SFD Report

Punta del Diablo
Uruguay

Final Report

This SFD Report – Comprehensive level - was prepared by the Inter-American Development Bank (IDB), Dica & Asociados (D&A) and Estudio Pittamiglio (EP).

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SFD Report Punta del Diablo, Uruguay, 2022

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FOREWORD

The Inter-American Development Bank (IDB), through the saniIDB platform, seeks to promote the development and implementation of optimal and non-conventional sanitation solutions in the Latin America region. The first step to identify solutions is to characterize the state of the sanitation situation that could serve as a baseline in the areas of intervention.

One well-known and globally accepted tool to analyse the sanitation service delivery chain to identify its strengths and weaknesses in any given area is the Shit Flow Diagram (SFD) graphic. The tool was developed by the SFD Promotion Initiative (SFD PI), a consortium of partners working together to improve excreta management in urban areas. The SFD PI is supported by the Bill & Melinda Gates Foundation and managed by GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH) as part of the Sustainable Sanitation Alliance (SuSanA).

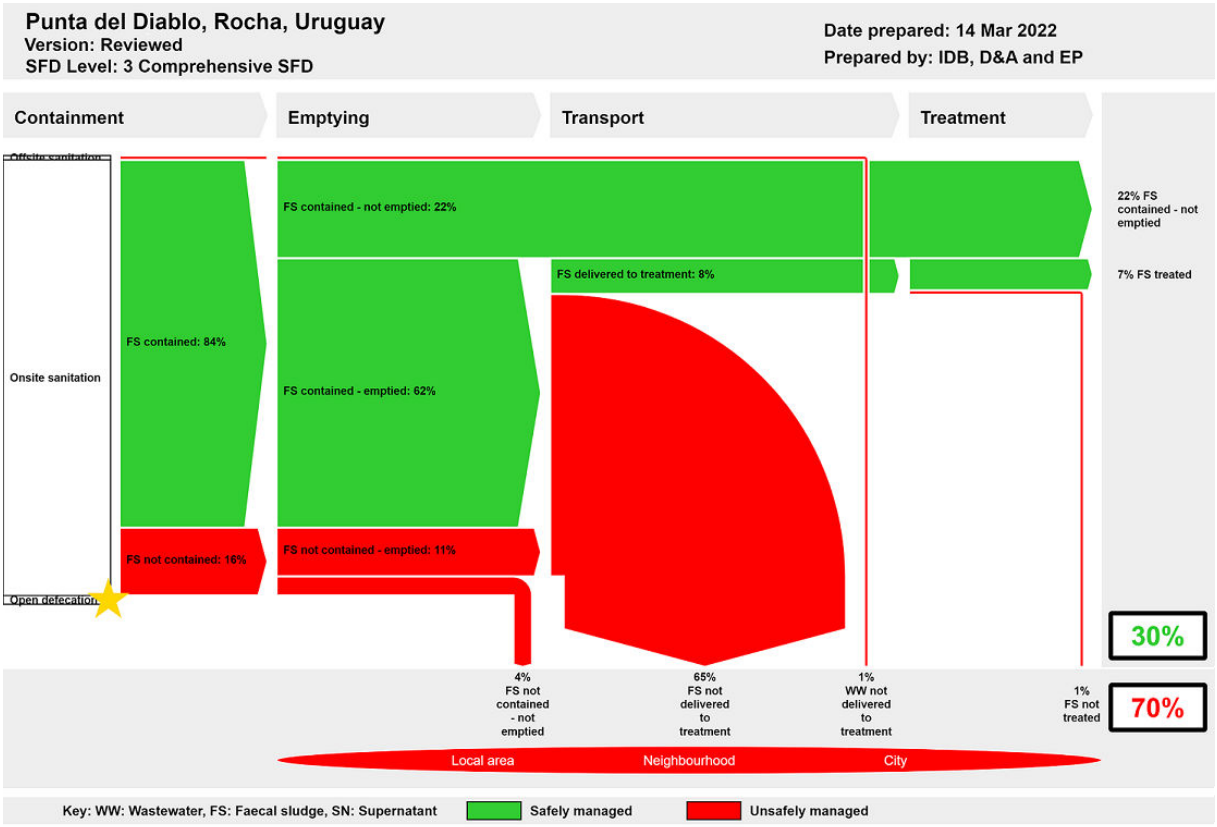
An SFD is an advocacy tool that aims to assist technical and non-technical stakeholders in order to implement plans and programs related to urban sanitation. The SFD methodology is increasingly being used to analyse the extent of safely-managed sanitation in urban areas, providing with a valuable picture of the prevailing sanitation condition from containment to disposal. So, it is a widely recognised advocacy and decision support tool that aims to understand, communicate, and visualize how the wastewater and faecal sludge moves within a city or town. As stated in the SuSanA website, the SFD methodology offers “a new and innovative way to engage sanitation experts, political leaders and civil society in coordinated discussions about excreta management in their city”.

The SFD graphic is made by a free online tool, the Graphic Generator (GG): https://sfd.susana.org/data-to-graphic and, to date, over 250 SFD reports, which must pass a review process before publication to assure the quality control mechanism of the SFD PI, have been uploaded in the SuSanA website.

The production and publication of an SFD report for Punta del Diablo (Uruguay) would help to visualise the current sanitation situation in the city, resulting in a potential to shift the current activities and efforts towards more efficient investments in the places of the sanitation chain that need more attention, improving the urban sanitation situation and the surrounding environment of the study area.

The structure of this SFD report consists of an executive summary and the SFD report. The latter includes: i) general city information describing its main characteristics, ii) the sanitation service outcomes with a thorough explanation of the SFD graphic outcome and the assumptions made, iii) the service delivery context analysis which contains information on the regulatory framework of water and sanitation at country and city level, also describing the city plans, budget and future projects to improve the sanitation situation and iv) a detailed description of the surveys, Key Informant Interviews (KIIs) conducted, as well as the key stakeholders involved, field visits carried out and references used to develop this SFD report

1. The Diagram



The SFD Promotion Initiative recommends preparation of a report on the city context, the analysis carried out and data sources used to produce this graphic.
Full details on how to create an SFD Report are available at: sfd.susana.org

2. Diagram information

SFD Level:

This SFD is a level 3 - Comprehensive report.

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Status:

Final SFD level 3 report.

Date of production: 16/05/2022

3. General city information

Punta del Diablo is located on the Atlantic Ocean coast of Uruguay in the department of Rocha. The city is made up of six large sub-divisions: Punta del Diablo, Coronilla del Mar, Aldea del Mar, Santa Teresa de la Coronilla, Parque Santa Teresa and Santa Teresa (D&A and EP, 2021).

The area has experienced strong growth process in the last 10 years. The main economic activity is sun and beach tourism, and its associated services, such as hotels, shops and restaurants. The other significant economic activity in the area is fishing, the main occupation and source of income for the fishing community settled in the city (D&A and EP, 2021).

The city is a seaside resort, settled on shallow soils and dune surfaces on a rocky mantle (D&A and EP, 2021).

The climate is warm and temperate with an annual average temperature of 17.2°C and an average annual precipitation of 1,257 mm (CD, 2021).

For this report, a total population of 23,128 is estimated. Comprising a resident population of 2,000 people and a “floating” or summer population of 21,128 people (D&A and EP, 2021).

4. Service outcomes

The consulting firms Dica & Asociados (D&A) and Estudio Pittamiglio (EP) together with the Inter-American Development Bank (IDB) and the support of the Ministry of the Environment of Uruguay prepared a study in September 2021: "*Diagnosis and Sanitation Strategy in Punta del Diablo, Diagnostic Report*" (D&A and EP, 2021) that included two surveys: i) a household survey to know the resident population's access to water, sanitation and hygiene, ii) a survey of tourist places (restaurants, hotels, hostels and rental houses) to know the access to water, sanitation and hygiene of the tourist population.

The data collected through the surveys were cross-checked with other sources, such as reports and documents provided by local authorities, also including field visits. In addition, Key Informant Interviews (KIIs) were carried out with emptying service providers, large entrepreneurs, social actors and masons in the area who provided information of interest to triangulate all the data collected.

The results obtained after triangulating the data with all data sources show the following distribution and use of sanitation systems:

Containment

There is no sewage system. The percentage of people using onsite sanitation systems is 99.6%. 92.4% have some type of tank and 7.2% of the population use toilets connected to a cesspit. The remaining 0.4% use toilets connected to "don't know where", considered as an off-site system by the SFD-PI methodology (D&A and EP, 2021).

Emptying

The percentage of households and tourist places that report that their onsite sanitation system has been emptied is 65% and 73%, respectively. After triangulating these values with the rest of the sources, an agreed and weighted value of the value of the variable F3 = 71% was reached.

The percentage of households and tourist places that declared that they had emptied their systems through an emptying service provider is 92% and 94% respectively (D&A and EP, 2021).

Two emptying service providers operate in the town: El Indio and WR Barométrica. Both companies are based in the city of Chuy and have provided the emptying service of onsite sanitation systems in Punta del Diablo for more than 5 years.

In the summer the El Indio company operates in from 7 a.m. until 9 p.m., while in winter it makes one trip per week on average. Their vacuum trucks have different capacities: 17, 9 and 4 m^3, and they normally use the 9 m^3 one, since it has a better accessibility to the main street. The population of the city is increasing alongside a reported increase in emptying work (KII 1, 2021).

The WR Barométrica company operates every day in the summer, while in winter it works every 15-20 days. The capacity of their vacuum truck is 9 m^3 (KII 2, 2021).

Almost all households interviewed (95%) mentioned that they never had problems with their tank. Only one case mentioned having suffered the break of the tank. However, 65% of the tourist places declared that they never had problems with their tank and of the remaining 35% that declared that they had a problem, most referred to overflows and, secondly, to bad odours.

The average price of emptying the tanks, which have an average volume of 5.7 m^3, is $U 1,850 (USD 42) and the average price in tourist places, which have an average volume of 9.4 m^3, is almost $U 4,000 (USD 90). In households, the tanks are mainly located at the back of the house, while in tourist places most of the tanks are located in front or behind the premises, in equal percentages (D&A and EP, 2021).

Transport

The emptying companies discharge the faecal sludge in the Castillos, Chuy or Rocha wastewater treatment lagoons. Castillos and Chuy are located about 40 km from Punta del Diablo while Rocha is located about 95 km from Punta Del Diablo. It takes at least one hour to reach the lagoons and as much as two hours in summer. However, only a small percentage of the collected faecal sludge is taken to the lagoons (KII1, 2021; KII 2, 2021).

Treatment and disposal

In tourist places that have their own Wastewater Treatment Plant (WWTP), the treatment consists of a septic tank followed by a wetland (D&A and EP, 2021).

The small percentage of faecal sludge that is delivered to treatment is treated in the Castillos, Chuy or Rocha lagoons.

Most of the faecal sludge collected (including sludge not collected by the two emptying service providers) is discharged into streams, rivers, beaches or directly on the ground without any treatment.

In addition, several problems due to poor disposal of sewage and faecal sludge were identified in places such as *Playa del Rivero* and *Playa de los Pescadores* (VC 1, 2021).

At present, practically all of the existing buildings are connected to the water distribution network of the State Sanitary Works (OSE). Drinking water comes mainly from three protected water wells. The OSE network is the main water source for 95% of households and 75% of tourist places. The remaining 5% and 25% rely on individual wells, respectively. The OSE network is supplied by protected wells where the water is extracted from the third underground layer, which is why it is considered a protected source (D&A and EP, 2021).

The SFD graphic shows that 30% of the excreta generated is safely managed while 70% of the excreta generated is unsafely managed.

5. Service delivery context

In Uruguay, national regulations are set out according to their hierarchical rank. Article 47 of the Constitution, incorporated in the 2004 Plebiscite, states that "*access to drinking water and access to sanitation constitute fundamental human rights*". It is also established that "*the provision of those services will be provided exclusively and directly by state legal entities*".

The *National Water Policy* is established in Law 18.610 of 10/2/2009. The objective of the policy on drinking water and sanitation is established in its Article 14: "*to ensure the universality of access to them, on the basis that social reasons prevail over economic reasons*".

The *National Sanitation Plan* addresses the specific objective of achieving the universality of access to sanitation, with an emphasis on the most vulnerable households. Different sanitation systems are proposed as a method to meet this objective, beyond the traditional ones through sewerage, and centralized treatment for their final disposal. This is particularly relevant in seaside resorts, with great seasonality, where the capex and opex cost per capita of traditional solutions is prohibitively high.

The principles and strategies that should be considered as guides, and applicable to Punta del Diablo, are proposed in the *National Sanitation Plan*. There are also several local regulations that address the management and disposal of wastewater and faecal sludge directly or indirectly (D&A and EP, 2021).

6. Overview of stakeholders

Stakeholders can be divided into three main groups, as can be seen in Table 1 (public institutions, private sector and external actors).

Table 1: Key Stakeholders.

Key Stakeholders	Institutions/ Organizations
Public Institutions	OSE, URSEA, DINAGUA, DINACEA, Ministry of Environment, Departmental Governments, Local Board of Punta del Diablo
Private sector	Emptying service providers, masons and builders
Internal and external financing and development actors	Inter-American Development Bank (IDB), Dica & Asociados (D&A) and Estudio Pittamiglio (EP)

At the national level, the State Sanitary Works (OSE) acts as the operator of sanitation and sewerage services in the interior of the country. OSE has an office and some staff dedicated to operate the drinking water network in Punta del Diablo. The Executive Power is in charge of formulating policies in the sector, and the Regulatory Unit of Services of Energy and Water (URSEA) in charge of the regulation and supervision of these services. Within the executive branch, the new Ministry of the Environment is in charge of monitoring and attending to the policies of the sector, both in aspects related to the sanitation service by the National Water Directorate (DINAGUA), and in environmental aspects by the National Directorate for Quality and Environmental Assessment (DINACEA).

The Departmental Governments are responsible for the hygiene and health of the population, and the territorial and regulatory ordering of buildings at the local level, whose significance is essential to provide adequate solutions for the disposal of household effluents, while not sewer networks are built for the sanitation service.

The departmental authority is represented in the town directly through the Local Board of Punta del Diablo.

Following the sanitation service chain, the private sector plays an essential role. Septic tank builders and emptying service providers are key players who provide critical services to keep the sanitation chain running.

