

ENGINEERING FOR PEOPLE

DESIGN CHALLENGE

DESIGN BRIEF 2020-21

LOBITOS AND PIEDRITAS, PERU



Produced in Partnership by
Engineers Without Borders South Africa, UK and USA
In collaboration with EcoSwell



This initiative has been delivered in the UK and Ireland since 2011. It is based on a concept developed originally by Engineers Without Borders Australia.

This document has been produced by Engineers Without Borders South Africa, UK and USA [August, 2020].

The content has been created in partnership with EcoSwell. To learn more or support the ongoing efforts of EcoSwell please visit their site. Disclaimer: EcoSwell is a third-party organisation and Engineers Without Borders is not responsible for ensuring content on this site.

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- EcoSwell: www.ecoswell.org
- Engineers Without Borders South Africa:
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Disclaimer: Across the world there are slight variations in English orthography (writing conventions), the two most recognised variations being British and American spelling. For the purpose of providing consistency, British English has been adopted throughout this document.

Please visit www.engineering-for-people.org



CONTENTS

| | |
|--|-----------|
| Welcome | .4 |
| About | 5 |
| The Competition | 5 |
| Lobitos & Piedritas | 6 |
| The Area | 7 |
| History | 8 |
| Geography & Climate | 10 |
| Local Governance | 11 |
| Population | 11 |
| Demographics | 12 |
| Lobitos Map | 14 |
| Piedritas Map | 15 |
| Industries & Employment | 16 |
| The Challenge Areas | 17 |
| Built Environment | 20 |
| Water | 24 |
| Sanitation | 27 |
| Energy | 30 |
| Waste | 33 |
| Food | 35 |
| Digital | 38 |
| Transport | 41 |
| Case Studies | 44 |
| Augusto Correa, Owner, Hotel Buenavista Lobitos | 46 |
| Darío Carreño, Transport Worker | 47 |
| EcoSwell, Sustainable Development NGO | 48 |
| Gino Pérez, Owner, Lobitos Surf School | 49 |
| Henry Espinoza, Director, Waves for Development and Councilor, Lobitos District Municipality | 50 |
| Jacky Eche, Former Employee, Lobitos District Municipality | 51 |
| Juan Eche, Vice President, Lobitos Artisanal Fisherman's Guild Association | 52 |
| Justo Blas, Master Builder and Member, Piedritas Tourism Committee | 53 |
| Leah Donatiello, Executive Director, High Tides International | 54 |
| Manuel Vásquez, Director, Santa Elena de Piedritas School | 55 |
| Marlyne Guerrero, Secretary and Treasurer, Piedritas Tourism Committee | 56 |
| Nicolás Landa, Co-Founder, Coast2Coast and Lobitos Cinema Project | 57 |
| Quenni Carreño, Artisan and Administrator, EcoSwell House | 58 |
| Rafael Aramburú, Surfer and Touristic Entrepreneur | 59 |
| Teófilo Erazo, President, Piedritas Community Council | 60 |
| Tullio Chapilliquén, Artisanal Fisher and Local Guide, Lobitos Ocean Adventure | 61 |
| Getting Started | 62 |

ENGINEERING FOR PEOPLE

DESIGN CHALLENGE

WELCOME

Both on a global and local scale, we are facing challenges that require urgent action. Engineering plays a key role in everyday life and our response to address current and future challenges. We have a global responsibility to help vulnerable communities adapt to changing conditions and to reduce inequality. Participating in the Engineering for People Design Challenge is the beginning of your journey to prepare you to invest your skills and talent to benefit all people and our planet.

You have an opportunity to join thousands of university students from across the world taking part in an Engineers Without Borders initiative. This year, students in South Africa, the UK, Ireland and the USA are participating in the Engineering for People Design Challenge. Over 41,500 students have participated since 2011 with a different design brief each year.

This is more than a theoretical exercise. In this document, the challenges described are real issues in Lobitos and Piedritas, two neighboring communities on the northern coast of Peru. The opportunities for improvement are identified by those people who live there. They have offered their perspectives to help form this design brief, enhance your educational experience and to share challenges faced in day-to-day life.



This design challenge is not about doing what you are told or finding a 'right' answer to a pre-defined problem. This is about ensuring you are designing for and with people to improve livelihoods. You will have the freedom to lead the direction of your project. There is plenty of guidance and resources available (in addition to this document) to help you achieve this, including:

- An online portal (with videos, photographs, discussion forum and lots more information) available at www.engineering-for-people.org
- Other online information about local initiatives available at www.ecoswell.org



ABOUT

Within this design brief you'll find information about Lobitos and Piedritas on the northern coast of Peru, each of our eight challenge areas as well as case studies of the local people and businesses. Finally, there is some guidance on the design process to get you started. Find out more at www.engineering-for-people.org.

The design brief is written so you may focus on one challenge area e.g. Water or Digital, or have a solution that addresses multiple. You are not trying to tackle everything within all the challenge areas, you are in charge of defining the problem that you aim to solve and deciding how broad or how focused to make it.

The Engineering for People Design Challenge is about understanding the context and adopting a reasoned approach to end up with an appropriate idea. Just as in real life, there is no predetermined 'right' answer and there are likely to be multiple possible solutions.

THE COMPETITION

By participating in this programme you'll also be eligible to enter into a competition where we'll be looking for the teams who have best understood the social, environmental and economic factors present in Lobitos and Piedritas and can clearly demonstrate the application of this understanding into their engineering design.



BUILT
ENVIRONMENT



WATER



SANITATION



ENERGY



WASTE



FOOD



TRANSPORT



DIGITAL

LOBITOS & PIEDRITAS

Lobitos and Piedritas are neighbouring communities on the northern coast of Peru and are the location of this year's Engineering for People Design Challenge.

Tourism is a growing economic opportunity for this arid region, due to the beneficial conditions for sports such as surfing. However, doing this sustainably to protect the local natural habitat, and including the local community in the economic benefit, is not without challenge. Since early this year, the coronavirus (COVID-19) pandemic has also had a significant impact on daily life.

Investigate the challenge areas highlighted in this document, find out how Lobitos and Piedritas are changing, and as you look for ways engineering design can improve the ability of people to survive, thrive and flourish, consider the long-term consequences of tourism and the coronavirus (COVID-19) pandemic. What could the future look like?

To prepare and inspire you to invest your skills and talent to benefit all people and our planet, Engineers Without Borders partnered with EcoSwell to create this design brief in early 2020. EcoSwell and other NGOs in Lobitos and Piedritas have already started a number of initiatives and hold a close relationship with the community.

You can:

- Read and hear directly from people living in Lobitos and Piedritas in our Case Studies section and view video interviews on the online portal at www.engineering-for-people.org.
- Read more about the local context in our Challenge Areas section and on EcoSwell's website at www.ecoswell.org/projects.





THE AREA

Lobitos and Piedritas are neighboring coastal communities located in the Piura region of northern Peru, South America. Lobitos is a small fishing and surfing town of 1,300 residents located 17 km from the city of Talara, the tourist capital of Piura. Piedritas is a community of 400 residents located halfway between the city of Talara and Lobitos. The residents of Piedritas are in the process of obtaining a land title to formally establish the community and gain reliable access to basic services such as electricity and water. Both Lobitos and Piedritas are located within an oil concession area.

The region is home to several key industries, including oil exploration and extraction, artisanal fishing, surf tourism, ecotourism, and transportation. With year-round swells and miles of coastline, Lobitos attracts surfers and tourists from around the world. Piedritas is located in a large equatorial dry forest, which offers many natural assets for ecotourism and forms part of a valuable ecosystem for wildlife and biodiversity. The recent growth of the tourism industry has caused some tensions and resentment among the local population in both Lobitos and Piedritas because the money generated from tourism largely benefits the foreign business owners and not the lower-income neighbourhoods.

While Lobitos is known for its surf tourism, 30% of the local population lives below the poverty line and 14% live in extreme poverty. In Piedritas, between 70-80% of the residents are living in poverty or extreme poverty due to high levels of unemployment and a lack of basic infrastructure and services.

The nearby solid waste dump of the city of Talara has significantly increased the level of pollution in the community and the surrounding environment.

The coronavirus (COVID-19) pandemic has impacted many aspects of daily life in Lobitos and Piedritas. On 15 March 2020, Peruvian president Martín Vizcarra declared a national state of emergency, closing Peru's borders and banning Peruvians from leaving the house except to access essential goods or perform essential work. The national state of emergency was extended until 31 July 2020, but eased some of the quarantine measures by eliminating all-day curfew on Sundays and reducing the hours for mandatory nightly curfew. Throughout Peru, parades, parties, civic and religious activities, and all large gatherings remained suspended. Commercial businesses that opened must operate at a maximum of 50% capacity and ensure the necessary sanitation and preventative measures are in place. International borders remained closed for passengers, with the exception of repatriation flights. In July, although Piura is no longer under mandatory quarantine, six regions of the country remain under strict lockdown.

Despite the challenges of the coronavirus (COVID-19) pandemic, there is a desire for a sustainable and equitable tourism industry that incorporates the unique skills and talents of the local residents, whilst ensuring all people can meet their basic needs, preserving the local ecosystem, and diversifying the tourism offerings.

HISTORY

3000-1800 BCE

Peru was home to the Norte Chico civilization, the oldest civilisation in the Americas and one of the six oldest in the world.

1000-1476 CE

The Tallán culture existed along the northern coast and in the Piura region. As a matriarchal society, the women leaders were called "Capullanas."

In a number of archeological sites in the Piura region, researchers have unearthed "huacas" (ancient buildings) and "conchales" (ancient collections of seashells). Exploration of these sites indicates that the area has been inhabited for centuries and the past cultures lived off the sea and land.

1200-1535

The Inca Empire, the largest and most advanced state in pre-Columbian America, flourished in ancient Peru.

1526-1811

Led by Francisco Pizarro, the Spanish colonised Peru. Under Spanish rule, much of the ancient culture was lost.

1811-1824

Peru gained independence on 28 July 1821, during the War of Independence. Spain made futile attempts to regain its former colonies and only in 1879 finally recognised Peruvian independence.

1878-1884

Territorial disputes occurred with neighbouring countries, including the War of the Pacific and the Ecuadorian-Peruvian War (1941). The government started to initiate a number of social and economic reforms to recover from the damage of the war. Political stability was achieved only in the early 1900s.

EARLY 1900S

US and British entrepreneurs led the early exploration and exploitation of Peru's oil fields, the majority of which were discovered in the remote northern desert coast. An Englishman, Alexander Milne, discovered the last major oil field near Lobitos and formed the Lobitos Oilfield Company to mine the fields.

1920S-1950S

The International Petroleum Company (IPC), owned by Standard Oil, acquired 50% of the Lobitos stock. The town of Lobitos and surrounding land became an enclave for British and US citizens. The

British influence is evident in the town's layout and buildings, making Lobitos unlike other Spanish colonial towns. While the foreign oil companies built much needed infrastructure, Lobitos was mainly an oil camp with a town and housing for the oil workers. The fishing community grew during this time as there was more local demand. Lobitos also became a major stopping place for large ships travelling along the coast.

