

The importance of coastal management of garbage and sewage on two tourist islands

A case study comparing the Islands of Ilha Grande (Brazil) and Île d'Oléron (France)

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Abstract: *Ilha Grande and Île d'Oléron are synonymous of terrestrial and marine natural diversity, with different and relevant areas of environmental protection. Both islands receive many tourists from all over the world. The large influx of people associated with tourism has led to inadequacy of coastal waste management, which has had a negative impact on the environment. Based on this fact, the main objective of this research was to compare and analyze the coastal waste management and sewage systems of Ilha Grande and Île d'Oléron. To reach this goal, we used a qualitative methodology: bibliographic survey and secondary data collected from coastal and waste management systems and from the tourism areas. In addition, the techniques of participative observation and photographic records were performed. As a primary conclusion the majority of inhabitants and tourists on Ilha Grande do not separate waste and one part of the sewage go straight to the sea without a previous treatment. Meanwhile, in Oléron since the 90' the inhabitants have been sorting their waste. Several pieces of equipment have been created for waste collection, processing and recycling. Both islands have projects and actions to contribute to better coastal management, but Island of Ilha Grande when compared with Île d'Oleron, needs some improvement.*

Keywords: *Tourism, coastal management of garbage and sewage*

1. Introduction

Ilha Grandebelongs to the municipality of Angra dos Reis and is situated in the bay of Ilha Grande, on the southern coast of the state of Rio de Janeiro, Brazil.

Among the more than 300 islands of the bay, Ilha Grande has approximately 80% of its terrestrial and marine territories included in four different types of protected areas. That are responsible for coastal islands, mangroves, sandstones and rocky shores, where it maintains a vast marine biodiversity (INEA¹, 2011).Ilha Grandehas 193 km² and 9.426 habitants with 113 beaches and it is possible to arrive at the island only by boat.The number of visitors is uncertain, received around 1.442.608 tourists in 2018².

The Île d'Oléronislocated in the Charente-Maritime, a French department of the regionNouvelle-Aquitaine. Its surface area is 175 km² and it has22.234 inhabitants. The number of tourists is also uncertain, as in Ilha Grande, itsreceived about 3,000,000 visitors in 2019 (L. Pacaud, personal communication, September 16, 2020³).Theaccess is by car since 1966, when viaduct has been built and also it is possible to arrive by shuttle during the summer season.

The Île d'Oléronis divided in 8 communes which are joined in the local council of the Île d'Oléron, called *Communauté de Communes*. The territory hasmany beaches, especially in the west and northeast parts of the island. The south part(Saint-Trojan) is also a huge forest, planted in a dune system, and there are other smaller coastal forests (Boyardville, Chaucre) so that the State-owned forest covers 20% of the island. In the southeast,the main landscape is made of marshlands (30% of the island) included in natural reserves, protected by Stateand European laws.

Regarding their natural beauty, both islands have encountered scenery changes because of the recent unstoppable growth intourism. Thisis causing environmental and social problems, since the number of tourists and visitors is exceeding the support capacity of the islands, especiallyon IlhaGrande, which is more isolated and has a difficult access than the Île d'Oleron. Moreover, waste generation has been so large, that it is modifying the natural and visual landscape.

¹Environmental department that is belongs to the Government of Rio de Janeiro

² A. Pires, personal communication, June 7, 2019

³ Forwarded by email the document Booster d'activité, 2019

According to the INEA, 2011, Ilha Grande has a great reserve of fresh water available, however the demand outweighs the supply. In addition, a part of the sewage goes, untreated, straight into the sea (INEA, 2011). Because of this, the quality of the marine environment has declined, making the main beach, Abraão, unfit for bathing. There are 4 sewage treatment plants, which in total have a capacity to treat sewage of 804,244 people per year but in summertime the island received 1,442,608 tourists in 2018.

In comparison to the île d'Oléron, in the past there was enough local water for the inhabitants, especially during the high season. Problems with water pollution contaminated the production of oysters around 1968 – 1972.

Nowadays the treatment of sewage and water supply and the collection of waste are priority in the public policies of the island. The island of île d'Oléron is supplied both by local fresh water and from the mainland. Regarding the sewage, there are 6 treatment plants [2]. About the wastes, they are collected in each home and in each enterprise. Then, there is a separation system based on the recyclability of the wastes. Those that cannot be recycled are burned. The others that can be recycled are collected in specific containers, or brought by the inhabitants themselves, in one of the three *déchetteries*. Last, there is also a place for organic wastes, called *Ecopôle*, as well as initiatives to reduce the waste to zero (SIL, 2018).

The premise is that the large influx of people associated with tourism leads to inadequacy in coastal management. This includes basic effluent treatment and separation and collected waste services, all having a negative impact on the environment. However, the environment plays a central role for the tourism of those islands and for the subsistence of the local communities. This situation is a threat to the maintenance of the environmental and life quality of Ilha Grande and may even mean devaluing tourism itself. The île d'Oléron seems more advanced in the process of wastes and sewage management and some of the paths chosen in France could inspire other experiences.