Other actors such as the IDB, together with local companies and consulting firms (Dica & Asociados (D&A) and Estudio Pittamiglio (EP)) have begun to carry out projects, such as the one on which this SFD report is based, which aim to improve the water and sanitation management in the city.

7. Credibility of data

The "*SFD source evaluation tool*" has been used

to score the credibility of the 17 data sources consulted. Most of the data sources have high or medium credibility.

8. Process of SFD development

The Inter-American Development Bank (IDB) financed and developed this report in conjunction with Dica & Asociados (D&A) and Estudio Pittamiglio (EP) and with the support of the Ministry of the Environment. The development process of the SFD graphic has been carried out in several stages:

1. Bibliographic review.
2. Population data obtained from the National Institute of Statistics and other complementary sources.
3. Data on the amount of services and average water consumption of the OSE network.
4. Data obtained from a household and tourist places surveys.
5. More than 10 key informant interviews (KIIs) and several field visits.
6. Use of the Graphic Generator to produce the SFD graphic.
7. A validation workshop attended by representatives of the Ministry of the Environment and the operator of sanitation and sewage services (State Sanitary Works, OSE) in which the results of the SFD graphic were presented and approved.

9. List of data sources

Below is the list of data sources used for the development of the SFD executive summary:

- CD, 2021. Punta del Diablo climate data. Web: https://es.climate-data.org/america-del-sur/uruguay/rocha/punta-del-diablo-321513/ [Accessed 11/19/2021]
- D&A and EP, 2021. report: "*Diagnosis and Sanitation Strategy in Punta del Diablo, Diagnostic Report*". UR-T1258, ATN/OC-18539-UR. September 2021. With the support of Inter-American Development Bank (IDB) and the Ministry of the Environment of Uruguay. (In Spanish).
- KII 1, 2021. Interview with the head of the company *El Indio*.
- KII 2, 2021. Interview with the head of the company *WR Barométrica*.
- FV 1, 2021. Several field visits to the beaches and surrounding areas. Taking of pictures of the problems identified.

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Abbreviations

AECID	Spanish Agency for International Development Cooperation
ASSE	State Health Services Administration
CAIF	Child and Family Care Centres
CFU	Colony Forming Units
D&A	*Dica & Asociados*
DINAGUA	National Water Directorate
DINACEA	National Directorate of Quality and Environmental Assessment
DINOT	National Directorate of Territorial Planning
EP	*Estudio Pittamiglio*
FDS	Final Disposal Sites
FGDs	Focus Group Discussions
FSTP	Faecal Sludge Treatment Plant
Ha	Hectare
IDB	Inter-American Development Bank (IDB)
INE	National Institute of Statistics
KIIs	Key Informant Interviews
masl	Metres above sea level
MEVIR	Movement for the Eradication of Unhealthy Rural Housing
NGO	Non Governmental Organization
OPP	Office of Planning and Budget of the Republic
OSE	State Sanitary Works
PSU	Practical Salinity Unit
SFD	Shit Flow Diagram
SFD-PI	Shit Flow Diagram Promotion Initiative
SNAACC	National Secretariat of Environment, Water and Climate Change
URSEA	Regulatory Unit for Energy and Water Services
$U	Uruguayan Peso (USD 1.00 = $U 44.04 as at 28 July 2022)
USD	United States Dollar
UTE	National Administration of Power Plants and Transmission
PVC	Polyvinyl Chloride
WWTP	Wastewater Treatment Plant

1 City context

1.1 Location

Punta del Diablo is located on the Atlantic Ocean coast of Uruguay in the department of Rocha. The city is made up of six large sub-divisions: Punta del Diablo, Coronilla del Mar, Aldea del Mar, Santa Teresa de la Coronilla, Parque Santa Teresa and Santa Teresa.

The main economic activity in the area is beach tourism, and its associated services, such as hotels, shops and restaurants. The amount of tourism has increased markedly in the last 20 years. The other significant economic activity in the area is fishing, which is the main occupation and source of income for the fishing community settled in the city since the early 1900s (D&A and EP, 2021).

There is a set of social organizations and agents which are proactive and participate in the city's social activities, these include the *Punta del Diablo Promotion League*, the *Punta del Diablo Social and Sports Club*, and the city's craft fair that constitutes a natural organization environment for small businesses and artisans (D&A and EP, 2021).

The city has a public school attended by more than 240 students, a private school, and a Child and Family Care Centre (CAIF). There is a polyclinic of the State Health Services Administration (ASSE), a police station and a detachment of the National Prefecture (D&A and EP, 2021). Figure 1 shows the map and location of Punta del Diablo.

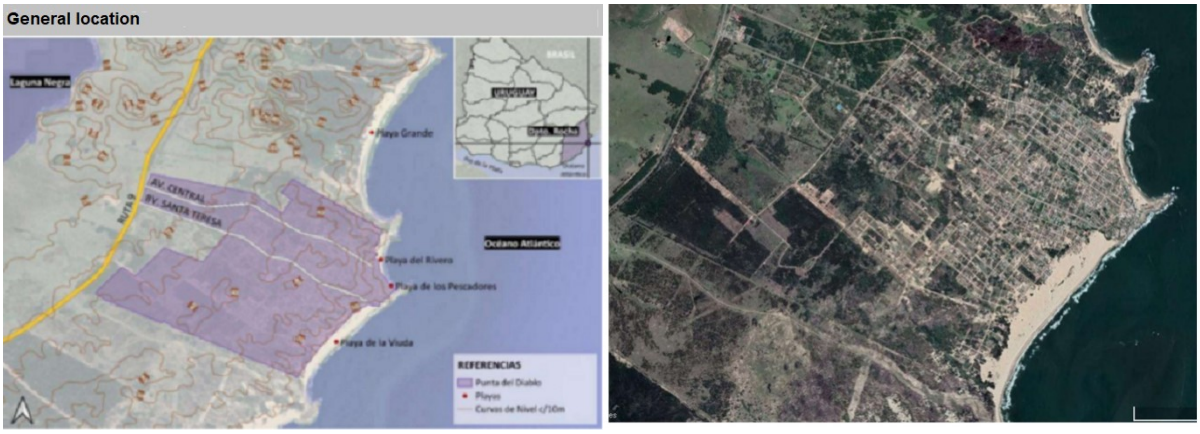

Figure 1: (Left) Location of Punta del Diablo; (Right) Satellite image of Punta del Diablo. Source: (D&A and EP, 2021).

1.2 Main physical and geographical characteristics

The city is a seaside resort, settled on shallow soils and dune surfaces on a rocky mantle (D&A and EP, 2021). According to the Uruguay Soil Charter (Scale 1: 40,000), Punta del Diablo has two main areas: *Punta del Diablo Unit* and *Cuchilla de la Angostura Unit*, with a third Unit called *Manantiales* that covers an area of 30 hectares (ha), approximately in the access zone by Route 9. The two main units are divided by the *Cuchilla de la Angostura*,

which generates two runoff zones: a north zone towards the Black Lagoon and a south zone towards the spa beaches (Figure 2).

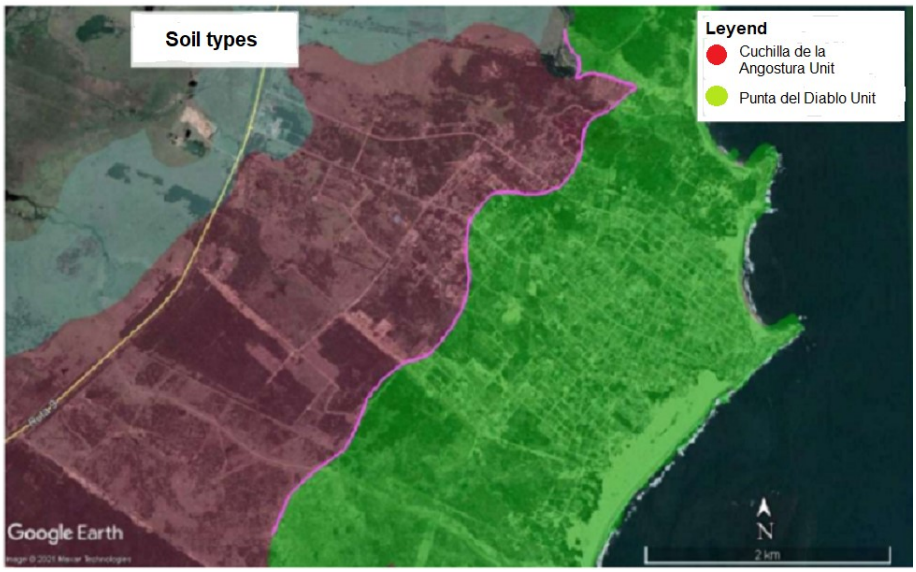

Figure 2: Soil types identified in Punta del Diablo. Source: (Uruguay soil chart).

The *Cuchilla de la Angostura Unit* corresponds to a miscellaneous area made up of soils totally or partially eroded by the wind and later covered by coastal sands transported or redistributed by the wind. The thickness of these coatings varies between 0.30 and 0.80 m and they are classified as Arenosols.

The *Punta del Diablo Unit* is made up of soils classified as Ocric Arenosols Sandy Family. They are poorly developed and excessively drained soils. This unit integrates the coastal dune system made up of recent marine sands, retransported by the wind, and can reach between 40 and 50 metres above sea level (masl).

The lithological profiles show that there is a predominance of sandy clay soils, with significant spatial variability, which does not allow the exact identification of large homogeneous areas (D&A and EP, 2021).

1.3 Climate

The climate is warm and temperate in Punta del Diablo. The average annual temperature is 17.2 °C., February is the warmest month (average of 22.6°C) while July is the coldest (average of 11.8 °C). In a year, the precipitation is 1,257 mm. The driest month is January with averages of 85 mm of precipitation. Most of the precipitation occurs in April, with an average of 118 mm (CD, 2021).

1.4 Demography

The city, according to data from the 2011 census of the National Institute of Statistics (INE, 2011), had a permanent population of 823 inhabitants who occupied 343 private homes of the 2,098 private homes that the city has (only 16%). In these last 10 years, the city has

grown strongly. The "floating" population should be added to the official population data[1], very relevant due to the tourist pressure.

For this SFD report, a resident population of 2,000 people and a "floating" or summer population of more than 20,000 people is estimated (D&A and EP, 2021).

2 Service Outcomes

Tourism in Punta del Diablo represents the main income of the city. Therefore, the protection and conservation of this coastal area is essential. The services and infrastructure that the city offers are scarce, mainly due to the strong growth in demand that occurs in the summer season, when the city receives approximately 10 times more people than those who live throughout the year.

Based on this, the consulting firms Dica & Asociados (D&A) and Estudio Pittamiglio (EP) together with the Inter-American Development Bank (IDB) and the support of the Uruguayan Ministry of the Environment prepared a study in September 2021: "*Diagnosis and Sanitation Strategy in Punta del Diablo, Diagnostic Report*" (D&A and EP, 2021) that included two surveys: i) a household survey to know the resident population's access to water, sanitation and hygiene, ii) a survey of tourist places (restaurants, hotels, hostels and rental houses) to know the access to water, sanitation and hygiene of the tourist population.

The objective was to conduct a thorough study of Punta del Diablo to understand the current situation of the sanitation service delivery chain (containment, emptying, transport and treatment), as well as the characteristics of the area and the main existing sanitation problems. The study was intended to serve as a basis for the proposal of future solutions adapted to the particularities of the city, being a first step to identify viable measures of rapid application that can be replicated in other areas of the country to help reduce contamination by sewage and faecal sludge.

One of the design criteria of the surveys was that they would allow the elaboration of an SFD graphic according to the SFD-PI (SFD Promotion Initiative) methodology. The data collection was carried out using the *KoboToolbox* tool. The surveys included questions about the use of drinking water sources, location of the sanitation systems in use, the volume of faecal sludge generated, collected and delivered to treatment, as well as information on the emptying systems or the fees charged, among many others. Appendix 2 and Appendix 3 present a summary of the design of the two surveys, as well as a selection of the questions asked.

The data collected through the surveys were cross-checked with other sources, such as reports and documents provided by local authorities, also including field visits. In addition, Key Informant Interviews (KIIs) were carried out with emptying service providers, large entrepreneurs, social actors and masons in the area who provided information of interest to triangulate all the data collected.

[1] For the purposes of this report, floating population is understood to be the estimate of people who, not being permanent residents of Punta del Diablo, have a residence here where they spend a few days a year or spend a certain period of time for reasons such as holidays, work, academic or other.

2.1 Overview and study area

According to the interview carried out with the Director of Territorial Regulation of the Province of Rocha (KII 6, 2021), there is no current territorial regulation plan for Punta del Diablo. It is estimated that 50% of the buildings are not regularized in the Province of Rocha, although there is no database to confirm this value.

Survey data

The 20 and 24 sampling points of the household and tourist places surveys are shown in Figure 3 (D&A and EP, 2021).

Figure 3: (Left): Household sampling points; (Right): Tourist places sampling points. Source: (D&A and EP, 2021).

In the study area, there is no sewage system. Most of the population is served by onsite sanitation systems, especially septic tanks, toilets connected to a cesspit and some privately-owned Wastewater Treatment Plants (WWTPs) (D&A and EP, 2021).

2.1.1 Containment

Off-site sanitation: According to the survey data, 0.4% of the population use toilets connected to "don't know where", considered as an off-site system by the SFD-PI methodology (D&A and EP, 2021).

Onsite sanitation: The percentage of people using onsite sanitation systems is 99.6%. 92.4% have some type of tank and 7.2% of the population use toilets connected to a cesspit. The remaining 0.4% use toilets connected to "don't know where", considered as an off-site system by the SFD-PI methodology (D&A and EP, 2021).

In addition to the surveys, qualitative interviews were conducted with builders/masons in the area, to find out the particularities that may arise during the construction works, the use of regulations, the type of sanitation system used and the perception of the expansion of the town (KII 4, 2021). Regarding the use of current regulations as a guide for new constructions, they indicate that their works are governed by the regulations, and they have processed the required construction permits and received the corresponding inspections. In any case, they mention that there are few constructions that have all the permits. This creates a temptation

not to request approval in their constructions, since those that are not declared do not receive inspections or sanctions. Regarding the type of constructions, many of the interviewees chose to respect the construction criterion on stilt houses, in accordance with the *Ordinance of Territorial Planning and Building*, respecting the normal runoff and the movement of sand from the dunes. Regarding the sanitation system used, they have built in all cases septic tanks connected to a soak pit (KII 4, 2021).

