in 2025 it will be a production of 1,138 ton/yr and in 2050 just 142 ton/yr.

As a result of situation described above early in 21st century, 45% of species included in the Colombian red book of endangered freshwater fish species are from the Magdalena basin: "two of them, the most important in fisheries, are in the category of Critically Endangered (*Prochilodus magdalenae* and *Pseudoplatystoma fasciatum*), three are Endangered (*Ageneiosus pardalis*, *Ichthyoelephas longirostris* and *Sorubim cuspicaudus*), eight are Vulnerable, and six are Near Threatened" (Mojica, 2002 in Galvis and Mojica, 2007).

National government expressed that La Mojana region has a high potential for economic development (Martínez, 2012) mainly for agro-systems and transportation potential. This approach, the government said, would tackle the extreme poverty situation that is taking place there. Seventh out of ten households live below the poverty line (Action Against Hunger, 2008). The average of the Unsatisfied Basic Needs index there is 2.5 times lower than the national mean (DNP, 2011).

Additionally, there are many stakeholders with different power and influence in decision-making. On one hand, there are some stakeholders who want to dry those floodplain lakes: farmers with small lands to produce cash crops; the huge private lands

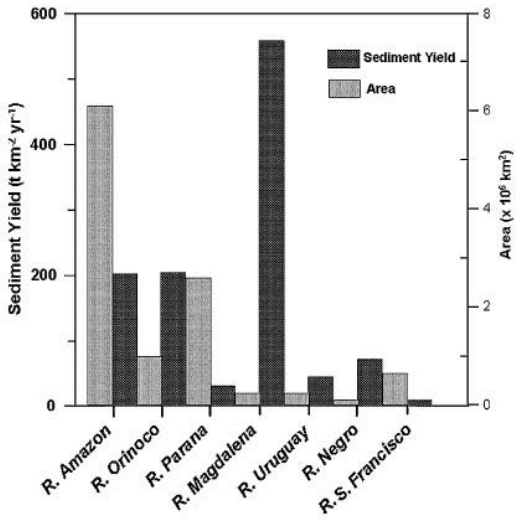

Figure 2. Sediment yield and basin areas for selected rivers in South America (Normalized sediment yield for the river basins was estimated by dividing sediment load (ton yr^{-1}) by drainage areas (Km^2). (Restrepo et al, 2006a).

owners with beef cattle; and private companies that see Magdalena River as an alternative to transport the merchandise between Caribbean coast and back country. On the other hand, some different stakeholders demand that this region remains as it is: gold finder need the sediments to find gold; few environmental NGOs with less power and influence said that this flood plain ecosystem is important for some fish and for reefs in the Caribbean Sea because it retains some of sediments that have a negative influence for that marine ecosystem (Restrepo et al, 2006b).

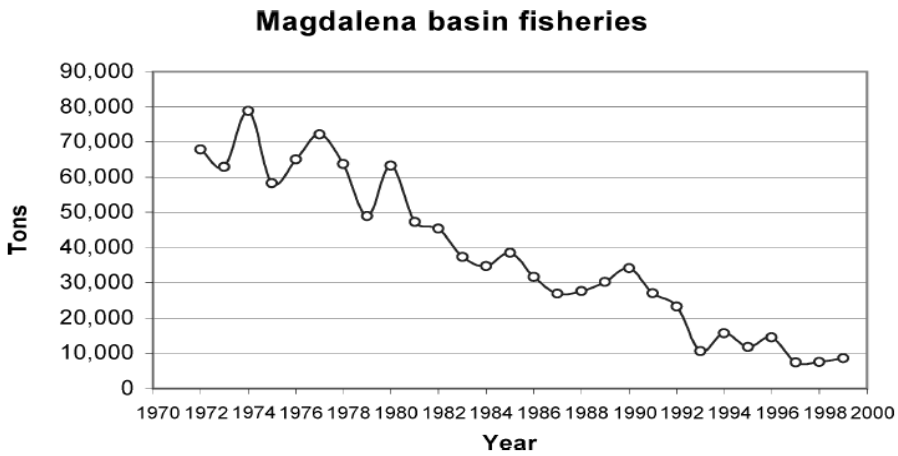

Figure 2. Magdalena river basin fisheries trend. (Galvis and Mojica, 2007).

A complex situation has resulted from these factors. A government top-down approach for an economic development is not supporting a sustainable development. Nowadays management of this area is a priority for the government for three main reasons. First, they want to increase the agricultural production and reduce floods. Second, regaining the fluvial transport in the area is crucial because now it is very difficult to navigate due to the water level in some places is not enough for ships. And third, the government desires to preserve the fauna and flora of the region.

To reach these goals looks like government strategy consists on canalising this part of the river with dikes; creating terraces with drainage systems for the farmers, and maintaining water flow between the river and the floodplain and wetlands around the river. The project is in the feasibility phase. The most important public university of Colombia is doing some recommendations (DNP-UN, 2012), and the Netherlands is starting an alliance with Colombia in order to advise using Dutch experiences (Porras, 2011). Management that will give to the fish species and social work in the region is not clear yet, in order to achieve a more integrated management.

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