Based on all this, the main objective of this research was to identify the problems related to the lack or inefficiency of solid and liquid waste management and describe the efforts of governmental, non-governmental and by the population relating to the importance of coastal management between Ilha Grande and île d'Oléron and make a comparison.

To reach this goal, we used a qualitative methodology: bibliographic survey, participative and direct observation and photographic records. Also collecting secondary data of the subjects of management and coastal tourism, sewage and garbage generation.

Considering all those issues this article contributes to the global discussion on sewage and garbage, which has become a large challenge in how to manage the amount of waste generated by tourism on the environment.

This paper is divided into the following sections: Data and Methods, Characterization of Ilha Grande and île d'Oléron, the importance of coastal sewage and waste management for preserving the environment and the tourist economy. Resulting in: Coastal management plans and actions developed by the government and the population of Ilha Grande and île d'Oléron, also, conclusions and recommendations.

2. Data and Methods

To achieve the main objective of this research, qualitative methodology was used, which is concerned with explaining and interpreting reality from a set of socially generated human phenomena. This set is formed by relationships, values, attitudes, beliefs, habits and representations [4].

Qualitative research has the characteristic of incorporating the perspective of subjectivity without losing its scientific character. Its choice as a research strategy in this study is justified by the recognition that “knowledge is a collective construction that starts from the reality of the subjects, mediated by processes of reflection and unveiling of the studied reality”, as well as “values the contradiction of the observed fact and the researcher's creativity, being responsible for discovering the meaning of social actions and relationships” (ALVES, 2011, p. 600-605).

For both islands techniques such as: bibliographic documents, direct and participant observation and photographic records were used. For the Brazilian part, three social participants (an INEA employee, a resident of the island and a hotel owner, as well as the manager⁴ of the Ilha Grande State Park) contributed with photos and information through social networks, regarding the subjects discussed here. For the French part in île d'Oléron, two social participants (a resident and former mayor of Saint-Denis commune and an ECOPOLE employee also a resident of the island.)

Characterization of Ilha Grande and île d'Oléron Ilha Grande it is known for its 113 beaches and surrounding mountains with typical regional vegetation preserved and protected by the state laws. It has terrestrial and marine territories included in four different types of Conservation Units that are responsible to a vast marine and terrestrial biodiversity (INEA, 2011). Some of the beaches have small villages that still maintain some “traditional” culture. Villages with Caiçaras (the name given to inhabitants born in the island) (INEA, 2011).

The Island Ilha Grande is also known for its two prisons, the first one located in the Abraão Village was founded in 1942 and closed in 1961. The other one located on Dois Rios beach, opened in 1894 and closed down in 1994.

Access to Ilha Grande, it is around twenty minutes by boat from Angra dos Reis to the principal beach, called: Praia do Abraão. Only the school bus and the garbage truck are allowed to circulate and both services are administered by Angra dos Reis municipal government.

For the preservation of this insular space of great natural and cultural relevance, the Government of the State of Rio de Janeiro has created in Ilha Grande four Conservation Units with complementary roles (Figure 1).

⁴Mr. Management of the park between 2017 to 2019

First: In 1971, the PEIG was created and administered by the State Government, designated for scientific, cultural, educational, spiritual and recreational purposes and it was incumbent upon the authorities to preserve and protect it. It occupies approximately 62% of the area of Ilha Grande and its main objective is the preservation of natural ecosystems against any changes that modify them (INEA, 2011).

Second: State Biological Reserve (ReBio) of Praia do Sul, created in 1981, is a protected area for scientific purposes and where the only tourists allowed are those taking part to a specific hike around the island with previous authorization of the INEA and (INEA, 2011);

Third: Tamoios Environmental Protection Area, (APA Tamoios), created in 1982, which governs the use of land where the law allows for some kind of human occupation. And finally, the Aventureiro Marine Park and the Aventureiro Sustainable Development Reserve (RDS), created in 2014. Aventureiro's RDS does not yet have a management plan, however, construction and commercial fishing are prohibited [6].

With the implementation of Conservation Units, some environmental laws were passed prohibiting damaging activities on almost all of the island, such as: commercial agriculture and fishing and hunting, due to this, the main economy currently of the island is tourism.



Figure1 Map with the divisions of the three Conservation Units of Ilha Grande

Source: adapted by the author, INEA, 2018.

Vila do Abraão is the most populated area of the island, with nine beaches in its territory, amongst them Abraão is the one that receives the most tourists in the island because of its easy access from the mainland and its natural beauty and historical attractions. Also it has a more structured tourism production chain, when compared to the rest of the beaches on the Island (INEA, 2011).