1950S-1970S

Piedritas was a town that mainly relied on the raising of livestock, including goats, pigs, and chickens. The town was located in a valley with ravines and a large carob tree forest that provided shade and natural grazing for the livestock.

1962

Burmah-Castrol (later to become British Petroleum or BP) bought the majority of shareholding of the Lobitos Oilfield Company. The petrol from Lobitos was refined and then sold in 229 service stations in Ireland and North West England. The population at this time included thousands of expats working in the oil fields.

1968

A military coup overthrew the democratically elected administration of Fernando Belaúnde. The military government saw the strategic importance of Lobitos and built a military base swelling the local population to more than 10,000 people. The new military government, led by General Juan Velasco Alvarado, took numerous steps to assert Peru's diplomatic and economic independence, including nationalising the oil industry, expelling all foreign operators, and establishing Petro-Peru.

1983

Heavy rains from a major El Niño event caused a huge mudslide that destroyed much of the dry forest in the valley where Piedritas was located. In the aftermath of this devastating event, the remaining residents resettled just outside of the valley, further towards the city of Talara.

1990

Alberto Fujimori was elected president of Peru, during a tumultuous time of severe economic crisis where a large percentage of the population of Peru was living in extreme poverty and there was a civil war with the terrorist group Sendero Luminoso (Shining Path).

1991

To stabilise the economy, the "Inti" was replaced with the nuevo sol (new sol) as the official currency in Peru.

1992

Fujimori dissolved the Congress and the judiciary, suspended parts of the constitution, and assumed dictatorial powers. He argued that the Congress, controlled by opposition parties, was obstructing his efforts to fight terrorism, poverty, and corruption. The following year, a new constitution tilted the balance of government power in Fujimori's favour to enable sweeping legislation and economic reforms and facilitate Peru's re-entry into the global economy.

1995-1999

Peru and Ecuador went to war over the border demarcation along the headwaters of the Cenepa River. The Montevideo Declaration went into effect in May 1999. Part of the peace agreement included reducing the military presence of both countries in the vicinity of the newly recognised border, which involved removing the Lobitos military base. The departure of the military had a dramatic impact on the town by not only removing an economic base, but also removing much of the military base infrastructure.

1998

A major El Niño event triggered mudslides that brought a large amount of sand to the beach and altered the seafloor. These environmental changes created perfect waves for surfing, and in the early 2000s, surfers discovered Lobitos and the opportunity for tourism grew.

2000

Fujimori won a controversial election, but amid growing allegations of corruption, he announced his resignation.

2001

Alejandro Toledo was elected president and ushered in a new era of political reform that involved decentralising the Peruvian government and giving more power and resources to the municipalities. With these reforms, the Peruvian government gave money collected from the oil and mining industries in each locality to the municipalities to invest in local development projects. The government, however, did not provide appropriate training in management, accountability, and transparency for public administrators, governors, and mayors. This lack of planning and oversight contributed to the prevalence of corruption and misuse of public funds at the regional and local government level.

2004

Sofía Mulanovich, a Peruvian, won the World Surfing Championship title in Hawaii, which sparked a renewed national interest in the sport.

2008

The Association of Surfing Pros hosted an international surfing competition in Lobitos.

2008-2011

ProInversión, Peru's state agency for the promotion of private investment, announced the sale of the military base land for a large-scale US\$119,000,000 tourism project to position Lobitos as an important international surf and wind surfing destination. The project was to include the construction of 400 condominiums, an 18-hole golf course, and shopping centres. The private land auction was supposed to take place in 2011 and be signed before the transition of presidential powers, but the residents of Lobitos protested because they were not included in the planning process. Lacking local support, the tourism project failed to take off.





GEOGRAPHY & CLIMATE

Peru's Pacific coastline accounts for 11% of the area of the country and stretches for 2,414 km (1,500 mi) along the western edge of the nation from Ecuador to Chile. The coastal area is characterised by narrow bands of arid to semi-arid desert, rocky coastline, beaches, and fertile valleys. Rivers that flow down from the Andes Mountains and into the Pacific Ocean feed the fertile valleys. Two important ocean currents, the cold-water Humboldt Current and the warm-water El Niño Current, connect along the coast of Peru to create an abundance of aquatic life and biodiversity.

Lobitos and Piedritas are located in Piura, where the climate is a tropical dry climate and warm all year round. Temperatures in Piura are at their hottest during Peru's summer months, from December to March, when by day, highs generally exceed 32°C (90°F). During the winter months of June to September, temperatures are slightly cooler. From June to August, daytime temperatures average between 25°C (77°F) and 27°C (81°F). Due to the arid conditions, precipitation is lower than 100 mm (4 in) per year, except in the case of severe El Niño events, which can provoke major flooding and annual precipitation that can be as high as 4,000 mm (157.5 in).

Peru's coast also experiences occasional El Niño events. This phenomenon generally occurs every 15-20 years, but in recent years, has been occurring more frequently due to climate change. Warm ocean currents mix with increased air pressure in an abrupt reversal of atmospheric and sea conditions. This oceanic upheaval produces heavy rains and major climate shifts. In 2017, Peru's northern coast experienced a major El Niño event, which caused intense rains, flooding, mudslides, and widespread power outages.

The northern coast of Peru has a wealth of mineral and natural resources. Petroleum fields are located both inland and offshore along the remote northern desert coast, and the oil industry has a long history of extracting oil from the region. Natural resources include the equatorial dry forest, which provides a habitat for a wide variety of flora and fauna, including the carob tree and the critically endangered Peruvian Plantcutter bird. The dry forest begins north of Lima, stretching along the coast and all the way to the southern border of Ecuador. Much of what remains of the dry forest has gone through desertification and widespread deforestation and degradation. It is estimated that only 10% of the original dry forest remains. From 2003-2018, the area of tree-covered areas in Piedritas increased by 182.13%, however, the main body of growth occurred in the invasive species Tamarix, not the native dry forest.

The following resources will help to build on your knowledge of Geography and Climate:

- [1] [Captured Planet Video - The 6th Extinction: Loss of the Dry Forest in Peru](#)
- [2] [Dry Forest Site Map](#)
- [3] [Ecoregion - Southwestern Ecuador and Northwestern Peru](#)
- [4] [Last call for the Peruvian Plantcutter](#)



An oil rig at sunset in Lobitos

LOCAL GOVERNANCE

The current mayor of Lobitos serves as part of the governing body for the Lobitos District Municipality. Within the district of Lobitos, there is a small parliament called the council. All but one of the council members are affiliated with the Somos Perú (We Are Peru) political party. The number of representatives on the council reflects the number of votes the party achieved in the last election. The municipality receives funding from the Peruvian government to oversee public projects in areas such as sanitation and wastewater management.

Piedritas is not incorporated into a municipality, but receives some support from the city of Talara. Although Piedritas does not have a formal government structure in place, it has a small community council composed of five people who are well respected in the community and very committed to their roles. The council oversees and coordinates many of the community's activities and development projects. The residents of Piedritas respect the council and follow its guidelines.

POPULATION

According to [The World Factbook](#), the total population of Peru is estimated at 32,914,989 people. At the regional level, Piura has a total population of 1,856,809 people (National Institute of Statistics & Informatics (INEI) - Peru).

TOTAL POPULATION OF LOBITOS: 1,300

The population of Lobitos has varied considerably over time. One of the population swells was from the early 1900s to 1968 where the population rose by thousands of expats due to the rise of the oil industry before nationalisation in 1968 (where expats were forced to abandon the town). Another swell of population occurred with an enhanced military presence (up to 10,000 people) from 1968, to when most military personnel were evacuated in the 1990s (due to peace agreement with Ecuador). Some of the infrastructure was therefore abandoned due to changing population or change in ownership. From

1997-1998, a major El Niño event created the perfect conditions for surfing, which resulted in an influx of surfers and tourists from 1998 to the late 2000s. In recent years, many of the people who moved to Lobitos for surfing and business opportunities have left because the town is no longer as peaceful as it once was. The change of population is reflected in the [census](#) data with a change from 1,456 people in 2010 to 1,340 in 2017. The population also experienced further decline due to youth leaving the town in search of education and job opportunities.

TOTAL POPULATION OF PIEDRITAS: 400

From 2013-2015, there was a steady flow of migration to Piedritas, with a relatively consistent population prior to this. Each year, the population grew by approximately 10-15 families or 75-90 people. In the past three years, the rate of migration has slowed, with only a few new families joining the community.

DEMOCRAPHICS

Peru's 2017 National Censuses of Population and Housing provide demographic data on Lobitos, but not Piedritas. The demographic data on Piedritas comes from a local survey in which 40 households responded. Despite the small sample size, the survey data provides an important reference point for Piedritas. In this section, only gender and age demographic data is listed for Piedritas.

GENDER

In Lobitos and Piedritas, the men are mostly dedicated to working and providing an income for the household, while the women care for the children and manage the domestic responsibilities. These gender norms, however, are not the same for every woman in the two localities. In Lobitos, a larger percentage of women work in municipal jobs, cleaning or cooking or running their own home shop or business. In Piedritas, the women actively participate in community activities, particularly the community greening projects and environmental education workshops. The women typically bring their children with them to the workshops. Women also attend meetings and activities at the Santa Elena primary school.

EMPLOYMENT

In Lobitos, the majority of the population is of working age (72.1%), which is more than 15 years of age. Almost half of the population works for payment or goods.

Below, are rough estimates of the percentage of the working population employed in various industries and commercial activities:

- 50% artisanal fishing industry
- 20% small shops/businesses/restaurants
- 10% hotel industry
- 5% municipality workers
- 5% farming / raising livestock
- 5% trade jobs (carpenter, plumber, construction worker, etc)
- 5% private security guard for a company or other operational job

Slightly more than half of the population does not work for money or goods, which includes many women who work in the home.

AGE

In general, the population in Lobitos is young (see Figure 1), however, in recent years, there has been a decline in the number of young people from ages 10-19 years and 20-29 years. In Piedritas, the majority of the population surveyed was over 30 years old.

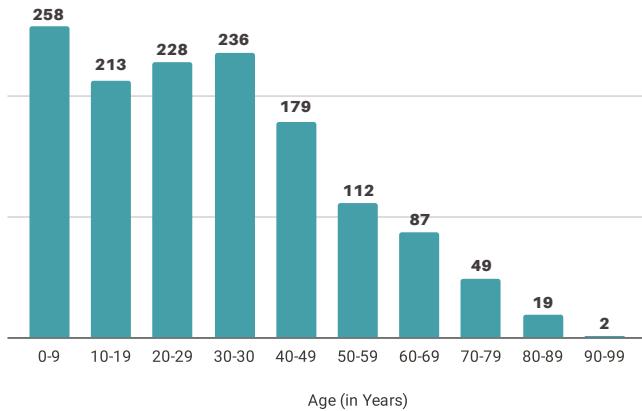


Figure 1: Age of population in Lobitos

LANGUAGE

In Lobitos and Piedritas, the majority of the population speaks Spanish. In Lobitos, a small percentage of the population speaks Portuguese due to Brazilian tourists who opened businesses during the tourism boom. In addition, a small segment of the population speaks Quechua, the language of the Inca Empire and the most spoken indigenous language in the Americas.