During the field visits, it was revealed that most sanitation systems had three covers (2 from the septic tanks + 1 from the soak pit). Figure 4 shows: a) a sketch of the ordinance where the tank and soak pit are outlined, which, according to interviews with masons, is the design used in most cases, as well as b) a soak pit under construction, where it can be seen that the joints between the rings are not sealed and the bottom is not observed due to the presence of the water table.

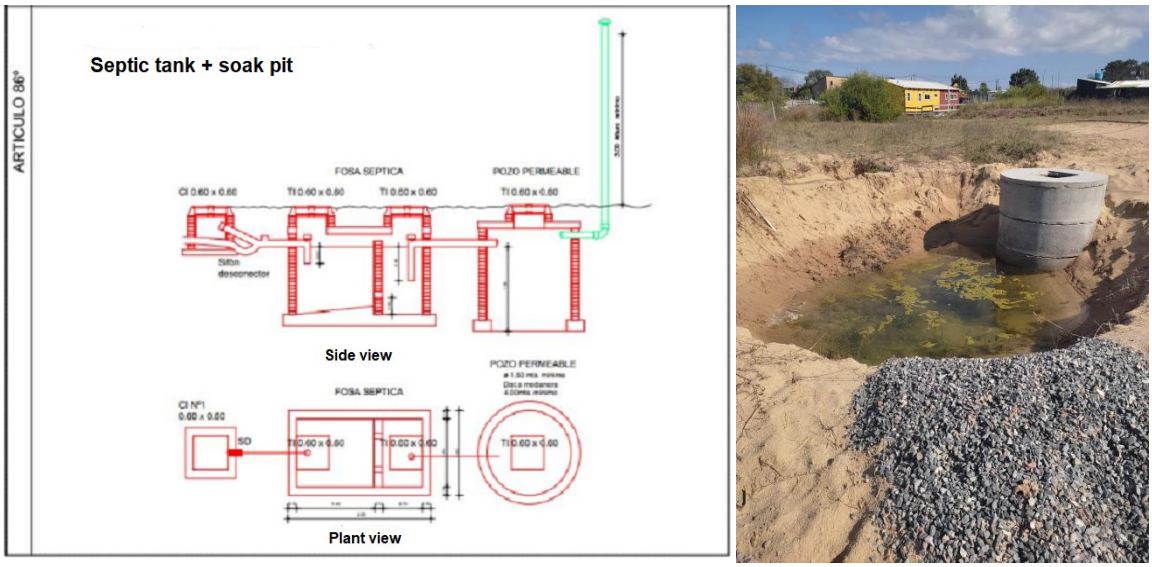

Figure 4: (Left): Sketch of the ordinance where the design of septic tanks is outlined; (Right): Septic tank under construction. Source: (D&A and EP, 2021).

On the other hand, it was pointed out in the interviews carried out with social actors (Influential entrepreneurs, etc.) in Punta del Diablo that most of the interviewees have a construction permit and, therefore, use septic tanks connected to a soak pit, as it is recommended by the regulations. However, it was not possible to verify that they carried out a soil study before the construction works. In addition, many entrepreneurs have presented complaints about the state of the streets to the Local Board. Finally, the interviewees expressed their concern regarding wastewater/faecal sludge management, mainly due to the huge growth of the city in recent years (KII 5, 2021).

2.1.2 Emptying

The percentage of households and tourist places that report that their onsite sanitation system has been emptied varies between 65% and 73%, respectively. Of those who affirmatively declare that they have emptied their system, the majority of households (39%) do so once a year, while in the case of tourist places, the majority (50%) do so more than once a month. The percentage of households and tourist places that declared that they had

emptied their systems through an emptying service provider is 92% and 94% respectively (D&A and EP, 2021).

Two emptying companies operate in the city: El Indio and WR Barométrica. Both companies are based in the city of Chuy and have provided the onsite system emptying service in Punta del Diablo for more than 5 years.

According to the interview with the person in charge of El Indio (KII 1, 2021), this company works all day during the summer months from 7 a.m. until 9 p.m., while in winter it makes one trip per week approximately. Their vacuum trucks have different capacities: 17, 9 and 4 m^3, and they normally use the 9 m^3 one, since it has a better accessibility to the main street. This person also points out that he has seen an increase in his work in recent years, accompanying the increase in the population of the city. Figure 5 shows a vacuum truck equipped with a suction hose from the emptying service provider El Indio.

Figure 5: Vacuum truck equipped with a suction hose from the emptying service provider *El Indio* used to empty septic tanks. Source: (D&A and EP, 2021).

According to the interview with the person in charge of WR Barométrica (KII 2, 2021), this company operates every day in summer, while in winter it works every 15-20 days. The capacity of their vacuum truck is 9 m^3.

Almost all of the households interviewed (95%) mentioned that they never had problems with their tank. Only one case mentioned having suffered the break of the tank. However, 65% of the tourist places declared that they never had problems with their tank and of the remaining 55% that declared that they had some kind of problem, most of them referred to overflows and, secondly, to bad odours.

The average price of emptying the tanks, which have an average volume of 5.7 m^3, is $ 1,850 *pesos* (US $ 42) and the average price in tourist places, which have an average volume of 9.4 m^3, is almost $ 4,000 *pesos* (US $ 90). In households, the tanks are mainly located at the back of the house, while in tourist places most of the tanks are located in front or behind the premises, in equal percentages (D&A and EP, 2021).

As additional information, 70% of households and 83% of tourist places recognize the current sanitation situation as a problematic issue. Of the households and tourist places that perceive sanitation as a problem, most detect it in the form of "*wastewater reaching the*

beach", in the form of "*wastewater in gutters or streets*" and in the form of the perception of "*bad odours*", specially mentioning the area of *Playa del Rivero*, followed by the area where the fishermen's markets are located (Figure 6), named *Playa de los Pescadores* (D&A and EP, 2021).

Figure 6: (Left) Problems identified in *Playa del Rivero*; (Right) Problems identified in *Playa de los Pescadores*. Source: (D&A and EP, 2021).

Finally, when asked if they have ever seen a vacuum truck overflowing or emptying faecal sludge onto a field, mountain or body of water, 10% of households and 17% of tourist places answered "*yes"* (D&A and EP, 2021).

2.1.3 Transport

The emptying companies discharge the faecal sludge in the Castillos, Chuy or Rocha lagoons. Castillos and Chuy are located about 40 km from Punta del Diablo while Rocha is located about 95 km, approximately. It takes at least one hour to reach the lagoons and it can take up to two hours in summer. However, only a small percentage of the collected faecal sludge is taken to treatment (KII1, 2021; KII 2, 2021).

2.1.4 Treatment and disposal

As mentioned in the previous section (2.1.3 Transport), the emptying service providers stated that the collected sludge is delivered to the Final Disposal Sites (FDS) of the Castillos, Chuy or Rocha lagoons for subsequent treatment (Figure 7). However, most of the faecal sludge collected, including the cases in which this emptying of the systems is not carried out through these companies, is discharged into streams, rivers, beaches or directly on the ground without any treatment.

Figure 7: Satellite images from Google Earth of the location of the Final Disposal Sites (FDS) of the Castillos, Chuy and Rocha lagoons.

According to the interview carried out with the architect of the province of Rocha (KII 7, 2021), who is the only person in charge of evaluating the internal sanitation projects and carrying out the pertinent inspections, it was indicated that no records of reports of spills are kept. The highest concentration of complaints received occurs in Punta Rocosa. It is also very common to receive reports of irregular discharges associated with neighbourhood problems. This happens when a sanitary tank overflows and the effluents run superficially towards neighbouring properties. In general, these problems end up being solved.

Fines are collected from tourist places, although their amount is not significant since they prefer to pay rather than regularize the cause that originated the fine. Irregular discharges from the emptying companies have also been reported. Monitoring of these issues should be done by the Local Board but, in practice, it is not happening (EIC 7, 2021).

1.4.1 Data triangulation and validation

An important aspect of the SFD-PI methodology is the triangulation of the data obtained from all the sources to reach a final consensus on the value of the variables needed for the elaboration of the SFD graphic.

In the development of the SFD graphic of Punta del Diablo, the data obtained in the household and tourist places surveys have been taken as a basis to estimate the SFD variables. Then, they were triangulated with the data obtained from the interviews to the emptying service provider and field visits.

In Appendices 4, 5 and 6, a detailed description of all the assumptions and estimates made to reach the final consensus of the value of the variables used in the final elaboration of the SFD graphic is presented.

2.2 SFD Matrix

To combine both surveys, the population residing in the households in the study area has been considered together with the floating population. The resident population was estimated at 2,000 people. As a floating population, the maximum allowed by the city has been taken, which has been estimated at 21,128 people.

When combining the percentages of each of the variables in the SFD graphic, the weighted average of each variable was calculated based on the number of people. Each weighting factor has been calculated as follows:

-Households = Resident population / Total population = 2,000 / 23,128 = 0.09

-Tourist places = Floating population / Total population = 21,128/ 23,128 = 0.91

The weighting factor is higher for tourist places (0.91 vs. 0.09) because the floating population is much greater than the resident population. To show this influence, Table 1 shows each of the weighted variables. The weighted values of the variables are more similar to those of the tourist places due to this influence.

Table 1: Variables of each SFD graphic, as well as the total weighted mean with respect to the population.

System	% of population use			Variable F3 (%)		
	Households	Tourist places	Mean	Households	Tourist places	Mean
T1A2C3	5.0%	6.0%	5.9%	-	-	-
T1A2C5	60.0%	65.5%	65.0%	65	73	72
T2A2C5	5.0%	16.5%	15.5%	65	73	72
T1A3C10	5.0%	6.0%	5.9%	65	73	72
T1A5C10	20.0%	6.0%	7.2%	65	73	72
T1A1C9	5.0%	0.0%	0.4%	-	-	-
Total	**100%**	**100%**	**100%**	-	-	-

Variables F4 (5%) and F5 (90%) have been estimated as the same in households and in tourist places, so no weighted average is required. In the same way, system T1A2C3 (WWTP + wetland) has been estimated to have the same efficiency in both households and in tourist places. Therefore, the variables F3, F4, F5, S4d and S5d are equal to 90% and no weighted average is required either.

The SFD selection grid for Punta del Diablo is provided in Figure 8.

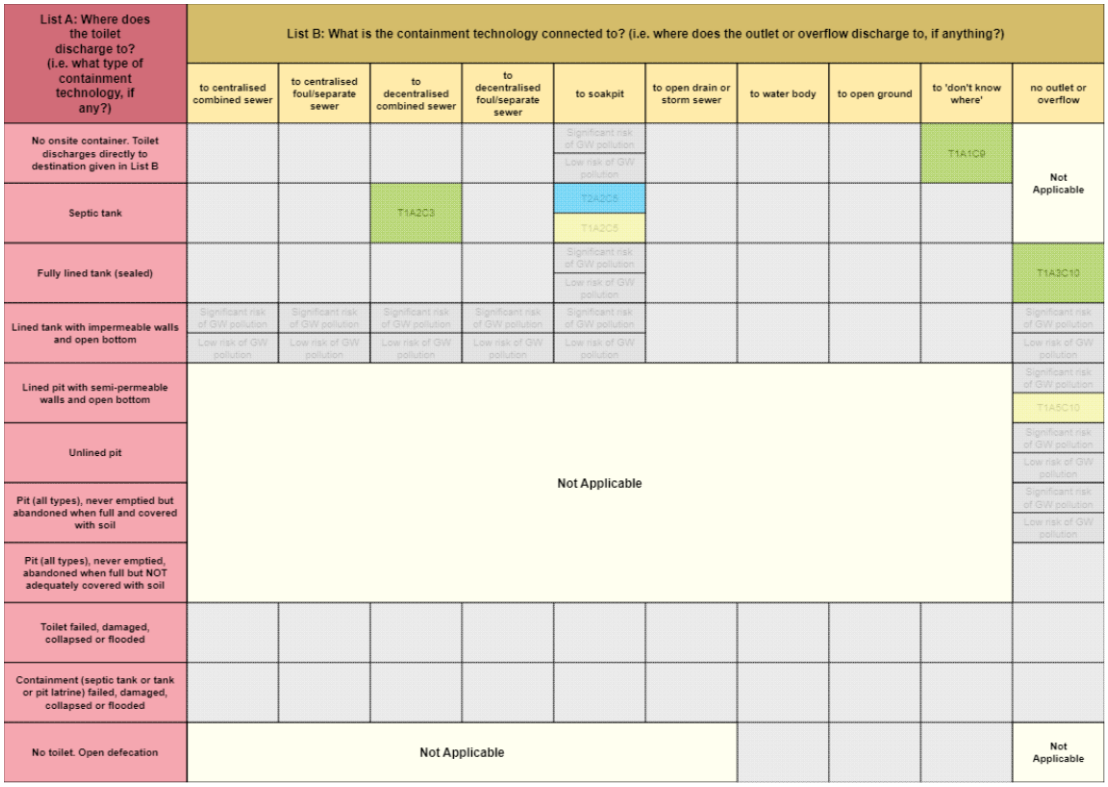

Figure 8: Selection grid for Punta del Diablo.

The SFD matrix for Punta del Diablo is shown in Table 2.

Table 2: SFD matrix.

Punta del Diablo, Rocha, Uruguay, 14 Mar 2022. SFD Level: 3 - Comprehensive SFD
Population: 23128
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 100%

Containment						
System type	Population	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	F3	F4	F5	S4d	S5d
System label and description	Proportion of population using this type of system (p)	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in sewer system, which is delivered to treatment plants	Proportion of supernatant in sewer system that is delivered to treatment plants, which is treated
T1A1C9 Toilet discharges directly to 'don't know where'	0.4					
T1A2C3 Septic tank connected to a decentralised combined sewer	5.9	90.0	90.0	90.0	90.0	90.0
T1A2C5 Septic tank connected to soak pit	65.0	72.0	5.0	90.0		
T1A3C10 Fully lined tank (sealed), no outlet or overflow	5.9	72.0	5.0	90.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	7.2	72.0	5.0	90.0		
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	15.5	72.0	5.0	90.0		

2.2.1 Description of sanitation system options

According to the results obtained in the surveys carried out (D&A and EP, 2021), the sanitation systems in use in the study area, as well as their equivalence with the SFD-PI methodology, are shown in Table 3.