L'île d'Oléron is the largest island of the French metropolitan coasts (Figure 2). Its territory is about 175 km² large with more than 22.000 inhabitants; to which can be added the day trippers, the people who stay in hotels or in a campsite and the secondary home owners, for a total of about 3.000.000⁵ visitors per year. The vast majority of them come by car to the island, since is connected by the bridge in 1966. The island has three domanical forests (Saint-Trojan, Boyardville and Chaucre) protected by the National Office of Forests (ONF) since they were planted in the middle of the 19th century.



Figure2 Map of the areas of protection in l'île d'Oléron (colored zones)

Source: adapted by the author, www.geoportail.fr, 2020.

⁵L. Pacaud, personal communication, September 16, 2020.

In 1993, an integral natural reserve was founded on the east coast, covered by marshes and mud flats, to protect a rich ecosystem inhabited by shellfish, fish and large migratory birds like geese or ducks. It was the consequence of a European policy, called Natura 2000, that each member of the Union European had to respect, by creating coastal natural reserves so as to cover the third part of its national littoral[7]. Since 2010, l'île d'Oléron belongs to the Marine Protected Area (AMP) of *La Mer des Pertuis*, and its coasts are governed by a council which joins the tourism industry, the fisheries, the agriculture community, the association of citizens, local elected officials and the administrators. The AMP council has the power to allow or prohibit each development projects if they pose a risk to the environment⁶. Since 2011, the French government has decided to consider l'île d'Oleron as a *Site Classé* in order to protect the landscape and the built heritage: each new building project must obtain a special authorization from the representative of the State: the préfet⁷ of the Charente-Maritime. On both the sea and land sides, the island of Oleron is a highly protected area in which the local council – the *Communauté de Communes* – develops also its own environmental policy whose aims are the garbage reduction and the resource and energy saving.

3. The importance of coastal management for sewage and garbage for the preservation of the environment and the economy of tourism on Ilha Grande and Île d'Oleron.

From the perspective of Polette et al. (2000), coastal management was created to resolve conflicts along the coastal area, to reduce impact and to end the dissemination of coastal resources. The objective of coastal management in Brazil is physical planning of land use and coastal waters. [9,10].

In addition to that, the coastal management must "improve the quality of life of human communities that depend on coastal resources taking into account the maintenance of biological diversity and the productivity of coastal ecosystems" [11].

Coastal management becomes an important resource, a central issue that aims to unite economic development, protecting and guaranteeing natural resources for future generations, including the well-being of the population. It results in the promotion of actions by the government, involving the community in decision-making, in order to minimize negative impacts.

Among the most varied economies explored in coastal regions, including island territories, the tourism sector stands out, it has been advancing economically, and for this reason it has significantly drained the natural resources of the oceans and coasts. A part of this economy is closely related to the good environmental quality and visual aspect, in which the landscape component becomes important when choosing these routes, by the tourists.

That is, the physiognomy or visual aspects of the environment, which are one of the components of the landscape, are decisive indicators for its valorisation[12].

The landscape changes resulting from the decline in the environmental quality of the sea due to the accumulation of waste and the increase in sewage occurring due to the popularity of tourist activities carried out in the ocean and sea. This makes these island environments a new frontier for the exploitation of tourism, with rapid economic growth worldwide [13].

Coastal management becomes important, because through this tool it is possible to preserve the landscape, analyze the negative points and propose improvement actions, aiming at the well-being of the population and the ecosystems and being able to bring an organized and less impacting economic support to the local communities living on tourism as their main source of income.

The islands, Ilha Grande and l'île d'Oléron have the natural landscape as their main tourist attraction. Both have most of their territories preserved by law, therefore are restricted by environmental zoning. This form of public management has the principle of conservation of ecosystems, which contributes to the preservation of the natural elements of the landscapes and consequently attracts a specific profile of tourists, who are looking for close contact with nature.

On Ilha Grande, as a result of natural environments and the environmental preservation policy, the island has received mass tourism after the closing of the last working prisons in 1994, which made the island accessible to everyone. This brought a significant increase in the tourist flow and consequently, an accelerated growth in the infrastructure to serve its economy since then. Due to the environmental laws of restrictions on economic activities, that began in 1971, tourism has become the main source of income for the local community.

In l'île d'Oléron, mass tourism began after Second World War (c.1950), it increased after the construction of the bridge between the mainland and the island (1966) and it exploded soon after the end of the toll on the bridge (1990). The protection policy of the landscapes, of the environment and of the ecosystem began in the 1990's. It was first of all a top down answer, implemented by the French government following the European rules of coastal protection. Since the 2000's, it became a bottom up and local policy, to prevent the negative impacts of the tourism and save the attractiveness of the territory.

For both Island the increase of tourism has contributed to the modification of the landscapes, causing negative impacts on natural resources, to welcome the demand of tourists. As a result, these island spaces have become a tourist hub with new buildings, in which wild landscapes have gradually become small villages.