RELIGION

In Lobitos, the majority of the population is Catholic (see Figure 2). Others identify as Evangelical and Christian. There is a segment of the population that does not profess any religion.

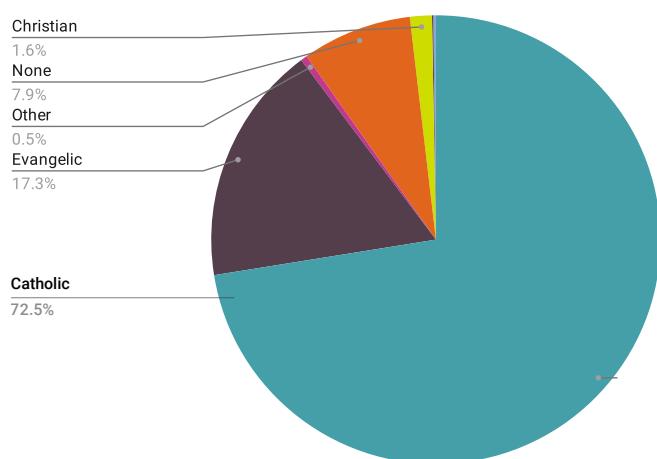


Figure 2: Religion in Lobitos

RACE & ETHNICITY

In Lobitos, the majority of the population identifies as mestizo. The term mestizo means mixed in Spanish, and is generally used throughout Latin America to describe people of mixed ancestry with a white European and an indigenous background. 12% of the population identifies as Black or Afroperuvian. Afroperuvians are citizens of Peru with African heritage who were enslaved and brought to Peru during colonial times. The Afroperuvian population currently suffers from marginalisation and racial discrimination, which negatively impacts their social mobility and access to basic services. Three percent of the population is Quechua, indigenous people originally from the Andean region of Peru. Indigenous groups and those of indigenous descent also face marginalisation and racial discrimination in Peruvian society.

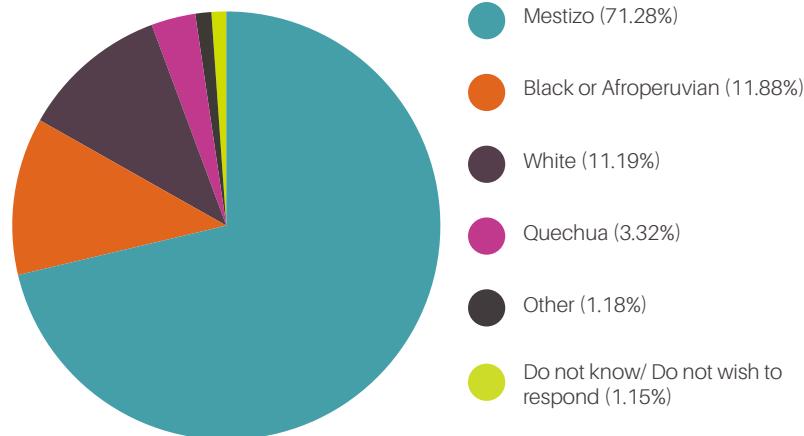
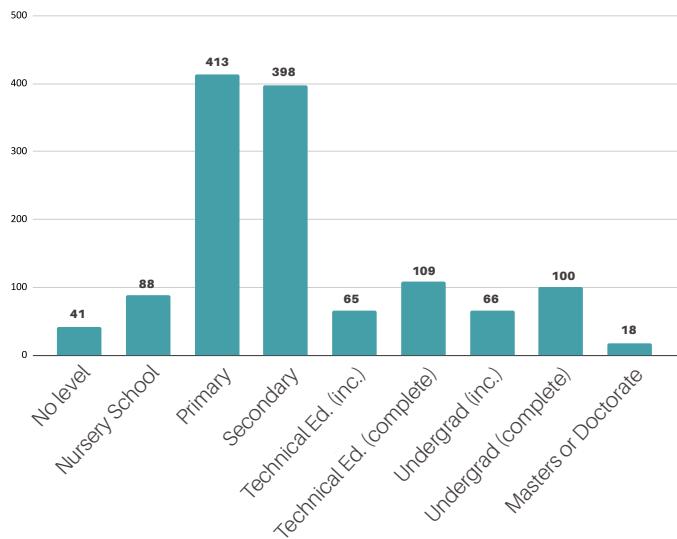


Figure 3: Race & Ethnicity in Lobitos

Figure 4: Education in Lobitos



EDUCATIONAL ATTAINMENT

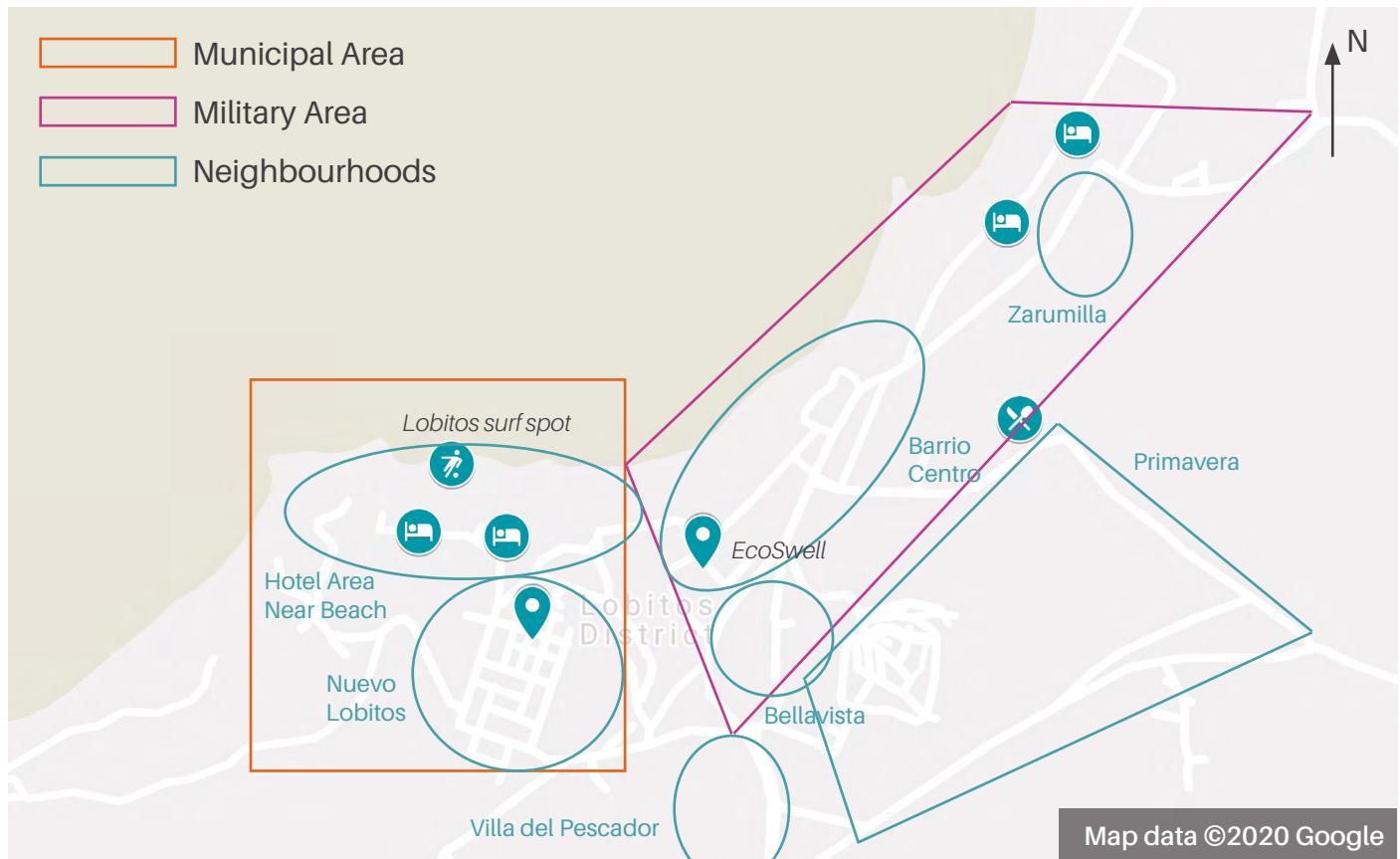
The level of educational attainment varies in Lobitos (see Figure 4), with a larger portion of the population having completed either primary school or secondary school.

PREVALENCE OF DISABILITY

7.32% of the people in Lobitos live with some form of disability. In Lobitos, 3.73% of the population experiences partial blindness or loss of vision. 1.67% of the population experiences difficulty walking or limited mobility.