Table 3: Sanitation technologies and corresponding containment according to the SFD-PI methodology, including percentages of population using the technology in areas of low and significant risk of groundwater pollution.

Sanitation system	where it discharges to	Groundwater risk	SFD variable	SFD variable description	% of population
Flush toilet	Septic tank + WWTP	NA	T1A2C3	Septic tank connected to a decentralised combined sewer	5,9%
Flush toilet	Septic tank	Low	T1A2C5	Septic tank connected to soak pit	65,0%
Flush toilet	Septic tank	High	T2A2C5	Septic tank connected to soak pit	15,5%
Flush toilet	Septic tank + Waterproof tank	NA	T1A3C10	Fully lined tank (sealed), no outlet or overflow	5,9%
Flush toilet	Cesspit	Low	T1A5C10	Lined pit with semi-permeable walls and open bottom, no outlet or overflow	7,2%
Flush toilet	Don´t know where	-	T1A1C9	Toilet connected to “don´t know where”	0,4%
TOTAL	-	-	-	-	**100%**

Offsite sanitation systems

0.4% of the population has toilets connected to “don't know where” (system T1A1C9), considered as an off-site system by the SFD-PI methodology (D&A and EP, 2021).

Onsite sanitation Systems

According to survey data (D&A and EP, 2021), 99.6% of the population in the study area relies on onsite systems. The equivalence of these systems with the SFD-PI methodology is as follows (Table 3): 65.0% belongs to septic tanks connected to a soak pit (system T1A2C5), 15.5% corresponds to septic tanks connected to a soak pit where there is a risk of groundwater contamination (system T2A2C5), 5.9% corresponds to septic tanks connected to a privately-owned WWTP (they have been modelled as a T1A2C3 system), 5.9% corresponds to sealed tanks, no outlet or overflow (system T1A3C10) and 7.2% are toilets connected to a cesspit (system T1A5C10).

2.2.2 Risk of groundwater contamination

OSE has been providing potable water service in Punta del Diablo for more than two decades through a distribution network. This network is constantly expanding due to the constant increase in constructions. At present, practically all of the existing buildings are connected to the distribution network, so only the Santa Teresa subdivision, part of the northern area of the Coronilla del Mar subdivision and the native forest of the Parque Santa Teresa subdivision are left without coverage of drinking water (D&A and EP, 2021).

In Figure 9, the areas that are not reached by OSE's distribution network are shown in red. According to satellite images, a total of approximately 170 constructions are counted in these areas in red, representing 4% of the total constructions identified.

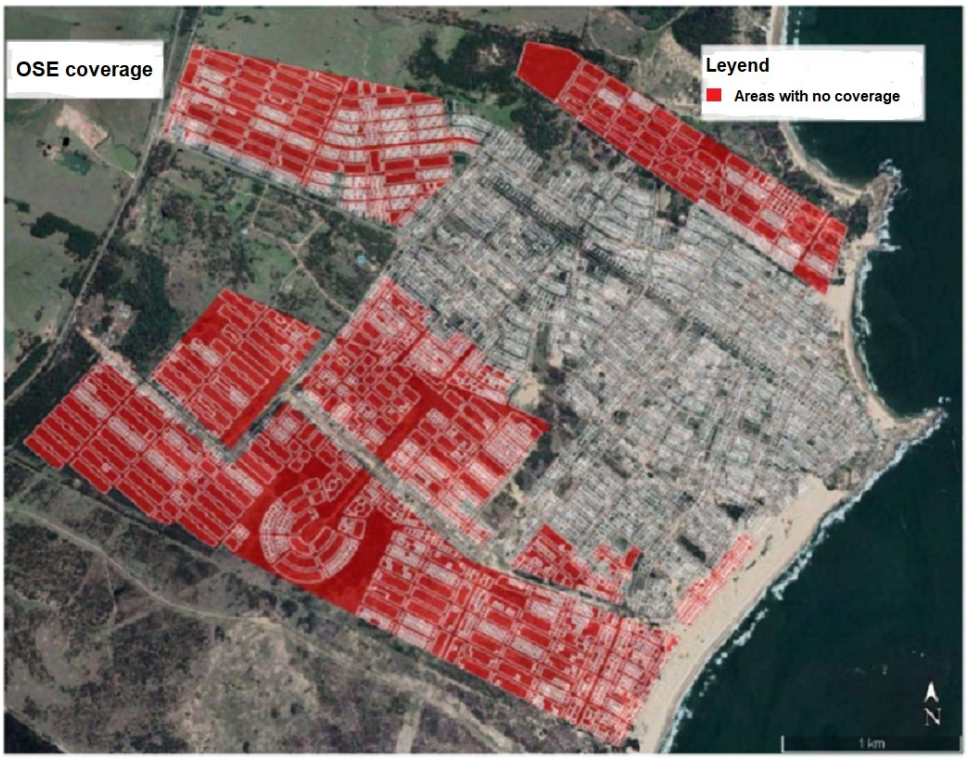

Figure 9: Sketch of OSE's drinking water distribution network. In red, the areas not covered by the distribution network. Source: (D&A and EP, 2021).

Drinking water comes mainly from protected water wells: two recently built boreholes and a third more superficial, with other complementary boreholes that supply the town in times of high consumption (D&A and EP, 2021). Table 4 presents information on the flow, depth and static level of the water wells registered in the National Water Directorate (DINAGUA).

Table 4: Records of OSE drilling data. Source: (DINAGUA, 2021).

Perforation #	Flow (m^3/h)	Depth (m)	Static level (m)
1	14	59	10.5
2	15	48	9.9
3	12	25	6.5

The water is disinfected with chlorine and is pumped into two elevated tanks from which it is distributed to most of the city (Figure 10). The distribution network consists of a system of Polyvinyl Chloride (PVC) plastic pipes with the following characteristics:

- PVC 63 mm, with a total length of 1,070 m.
- PVC 75 mm, with a total length of 40,450 m.
- PVC 110 mm, with a total length of 19,625 m.

Figure 10: Location of extraction wells, distribution tanks and the OSE office in Punta del Diablo. Source: (D&A and EP, 2021).

Origin of water in households and tourist places:

The OSE network is the main water source for 95% of households and 75% of tourist places. The remaining 5% and 25% rely on individual wells, respectively. The OSE network is supplied by protected wells where the water is extracted from the third underground layer, which is why it is considered a protected source (D&A and EP, 2021).

Regarding the 5% of households that are supplied with water for consumption from individual wells, the soil presents impermeable layers that limit the layers, and the general perception that the quality of the surface layer is not good generates that the extraction is of the second or third layer, understood by the drillers and builders interviewed as of good quality (KII 3, 2021; KII 4, 2021), although there are no studies that can affirm one thing or the other. These households have a septic tank connected to a soak pit as their sanitation system.

According to an interview with the person in charge of the OSE service in Punta del Diablo (KII 1, 2021), many hotels and large enterprises use mainly well water, leaving the connection to OSE as a backup, being water of good quality. However, there are no studies that can confirm this information. On the other hand, with respect to 25% of the tourist places that have their drinking water supply from individual wells, there is only one case in which it was reported that the sanitation system produced problems with the quality of the water form the well (odour in summer). Of this 25% of tourist places, 33% have a fully lined tank (sealed) (sealed) and 66% have a septic tank connected to a soak pit.

Based on this information, it has been considered that there is a potential risk of cross contamination of the sanitation system and individual wells, therefore a potential vulnerability, in 5% of households and 25% of tourist places.

2.2.3 Emptying, transport and treatment

Assumptions for offsite systems:

- ✔ 0.4% of the population has toilets connected to “don't know where” (system T1A1C9), considered as an off-site system by the SFD-PI methodology.

Assumptions for onsite systems:

- ✔ 5% of onsite sanitation systems for households and 25% of onsite sanitation systems for tourist places are located in areas of high risk of groundwater contamination.
- ✔ 99.6% of the population depends on toilets connected to an onsite sanitation system.
- ✔ The proportion of faecal sludge in septic tanks, fully lined tanks and all types of pits were all set to 100% (step two of the Graphic Generator), as per the guidance given in the Frequently Asked Questions (FAQs) in the Sustainable Sanitation Alliance (SuSanA) website.
- ✔ For system T1A2C3, there is no wetland treatment efficiency data available. The value of the variables F3, F4, F5, S4d and S5d were assumed to be 90%. In other words, a typical overall wetland treatment efficiency of 90% has been assumed.
- ✔ The percentage of households and tourist places that report that their onsite sanitation system has been emptied varies between 65% and 73%, respectively. After triangulating these values with the rest of the sources, an agreed and weighted value of the value of the variable F3 = 71% was reached.
- ✔ Regarding variable F4 (percentage of faecal sludge delivered to treatment), it has been estimated that only 5% of all faecal sludge is delivered to treatment and the remaining 95% is dumped into the environment without any type of treatment. That is, the value of this variable F4 was considered equal to 5% (D&A and EP, 2021).
- ✔ The value of the variable F5 is the percentage of faecal sludge delivered to treatment which is treated. It can be considered as the treatment efficiency. The faecal sludge is delivered for treatment at the Castillos, Chuy or Rocha lagoons. A typical treatment efficiency of 90% (F5 = 90%) has been assumed.
- ✔ No open defecation practices have been observed or reported, so it can be considered a city free of this practice (D&A and EP, 2021).

2.2.1 Data uncertainties

The preparation of this SFD report is based on surveys (households, tourist places) and interviews with emptying companies carried out by *Estudio Pittamiglio* and *DICA & Asociados* in collaboration with the IDB in 2021, on reports prepared by the entities responsible for the management of water and sanitation in the area, as well as in the triangulation of the data, field visits and interviews conducted to key informants in the area.

The greatest source of uncertainty is the estimate of the real amount of faecal sludge collected due to the uncertainty of the total number of homes and tourist places in the absence of an updated census. The number of households and tourist places surveyed has not been completely representative (see Appendices 5, 6 and 7), being another potential source of uncertainty. However, the triangulation of the data with those obtained in the interviews with the emptying service providers indicates that the estimates made are reasonable.

The "*SFD source evaluation tool*" has been used to score the credibility of the 17 data sources consulted. Most of the data sources have high or medium credibility.

2.3 SFD Graphic

Despite the fact that the floating population stays both in houses (fundamentally rental houses) and in tourist places (hotels, hostels, etc.), the floating population has been assumed to stay in only tourist places because: a) there is no exact figure of the distribution of that floating population between rental houses and hotels/hostels and b) the percentage of distribution of the different sanitation systems found in the city is very similar in households and tourist places (Table 1).

This section presents the combined SFD graphic considering both the resident and the floating population. Appendix 5 and Appendix 6 show, respectively, the SFD graphic for households that reflects the management of the excreta of the resident population and the SFD graphic for the tourist places, which reflects the management of the excreta of the floating population.

Figure 11 shows the SFD graphic for the city where 30% of the excreta generated are safely managed and 70% of the excreta generated are unsafely managed.

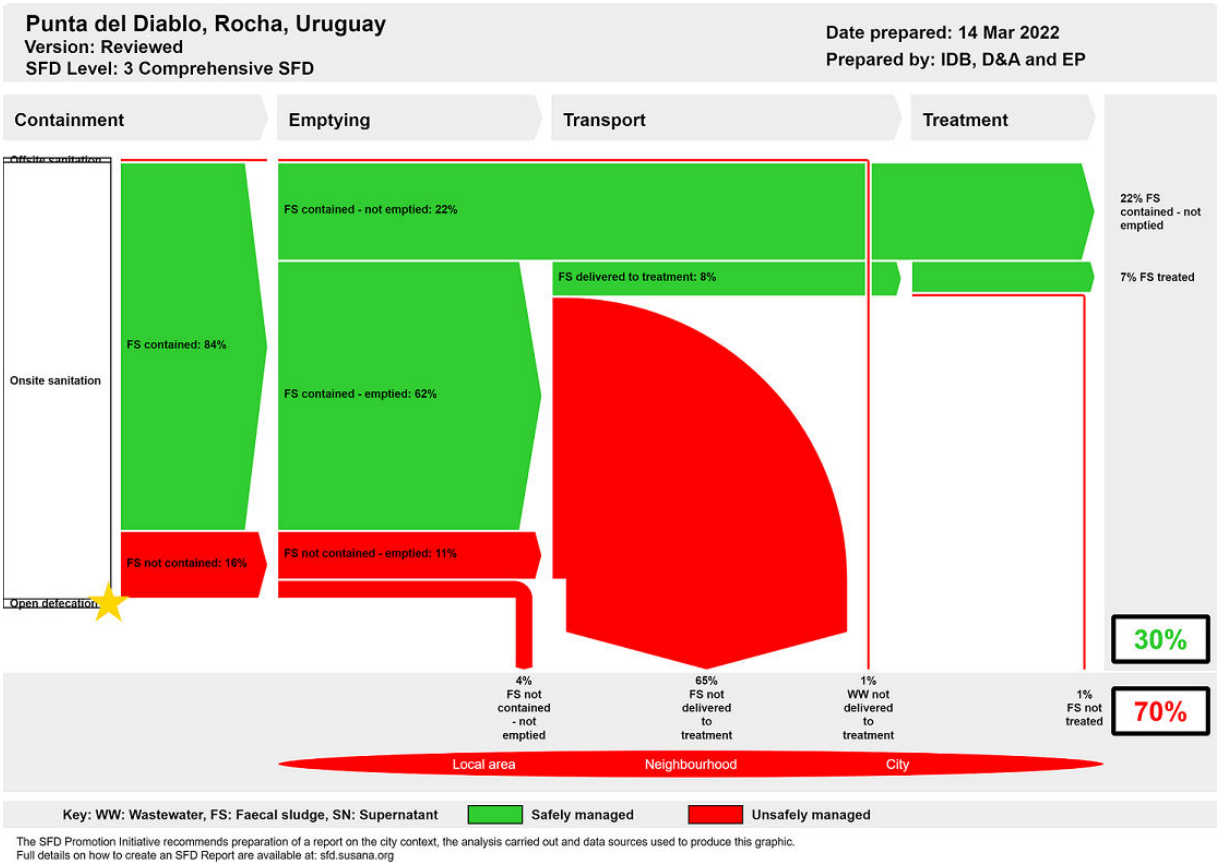

Figure 11: SFD graphic.