In the case of Ilha Grande, even with the environmental protection laws, the unrestrained growth in tourism has caused problems of tourist congestion, surpassing the island's population capacity in some villages especially in Abraão.

⁶ For exemple, since 2013, the AMP council has three times rejected the mining industry's application for the exploitation of marine aggregates.

⁷ France is divided in regions, which are split up in departments each department has one mayor.

Wunder (2006) points out that in the village there is already saturation. The same author highlights that the garbage and pollution on the beaches increase with the number of visitors, negatively impacting the island in the socio-environmental issue, changing the landscapes and the environmental quality. These facts contribute to modifying the environmental quality and the visual aspect.

Among the various sources of negative impact on the environment, domestic sanitary, waste is identified as one of the most harmful pollutants for water quality and causes immeasurable negative impacts on the marine environment and society [15], and causing the lack of bathing on the main beach of Ilha Grande.

According to data from INEA, 2008-2015, the water quality of village of Abraão inlet, between the years 2012 to 2015, was considered unsuitable for bathing, with a large concentration of fecal coliforms⁸.

The Sewage Treatment Station, which treats the sewers of Villa de Abraão, belongs to the Autonomous Water and Sewage Service (SAAE), which is the responsibility of the municipality and has the treatment capacity for 7,500 people. In 2018, Ilha Grande received a tourist influx of 1,442,608 tourists⁹, it is possible to affirm that the majority of tourists stay at Villa do Abraão, because has a biggest infrastructure to receive the tourists.

In addition to these data, the park manager says that some houses are not directly connected to the sewage system and there are also illegal buildings, which do not have any type of treatment system.

INEA has already legally assessed the SAAE several times, but the problem persists due to lack of funds from the municipality for the expansion of the treatment station.

Moreover, to reinforce this problem of the pollution, some interviewees cited the neglect of a part of the population that throw liquids directly into the rivers. The park manager also emphasizes the lack of public funds to carry out regular monitoring and inspection actions throughout the island.

Collection points for rubbish were demarcated throughout the village by city hall of Angra dos Reis, some are located on the main streets while, other points are in narrow streets uphill.

Even with the defined collection points with established dates and times, a dump was discovered beside the river in one of the streets in the upper part of the island. According to a resident, when it rains, the garbage flows down the river and goes into the sea. In addition, some debris is large and ends up being deposited directly on the ground, there is no infrastructure to store all the waste and consequently the dogs destroy the garbage bags and vultures appear, making part of the island's look like an open air dump (Figure 3).



Figure 3: Collection point, Villa do Abraão

Source: Thompsom,2019

The issue of garbage collection and selective collection is also responsibility of the municipality of Angra dos Reis, which sends a collection truck by ferry to the Villa de Abraão daily, except on Sundays, but selective collection is not carried out. These services in Brazil are implemented with municipal budgetary resources from a specific public cleaning fee or fee collection, as well as a portion of the Urban Territorial Tax that is destined for this purpose [16]. It is possible to receive funds through “incentives or financing from federal credit or development entities for this purpose” [17].

The Aventureiro beach located on the ocean side of the island, which has only a small fishing village of approximately 100 inhabitants [6]. It does not have any sewage treatment plant. Its location, facing the open sea, is a great natural limiter, because when the cold fronts enter, the sea becomes "thick", an expression used by the Caiçaras, and maritime transport becomes impractical. This beach receives mass tourism in the months of January and February and it is possible to affirm through photographic documents, (figure 4) that some homes do not have a septic tank and all domestic sewage drains into the sea. Some respondents stated that this is normal, and that this situation occurs every year.

⁸ L.F.T. Rodrigues, personal communication, December 12, 2018

⁹ A. Pires, personal communication, June 7, 2019



Figure4: domestic sewage

Source: Chueiri, 2019

In addition to this situation, the issue of garbage collection is yet another issue that bothers residents, tourists and negatively impacts the marine environment. Due to the difficulty of accessing this beach and the low regularity of waste collection (once a week and sometimes taking up to two weeks for collection) by boat. This has resulted in an outdoor rubbish dump close to the tourist arrival docks. The accumulation of garbage causes a bad odour and, when it rains, a part it flows into the sea.

The situation is quite different for the French side of our study. First of all, as most of the French Atlantic islands, l'île d'Oleron is a very flat territory, and it is very close to the mainland. Until 1966, there was a ferry service and then a bridge with a toll, which became free in 1990. Thus, the accessibility for trading or leisure is easier than in Ilha Grande. The connection by cables or pipes which can provide resources that lack in the territory are also more convenient, because of the easy access. Therefore, since the 1950's, the touristic development has increased. The tap water arrived in the main villages during the 1920's in the south of the island (Le Château) and in the 1930's in the north (Saint-Denis). At that time, the water was drawn from the island underground [18] and the supply was sufficient for the local population: 15,000 inhabitants in 1936. In the 1960's, an extension and reinforcement of the drinking water distribution network was carried out [19]. The inhabitants of Oleron weren't the only contributors for those expensive works. Since its foundation in 1952, a water public syndicate organizes a financial solidarity among all the communes of the Charente-Maritime, the department which belongs to l'île d'Oleron (Syndicat des Eaux de Charente-Maritime, 2016).