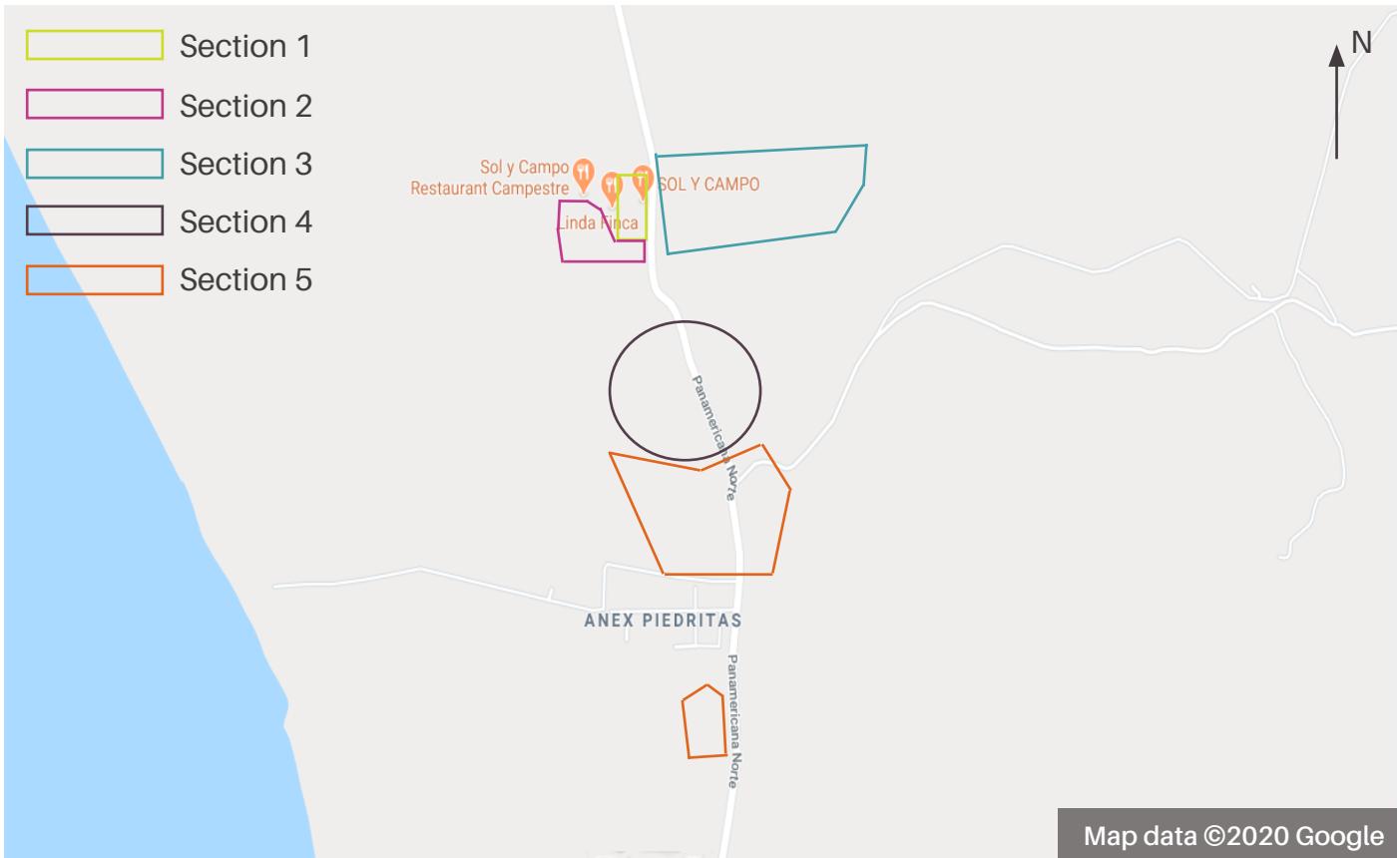
LOBITOS MAP



- Lobitos is composed of six main neighbourhoods, which are under the jurisdiction of different entities, including the Fisherman's Guild, military, and Lobitos District Municipality. These neighbourhoods vary in size, demographics, and socioeconomic status.
- The fishing community mainly resides in Primavera, with a population of approximately 800 people. Most of the families in this neighbourhood have lived in Lobitos for generations and work in the artisanal fishing industry. Primavera is an underserved neighbourhood where some of the poorest people of Lobitos live.
- The Zarumilla, Castilla, Barrio Centro, and Bellavista neighbourhoods are located within the military zone. All of the land in this area is under the control of the military, which rents out old houses and buildings to residents. Approximately 150 people live in Zarumilla. In 2016, there were 5-10 families living in Castilla, but due to the growing demand to live in this area, that number has doubled.
- In Barrio Centro, the military rents out the houses to existing families of Lobitos and newer residents. Bellavista is a small neighbourhood located on a hill behind Barrio Centro.
- A dry gully or ravine separates Nuevo Lobitos, which is under the jurisdiction of the Lobitos District Municipality, from the military zone. Approximately 500 people live in this neighbourhood. Many fishing families live in the poorer areas of Nuevo Lobitos. The coastal area of Nuevo Lobitos is a popular tourist destination that caters to surfers and foreigners.

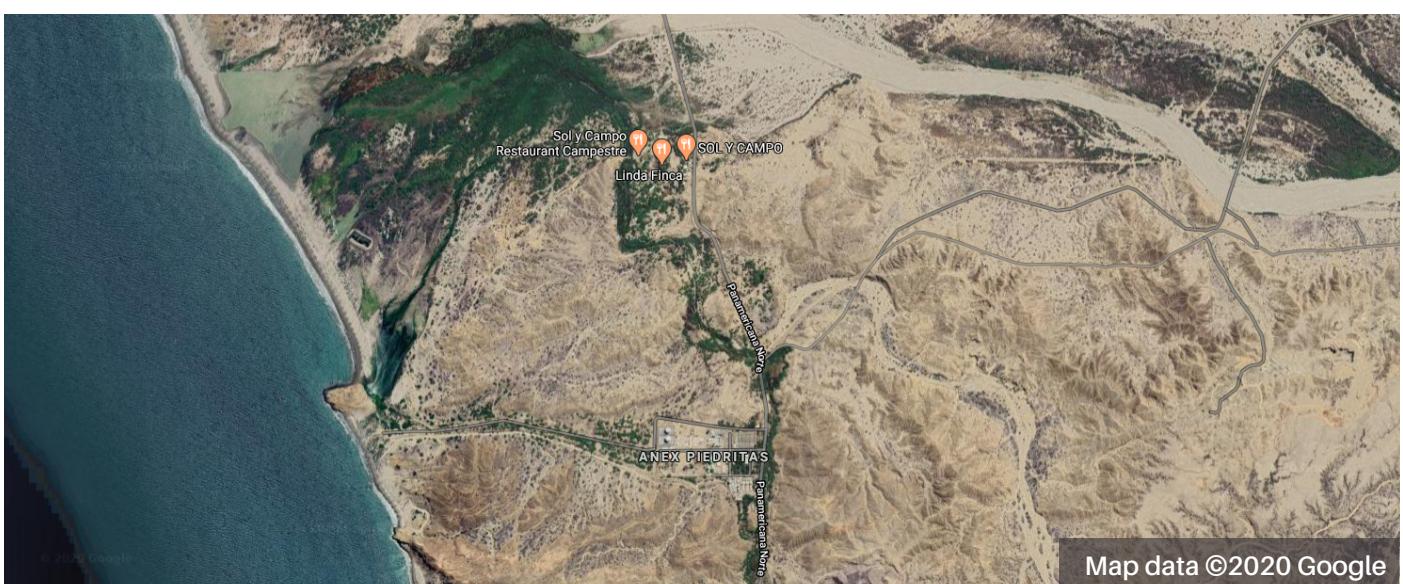


PIEDRITAS MAP



- The housing in Piedritas is organised into five sections, according to which houses are connected to the electrical grid.
- The houses in sections one and two are located right next to the Santa Elena primary school and the road that passes through Piedritas (west of Panamericana Norte). The longer-standing families who live in this area have achieved a higher socioeconomic status, and some own small businesses located near the community's ecotourism route.

- The more vulnerable and impoverished families live on the other side of the road (east of Panamericana Norte) in basic housing with no water or electricity. Approximately half of these families dedicate their lives to the logging of carob trees and the production of charcoal. The other families in this area raise and sell livestock, including goats, horses, chickens and pigs.



INDUSTRIES & EMPLOYMENT

The residents of Piedritas engage in a variety of commercial activities, while roughly half of the population in Lobitos works in the fishing industry.

Some residents engage in small-scale subsistence agriculture and raise goats, pigs, or chickens and sell the meat and dairy products. The people of Lobitos and Piedritas are heavily reliant on the nearest city, Talara, for buying food and goods and accessing essential services such as banks and hospitals as they are not available locally.

Artisanal and commercial fishing are practiced along the coast. The Talara Provincial Municipality and Lobitos District Municipality provide some employment opportunities, including street cleaning, garbage collection, security, trades, and when available, local construction projects. Previous administrations used to hire over 50% of the population on a rotating basis throughout the year, however, the current mayor of Lobitos stopped this practice because it was financially unsustainable and fostered corruption and misuse of public funds. Opportunities for advancing individual or household economic prospects through municipal employment are limited.

Although the oil industry is one of the largest industries in Lobitos, the only residents employed work predominantly as security guards. Over the last decade, oil prices have declined severely, which has reduced the amount of oil royalties the central government can provide to the Lobitos District Municipality.

The oil companies built several oil platforms on top of reefs that provide an important habitat for marine life. These platforms have disrupted the local fishing industry because the oil companies prohibit fishing near the platforms. Oil spills happen frequently and often go unnoticed due to a lack of government patrols and regulation.

LA COSTANERA

The central government is planning to build a new highway called La Costanera, which will run along the entire coast of Peru, parallel to the Pan-American Highway. By providing a direct and accessible route along the coast, La Costanera could significantly increase the influx of tourists to Lobitos.



Surf school in Lobitos

TOURISM & ECO-TOURISM

Surf tourism plays a critical role in Lobitos' economy, bringing an estimated 8,400 people to Lobitos each year and contributing a total of US \$3,555,612 to the local economy. EcoSwell led a multi-stakeholder National Wave Break Protection Campaign in Lobitos, which now protects by law five of the local world class wave breaks (Piscina, Muelles, Lobitos, El Hueco, Baterías) against any potential development threats.

Because of the changing surfing conditions in Lobitos, the tourism industry is keen to diversify its offerings to include fishing, diving, kite surfing, kayaking, and mountain biking to attract new visitors. The municipality of Talara is interested in Piedritas' growing ecotourism industry, which could help boost overall tourism in the area.

Deforestation and environmental degradation are two of the main challenges Piedritas faces in its efforts to build a sustainable ecotourism industry. In the early 1990s, newly built highways offered easier access to Talara, prompting an influx of domestic and international imports into the area. Residents struggled to sell their produce in the local markets due to the competitive prices of imported goods. Unable to sell their produce, many of the residents turned to logging the carob tree and selling charcoal to generate an income, which caused significant damage to the dry forest. To address these issues, EcoSwell has implemented, with support from energy company Enel, the "Green Piedritas" Environmental Education and Community Ecotourism Project, educating the community on the harmful impacts of producing charcoal and implementing initiatives to preserve the local ecosystem.

Recently, the community started to receive its first groups of tourists and visitors. Integrating ecotourism into the beach and sun tourism of Talara would diversify the tourist experience and help Piedritas capture the flow of tourists traveling through the community to reach the coast.

OVERVIEW: THE CHALLENGE AREAS

Before introducing the challenge areas, it is important to note that the UN Sustainable Development Goals (SDGs) are a useful framing for tackling this design challenge.

2020 marks 10 years until the rapidly approaching deadline for achieving the United Nations Sustainable Development Goals (SDGs). The goals, launched in 2015, laid out 17 areas to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. A number of UN Sustainable Development Goals are linked here to provide a first step for wider reading. Read through the goals to explore to understand both the local and global perspective, whilst reading about Lobitos and Piedritas.

SUSTAINABLE DEVELOPMENT GOALS



BUILT ENVIRONMENT



The built environment includes all human-made physical spaces where we live, take leisure and work. These include housing, public spaces, healthcare facilities, schools, markets and shops that people need for a healthy and thriving society. When properly designed, an inclusive built environment can help solve a number of other issues such as the provision of clean water, adequate sanitation, access to education, reliable energy and the disposal of waste.

What ideas can you come up with to improve the existing homes, buildings and public spaces to meet future needs? Whilst generating ideas for this area, it will be important to consider the imminent growth of tourism in the area to ensure the development of inclusive solutions that meet the needs of the whole community.



Food security occurs when all people have access to sufficient, safe, and nutritious food that meets their requirements for an active and healthy life in ways the planet can sustain into the future. A changing climate, growing global population, rising food prices, and environmental stressors create a number of challenges for the production and consumption of food. These global changes can be particularly challenging for coastal communities which often source food from the land and sea. Undernutrition, overweight and obesity are different forms of malnutrition, and it is common to have people with these differing forms living side-by-side in one country, in one community, or even in the same household. Small-scale sustainable food producers, resilient and regenerative agricultural practices, maintaining gender diversity and providing timely access to up-to-date information are all key to achieving reliable food systems.