30% of the safely managed excreta comes from: faecal sludge contained but not emptied from onsite systems (22%) and faecal sludge from septic tanks connected to a WWTP (wetland) which is treated and faecal sludge emptied and delivered to treatment from the rest of the tanks (7%).

70% of the unsafely managed excreta comes from: faecal sludge not treated due to the efficiency of the treatment systems (1%); wastewater not delivered to treatment coming from toilets connected to "don't know where" (1%), faecal sludge emptied but not delivered to treatment (63%) and faecal sludge not contained and not emptied (5%).

It is important to highlight:

This SFD graphic applies to households and tourist places with the assumptions applied to each of the individual SFD graphics (see Appendix 5 and Appendix 6).

Most of the safely managed faecal sludge (22%) comes from tanks that are not emptied. Therefore, 22% of the sanitation systems could be contaminating groundwater, even if it is not intended for human consumption.

- ✓ In addition, 63% of the unsafely managed excreta comes from faecal sludge which is emptied but not delivered to treatment since it is discharged into the environment without treatment, and thus, contaminating the environment.
- ✓ Therefore, 63% of the excreta generated is contaminating the environment and 22% of excreta are contained but could potentially be polluting the environment. Although in both cases the drinking water sources for human consumption are not affected, further

studies should be carried out to quantify this potential contamination of groundwater. In other words, despite the fact that according to the SFD-PI methodology there is no such risk of contamination of drinking water sources, since they are protected (section 2.22), these *in situ* sanitation systems could be contaminating groundwater by infiltrations to the subsoil of organic matter, mineral salts (e.g. nitrates), remains of non-biodegradable compounds, as well as viruses and faecal microorganisms (*faecal coliforms*, etc.). This potential contamination could be affecting the aquifers and influencing the quality of the bathing water in the area, with the consequent potential risk to people and potential economic impact. This is especially critical in the study area, due to the weight of tourist resources, as it is a coastal area where seasonal tourism is the main economic activity in the city. Therefore, this potential source of environmental contamination justifies a subsequent study to evaluate the quality of the groundwater, as well as the quality of the coastal waters.

- ✓ This combined SFD graphic is similar to the individual SFD graphic for tourist places because the floating population is larger than the resident population. As the SFD graphic is based on percentages of the population connected to a certain sanitation system, the influence of this floating population is greater, a fact that is reflected in the final outcome of the SFD graphic.
- ✓ Septic tanks will require emptying services in the short and medium term as they fill up. In other words, the two emptying companies that currently operate in the city are not enough to cover this demand in which 22% of the faecal sludge currently generated is not emptied and 63% is discharged without treatment into the environment. Therefore, it is necessary to implement a faecal sludge management plan in Punta del Diablo to meet this future demand for faecal sludge emptying, disposal and treatment.

3 Service delivery context

3.1 Policy, legislation and regulation

INSTITUTIONAL FRAMEWORK

National regulations that define the competencies of the different relevant state institutions in the sector are mentioned in this section. A detailed description is developed in the National Sanitation Plan, Cap 3.2.2 Institutional Framework (D&A and EP, 2021).

Decree No. 349/005 of 09/21/2005, *Regulation of Environmental Impact Assessment and Environmental Authorizations*, regulates, at the national level, the environmental authorizations necessary for constructions that are installed under certain conditions. In particular, this regulation acquires interest in Punta del Diablo since it can be applied to any construction or work that is projected in the coastal belt, in addition to the construction of tourist and recreational complexes.

On the other hand, **OSE Organic Law No. 11.907** (OSE, 1952) assigns the competence to provide the sewerage service in the interior of the country (Art. 2, lit. b), as well as to "*enter into agreements with the Departmental Governments and/or neighbourhood commissions to carry out sewerage or drinking water supply works of local interest, through the contribution of the parties* "(Art. 2, lit.c).

On the other hand, from the creation of the *Regulatory Unit for Energy and Water Services*, the tasks of inspection and normative and economic regulation of public drinking water and sanitation services remain within the framework of its powers (RNLD, 2002) .

3.1.1 Policy

The normative and institutional framework related to sanitation must be addressed at the three levels of territorial division: national, departmental and local level (D&A and EP, 2021).

NATIONAL REGULATIONS

National regulations are set out according to their hierarchical rank explicitly in the new wording of Article 47 of the Constitution, incorporated in the 2004 Plebiscite, which establishes that "*access to drinking water and access to sanitation constitute fundamental human rights*". It is also established that "*the provision of those services will be provided exclusively and directly by state legal entities*".

It also established that "*the national water and sanitation policy will be based, among others, on land use planning, the conservation and protection of the environment and the restoration of nature, and the principle by which the provision of the drinking water and sanitation service, should be accomplished by putting social reasons before economic ones*".

A. REGULATIONS SPECIFIC TO WATER

The National Water Policy

The *National Water Policy* is established in Law 18.610 of 10/2/2009. The objective of the policy on drinking water and sanitation is established in its Article 14: "*to ensure the universality of access to them, on the basis that social reasons prevail over economic reasons*".

"*Sanitation includes the sanitary sewer system or other systems for the generation, treatment or disposal of sewage."* On the other hand, it is also established that *"The State will promote efficiency in the use of drinking water and sanitation systems, promoting the rational use of water and attending to cultural and educational aspects*" (Art. 15).

The creation of the *National Council for Water, Environment and Territory* is entrusted "*to develop a national plan for drinking water and sanitation, which defines the general guidelines and the mechanisms and instruments for their implementation and monitoring, in coordination with the public agencies that by Act have action in providing services of drinking water and sanitation. Sanitation is understood as: sanitation, drainage and storm sewers, and the collection and disposal of solid waste*".

"T*he plan must be formulated in accordance with the other national and departmental policies related in particular to hydrographic basin plans, as well as with environmental, territorial, social and economic policies. It should be reviewed periodically*".

"*The plan will take into account, among other aspects, the different local and regional situations, the most appropriate technologies, the different contributory capacities and the gradual and progressive implementation*".

Within the framework of the aforementioned *National Water Policy*, the **National Water Plan** (PNA, 2020) has been prepared and approved, through Decree 205/17 of July 31, 2017, and as a result of it, the **National Sanitation Plan** (PNS, 2020) has also been developed by the *Advisory Commission on Water and Sanitation* (COASAS) and approved by Decree No. 014/2020 of January 13, 2020.

Both plans were developed with the participation of key actors involved, providing definitions to be followed by the institutions and organizations of the sector, with a time horizon of 2030. The decrees of both plans state that: "*the different Institutions involved in the realization of the plans must make explicit their annual budgetary and/or operating plans and the programs and projects included, reporting on their monitoring as well*".

B. REGULATIONS SPECIFIC TO SANITATION

Specific national regulations also apply to sanitation, including the mandatory connection of the frontage properties to existing and future sewerage networks, as stated in Law No. 18.840 (RNLD, 2011).

C. REGULATIONS OF LAND MANAGEMENT

Planning objectives, competencies and instruments are established in the regulations relating to land management established in Law 18.308 of the *General Framework for Land Management and Sustainable Development* of 2008 (RNLD, 2008).

- ✓ ***Art. 4.- Land use planning and sustainable development*** defines a series of sustainable development strategies, identifies areas at risk due to the existence of natural factors and adopts management instruments and procedures that promote land planning, among other factors.
- ✓ ***Art. 50.- Protection of the coastal zones*** delimits the coastlines of the rivers that will be specially protected by the instruments of land management. It establishes the actions that can be carried out when constructing buildings on the coasts.

✓ ***Art. 51.- Negative territorial impacts in coastal areas*** establishes the possible negative impacts that may lead the *Ministry of Housing, Territorial Planning and Environment* (MVOTMA) to fundamentally reject any construction in the coastal areas.

REGULATIONS WITH LOCAL SCOPE

Local regulations that address, directly or indirectly, wastewater and faecal sludge treatment are presented in Table 6.

Table 5: Local regulations related to wastewater and faecal sludge.

Year	Local regulation	Article	Details or objectives
1999	*Excellence Plan 1999*	-	Resolution of socio-territorial conflicts through agreements between *"those from above"*, owners of the formal parcel and "*those from below*", de facto occupants of the public domain and dozens of private lands. Improve the living conditions of the inhabitants (fishermen and providers of tourist services).
2003	*General Plan for Planning and Sustainable Development of the Atlantic Coast of the Rocha department. Decree 12 of 2003*	Art. 17.1	It defines those spas or spa complexes that present a certain degree of consolidation and that currently have adequate road accessibility, population, defined streets, buildings, services and basic equipment; Historically, they have shown a vocation for urban development and traditional summer tourism, and are generally located on beaches suitable for bathing.
		Art. 17.2	In these areas, the Departmental Government will concentrate most of the public investments for consolidation and improvement of the urban area, provision of infrastructure and services, and incentives for the promotion of public and private projects and programs in accordance with the principles of rational sustainable use of the tourist resource of the Atlantic Coast.
		Art. 34.3.	Indicates a series of actions to implement the special plans for land use planning for irregular settlements: Barra de Valizas, Aguas Dulces and Punta del Diablo.
2011	*Ordinance and Regulation of the Sanitary Installations IDR/2011*	Art. 86º: Final disposal where there is no sanitation	In cases where there is no sanitation, the final disposal of wastewater can be done through: a) dumping of the treated effluent into watercourses. b) infiltration of the treated effluent into the ground. b) waterproof chamber option with periodic drainage. c) septic tank followed by a soak pit.
		Art. 87°: Responsibility	Projects whose final disposal is by infiltration or discharge into the watercourse, which exceed five housing units or exceed ten toilets, must be carried out and signed by Civil Engineers, with knowledge in the sanitary area, who are responsible for the facility. A technical report must be presented where the design parameters and details of the units and component elements of the system are established. A justifying report must also be presented.

		Art. 88º: Location of the final disposal system	The final disposal units of the sewage (septic tanks, impermeable wells, etc.) of the homes, should be carried out, whenever possible, in front of the corresponding buildings, in order to facilitate the connection to the sewer network.
		Art. 89º: Septic tanks	Indicates the characteristics that septic tanks must have. Its location, execution and operation must include a series of characteristics. The tank will be constituted by a sanitary tank made of reinforced concrete, fixed and impermeable, destined to receive and decant the solids coming from the residual waters of the internal sanitary installations. The resulting liquid effluent must be disposed of in adequate sanitary conditions, in accordance with the permitted treatment and final disposal systems.
		Art. 90º: Waterproof sanitary tank	The sanitary tank will be constituted by a fixed, impermeable container, destined to receive by gravity or pumping, all the residual waters, primary and secondary, coming from the internal sanitary installation, in areas where the situation allows for it. Their capacity, location and execution, must contemplate a series of characteristics established in this article.
		Art. 91º: Individual treatment systems	In cases where the particular conditions of the site allows for it, an individual treatment of liquid effluents may be proposed for each property, consisting of: A. Primary treatment in septic tank. B. Secondary biological treatment (activated sludge, filtration, wetland, lagoons or others). C. Infiltration of the treated effluent into the ground, through ditches, beds or infiltration wells; alternative of re-use of the effluent previously treated and disinfected.
		Art. 92º: Distance to houses	Indicates the minimum distances to respect for the location of the septic tank, waterproof well, and filtering systems.

3.1.2 Institutional roles

At the national level, the **State Sanitary Works (OSE)** acts as the operator of sanitation and sewerage services in the interior of the country. OSE has an office and some staff dedicated to operate the drinking water network in Punta del Diablo. The **Executive Power** is in charge of formulating policies in the sector, and the **Regulatory Unit of Services of Energy and Water (URSEA)** in charge of the regulation and supervision of these services. Within the executive branch, the new **Ministry of the Environment** is in charge of monitoring and attending to the policies of the sector, both in aspects related to the sanitation service by the **National Water Directorate (DINAGUA)**, and in environmental aspects by the **National Directorate for Quality and Environmental Assessment (DINACEA)**.

The **Departmental Governments** are responsible for the hygiene and health of the population, and the territorial and regulatory ordering of buildings at the local level, whose significance is essential to provide adequate solutions for the disposal of household effluents, while not sewer networks are built for the sanitation service.

The departmental authority is represented in the town directly through the **Local Board of Punta del Diablo**, which has six officials from the province, plus four from the *Solidarity*

Work Plan until the month of November, and assumes daily waste collection tasks, pruning, cutting grass, chipping branches, repairing streets, minor repair and maintenance works for speed bumps, culverts, collecting fish leftovers, and other minor tasks.

3.1.3 Service provision

Faecal sludge emptying companies:

The collection of domestic and commercial faecal sludge is carried out mainly by two private companies equipped with vacuum trucks which are based in the city of Chuy (El Indio and WR Barométrica).

Faecal sludge treatment companies:

Only a small percentage of all the faecal sludge collected is delivered for treatment to the lagoons in the towns of Castillos, Chuy and Rocha for treatment.

3.1.4 Service standards

The *National Sanitation Plan* (see section 3.2.1) poses a break in a historical trend, adopting the paradigm of comprehensively addressing all elements of public policy related to the sector. It seeks to provide adequate sanitation service not only through the construction of infrastructure, but also through the analysis and innovation of governance and management that allow solutions to be provided according to the possibilities of the country and taking into account each context to address. It is necessary to move from an infrastructure development approach to a service provision approach, with a focus on the citizen and the environment.

The strategy of the *National Sanitation Plan* incorporates the concept of progressive improvement in the process that implies reaching universal access to adequate sanitation service. The quality of life or the quality of the environment can be improved by implementing actions until finally reaching the goal set.

The *National Sanitation Plan* allows progress in these actions, taking into account the priorities to be considered, and the resources and capacities available in each case. It is important to define the prioritization criteria according to health risks, environmental risks and ecosystem value.