Until the 1970's, each owner had an individual tank that received the sewage of his house. Some of those tanks were septic, some other not, and must be evacuated by a professional. The risk of pollution of groundwater and of coastal waters became gradually more and more important. As the bridge allowed people to visit easily the île d'Oleron, the sale of building plots increased in the north part of the island. According to the INSEE¹⁰ as early as before 1968, the municipalities of Saint-Denis, La Brée and Saint-Georges had fewer primary residences than secondary residences. From the beginning of the 1970's the communes of Saint-Trojan-les-Bains and Grand-Village-Plage followed the same trend. Thereafter, around 1968-1972, a disease contaminated the oysters, and the water pollution was one of the explanations. That's why the construction of 6 sewage treatment plants was decided. The water syndicate entrusted that construction to the two water companies, which distributed the fresh water in l'île d'Oleron since the 1950's: the RESE and the CER¹¹.

The plant of Saint-Trojan was built in 1974, those of Grand-Village and of La Brée-Saint-Denis were built in 1977, followed by Saint-Pierre and Dolus (1982) and Saint-Georges was the last commune equipped with two plants in 1987.

The capacity of those six plants (figure 5) is to treat the sewage up to 150,000 inhabitants. Immediately after treatment, the purified water is stored in artificial lagoons where it remains between 50 days (in summer) and 150 days (in winter) before being discharged into the sea, through pipes or by infiltration through the dunes.

¹⁰ Institut National de la Statistique et des Études Économiques, <https://www.insee.fr/fr/statistiques/>

¹¹ RESE : Régie Syndicale d'Exploitation des Eaux (public organism, created in 1952) ; CER : Compagnies des Eaux de Royan that belongs to the SAUR, Société d'Aménagement Urbain et Rural (private company, created in 1934.)



Figure5: Map of water network in l'île d'Oleron

Source: adapted by the author, www.geoportail.fr, 2020.

That system is exposed to four risks:

The exceeding of the treatment capacity; The infiltrations of rainwater into the system, which clog the plants ; The release of nitrogen products into the ecosystem, which leads to the development of algae that are harmful to the environment[2]Risk of erosion (and submersion) because of the location of several sewage plants, in the marshes and close to a dune or a beach [20]

At the beginning of the 1990's, the population of Oleron surpassed 20,000. According to INSEE, between 1982 and 1999, the number of principal houses grew from 6.622 to 8.907 and the secondary houses grew from 6.700 to 13.700. Together, the number of houses recorded an increase of +41% over the period. The number of official campsites follow the same trend and increased. Finally, in the early 1990's, the daily need of fresh water was about 4500m³ in winter but it grew to 20,000m³ in summer, due to that increasing touristic economy. There was not enough water drawn from the island underground and the inhabitants were suffering from the lack of tap water during the high summer season. For this reason the authorities installed a pipe in order to bring water from the mainland and today, the main part of the water consumed in l'île d'Oleronis imported. Nowadays, the territory has about 25,000 places to stay, including more than 12,000 in campsites and more than 5,000 in furnished rentals. The activity is therefore mainly dynamic during the summer season from April to September. In spite of the evolution, the treatment of the sewages seems to be correct, also thanks to the individual efforts made to consume less water. Therefore, the progress in the management of water distribution has been proportional to the increase in the number of users, but it requires major investments and regular upgrading. They are fortunately taken in charge by the Syndicat des Eaux de Charente-Maritime.

The growth of the population, of temporary residents and visitors have also been responsible for a problem of garbage collection and treatment, since the second world war, in a context of transition to the consumer society. About household waste, we have to take into account the local population, the accommodation places but also the camping on isolated plots, not connected to the water network. From the 1960's to the 1980's, to make up for the lack of profitability in agriculture, the farmers of Oleron sold plenty of land "to camp on". In 2018, those individual campgrounds are about 3,600, but in the early 1990's, when the policy of the Communauté de Communes aimed to reduce that number, they were 7,000[21].Face to the garbage production, in the 1960's, as the south part of the island had been bombed at the end of the war, some municipalities managed the problem by using as landfills the bomb craters remained among the dunes. Some other municipalities took the same solution, with basins of former disused salt marshes or stone quarries, which could be filled by wastes. Most of those public waste dumps opened in 1960's and the last one to close was that of Saint-Trojan, called "La Dune Blanche" in 1987.