What ideas can you come up with to improve food systems and nutrition and promote sustainable practices to meet current and future needs? Whilst generating ideas for this area, it will be important to consider the imminent growth of tourism, and thus greater demand for locally available food, to ensure the development of inclusive solutions that meet the needs of the local community. How might these opportunities be realised, whilst including safety protocols needed to combat the coronavirus (COVID-19) pandemic?



Reliable access to energy, in particular electricity, often reduces the time people spend on everyday tasks. This means that they can engage in other activities such as education, employment and entertainment, thereby improving the quality of life. Although energy is an essential requirement for human development and the eradication of poverty, most of our energy comes from finite fossil fuels. In the 21st Century, there is a significant global challenge to balance out energy demands against the associated environmental impacts.

What ideas can you come up with to improve access to safe, low-cost energy to meet current and future needs? Whilst generating ideas for this area, it will be important to consider the imminent growth of tourism, and thus greater demand for reliable energy, to ensure the development of inclusive solutions that meet the needs of the whole community.



Human activity produces waste. It is vital to address and properly manage waste to prevent environmental damage, health risks and the development of unsightly and undesirable areas. Reducing, reusing and recycling waste are key priorities for sustainable human development. Waste is an evolving issue, with the majority of waste ending up in the landfill.

What ideas can you come up with to improve the situation to meet current and future needs, whilst restoring the local environment? Whilst generating ideas for this area, it will be important to consider the imminent growth of tourism, and thus greater demand for clean spaces, to ensure the development of inclusive solutions that meet the needs of the whole community.

WATER



Water is an essential resource, and to lead healthy lives, people need a reliable supply of clean drinking water. Water is also used in industrial processes we depend on for food, energy and the production of many of the products we use daily. Water is vital for human development.

What ideas can you come up with to improve the resilience and availability of the water supply to meet current and future needs? Whilst generating ideas for this area, it will be important to consider the imminent growth of tourism in the area, and thus greater demand on the available water resources, to ensure the development of inclusive solutions that meet the needs of the whole community.

SANITATION



Sanitation is critical for maintaining public health. Sanitation involves the safe management, treatment and eventual safe end use or disposal of water that is contaminated and presents potential health problems. This includes sewage, water run-off from buildings, and water that has been used for purposes such as washing and cleaning in both domestic and industrial purposes. With treatment, contaminated water can be returned to the water cycle with minimal environmental issues.

What ideas can you come up with to improve access to sanitation and to decrease pollution to meet current and future needs? Whilst generating ideas for this area, it will be important to consider the imminent growth of tourism, and thus greater demand for decent sanitation, to ensure the development of inclusive solutions that meet the needs of the whole community.



TRANSPORT



Mobility and access to transport infrastructure allow people and goods to move around freely. Mobility plays a key role in making societies more inclusive through enabling access to key services and educational, economic and social opportunities. Transport infrastructure comes in many forms such as pedestrianised areas, cycling facilities, boats, public transport, shared-ownership transport, rented and hired transport and private transport.

What ideas can you come up with to improve transportation on land or at sea to meet current and future needs? Whilst generating ideas for this area, it will be important to consider the imminent growth of tourism and the planned La Costanera highway to ensure the development of inclusive solutions that meet the needs of the whole community.



DIGITAL



The world is becoming increasingly connected. Whilst many people benefit hugely from modern advances in information communications, some of us have not had the same opportunities. Enabling access to technologies from which information flows, knowledge is gained and people communicate is recognised globally as an important factor in reducing the inequality gap. Information communication technologies (ICT) facilitate educational, social and economic opportunities for people. ICT comes in many forms, such as radios, televisions, computers, internet networks, mobiles and mobile platforms, data loggers and sensors, small data and big data. Due to recent social distancing measures, the ability to buy/sell, work, connect and perform many other tasks has been limited to those that have available digital systems.

What ideas can you come up with to use digital technology to meet current and future needs? How can you leverage digital systems to facilitate daily life where social distancing is a necessity to protect against the coronavirus (COVID-19) pandemic?

BUILT ENVIRONMENT

In Lobitos and Piedritas, plans to expand community facilities and enhance conservation efforts of the dry forest are renewing the built environment.

What ideas can you come up with to improve the existing homes, buildings and public spaces to meet the future needs of the whole community, whilst restoring the local environment? It will also be important to consider the imminent growth of tourism in the area to ensure the development of inclusive solutions that meet the needs of the whole community.



OVERVIEW

The built environment of Lobitos and Piedritas shapes residents' and visitors' experience of the place. As with any setting, the built environment influences aspirations, sense of self-worth, safety and security. Both towns have evolved over time to feature both public buildings and residential homes.

The built environment in Lobitos has gone through significant periods of change over time. Lobitos has about 58 hotels and hostels, a few restaurants, and other tourist-related businesses, including surfboard shops and yoga studios.

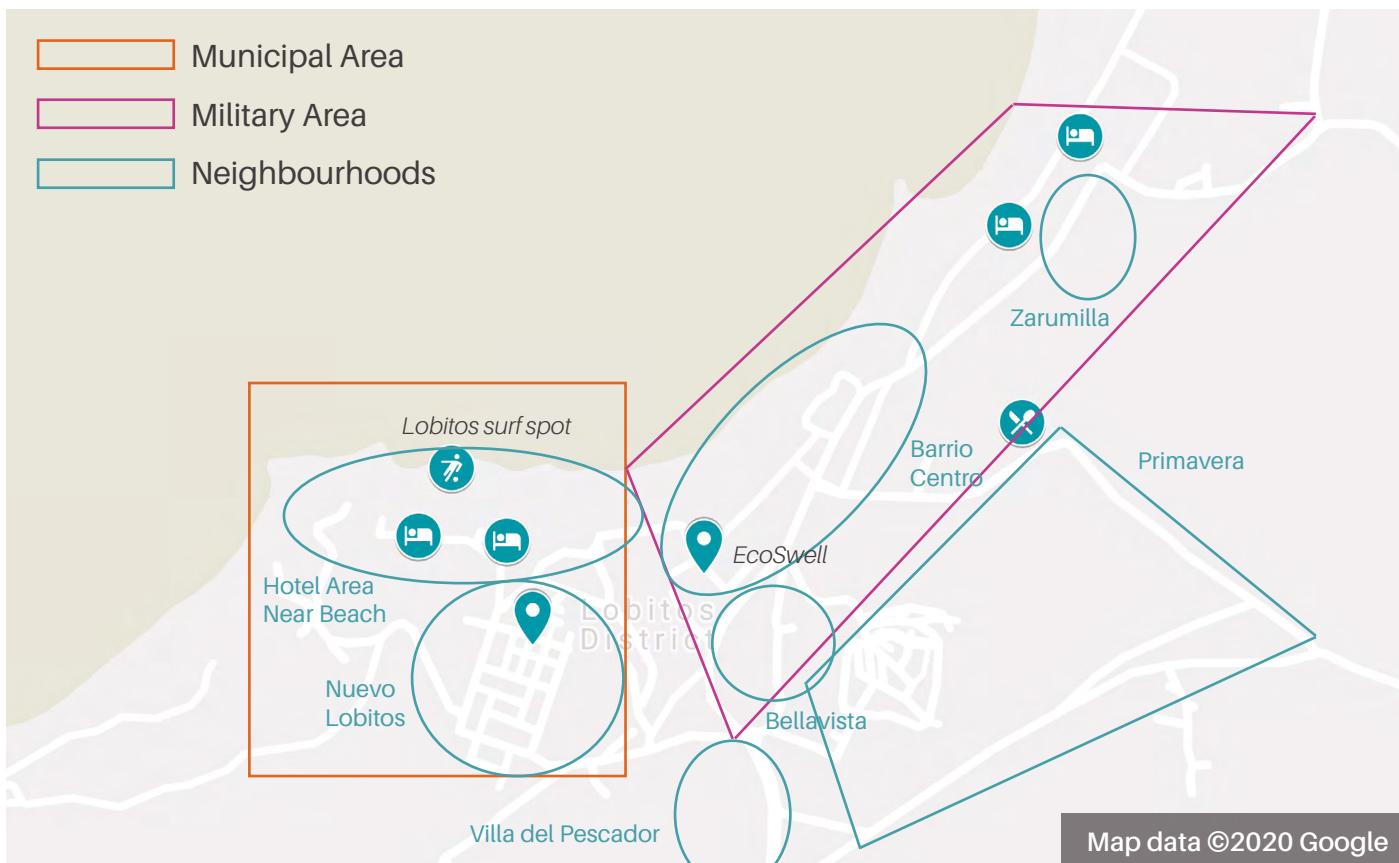
In Lobitos, the oldest homes are around 100 years old, while others were built during the 1970s. Living conditions range within the key areas of Lobitos. In general, many buildings are poorly adapted to the desert environment. New developments in Nuevo Lobitos and Primavera have no sewer connection or septic tank and are not connected to the grid. People use friends' toilets or defecate outside. Approximately 5% of the people in Primavera do not have toilets. Across all the non-military areas there are fenced off plots of land 'owned' (no formal land titles) mainly by people that have migrated to Lobitos, but also some local residents.

In Piedritas, there are two main tourist businesses that receive visitors from Talara. Piedritas is traditionally an animal farming/logging community and has only recently opened to tourism.

Both communities are located within a largely desertified dry forest. The conservation requirements to preserve the dry forest are impacted by the built environment. The increase in precipitation brought by El Niño brings opportunities for vegetation restoration in Piedritas.

There are local examples of the impacts of poorly managed tourism, which is of concern to the people of Lobitos and Piedritas. The nearby tourist hotspot of Mancora is known for the environmental and social damage caused by the tourism industry. Unmanaged waste and sanitation presents health risks, environmental pollution and affects the location's aesthetics. Buildings that have been located too close to the shore affect the movement of the sand and have significantly changed the quality of the waves. Many of the people financially benefiting from tourism in Mancora are not from Mancora, and the local people have seen their quality of life go down rather than up, resulting in increases in civil unrest, crime and inequality.

There are, however, other local examples where the communities have dealt with the issues in a more effective manner. For example, Los Órganos is considered to have better managed the waste and sanitation issues and preserved the natural environment rather than destroy it.



MAP

Military Zone (Zarumilla, Castilla, Barrio Centro and Bellavista):

There are a few hostels in the military zone, but no new houses or hotels are being built in this area.

The area mostly includes restored old wooden houses previously used by those who worked in the oil companies and some newer (1970s) brick houses. Most have yard space and are detached. Some parts of this area are still collapsed and there are still many empty buildings and houses that have yet to be restored.

The military zone also has more trees and vegetation than the surrounding areas.

Zarumilla has many concrete houses built during the military regime to house military personnel, which are now rented out to newer residents of Lobitos.

In Castilla, many of the concrete houses were in complete disrepair with cracked and crumbling walls and no roofs or windows. Because of the growing demand to live in this area, the military started to rent out houses at very low contract prices to people from Talara and other areas. These new residents have restored many of the collapsed houses and moved in.

In Barrio Centro, the houses are mostly made of wood and were built by the British during the booming oil years. In Bellavista, there are also wooden houses built by the British, some of which are close to 100 years old.