The strategy starts from identifying three types of adequate sanitation solutions to achieve the objective of universality. Beyond the existence of other valid adequate sanitation solutions in the country, the *National Sanitation Plan* proposes to reach the majority of the population through these three solutions:

1) Sanitation with a dynamic system with collective networks and centralized treatment of wastewater.
2) Sanitation consisting of a storage unit onsite with faecal sludge emptied and transported with a vacuum truck to treatment and final disposal in a treatment plant.
3) Sanitation with systems with a final disposal onsite (infiltration, reuse or discharge into a water course).

In order to tentatively define the sanitation system to be considered in each situation, it is identified that population density is an adequate parameter. As additional criteria to take into account, other parameters should be considered according to local characteristics, such as, for example, type of soil, topography, building typology or seasonality of the population.

Special attention should also be paid to education and communication tasks, and to explain to the population that all types of sanitation that are proposed are adequate. This aspect is key, since there are culturally rooted concepts in certain sectors of the population that identify that adequate sanitation is only obtained through connection to the network. In this sense, promoting public participation processes will help to raise awareness among the population to achieve a better understanding of the solution proposed.

3.2 Planning

3.2.1 Objectives

The *National Sanitation Plan* was developed at the proposal of DINAGUA and the *National Secretariat of Environment, Water and Climate Change* (SNAACC), with the participation of key actors, in particular OSE, URSEA, the *Office of Planning and Budget of the Republic* (OPP), the *Movement for the Eradication of Unhealthy Rural Housing* (MEVIR), and representatives of the municipalities of the entire country, among others.

The plan addresses the specific objective of achieving the universality of access to sanitation, with an emphasis on the most vulnerable households. Different sanitation systems are proposed as a method to meet this objective, beyond the traditional ones through sewerage, and centralized treatment for their final disposal. This is particularly relevant in seaside resorts, with great seasonality, which can hardly assume and justify the cost of traditional solutions.

The National Sanitation Plan advances in general solutions for the final disposal of domestic liquid effluents, although it also identifies the regulatory void of Decree 253/79 conceived for the disposal of industrial effluents and establishes that it must be reviewed and developed for its implementation at the urban level, compliant with local regulations. In turn, the *National Sanitation Plan* provides the necessary elements to define the approach and action strategy (Figure 12).

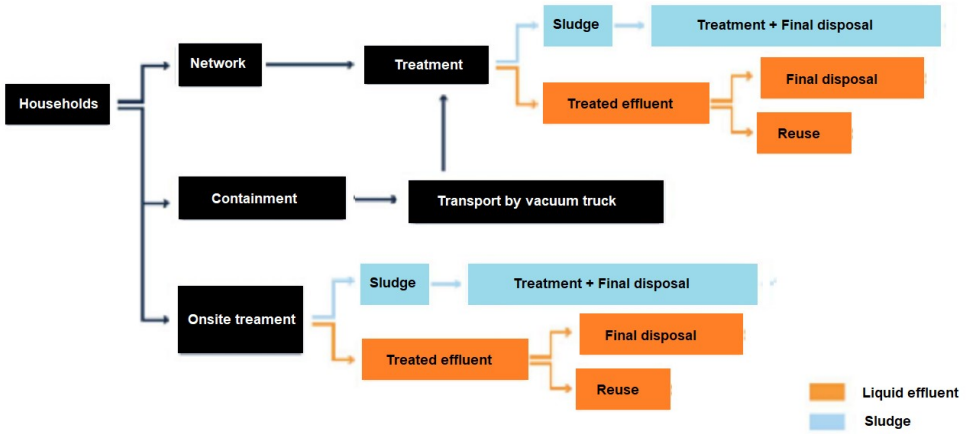

Figure 12: Simplified diagram of the sanitation configuration. Source: National Sanitation Plan.

The principles and strategies that should be considered as guides, and applicable to this particular case of Punta del Diablo, are proposed. The 10 guiding principles of the *National Sanitation Plan* apply, and must be taken into account for the elaboration of the sanitation strategy of Punta del Diablo.

Guiding principles

1. *Access to sanitation is a fundamental human right.*
   Access to drinking water and access to sanitation constitute fundamental human rights in accordance with the provisions of Article 47 of the Constitution of the Republic, after its reform in 2004.
2. *Consideration of health, social and environmental aspects.*
   The implementation of the *National Sanitation Plan* should contribute to improving the health of the population, reducing water-borne diseases and improving the quality of the environment, for which it is essential to achieve equity in access to adequate sanitation.
3. *The existing situation is known.*
   The *National Sanitation Plan* is based on a diagnosis of the current situation and considers the existing sanitation services and proposes their eventual improvement, expansion and development, trying to optimize the installed infrastructure.
4. *Diversity of solutions is contemplated.*
   In order to achieve universal access, the *National Sanitation Plan* addresses different solutions for adequate sanitation, according to local conditions, both through collective networks and through individual solutions, also taking into account economic and management limitations.
5. *Implementation requires definition of stages and priorities.*
   The *National Sanitation Plan* considers implementation stages and the application of prioritization criteria, in order to progressively advance towards the universal access to adequate sanitation by 2030.
6. *Safe management models.*
   It is understood that the network sanitation services that lead the residual liquid to a treatment plant have a safe management model. The *National Sanitation Plan* considers a change in the management model necessary to guarantee that it is adequate.
7. *Affordable rates and financially sustainable services.*
   The sanitation service must be provided at an affordable rate. This requires a viable and economically sustainable delivery scheme.
8. *Innovation and development must be considered.*
   Innovation and the development of new capacities are proposed with regard to technical aspects, based on support for research and training.
9. *Linking with other plans.*
   At the local level of each city, town or village, planning of sanitation systems should be linked particularly with city water plans, incorporating urban drainage, drinking water and flood risk management.
10. *Normative and institutional adaptation.*

The *National Sanitation Plan* identifies and proposes the normative and institutional adaptation necessary for its implementation, in order to coordinate the multiplicity of actions developed by the different institutions. It also aims to update the technical regulatory framework, as well as the development of guidelines that accompany new sanitation solutions planned.

3.2.2 Investments

In July 2021, the President of the Republic announced the "P*rogress of an important project for human health and care for the environment. Historic private initiative voted by the OSE board of directors. Almost USD 1 billion in investment that will allow intervention in more than 120 localities, and more than 560,000 Uruguayans have access to sanitation*" (EP, 2021).

According to the president of OSE, "*this is an initiative presented by an important group of Uruguayan companies that propose to increase sanitation coverage (in the interior of the country) from the current 50% to 88%, intervening in 124 localities, those that have more than 2,000 inhabitants*" (EP, 2021), also pointing out that the project aims to "*remove sewage from homes, but also to do the corresponding treatment to avoid the harm of the environment*".

3.3 Equity

3.3.1 Current choice of services for the urban poor

The *National Sanitation Plan* considers the aspects of inclusion of different social groups in access to drinking water and sanitation as fundamental human rights (guiding principle 2), as well as aspects of gender, childhood, migrants, among others that deserve particular approaches and especially the most vulnerable.

A large part of the problem is associated with the constructions prior to the territorial planning instruments and the current construction regulations, fundamentally in the central area of the city, precisely where the characteristics of the rocky soil makes solutions for sanitation difficult, not generating incentives for improvement in the affected inhabitants.

Another problem of less relevance revealed in the surveys refers to the settlement of the population in non-formalized properties, which due to its location in less populated areas does not generate major environmental conflicts. These problems reflect the weakness of the capacities of inspection and control of the regulations in the territory.

3.3.2 Plans and measures to reduce inequity

The *National Sanitation Plan*, in its ***section 4.6 Population of irregular settlements or in precarious conditions***, also includes the need to address solutions, which, although referring to cases of vulnerable population, may be applicable to the area of informal occupation based on public property in the centre of Punta del Diablo.

The need to provide coordinated solutions for relocation and regularization of irregular settlements is highlighted there as the main sector strategy to achieve the universal access of adequate sanitation service for the population. At the same time, more focused actions must be taken to address the lack of access to adequate sanitation in order to reduce health

risks. With the concept of progressive improvements, actions must be coordinated with the institutions involved to achieve a significant and rapid improvement in the quality of life of this population. With this same line of action, intervention should be made in special cases that, due to health risks, are identified as emergency situations.

3.4 Outputs

3.4.1 Capacity to meet service needs, demands and targets

There are several situations in which the allowable land occupation factor is exceeded in Punta del Diablo, evidencing the existence of homes built outside the regulations or not registered, intensifying the problem and compromising the adoption of possible solutions.

Effluent collection systems using vacuum trucks do not currently meet the need for collection of the faecal sludge generated, mainly in summer, due to their scarcity, cost, and time restrictions, and considerable distance to the authorized final disposal sites.

Some households in a precarious ownership situation do not have storage facilities capable of retaining the effluents for extraction and discharge them directly into the sea or the rocks through discharge pipes. Although the regulations regarding construction accept individual solutions for the treatment and disposal of effluents under certain conditions, the lack of control and monitoring in the territory do not allow to conclude on the efficiency of these individual systems.

3.4.2 Monitoring and reporting access to services

There is no monitoring system to know the current status of the sanitation systems in the area or the control of the emptying sanitation systems. However, due to the tourist importance of the area, studies have been carried out to monitor the water quality of the beaches in the town. The bathing waters in Punta del Diablo is between *Very Good* to *Excellent* quality, with the average of *Thermotolerant Coliforms* (in 67 samples) less than 40 Colony Forming Units (CFU) and with only a single case that exceeded 250 CFU. Beyond this, it is understood that it is necessary to monitor the waters that are discharged to the beach in order to determine their quality.

These waters also receive subsurface runoff that outcrops in the natural lowlands and runoff superficially towards the coast. Additional information on these water quality analysis studies has been included in Appendix 8.

3.5 Expansion

3.5.1 Stimulating demand for services

At the national level, regulation is relatively recent and specifically applicable to the case of Punta del Diablo, where its implementation may be a pilot case as an example for other similar cities.

The situation of the spa areas deserves a particular approach. In these cases, areas with a permanent population and a floating population coexist in diverse proportions, which presents particular opportunities and challenges. It should be considered that the floating population occupies and generates a large proportion of effluents for a few days a year, and

these are second homes with sufficient capacity to pay for the removal of effluents by vacuum trucks. In general, this practice is already in place, and since the construction of sewer networks is notoriously expensive, onsite sanitation systems may function adequately in some cases, bearing in mind that they are temporary occupation areas.

On the other hand, possible detrimental effects of infiltration of wastewater/faecal sludge on beaches should be considered. In these cases, the accumulated environmental impact and the health risk due to lack of access to adequate sanitation must be surveyed, evaluated and determined in the different sites, determining areas to be sanitized in various ways. This coverage will take into account the stage of development and the user's ability to pay. In the case of spas and tourist centres, it may be of special interest that the works, maintenance and management of the sanitation systems may be in charge of departmental or municipal governments, directly or in agreements with OSE.

3.5.2 Strengthening service provider roles

Although the territorial ordering regulations have been sufficiently developed, many issues still remain and require complex political decisions for their solution.

Problems such as the lack of specific actions to control the construction of buildings and its impacts seem to be increased by the stress of the significant growth of activities and the fragility of the environment in the area. The disposal of wastewater, and the deterioration of the beaches and the environment due to the dragging of materials from the streets to the beaches and the possible runoff of wastewater, are some of the issues that increase with the densification process.

Governance results from an important regulatory development, which has had the active participation of the actors in the territory, but with a low capacity for control and institutional presence in the territory, which has resulted in a low level of application. The problems in the high season are even more evident when the few existing services collapse and the structural problems of land use planning and lack of infrastructure are visualized.

In order to address the problem of sanitation in Punta del Diablo, the need to articulate the private efforts of the residents responsible for the impact of their activities as well as the public efforts of the Departmental Intendancy, responsible for the health and control of the building works, with those of the OSE as responsible for the sewerage service in the interior of the country, must be recognized.

4 Stakeholder Engagement

In total, more than 10 Key Informant Interviews (KIIs) and several field visits were carried out to validate and triangulate the information collected in the surveys, the bibliography and documents consulted.

4.1 Key Informant Interviews (KIIs)

Interviews and surveys were carried out with different key actors. Among them, responsible persons in public institutions (OSE, Intendancy of Rocha), emptying service providers, masons and local businessmen. Each of these interviews is detailed below:

Interviews with institutional actors: An interview was conducted with the person in charge of the OSE service in Punta del Diablo. Two additional interviews were also conducted: one with the Director of Territorial Planning and another with the person in charge of evaluating the internal sanitation projects and carrying out inspections, both belonging to the Rocha Municipality.

Interviews with emptying service providers: Two interviews were conducted with the two companies operating in the city: *El Indio* and *WR Barométrica.* Both companies are based in Chuy and have been performing the service in Punta del Diablo for more than 5 years.

Interviews with builders and social actors: Nine qualitative interviews were conducted with masons and businessmen in the area to learn about the particularities that may arise during the sanitation construction works, the use of regulations, the type of sanitation system used or the perception of the expansion of the town, as well as to encourage the support of local entrepreneurs to implement sanitation solutions.

4.2 Focus Group Discussions (FGDs)

In the preparation of this SFD report from Punta del Diablo, no Focus Group Discussions (FGDs) were held. This is due to the fact that all the pertinent and necessary information for the preparation of the report and the SFD graphic was obtained from the rest of the sources: two surveys of households and tourist places, more than 10 KIIs and the use of bibliographic sources such as documents, studies and reports on the status of access to water and sanitation in the country and in the study area.

4.3 Field Visits (FVs)

Several field visits were made to the beaches and surrounding areas. These visits allowed the taking of photographs of the problems identified.

4.4 Validation workshops

On May 6, 2022, a validation workshop was held with the participation of representatives of the Ministry of the Environment of Uruguay and the operator of sanitation and sewage services (State Sanitary Works, OSE) where the results of the SFD graphic were presented and approved.

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7 Appendix

7.1 Appendix 1: Stakeholder identification and engagement

Table 6: Stakeholder identification and engagement.

