

Integral Management for organic waste and sewage: Los Carrizales, Tenerife.

● Introduction.

This project means a strategic shift to managing together organic waste and sewage in urban and rural areas. Our goal is to imitate Nature, closing the water and organic carbon cycle as they flow from the natural environment.

The experimental plant's results at several islands of the Canarias Archipelago have demonstrated a substantial saving in the budget administration for both flows: sewage and organic waste.

Also it is remarkable the reduction of carbon dioxide and methane emissions, or the costs related to waste transportation and conventional depuration; particularly the sludge's management is quite difficult to include the local economy because its potential pollutant load.

The intervention's effect is definitive at the territory but also at the local economy; constructed wetlands reclaim water using territory however we can take advantage of economic diversification: increase biocapacity through agro-forest production, water, energy (biogas production is feasible through anaerobic biodigestion), environmental education, alternative tourism, social leisure zone or business incubator related to Green Economy or Circular Economy in regard to composting, agriculture, reforestation or even fish farming.

The project success demands the social implication; in fact it would be a previous information and formation of the citizens in order to create an inclusive mood in the local society. Our goal is to compromise the inhabitants with the advantages and opportunities of the project and at the same time to avoid the discarding of non-biodegradable plastics at the inflow.

●Strength's Design.

The most outstanding highlight of the project is the development of a Circular Economy through organic waste and sewage. Essentially we obtain energy through the organic waste precipitated at the bottom of the septic tank (previous degradation before the water flows to the constructed wetland). Specifically the water reclaimed at the Constructed Wetland is entirely available to be included in the natural or urban water cycle, of course there are programmed several periodic controls to confirm the quality of the water flow (physical, chemical, and biological parameters of standard analysis).

This project is mainly resilient; it decouples the fossil energy demand for the community development and reclaims fresh water without the disadvantages related to the conventional depuration sludge.

This volume of water reclaimed recharges aquifers and reduce water stress, in fact, sewage is transformed into an optimal water resource for consumption and at the same time biogas is obtained from the organic matter degraded.

The organic matter fraction degraded is affordable to produce compost for several activities: soil reparation, agriculture, reforestation, or, in other words, embellishing the natural surroundings through the enhancement of local vegetal biodiversity.

This management model acts as a valuable catalyst for energy, water, and food sovereignties. The fact is that the environment produces indirectly energy, water, and food through the sewage reclaimed by the constructed wetlands and the closing of the organic carbon cycle at the edaphic layer.

In particular it means the implementation of a Circular Economy model based on a Green Economy framework; where citizen's information and formation are requisites for the success. What's more we need a self-organized community with a decentralized management of the reclaimed resources.

The retention time for the solutes dissolved is essential to degrade them; indeed enough time at the constructed wetland can break down persistent organic compounds, considering that conventional depuration can't afford that result efficiently. Moreover, the quality of the reclaimed water is peak condition for agriculture consumption and even human consumption.

The enhancement of living standards at the local community is undeniable: fewer taxes linked to landfill management and conventional depuration and less consumption of fossil fuel; above all we are focused on a new paradigm of development based on citizens' empowerment to administrate their sovereignty at basic needs - energy, water and food- besides recovery of local biomass and availing of local renewable resources (beginning with anaerobic biodigestion).

● Opportunities.

The feasibility of the project can be extended to any population center that produces sewage and organic waste. The redesigning needed is amortized with the cost savings at several infrastructures, contractors or fossil fuel budget accountings.

The community is trained to become self-organized and autonomous to increase their resilience; moreover they settle what economic activities are more suitable for their peculiarities, not only social features but also natural ones: water-energy-compost is a cluster of opportunities where community and environment join.

The size of the project is *ad hoc*; we need a previous analysis of the community (amount of households, characterization's sewage and organic waste) and its surroundings (geographic conditions, climate, or orography); even though, the citizens' expectation and their compromises with the scheme; thenceforth all the decisive variables are taken into account. Specially, the septic tank is designed to support feasible contingencies, and there is a plan for risks and possible accidents.

The attractiveness of this proposal is precisely the relative low budget and the swift paying-off: anaerobic biodigester, septic tank and constructed wetland , all of them avoid investments for waste transport, and indirectly improve the efficiency of the selective waste collection (paper, plastic and glass would be easily separated without organic waste mixed with them). In the end, it would be unnecessary the maintenance of the landfill or the conventional depuration.

Another factor is the social implication of the project, it has an inclusive compromise to empower citizens. The community determines which type of activities would develop: urban farming, reforestation, fish farming, compost, reclaiming soil to avoid eroded areas, as examples.

●Conclusions.

This project is crucible where flows together the integration of energy with the objectives of sustainability, betting on a resilient vision as a goal. Checking the Millennium Objectives, this project enhances the implementation of many of them:

- Eradicate poverty and hunger.
- Promote gender equality and woman empowerment.
- Improve health.
- Guarantee the environmental sustainability:
 - The increase of forestall zones.
 - Reduce carbon emissions.
 - Protection of water resources.
 - The increase of local biodiversity.
 - Improve access to fresh water.
 - Improve sanitation services.

- Dignify the standard of living in marginal districts.
- Promote international cooperation for a resilient development.

Above all, the management of avalanches or droughts are under control through this facilities; it means ,without doubt, that this design increase the local resilience of the region.

The Natural Depuration System is the most ecological and economic way to reclaim sewage and organic waste. The state of art of the design's methodology and implementation allows safety recharge of aquifers and its reuse; apart from that as by-products we obtain biogas, liquid fertilizer, and energy. All the outflows -water, energy and compost- are in accordance with the international laws about sewage and organic waste management.

Jose Luis Peraza Cano has an intelectual property registration in Spain, based on R.D. 1/1999, 12th April, certified by no R.P.I.: 3217, as scientific work dated 13th October 1999. In 2011, this design was presented at the Institute for Water Education- UNESCO-IHE as practical case by **Dr. Fátima Campos** at an online course on Constructed Wetlands for Wastewater Treatment.