Because of the erosion of the dunes, due to climate changes, the waste buried 30 years ago are gradually resurfacing today and they pollute the coastal sea. The situation forces the Communauté de Communes to pay for cleaning everything up [22]. As early as the 1970's, when they initiated the sewage treatment policy, local elected officials also created an intermunicipal syndicate (called SIVOM) to manage the collection and the incineration of the waste. An incineration plant was built in 1975, in the commune of Saint-

Pierre (Le Boisd'Anga). Its unique furnace was able to burn 3,000 tons of household waste per year. A second furnace was built in 1991, in order to treat 24,000 tons per year. In 2003, that plant was modernized to respect European

standards, which come into effect in 2006 [23]. The figure 6, shows the individual container and its collection by truck; collective containers; professional déchetterie of La Cotinière harbor; sticker “no pub” put on a letterbox)



Figure6: Views of the waste policy in îled’Oleron

Source: Sauzeau, 2020.

The Communauté de Communes, created in 1996, was immediately sensitive to the reduction and the recycling of waste. The cost of household waste collection and its treatment absorbed half of its operating budget in 2000 (3.5 million €). In order to maintain activity of the plant in winter, the waste to burn in the off-season was stored in the Bois’Anga, in smelly plastic bales, and this led to complaints. There was also a debate over the pollution from the incineration plant fumes. Bringing the plant up to standard had led to a 36% increase in the household waste collection tax in 2003, and it was clearly unpopular [24]. At last, recycling was also a trend in Europe and in France. That is why the President Jean-Claude Blemont, mayor of Grand-Village, launched a plan of equipment in the early 2000’s: 155 glass waste collection columns (4 m³) and 135 columns for paper and cardboard collection have been installed among the 8 communes of the island. Then, 3 déchetteries were opened (Le Château, Saint-Pierre et La Brée): these are drop-off platforms where residents are welcomed and guided by public service agents to throw their garbage in specific containers for each type of waste. At the same time, the inhabitants were invited to sort out their iron and plastic household wastes, which were collected every week in yellow bags [25]. In 2008, the election of Patrick Moquay as Mayor of Saint-Pierre and President of the *Communauté de Communes* (2008-2014) has accelerated the decisions and their achievements. He gradually extended the waste sort policy to all kinds of waste.

- 2008, domestic composting of vegetable waste: 3250 houses equipped;
- 2009, construction of the *Ecopôle*, a platform for waste recovery (wood, green waste, rubble, vegetable oil) to develop a circular economy;
- 2010, launch of the *Agenda 21*, built in consultation with the inhabitants and their associations for a sustainable development;
- 2011, specific actions to train campers in selective sorting;
- 2013, replacement of the yellow bags by individual containers;
- 2014, creation of 25 selective sorting points on the territory allowing users who leave the island to dispose of their waste, whatever the day.[26]

On figure 6, shows the quantity of waste per person per year on the îled’Oléron

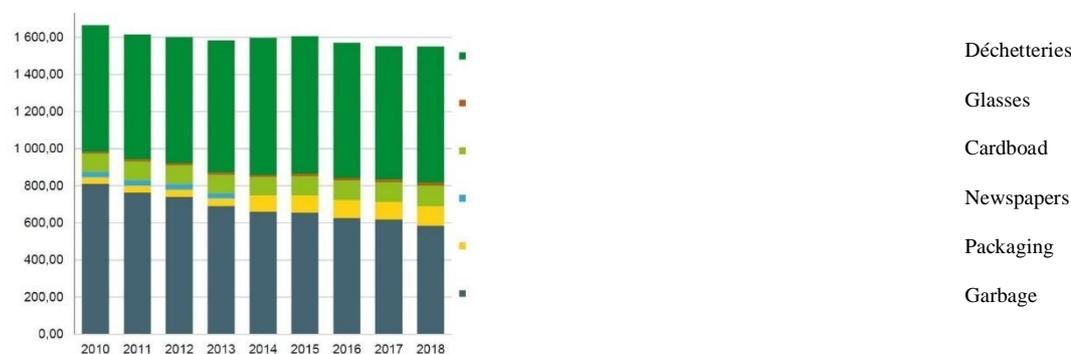


Figure 6: graph of the quantity of waste / person / year on the îled’Oléron

Source: MEDDE, 2015, p.5.