In Primavera, the fishing community has a land title for their whole neighbourhood.

The houses and buildings are mostly made of concrete, but some are made of plywood and corrugated iron or tin roofs.

In recent years, the neighbourhood has been growing because the Fisherman's Guild has been giving out small plots of land to the family members of the fishers.

Most homes have limited yard space and are in close proximity, often sharing walls with neighbours.

Recently, the neighbourhood of Nuevo Lobitos has experienced population growth because the previous mayor created a new residential area with 60-80 plots of land.

Most of the houses built on these plots are simple structures made of brick or plywood.

Nuevo Lobitos also includes a strip of hotels, shops, and restaurants along the beach, which is a popular tourist destination that caters to surfers and tourists.

CURRENT SITUATION

In Lobitos, there have been several new government infrastructure initiatives, some of which have had varying success due in part to a poor sense of local ownership. These projects included a market in Nuevo Lobitos (which closed in 2019 due to poor location choice and lack of local demand), a preschool (which resulted in a major conflict with an oil company) and high-tech security huts interconnected with cameras and Wifi throughout Lobitos (which resulted in conflict between surfers and the military).

Since 2015, tourism in Lobitos has been declining. The rapid development of housing and hotels along the coast has disrupted the natural flow patterns of the sand and wind, which has negatively impacted the quality of the waves. Many advanced surfers have left Lobitos in search of less crowded beaches. One option the town is currently considering is trying to attract more beginner and intermediate surfers because the current waves are better suited for those who are learning how to surf.

Piedritas has an ambitious long-term plan entitled the '**Piedritas Verde Project**' (Green Piedritas) focused on environmental sustainability and ecotourism to:

- Acquire a land title and gain reliable access to basic services such as water and electricity
- Expand the local facilities to include a chapel and marketplace
- Build hiking trails leading to the wetlands and archaeological sites, a canopy tower, and birdwatching sites
- Be recognised in bio-commerce, ecotourism and fair trade
- Enable further academic research about the dry forest
- Restore the carob tree forest ecosystem

HOUSING:

- There are 102 homes in Lobitos [1]. Piedritas is made up of 60-70 homes, with only around 2-5% of them constructed from brick. Most of the homes are single story structures made of plywood and corrugated iron, with the majority of them built using local labour.
- A typical household will include between five to six family members, and it is common for newly married couples to leave the family home and seek new housing.
- Lobitos and Piedritas are considered to be open and safe towns, although in recent years, there has been a noticeable increase in petty theft.
- Houses have been broken into with TVs, motorcycles, and laptops stolen. The residents have started to put up more fences, where before the spaces were very accessible.

EXISTING COMMUNITY FACILITIES:

- There is limited public infrastructure, and the hot climate makes it difficult for people to make use of any unshaded public space.
- As fútbol (football or soccer) is the major sport in Peru, the school in Piedritas has a concrete pitch for the children to play. There are two fútbol pitches in Lobitos (in Primavera and Nuevo Lobitos), and there also is a cement pitch in the middle of the town with lighting available.
- In Piedritas:
 - » The Santa Elena primary school is the main community facility and the others include an information centre, hiking and bird watching trails and two restaurants (Sol y Campo and Villa Jordan) for tourists.
 - » Piedritas only has public lighting along the main road and school.
 - » The school (built by the energy company, Enel) is made with Caña de Guayaquil (bamboo-like material), bricks and iron/steel beams. Some of the classrooms are made of large shipping containers [2].
- In Lobitos:
 - » There are three main churches and several communal facilities where residents can gather, including parks, plazas, hotels, restaurants, the pier, and the Fisherman's Guild Community Hall.
 - » The pier is where the fishers keep their equipment. The building used to have a functioning toilet and shower block, but it has fallen into disrepair and is no longer accessible.
 - » There is a public medical centre in Lobitos, located in the Primavera neighbourhood. The public centre has three nurses and no doctors. The nurses can perform simple procedures and have access to basic medications, including vaccinations. The nearest large hospital is a 1.5 to 2 hour drive via the Pan-American highway to the city of Piura.
 - » There is street lighting in most of Lobitos, more so in Nuevo Lobitos than in the military zone, but not all of the street lights work.
 - » The public spaces in Lobitos, such as the town square, sports courts and small park areas, are made of concrete, with little available human-made or natural shade. These spaces are mostly unusable during the day because of the heat.

[1] Lobitos Map of homes by area

[2] Video of Santa Elena primary school

RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

IN LOBITOS:

- **Darío** is a transport worker who discusses the need for well-equipped bus stops and enhanced public spaces.
- **Gino**, owner of the Lobitos Surf School, discusses his aspirations to expand his business with new facilities for visitors and residents.
- **Jacky**, former Lobitos District Municipality Employee, describes the need for collaboration between stakeholders to upgrade the community's educational facilities.
- **Leah**, Executive Director of High Tides International, discusses the organisation's after-school educational activities and the facilities that need upgrading to support educational opportunities for children in Lobitos.
- **Nicolás**, co-founder of Coast2Coast and Lobitos Cinema Project, highlights the need for physical spaces to enhance community development initiatives.

IN PIEDRITAS:

- **Justo**, Master Builder and Member of the Piedritas Tourism Committee, and Teófilo, President of the Piedritas Community Council, highlight the need to build multi-use community facilities in Piedritas.
- **Manuel**, Director of the Santa Elena de Piedritas School, describes the growth and development of the school.
- **Marlyne**, Secretary and Treasurer of the Piedritas Tourism Committee, shares her insights on reforestation efforts in Piedritas.

SUGGESTED STARTING POINTS

To get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

Creating new and retrofitting existing public spaces inside the dry forest that provide opportunities for economic activity, shade from the sun and services such as waste collection points would greatly improve the prosperity of Lobitos and Piedritas. Can you come up with innovative ways of developing mixed-use public spaces?

The growth of the tourism industry has caused some tensions between the local population and foreign business owners. Can you think of creative ways to build public spaces where the local residents, foreign business owners and tourists can interact, either commercially or socially, to build more cohesion and sense of community and include the local residents in the long-term plans for tourism?

Increased tourism has brought development to Lobitos. Piedritas' community council designated a large area of public land across the road from the Santa Elena primary school for community facilities. In addition, the community wants to build a small chapel and a marketplace to sell local artisanal and organic products to visitors. Can you suggest ideas to help Piedritas expand its existing infrastructure?

The Green Piedritas Project also has an ambitious long-term plan focused on environmental sustainability and ecotourism. Can you propose ways to help achieve this plan?

REMEMBER:

Consider the overall context of the social, environmental and economic factors in Lobitos and Piedritas. This is part of our marking criteria and is key to the success of any engineering intervention you come up with. We recommend you read all the other Challenge Area pages and our guidance pages on getting started. You will need to conduct your own research beyond the information available here to show your depth of understanding. Additional information can be found in the pages about Lobitos and Piedritas and online at www.engineering-for-people.org.



WATER

The Rio (river) Chira supplies water to all the towns from Piura to Mancora and many of the small rural communities in between. Around 1.1 million people rely on this precious resource spread over 26 towns.

Other demands on the river include agriculture, two hydroelectric dams, a fish farm, oil and gas refineries and other industrial activities. For Lobitos and Piedritas, water is a scarce resource due to the desert climate and increasing demands on the water source. What ideas can you suggest to improve the situation?

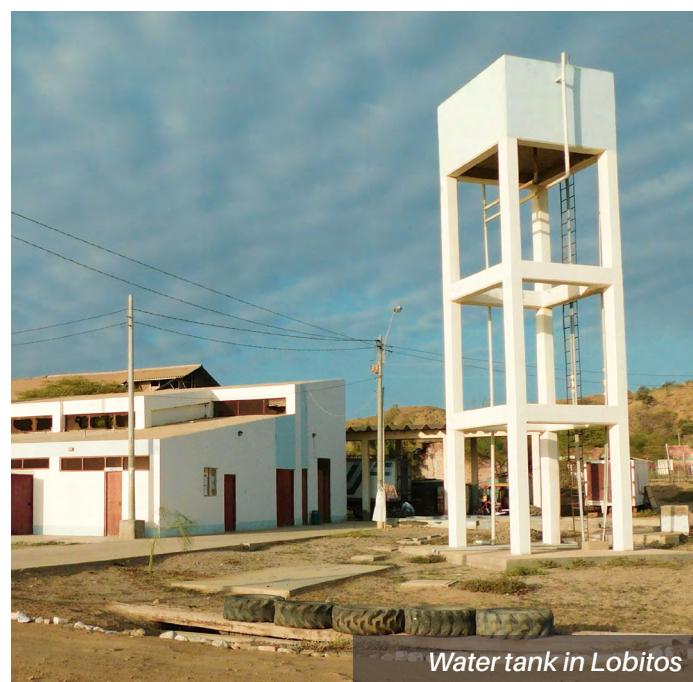
OVERVIEW

Potable water, suitable for drinking, is piped 70km into Lobitos and Piedritas for domestic and local industrial and economic needs. Water is treated at the Potable Water Treatment Plant, El Arenal, located in Paita close to the river, then piped to Talara city and then to Lobitos and Piedritas. The network is maintained by EPS Grau. Some connections in Piedritas are still informal and tapped illegally.

The water supply is unreliable. During a good week, water is available for about two to three hours for three days of the week. Due to shortages, many households have water tanks that they fill up when water is available. Other water sources in the area include two artisanal wells or boreholes, only one of which is currently active but not used much at Ecológica Tallán, a local conservation organisation. Shallow groundwater is also available but it is not regulated; some of the groundwater is brackish with high concentrations of chlorides, sulphates, some metals and coliform bacteria above the levels considered safe for human consumption.

Residents cannot drink water straight out of the tap and must boil it first. Water testing kits highlighted the presence of harmful bacteria, including coliform in the water. The bacteria is the likely cause of many

of the most common local illnesses (diarrhea and stomach aches). Water is a particular issue for the medical facility, where clean, safe water is a necessity to prevent infection and protect those that are already vulnerable to disease. The alternative is to buy expensive two litre water bottles of fresh water to use.



Water tank in Lobitos

CURRENT SITUATION

A remnant from the 1960s is an abandoned desalination plant, of which there is little left. The system is gone now except for pumps and a spherical tank, used to store the water supplied from Talara which comes all the way from La Chira. Once the water level is high enough in the tank, operators from EPS Grau manually open a valve giving water to a certain section of Lobitos. They do this on a schedule and by riding a motorbike to each valve, to provide access to a few areas over the course of several days. This schedule allows the tank to always maintain a certain level of water, and at the same time water pressure is checked and any other water issues are attended to. As they provide access to some areas at different times, some people in Lobitos receive more water than others. Barrio Centro, which has a smaller population, receives a similar amount of water but has less demand than Nuevo Lobitos, which has a larger population and several hotels and businesses. Hotels have large monthly bills of S/500 - S/1000 depending on the number of tourists and the level of consumption. The behaviour of tourists is critical to ensure the hotels do not run out of water, and many hotels are worried about increasing water demand.