Name	Institution/ company	Position	Date	Purpose of engagement
--	Company *El Indio*	Head	2021	Gathering knowledge of the process of emptying septic tanks.
--	Company *WR Barométrica*	Head	2021	Gathering knowledge of the process of emptying septic tanks.
--	OSE	OSE service manager	2021	Gathering knowledge of the drinking water supply network
Alex Hernández, Andrés Carrau, Saturnino and one sanitary worker	Various	Masons/builders	2021	Gathering knowledge of the construction practices of on-site sanitation systems
Eng. Agrim. Juan Ignacio Beyhaut, Ricardo, Mr. Bat, Eduardo Vigliola and other business owners	Various	Social actors	2021	Encourage support from local entrepreneurs to implement sanitation solutions
Eng. Lumber Corradi	Intendancy of Rocha	Director of Territorial Planning	2021	Know the state of land use planning in Punta del Diablo
Arch. Enrique Rótulo	Intendancy of Rocha	In charge of evaluating internal sanitation projects and conducting inspections	2021	Know the status of compliance with the regulations

Key Informant Interviews (KIIs)

KII 1, 2021. Interview with the head of the company *El Indio*.

KII 2, 2021. Interview with the head of the company *WR Barométrica*.

KII 3, 2021. Interview with the OSE service manager in Punta del Diablo on 15/07/2021.

KII 4, 2021. Four interviews with builders in Punta del Diablo: 1) Alex Hernández, owner of the *Villa Juana complex*, builder of houses and cabin complexes, and member of the Promotion League, 2) Andrés Carrau, builder of several houses and cabin complexes, 3) Saturnino, builder and driller and 4) a sanitary worker in Punta del Diablo.

KII 5, 2021. Five interviews with social actors in Punta del Diablo: 1) Eng. Juan Ignacio Beyhaut, owner of *Chacras de la Laguna Negra*, 2) Ricardo, owner of *Altos de la Viuda*, 3) Mr. Bat, owner of *El Diablo Chic*, 4) Eduardo Vigliola, owner of *Nativos* and part of the Promotion League and 5) Other business owners.

KII 6, 2021. Interview with Eng. Lumber Corradi, Director of Territorial Planning of the Intendancy of Rocha. (27/08/2021).

KII 7, 2021. Interview with Arch. Enrique Rótulo, from the Intendancy of Rocha. (27/08/2021).

Field Visits (FVs)

FV 1, 2021. Several field visits to the beaches and surrounding areas. Taking of pictures of the problems identified.

7.2 Appendix 2: Data and Information gathering

7.2.1 *Population estimation*

Permanent population:

Table 7 summarizes the estimated permanent population based on baseline information collected from various sources.

Table 7: Summary of permanent population estimation from different sources.

	baseline information				
	INE	*OSE*	*UTE*	*ANEP*	*Public Opinion*
Estimated permanent population	2,487	1,382	2,155	1,674	2,500

INE: National Institute of Statistics
OSE: State Sanitary Works
UTE: National Administration of Power Plants and Transmission
ANEP: National Administration of Public Education

Considering the particularities of each data source, being in all cases estimates, some based on hypotheses of linear growth or on data provided that may not cover the entire population (OSE and UTE), it was to considered that the permanent population, in August 2021, is of the order of 2,000 people.

Floating population:

It is difficult to quantify the floating population in Punta del Diablo for several reasons:

- ✓ More people attend rented households than the capacity in beds in hotels or other similar facilities.
- ✓ The times of greatest influx of tourists are a few weeks.
- ✓ During the day the city receives residents of nearby cities.
- ✓ The data received by the Ministry of Tourism correspond only to inbound tourism (foreign tourists).

In any case, it is known that tourism is very important in the area, with specific peaks from 24/12 to 15/01 and during the carnival week. The tourist places interviewed estimate that, in the period of greatest influx of tourists, the city can receive more than 20,000 people.

7.2.2 Survey design

The criteria followed to conduct the household and tourist places surveys are shown below:

Household survey:

Although a survey of a representative sample of 110 households was planned, (which implied a margin of sampling error of around 8%, at a 95% confidence level; p = 0.5 and q = 0.5, for an approximate universe of 340 homes), at the end of the first field trip (20 surveys), and in light of the results obtained, a critical review was made regarding the opportunity and convenience of continuing with the application of the survey, which resulted in the following conclusions and recommendations:

Difficulties encountered in the sampling frame

There is a lack of updated data regarding the number of households, as well as their occupation status, existing in Punta del Diablo. The last formal record refers to the 2011 Census, which is outdated given the explosive growth suffered by the city over the last 10 years. This situation is verified from the data obtained from secondary sources.

This lack of updated data makes it difficult to construct a complete and precise framework on which to carry out a sampling procedure that respects the requirements of a representative statistical study, which allows the results obtained to be inferred from the total number of households with a population residing in the city. Although the sampling frame used, an updated Google Earth cartography, made it possible to largely identify the location of the households, and based on that randomly selecting sample points and random routes, once in the field it was found that it was very difficult to find those households with permanent inhabitants who could respond to the survey within the points and routes selected in the sampling stage. This problem of coverage of the sampling frame, and the consequent increase in the non-response rate, have an impact both at the level of representativeness of the sample, and with respect to the considerable increase in the time and money efforts required to complete the entirety survey.

Tourist places survey:

The procedure developed consisted of:

- ✓ Interview method: face-to-face or telephone interview, based on a structured questionnaire.
- ✓ Sampling procedure: For convenience, depending on the availability of access to the respondents (tourist places open during field work or available to answer by phone), and intentional: prioritizing the tourist places with the largest size (number of beds or tables), based on a list made up of information obtained from different data sources: Ministry of Tourism, lodging reservation portals, Google maps and primary data collected *in situ* in the field.
- ✓ Sampling frame: Tourist places located in Punta del Diablo.
- ✓ Total of surveys: 24.

7.3 Appendix 3: Examples of the survey questions

Table 8 shows a selection of the questions asked in the household survey and Table 9 shows a selection of the questions asked in the survey of tourist places.

Table 8: Selection of questions included in the household survey.

Question	Answer
What is the (main, if you have 2) water source in your home?	- OSE network - Individual well - Collective well - Storage tank filled with rainwater - Not available - Other _____
Where are the waters of the sanitary service in your home discharged to?	- Cesspool / filter tank - Cesspool / waterproof tank - Septic tank - Own treatment plant - Rain gutter - Directly to the ground - Body of water (stream, beach) - Sanitation network (internal) - Other _____ - Don´t know
Where in the house is your tank located?	- Behind the house - In front of the house - On one side of the house - Inside the house - Don´t know
Was the water table reached when digging the tank?	- Yes, it was reached - No. It was not reached - Don´t know
Have you had problems with your tank?	- Bad smells - Tank overflow - None - Others _____ - Don´t know
Have you ever emptied or cleaned your tank?	- Yes - No - Don´t know
If so, how often do you usually do the emptying?	- More than once a month - Once a month - Several times a year - Once a year - Every 2 years - More than 2 years
Do you have any idea where the faecal sludge emptied from your tank is delivered to?	- Municipal Landfill / OSE Treatment Plant - Disposed into the ground - Buried - Thrown into a watercourse - Don´t know
From the following list, check the options for wastewater management problems that you can identify in your community (you can check several):	- Wastewater in gutters or streets - Wastewater in streams and reaching the beach - Bad smells - Wastewater reaching groundwater - None of the above - Others _____

Table 9: Selection of questions included in the tourist places survey.

Question	Answer
What is the main water source of your tourist place?	- OSE Network - Water well - Storage tank filled with rainwater - No source - Other
Where are the waters of the sanitary system of your tourist place discharged to?	- Cesspit - Septic tank - Privately-owned WWTP - Open drain - Directly to the ground or terrain - Body of water (stream, beach) - Sanitation network (internal) - Other _____ - Don´t know
If there is a septic tank, where does the water that comes out of the unit drain to?	- Privately-owned WWTP - Directly to the ground - Body of water (stream, beach) - Other _____ - Don´t know
Do you know the volume of your tank?	- Yes - No Indicate volume approximately:
¿Have you ever emptied your tank?	- Yes - No - Don´t know
If yes, how often do you usually empty the tank?	- More than once a month - Once a month - Several times a year - Once a year - Every 2 years - More than 2 years
Can you remember the tariff?	- Yes - Cannot remember or provide it - It had no cost Enter approximate amount: _____
Do you consider that wastewater management is incorrect in your community?	- Yes - No - Don´t know

7.4 Appendix 4: Estimation of the amount of faecal sludge emptied by the emptying service providers:

Although in the preparation of the SFD graphics the amounts of faecal sludge collected are not specified since the methodology uses percentages, that amount has been estimated, comparing it with that reported by the emptying service companies when triangulating the data.

According to data from the two emptying service companies that operate in the city, in winter one of the companies empties 9 m^3 every 7 days (469 m^3/year), and the other empties the same amount every 10 days (328.5 m^3/year). In addition, the emptied amount of faecal sludge on the busiest days are highly variable, ranging from 1 to 8 emptying services. On average, both companies estimate to empty the faecal sludge equivalent to 4 tanks of 9 m^3 each, making a total of 72 m^3/day.

Data on monthly water consumption from the OSE network are also available (Table 10). The total amount of sludge collected is estimated with the value of the maximum of 72m^3/day emptied and these average consumption factors of the OSE network. The calculation is made by multiplying the maximum withdrawal value (72m^3/day) by the average water consumption factor of 2019 for each month, arriving at an average estimate of the amount of sludge emptied in each month as shown in Table 10.

For the calculation of the average factor, the month of January 2020 is taken as the as the maximum water consumption of the city (39,439 m^3), that is, 100%. Due to the fact that the rest of the consumption of water and tourism in that year was affected by the coronavirus situation, the values of the year 2019 have been taken as the most up-to-date ones and most representative. Based on this maximum data and the water consumption values for each of the months of the year 2019, the average factor is calculated. For example, for the month of January, Average Factor = (29,623 m^3/ 39,439m^3) x 100% = 75%.

To calculate the volume emptied for each month: the volume emptied = 72m^3/day x average factor. For example, for the month of January, the volume emptied = 72 m^3/day x 75% = 54 m^3/day. This option has been chosen due to the information available and the assumption of the existence of a relationship between the volume of water consumed and the number of faecal sludge that is emptied by the companies, being greater as the water consumption increases. That is, in the summer season, where the population is greater, there is a greater demand for the number of emptying services, which is positively correlated with the increase in water consumption.

In total, it is estimated that the emptying companies empty 8,928 m^3/year in Punta del Diablo. It is assumed that this volume is from both households and tourist places.

Table 10: Volume of faecal sludge emptied according to emptying companies.

	Water consumption 2019 (m^3/month)	Average water consumption (m^3/day)	Average factor (2019)*	Volume emptied (m^3/day)**	Volume emptied (m^3/month)
January	29,623	956	75%	54	1,622
February	26,902	961	68%	49	1,473
March	26,012	839	66%	47	1,425
April	9,788	326	25%	18	536
May	10,231	330	26%	19	560
June	5,228	174	13%	10	286
July	6,624	214	17%	12	363
August	7,571	244	19%	14	415
September	14,064	469	36%	26	770
October	7,206	232	18%	13	395
November	7,657	255	19%	14	419
December	10,631	343	27%	19	582
Total (per year)	**161,537**	**445.25**	-	**295**	**8,928**

*The average factor for 2019 is calculated as the consumption of the month of 2019 divided by the maximum consumption in Punta del Diablo (January 2020).

**The volume emptied is calculated as the largest volume emptied by the companies (72 m^3/day) multiplied by the average factor.

7.5 Appendix 5: SFD graphic for households and analysis of the most relevant data

Risk of groundwater contamination

The OSE network is the main water source for 95% of households. The remaining 5% rely on individual wells. The OSE network is supplied by protected wells where the water is extracted from the third underground layer, which is why it is considered a protected source.

Regarding the 5% of households that are supplied with water for consumption from individual wells, the soil presents impermeable layers that limit the layers, and the general perception that the quality of the surface layer is not good generates that the extraction is of the second or third layer, understood by the drillers and builders interviewed as of good quality (KII 3, 2021; KII 4, 2021), although there are no studies that can affirm one thing or the other. These households have a septic tank connected to a soak pit as their sanitation system.

Based on this information, it has been considered that there is a potential risk of cross contamination of the sanitation system and individual wells, therefore a potential vulnerability, in 5% of households.

Description of the sanitation systems

In the study area, there is no sewage system. Most of the population is served by onsite sanitation systems, especially septic tanks, cesspits and some WWTPs for their own use.

The SFD selection grid for households in Punta del Diablo is provided in Figure 15.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B					Significant risk of GW pollution / Low risk of GW pollution				T1A1C9	Not Applicable
Septic tank			T1A2C3		T2A2C5 / T1A2C5					
Fully lined tank (sealed)					Significant risk of GW pollution / Low risk of GW pollution					T1A3C10
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / Low risk of GW pollution	Significant risk of GW pollution / Low risk of GW pollution					Significant risk of GW pollution / Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution / T1A5C10
Unlined pit										Significant risk of GW pollution / Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution / Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable									Not Applicable

Figure 13: Selection grid for households.

SFD matrix

The SFD matrix for households in Punta del Diablo is shown in Table 12.

Table 11: Matrix SFD matrix for households.

Punta del Diablo (households), Rocha, Uruguay, 14 Mar 2022. SFD Level: 3 - Comprehensive SFD
Population: 2000
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 100%

Containment						
System type	Population	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	F3	F4	F5	S4d	S5d
System label and description	Proportion of population using this type of system (p)	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in sewer system, which is delivered to treatment plants	Proportion of supernatant in sewer system that is delivered to treatment plants, which is treated
T1A1C9 Toilet discharges directly to 'don't know where'	5.0					
T1A2C3 Septic tank connected to a decentralised combined sewer	5.0	90.0	90.0	90.0	90.0	90.0
T1A2C5 Septic tank connected to soak pit	60.0	65.0	5.0	90.0		
T1A3C10 Fully lined tank (sealed), no outlet or overflow	5.0	65.0	5.0	90.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	20.0	65.0	5.0	90.0		
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	5.0	65.0	5.0	90.0		

Emptying, transport and treatment

- According to surveys, *"65% of households declared having cleaned the tank at some time."* Therefore, this value of 65% can be considered as an approximation of the value of the variable F3 (percentage of faecal sludge that is emptied).
- It has been estimated that, in total, the service providers empty 8,928 m^3/year of faecal sludge. As it has been mentioned, this value includes both households and tourist places (Appendix 4). 65% of the variable F3 corresponds to values that vary between 2,572 m^3/year and 5,401 m3/year, depending on the estimated number of households. This range of values is within the estimated total (the rest would correspond to the faecal sludge removed from tourist places). Therefore, a first approximation of the value of the variable F3 = 65% seems reasonable. In other words, of all the tanks installed in households in the city, 65% have been emptied at some time.
- Regarding variable F4 (percentage of faecal sludge delivered to treatment), it has been estimated that only 5% of all emptied faecal sludge is delivered to treatment and the remaining 95% is dumped into the environment without any type of treatment (F4 = 5%).