The îled’Oléron has also a fishing harbor (*La Cotinière*) on its West coast and there are about 600 oyster farmers in the South part of the island. Those activities produce industrial waste: plastic materials, mechanical parts, and so on. That is why two déchetteries for those professionals opened too. In 2015, with a new President, Pascal Massicot (Mayor of Saint-

Trojan), the Communauté de Communes won the *Zero Waste* program provided by Ministry of the Environment. From 2010 to 2018, the individual household waste per year went from more than 800kg to less than 600kg (-17,7%). Since 2011, the syndicate (SIL, Syndicat Intercommunal du Littoral) is in charge of the incineration operations, which is administered by the communes of Rochefort, Royan, Marennes and Oléron. Those communes decided to close the plant of the *Boisd'Angain* 2018. Now, there is a single treatment plant based on the mainland (Echillais, near Rochefort), which treats the waste of a population of 200,000 inhabitants. In 2017, inhabitants of Oleron produce together 13,700 tons of household waste, 2,300 tons of glass, 2,100 tons of packaging and paper, 500 tons of cardboard. In Oleron, the cost of the waste policy is now about 11 millions € per year: 45% for the treatment and 40% for the collection cost [27]. The result of 25 years of a continuous policy of waste reduction and recycling is positive. In spite of the growing volume of waste, there is less and less household garbage. The rubbish tax has not increased since 2014 (200€ per household and per year) and the Régie Oleron Déchets (ROD) makes benefits (about 250,000€ per year) that are put in a financial reserve of almost 3.6 million €. With the collected money, the next step is the introduction of an incentive fee that will offer a tax reduction to households that throw away the least quantity of waste (SIL, 2018).

4. Results: Coastal management, plans and actions developed by the government and the population of Ilha Grande and L'île d'Oléron.

Obtaining good results from an integrated and efficient coastal management, is based on the premise that it is necessary to implement actions to minimize problems, with initiatives by the population, the government and non-governmental companies. In this sense, the most efficient assessment comes from analyzing the integrated actions of these bodies, in which it seeks to examine human behaviour more objectively, with an emphasis on everyday actions.

The issues of sewage and garbage are emerging issues in Ilha Grande that have taken on large proportions, far beyond pollution or landscape modification. The deposits and the exposure of garbage and the main beach of the island, unsuitable for swimming, will in the long run reduce tourism, affecting the economy of the local population.

Actions by the civil community have been made to reduce the issue of solid waste, such as the project by one researcher from the University Estadualdo Rio de Janeiro, in partnership with the NGO Brigada Mirim, located at Praia de Abrãao. As the first stage of the project in April 2017, they carried out environmental education work with residents, teaching the importance of separating garbage, through conversations and booklets. After this stage, a collection point was created to collect recyclable waste, send it to the city of Angra dos Reis, to be sold with the money returned to the person who produced the waste. The NGO Mirin Brigade supervisor reports: "We are seeing a significant increase in the collection of recycled materials" (figure 4).



Figure7- bags with garbage recyclable in front of Guarda Mirim.

Fonte: CHUEIRI, 2018

Some initiatives by the population are carried out to maintain the ReciclaIlha project. In schools, teachers encourage students to take their waste from the school to the Mirim Brigade, to weigh and receive a voucher with the monetary value, which will be delivered after the sale of the material on the mainland. The money is invested in material to carry out extra activities with the students.

One of the Spiritualist centres of Villa mobilizes its faithful to take their recyclables to convert the money into basic baskets for the poorest residents of the Island.

Although selective collection is the responsibility of the municipality, the participation of the population in the ReciclaIlha program as volunteers is notable. This is what happens in most Brazilian cities. According to Ribeiro e Besen (2007), the organization in favour of the movement for the separation of garbage and later recycling, is usually done through voluntary campaigns, through awareness campaigns promoted in the neighbourhoods, condominiums, schools, commerce, companies and industries.

Residents in partnership with the PEIG and INEA management organize environmental educational activities with schools, boy scouts, children in general, adults, with the main objective of raising environmental awareness to persuade them that: the land belongs to the population and that taking care is also a responsibility of residents and not just the government.

Lectures and events are held for university students on the management of conservation units with the aim of exposing the problems faced and proposing spaces for debates and discussions to bring about improvements.

INEA and residents carry out garbage collection efforts on the beaches. A lot of waste is brought in by the tides and end up accumulating on the beaches, mainly on ReBio beach, due to the dynamics of the sea.

As a type of conservation where no human activity is allowed, ReBio da Praia do Sul authorizes only the entry of employees and researchers who are studying preservation. For tourists who travel around Ilha Grande on foot, prior authorization is granted provided that, in return, they must collect the garbage on the way and deposit it in the appropriate place, where INEA collects it.

For Ribeiro e Besen (2007), it is necessary to include selective collection as part of the public management strategy in the city's Urban Cleaning System, so that proper management occurs, this does not occur on Ilha Grande. This problem about the lack of commitment in the municipality of Angra dos Reis extends to other municipalities in Brazil, such as the state of Rio Grande do Sul [28].

For Île d'Oleron waste disposal has been an issue discussed and worked on by public agencies and residents, with the change of the refuse collection company being outsourced by the city council, there has been better public organization regarding the collection of waste, resulting in the reduction of garbage deposits on Ilha Grande. As for tree cutting, debris, construction waste and scrap iron, it is necessary to schedule the collection with the city.

The lack of planning and investment focused on pollution prevention issues that is, sewage and solid waste, has become a visible problem, causing pollution of sea water exceeding the standards safe for human health and the environment.