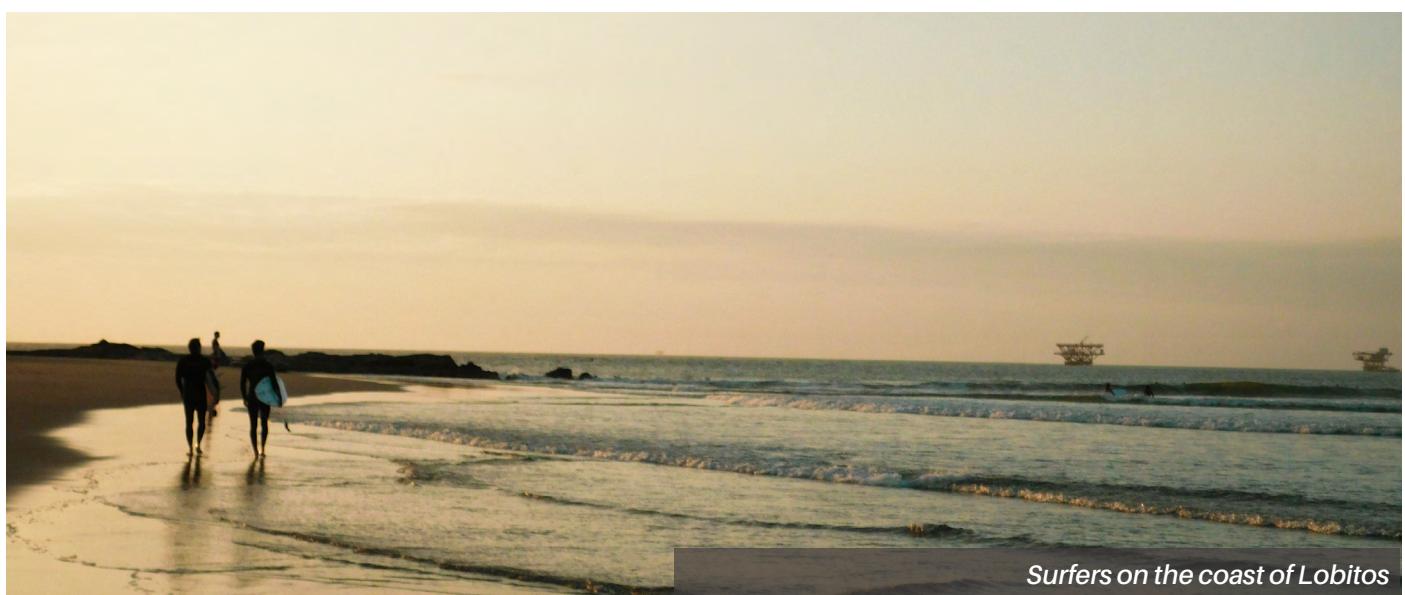
The residents who can afford it purchase large tanks (typically 1,100 or 2,500 litres) to place on the roof of their homes. Some residents also use smaller 600 litres tanks. Others also buy pumps to transfer water to the tank, but for many, storing water is a manual activity that requires filling up buckets when water is available. At times, there has been no water available, perhaps due to broken water pipes in the ravine near Piedritas (due to El Niño rains). During these times, people have been left without water for two to three months, surviving on water bought from water trucks and bottled water, which are both expensive and not always easy to obtain.

There is no available data on water flow rates. In Castilla, Zarumilla and Nuevo Lobitos, there are limited water meters, but most households do not have one. Households are billed on an estimated use of 20m^3 per month at around S/0.86 per m^3 + S/2.42 of fixed/maintenance costs. For businesses, restaurants and hotels, a commercial rate of about S/3.26 per m^3 + S/2.42 of fixed/maintenance costs for 30m^3 . The distribution system is manually controlled.

Lancaster University and EcoSwell conducted an investigative study into potential groundwater sources in Ecológica Tallán and concluded the groundwater needs treatment for human use. So far, no other suitable sources have been identified. Quebradas are geographical features which represent a narrow pass between elevated terrains [1]. These are dry channels until extreme events of intense rainfall like El Niño occur. In Quebradas Pariñas [2], there is groundwater emanating in a wide hole by the main road connecting Talara to Lobitos and near Piedritas. Since this water is not brackish or salty, trucks and people come and use it often without regulation and without ensuring it is safe for human use (further studies are needed). Sometimes, this groundwater can be there year round, depending on the rains and runoff of the quebrada.

[1] [Description of a Quebrada](#)

[2] [Detail of Quebradas near Lobitos and Piedritas](#)



Surfers on the coast of Lobitos



Spherical water tank in Lobitos

RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

- **Augusto**, owner of Hotel Buenavista Lobitos, has a vision of environmental sustainability and shares his views on the challenges with water shortage and a lack of clean drinking water.
- **Rafael**, Surfer and Touristic Entrepreneur, discusses the tourism industry's need to gain access to a reliable supply of potable water.

SUGGESTED STARTING POINTS

To get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

Increased tourism will increase levels of water consumption. Do you have any ideas to help the communities use water more efficiently or how to identify possible alternative sources?

Unreliable water supply disrupts households and businesses. Can you propose ideas to improve the water distribution infrastructure and ensure people have a consistent water supply?

When a water connection is physically exposed, people tap it illegally to gain water access. Can you propose a solution to prevent illegal water tapping and ensure legal water access for all residents?

REMEMBER:

Consider the overall context of the social, environmental and economic factors in Lobitos and Piedritas. This is part of our marking criteria and is key to the success of any engineering intervention you come up with. We recommend you read all the other Challenge Area pages and our guidance pages on getting started. You will need to conduct your own research beyond the information available here to show your depth of understanding. Additional information can be found in the pages about Lobitos and Piedritas and online at www.engineering-for-people.org.



SANITATION

Sanitation is vital to keeping people healthy. In Lobitos, the majority of homes are connected to the collapsed sewer line, which is polluting the local area. Sanitary waste must be treated and managed to prevent it building up and causing unsanitary living conditions that enable diseases to spread. Can you propose ideas to improve the situation?

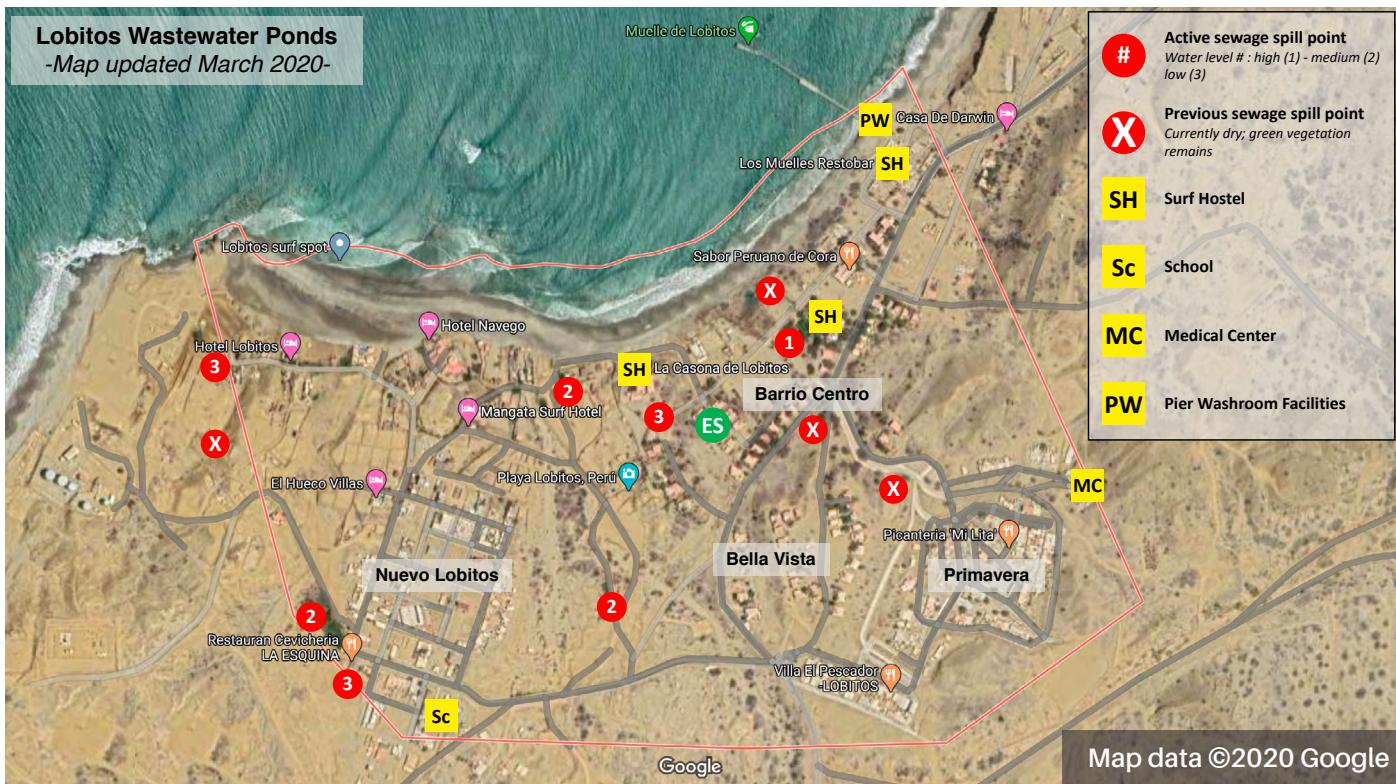
OVERVIEW

In Lobitos, there is an abandoned wastewater system that has never been in use. In 2010, the municipality built four large oxidation ponds about one kilometre north of the town with the intention to pump the wastewater from the combined sewage system for oxidation treatment. To date, the municipality has never pumped wastewater to the oxidation ponds or used the supporting infrastructure of substations around Lobitos and pipes to collect wastewater from neighbourhoods and pump it to the ponds. When the project was initially delayed, the municipality stated that an issue occurred when an order was placed for three phase pumps rather than single phase, before that issue could be addressed, the pumps were stolen and never bought again. There is only a single phase supply available in Lobitos but the oil companies have their own independent three phase supply.

Many households in Lobitos are connected to another combined sewer system which is reliant on water to take away the wastewater from each household. This wastewater includes sewage from flush toilets and greywater from sinks, showers and occasionally washing machines.

EPS Grau maintains the water supply network in Lobitos, but sanitation in this municipality is not within their remit here. A key requirement for EPS Grau to take over maintenance is that the systems need to be working properly to begin with, which is not the case currently (despite the significant financial investments in the past).

The effluent from the nearby Wastewater Treatment Plant, which serves the city of Talara and is operated by EPS Grau, becomes a stream that passes through Piedritas into Quebrada Pariñas to reach the wetlands and then the sea. Some use this water to grow their crops. When the Wastewater Treatment Plant overflows, as it is often over its capacity, the effluent is then impacted, and the stream becomes polluted with raw or partially treated sewage. Bio-treatment options are being considered, including using reed bed designs with the Vetiver plant.