- The value of the variable F5 is the percentage of faecal sludge delivered to treatment which is treated. It can be considered as the treatment efficiency. The faecal sludge is delivered for treatment at the Castillos, Chuy and Rocha lagoons. A typical treatment efficiency of 90% (F5 = 90%) has been assumed.

SFD graphic

Figure 14 shows the SFD graphic for households of the city where 37% of the excreta generated are safely managed while 63% of the excreta generated are unsafely managed.

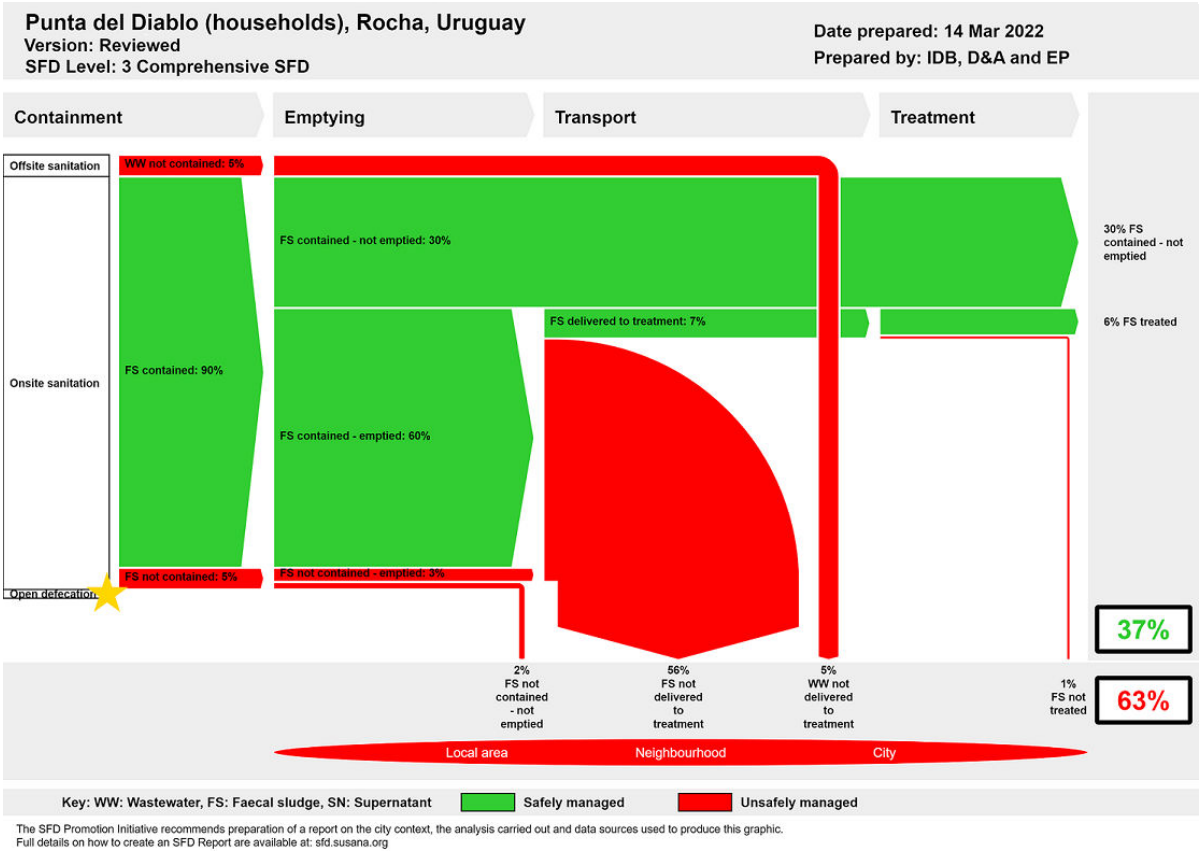

Figure 14: SFD graphic for households.

7.6 Appendix 6: SFD graphic for tourist places and analysis of the most relevant data

Risk of groundwater contamination

The OSE network is the main water source for 75% of tourist places. The remaining 25% rely on individual wells. The OSE network is supplied by protected wells where the water is extracted from the third underground layer, which is why it is considered a protected source (D&A and EP, 2021).

With respect to 25% of the tourist places that have their drinking water supply from individual wells, there is only one case in which it was reported that the sanitation system produced problems with the quality of the water form the well (odour in summer). Of this 25% of tourist places, 33% have a fully lined tank (sealed) (sealed) and 66% have a septic tank connected to a soak pit.

Based on this information, it has been considered that there is a potential risk of cross contamination of the sanitation system and individual wells, therefore a potential vulnerability, in 25% of tourist places.

Description of the sanitation systems

In the study area, there is no sewage system. Most of the population is served by onsite sanitation systems, especially septic tanks, cesspits and some WWTPs for their own use.

The SFD selection grid for tourist places in Punta del Diablo is provided in Figure 15.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)								
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B					Significant risk of GW pollution Low risk of GW pollution					Not Applicable
Septic tank			T1A2C3		T1A2C5 T1A2C6					
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution					T1A3C10
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution					Significant risk of GW pollution Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution T1A5C10
Unlined pit										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable									Not Applicable

Figure 15: Selection grid for tourist places.

SFD matrix

The SFD matrix for tourist places in Punta del Diablo is shown in Table 12.

Table 12: SFD matrix for tourist places.

Punta del Diablo (tourist places), Rocha, Uruguay, 14 Mar 2022. SFD Level: 3 - Comprehensive SFD
Population: 21128
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 100%

Containment						
System type	Population	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	F3	F4	F5	S4d	S5d
System label and description	Proportion of population using this type of system (p)	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in sewer system, which is delivered to treatment plants	Proportion of supernatant in sewer system that is delivered to treatment plants, which is treated
T1A2C3 Septic tank connected to a decentralised combined sewer	6.0	90.0	90.0	90.0	90.0	90.0
T1A2C5 Septic tank connected to soak pit	65.5	73.0	5.0	90.0		
T1A3C10 Fully lined tank (sealed), no outlet or overflow	6.0	73.0	5.0	90.0		
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	6.0	73.0	5.0	90.0		
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	16.5	73.0	5.0	90.0		

Emptying, transport and treatment

- According to the surveys, "*73% of the tourist places declared having cleaned the tank at some time*". Therefore, this value of 73% can be considered as an approximation of the value of the variable F3 (percentage of faecal sludge that is emptied).
- It has been estimated that, in total, the service providers empty 8,928 m^3/year of faecal sludge. As it has been mentioned, this value includes both households and tourist places (Appendix 4). Of these 8,928 m^3/year, between 2,572 m^3/year and 5,401 m^3/year correspond to households based on the estimated number (340 - 714 households).
- Putting together the ranges of faecal sludge collected in households (2,572 m^3/year - 5,401 m^3/year) and in tourist premises (5,557 m^3/year - 15,728 m^3/year), the total range would be 8,129 m^3/year - 21,129 m^3/year based on the estimated number (53 - 150 tourist places). The estimated value of 8,928 m^3/year emptied by the service providers is within that range, so, in the absence of another additional source of more precise information, that value of F3 = 73% is considered as a reasonable estimate of the value of said variable when making the SFD graphic. That is to say, of all the tanks installed in the city in tourist places, 73% have been emptied at some time.

- Regarding variables F4 and F5, the same assumptions as in households are considered. Therefore, it has been estimated that the values of the variables F4 and F5 are 5% and 90%, respectively.

SFD graphic

Figure 16 shows the SFD graphic for the tourist places of the city where 29% of the excreta generated are safely managed while 71% of the excreta generated are unsafely managed.

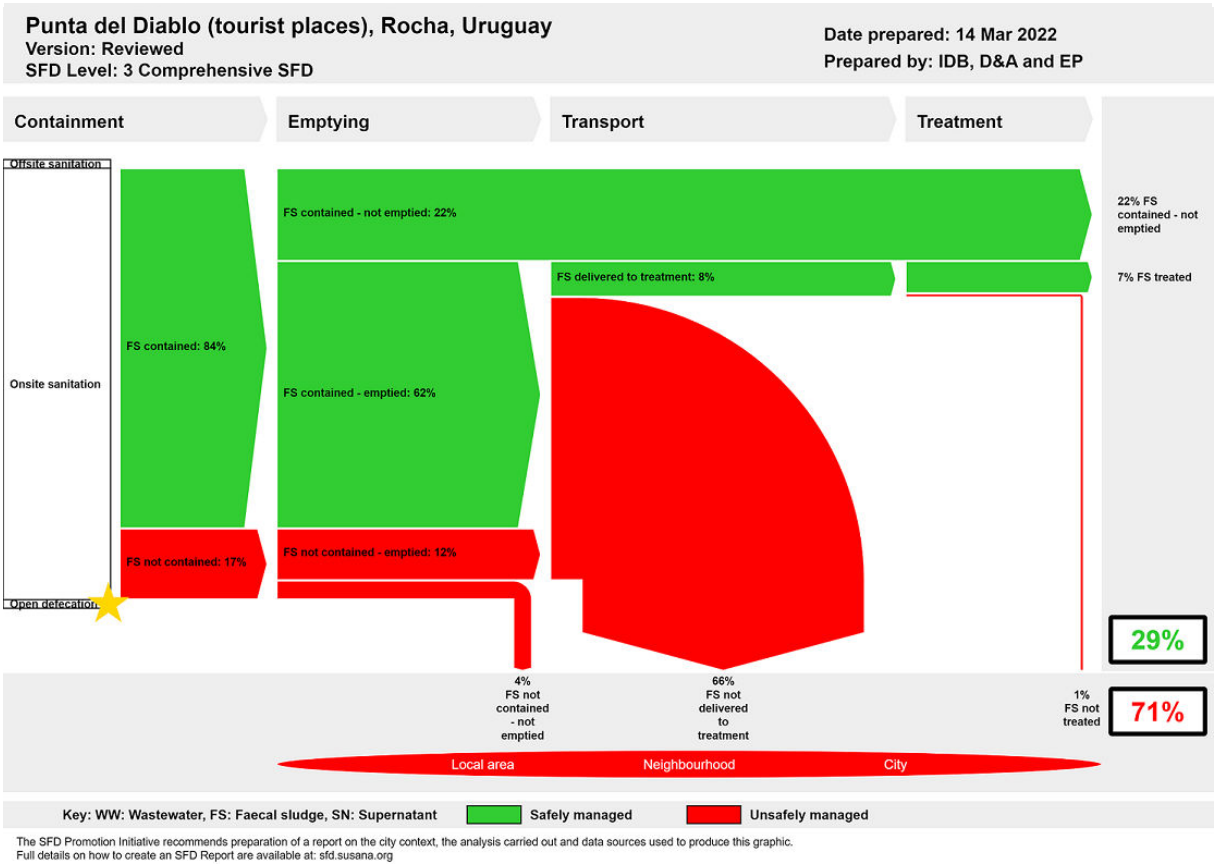

Figure 16: SFD graphic for tourist places.

7.7 Appendix 7: Summary of the most relevant data of the combined SFD graphic

- ✓ The combined SFD graphic takes into account both the resident and the floating population and represents how excreta are managed in the city.
- ✓ The value of the variable F3 has been taken based on the value given in the surveys of households and tourist places. that value has been triangulated with the estimation of the amount of emptied faecal sludge reported by the emptying service providers. To make this triangulation, a series of assumptions had to be made. For example, the number of households, the number of tourist places, as well as the value of variables F4 and F5 had to be estimated due to the lack of exact data. According to that triangulation, the data reported in the surveys have been found to be valid in a scenario of between 340 and 714 households and between 53 and 150 tourist places. Therefore, values from the surveys have been taken as the values of the variable F3.
- ✓ Although in the preparation of the SFD graphics the amounts of faecal sludge collected are not specified since the methodology uses percentages, that amount has been estimated, comparing it with that reported by the emptying companies when triangulating that data. This value can be used in later stages such as the proposal of a treatment system for the emptied faecal sludge and in the elaboration of a future faecal sludge management plan in the city.

7.8 Appendix 8: Beach monitoring by the Ministry of Environment

DINACEA (formerly DINAMA) has been monitoring in summer and, sometimes, out of season, certain beaches in Uruguay since 2007. Since 2015, *Playa de los Pescadores* de was included in the monitoring network of the Ministry of Environment. The main monitored parameters are: Conductivity, Salinity, pH, *Thermotolerant Coliforms*, Dissolved Oxygen and Algal Flowering.

Only the bathing waters are monitored, as the presence of *Thermotolerant Coliforms* in the sand of the beaches is not monitored. In total, there has been conducted 67 analyses. Table 13 shows a summary of the monitoring information:

Table 13: Water Monitoring Plan in Punta del Diablo.

Parameter	Unit	Average	Minimum	Máximum
Conductivity	S/cm	41,812	28,360	48,980
Salinity	PSU*	29.1	19.3	33.3
pH	-	7.9	7.49	8.4
Thermotolerant Coliforms	CFU/100mL	36.1	<2	440
Dissolved Oxygen	mg/L	7.6	6.36	9.39

*PSU: Practical Salinity Unit

The categories of microbiological quality of the beaches proposed by GESTA-Agua propose:

1. For *Thermotolerant Coliform* values less than 250 CFU/100ml, the category is EXCELLENT.
2. For *Thermotolerant Coliform* values between 250 and 500 CFU/100ml, the category is VERY GOOD.

According to the analysis and data shown in Table 13, there is only one value above 250 CFU/100ml (date 20/02/2018). In the rest of the cases, the values indicate a microbiological quality of "EXCELLENT", being noteworthy that, as the average shows, the values measured are well below the limit between "EXCELLENT" and "VERY GOOD". It should also be noted that at no algae blooms been observed in the beaches monitored.

SFD Punta del Diablo, Uruguay, 2022

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SFD Promotion Initiative