It is possible to note that there has been an integrated management by INEA and the population. Efforts have been put into environmental education actions, so that residents now take care of their land and that a new generation grows within the context of preservation, where the objective is the collection and separation of solid waste.

There were no identified actions about sewage, of the harm that the lack of treatment brings to the marine environment and to the health of the local population, even though it is the most harmful pollutant for the marine environment. INEA data points out the lack of ability to swim on the main beach of Abraão, which is the main arrival point to the island, tourists and even some residents, had been using this beach for swimming.

However, the fact that the growth of tourism activity, the lack of public management and the lack of environmental awareness by a part of the population, has been causing a series of negative impacts on the quality of the sea environment.

The principle of paying tax on the removal of household waste was adopted in France in 1926, but only in the cities. Since the 1960's in the rural areas and on the islands, the population was used to pay for the collection of the waste. The project of the treatment plant of Île d'Oleron began in 1966 and it was completed in 1975. The tax system was extended to the campsites by a national law in 1993. In Oleron, ten years later (2003) the waste treatment plant needed to be upgraded and it compelled the Communauté de Commune to increase the tax of +36%. Such a trajectory was not sustainable. That is why the financial question has then been managed so as to make profits with the waste. The first steps were the collection of glass and paper/cardboard. In Île d'Oleron, Patrick Moquay's presidency (2008-2014) was a moment of sharing the stakes of the waste problem from a global point of view, with the inhabitants. Before his election, the inhabitants didn't mind about the waste and its recycling: the main solution was to burn it and in Oleron, the energy produced by the incinerator was lost. So, the political mandate of Patrick Moquay aimed to find to each kind of waste, its chain value. In 2009-2010, the local council prepared a list of topics which have been discussed in a round of local meetings. The result was the local waste program called Agenda 21, which Oleron adopted in the framework of a large ecological policy voted by the French government: the "Grenelle" of environment. According to the Agenda 21, there were a lot of actions which continue in 2020, such as: Students in schools have been sensitized to waste reduction; Animations in supermarkets to promote products with less packaging;

Provision of returnable cups (with logo of the council) for outdoor events; Heating of public buildings (also the recreational water park *Îléo*) was carried out with recycled fuels (2011); Agreements with associations so that they recover reusable or recoverable wastes (ex : OCEAN for shoes and clothes); Opening of a shop which proposes to the public the valued goods: the *Ressourcerie* in Dolus (2016); Marketing communication; Prohibition of unauthorized dumpsites with fines ranging from 450 to 1500€; Regular presentation of sorting results in the community newspaper "*Vent Portant*".

Because of those actions, the future introduction of an incentive fee (2021) in order to offer a tax reduction to households that throw away the least quantity of waste is probably achievable

5. Conclusion

One of the biggest challenges of the coastal management of waste and sewage it finds infrastructural, institutional and financial solutions that promote preservation and maintenance of the environment and life quality. Especially when the large influx of people associated with tourism brings some negative impact on the environment principally in the high season of tourism.

Oleron Island is an example of a successful integrated coastal management, which articulates with the local population, through its associations. The issue of garbage and sewage were identified as problems that were resolved over time. For the past 25 years, on Ile d'Oleron, there has been political stability and public education which allowed the communes to gain a strong experience in controlling the pollution and environmental degradation.

The alteration of the natural landscape of Ilha Grande is a problem created by two types of pollution, visible and non-visible, respectively: the deposits and the sight of garbage inhibits swimming on the main beach of the island, Abraão. Environmental education actions tend to focus only on what is visible, garbage, however, the most harmful pollution to the

marine environment is sewage pollution, which is the non-visible pollution and this also causes the lack of swimming. In Oleron, the problem has been solved, the only problems that still arise may be due to malfunctions in sewage treatment plants or lack of civic-mindedness on the part of residents or visitors.

As the experience of l'île d'Oleron may indicate, it is necessary to promote in Ilha Grande participatory collection actions by the population that require better basic sanitation, since the government has not resolved this issue and INEA has already notified the SAAE several times, so the government in this situation is inefficient.

Before the mid-1990's it's difficult to have data about the waste and the sewage in Oleron and the situation seems to be comparable for Ilha Grande nowadays. With the lack of updating and inaccuracy of population data and quantities of houses with some type of sewage treatment, it is difficult to make a quantitative analysis of the current reality of the Island, to verify the amount of m² of sewage that is being released into rivers and the sea at Villa do Abraão.

As a short-term solution to this sewage problem, there should be extensive work on environmental education for residents on the island, with a focus on rationing the use of water, as this will reduce sewage production. That is the methodology the local authorities have succeeded to share with the inhabitants in Oleron, with the help of the French government.

In governmental terms, a tourism plan or fund could be implemented for issues of social-environmental development in island regions affected by tourism, which would concentrate on the conservation territory.

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