CURRENT SITUATION

The existing sewage pipes are in a poor state of repair, and as a result, pools of wastewater have appeared in areas of Lobitos that present health hazards, unpleasant sights and smells and pollution of the local environment. The pools of wastewater are pumped out roughly once every one to two months when they significantly overflow, however, they spill constantly. It can take some time for the municipality to react and arrange HydroJet trucks from EPS Grau to transport the wastewater away. EPS Grau currently helps to pump out the system and deal with the local spills as a favour to the local Lobitos municipality. There are some of these pools of wastewater near the hotels, leading to a very unpleasant experience for tourists and a likely factor in the reduction of tourists over the years.

Many households have built their own soakaways, which tends to be a hole in the ground with no membrane. Some homes share a soakaway between two or three households. When the hole is full, the residents cover it over and dig out a new one.

Around 20-30 households in Lobitos (100-150 people) and 15-20 homes (approx. 100 people) in Piedritas are not connected to the combined sewer system and have not been able to build soakaways of their own or with neighbouring homes. With few other available options, people resort to open defecation. Alongside the associated health and environmental concerns of this practice, it can have social stigmas attached, often impacting women the most.

Most of the people in Piedritas have been able to build soakaways for their homes or groups of homes. Judging from our socio-economic level results, approximately 25% of the households in Piedritas have not been able to do so. This would give us around 15 - 20 households without toilets of any sort.

Since 2016, households have been trained to reuse their greywater for growing plants along the street to beautify the area and provide shade. Currently, there are 60 families in Lobitos and 20 families in Piedritas participating in the initiative and reusing greywater.



RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

- **EcoSwell** is a sustainable development NGO that led a pilot project to develop and implement dry toilets in Lobitos.
- **Jacky**, former Lobitos District Municipality Employee, describes her personal experience of the failing sanitation system in Lobitos.
- **Justo**, Master Builder and Member of the Piedritas Tourism Committee, talks about the sanitation requirements in Piedritas.
- **Quenni**, Artisan and EcoSwell House Administrator, describes the negative impact of the collapsed sewerage system on local residents and tourists in Lobitos.

SUGGESTED STARTING POINTS

To help get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

The sanitation facilities and systems in Lobitos and Piedritas are not adequate. Pools of wastewater have the potential to cause health, environmental and social issues and must be dealt with. Can you suggest ways to improve or adapt the existing systems to improve the current situation and reduce the risks?

The Wastewater Treatment Plant has caused environmental pollution in Piedritas, and the community is interested in bioremediation to allow the reuse and treatment of water to improve the tourist experience. Can you propose ideas for this?

With the growth of the tourism industry, new hotels, hostels and houses are being built all the time, and all of them need to deal with their inherent sanitation needs. There is also an increased demand for public toilets. Can you suggest new ways that these needs can be met that reduce reliance on water and the existing system that is not working properly?

Can you learn from EcoSwell's two-year pilot of the waterless toilet and critically understand how and whether this project could or should be scaled out across the two communities?



One of the spills caused by the leaking sanitation system

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ENERGY

Energy is a major household expense in Lobitos and Piedritas and is sometimes not reliable. Can you find ways to improve affordability while improving reliability of the energy sources for the communities of Lobitos and Piedritas?

OVERVIEW

Northern Peru has consistent high-intensity sun, which can provide a valuable source of energy [1]. While the residents of Lobitos enjoy very high electrification rates, much of Piedritas has only been electrified in the last few years by Enosa through influence of the energy generation company Enel. However, sections of Piedritas remain without electricity. The majority of residents (95% in Lobitos and 90% in Piedritas) are connected to the national electricity grid. The electrification of Piedritas households only occurred in 2017, while Lobitos has been grid connected for a longer time.

The coastal area of Lobitos and Piedritas is very windy, and the whole north coast of Peru is known for constant high wind speeds [2]. In a week in June 2020, for example, speeds averaged between 30-34 kph (19-21 mph). The energy company Enel has built two commercial wind farms near Talara.

While the generation of electricity in Peru still remains mostly fossil fuel dependent (~50%), hydroelectric power plants supply a significant portion of the country's electricity (~40%). Renewable energy sources like solar and wind make up a small portion of the total electricity supply (~4%). The company that operates the national grid in Lobitos and Piedritas is called Enosa and is state owned.

Since 2003, Piedritas has formed a strong partnership with Enel, an Italian energy company which has a power plant located 500m from Piedritas. In 2005, Enel helped build the Santa Elena primary school in Piedritas to ensure that the local children could receive an education within their own community without having to walk for several miles in the hot sun to nearby schools in Talara and Lobitos. Currently, Enel is working with the community to connect households to the electrical grid and complete the necessary paperwork to acquire a land title. Piedritas' ecotourism project is one of Enel's flagship corporate social responsibility (CSR) projects. A manager within Enel was fundamental in enabling the CSR work, and the partnership with Piedritas but recently retired in early 2020.

[1] [Solar radiation map Piura](#)

[2] [Wind Speed Map Piura](#)

CURRENT SITUATION

The electricity network is reasonably reliable, but still suffers from outages. Generally, an outage occurs once a week and lasts between two and eight hours. The people of Lobitos and Piedritas use electricity for running fridges, TVs, lights and other basic appliances like phones and fans. Cooking is done using natural gas, which is purchased in canisters. The majority of tourists are also impacted by the outages, impacting their experience and they can be surprised by not having electricity for large parts of the day.

In Lobitos and Piedritas, a very small portion of people have individual renewable energy installations, and these are limited to the hotel/surfer community. In 2016, EcoSwell installed two 300W solar panels, a smart inverter and four deep-cycle batteries on the roof of the Fisherman's Guild Community Hall, used for meetings, workshops and events.

Only a few hotels have their own Photo-Voltaic (PV) system; Hotel Buenavista Lobitos is one of these. Since the generation of electricity in Peru happens far away from Lobitos and Piedritas, electrical outages are often due to faults in the network, which are caused by the rough environment, aging equipment, and even damage by animals such as vultures. These weekly electrical grid outages can have a significant economic impact, as they usually last for a maximum of 8 hours. There are limited battery storage installations in Lobitos and Piedritas due to cost and investment required. Some hotels have diesel and petrol generators, which they use during outages.

The outages have an extremely detrimental effect on the provision of health services, particularly the preservation of vaccines. The existing energy backup system for the local Medical Centre originated as an idea in the Engineering for People Design Challenge in 2016-2017. The design brief highlighted this issue, and a team from the University of Strathclyde further defined the scope and proposed a solution. Using the team's idea, EcoSwell installed a UPS in 2019 and is currently looking into renewable energy sources to boost resilience. EcoSwell is investigating solar and wind as options for the local medical centre to ensure there is consistent energy to power the vaccination fridges.

ENERGY USE:

- Cooking in Lobitos and Piedritas is done primarily using LPG from portable canisters. Very few households use an electric stove top, and a few also cook using wood or charcoal fires. A 10 kg gas canister costs S/40 to refill and S/75 for a new tank.

- The most common electrical appliances in Lobitos are fridges (without freezers), TVs (for entertainment and news), lights and other smaller appliances like cellphones and fans.
- Electricity is metered and billed monthly.
- Energy is a significant monthly cost for residents. Between gas costs for cooking and electricity costs, energy costs are often one of the biggest expenses for a typical household. For the fishing community, households can earn S/400 per month and spend between S/60 and S/100 on energy expenses (between 15-25% of their income).
- The high energy costs are also heavily responsible for the lack of heating and cooling options available to residents.
- Lobitos is hot. The use of air conditioning units is limited to a few hotels due to the high cost of purchase and operation. Many people have fans to try to take the edge off the heat of the day but this is often not enough and it is necessary to break and rest for a few hours over the middle of the day due to the impact of the heat.
- Due to the lack of building codes, houses are often built without considering cooling mechanisms.



RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

- **EcoSwell** is a sustainable development NGO that led a pilot project to install PV (solar panels) within the local community.
- **Henry**, Director of Waves for Development and Municipal Councilor, shares his ideas for community initiatives that provide reliable energy.
- **Teófilo**, President of the Piedritas Community Council, discusses the need to complete the electrification project in Piedritas to ensure that all residents have reliable access to energy.

SUGGESTED STARTING POINTS

To help get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

Like many places in the world, energy costs are a significant household expense in Lobitos and Piedritas. Can you explore options that have perhaps been successfully used in other parts of the world to reduce energy costs and increase the reliability of the energy supply?

Due to high energy costs, people in Lobitos and Piedritas are limited to the use of fans for cooling. Can you think of alternative ways to cool buildings?



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WASTE

Human activity produces plastic, metal, organic and general waste. Unmanaged waste presents health risks, creates environmental pollution and affects the location's aesthetics. Can you propose innovative ways for this waste to be dealt with safely and sustainably?

OVERVIEW

Waste produced in Lobitos and Piedritas from households and local businesses includes plastics, glass, card, organic matter, construction waste and metals. Waste can be organic and biodegradable, and it can also be in the form of chemicals, plastics and metals, which are harder for the environment to deal with. The scale and rate at which waste is produced can overload the natural environment that people rely on, making it uninhabitable. In Lobitos and Piedritas, an attitude of "out of sight, out of mind" exists, and people are used to dumping or burning their waste.

In Lobitos, household waste is collected on an informal schedule by small waste trucks managed by the municipality. These small waste trucks are motorbikes connected to small trailers, and after they collect the waste, they transport it to a separation facility or the dumpsite (landfill site). Treatment is currently limited to dumping the waste into pits at a dumpsite, occasionally burning the waste to reduce its size and then creating new pits when the existing

pits become too full. This form of waste treatment is not considered to be sustainable in the longer term and burning waste, particularly plastics, can release dangerous toxins which affect health and the local environment. As lifestyles change and tourists and others arrive, there is a high likelihood of more waste being produced in the future, further exacerbating the issue.

Lobitos' dumpsite is just south of a conservation area called El Tallán. Unfortunately, due to the wind, lightweight waste from the dumpsite, and in particular plastic bags, is swept out of the dumpsite into this local conservation area and gives the appearance of what has become known as a 'plastic forest'. With limited human resources and funds available, the owners of El Tallán have not been able to address this issue at the rate at which it is created. The sun breaks down the plastic, making collection all the more difficult, as the plastic falls apart in your hand.

CURRENT SITUATION

In Lobitos, the municipality hires cleaners who attend to the streets with dustbins and brooms. A few years ago, the municipality implemented a recycling effort that included separate bags and bins for collection. They also built a segregation facility, however, the effort is not widely implemented. In Piedritas, there is little in the way of trash collection, and people resort to burning. What remains is left to the elements with the wind carrying it away.

Along beach areas, there are no litter bins or options available to dispose of waste. As a result, there is a build up of waste on the beach which, alongside health and environmental impacts, is unsightly,

potentially dangerous and makes the beach a less attractive area to visit. This waste also ends up in the sea and contributes to the increasingly problematic accumulation of plastics in the world's oceans. This accumulation is now known to be causing serious harm to the fish, mammals and birds that are supported by the ocean, with potentially harmful impacts on people as a result. The negative impacts of the waste buildup are evident on a daily basis in Lobitos with pelicans, other birds, sea lions and dolphins found dead on the beach due to having ingested or getting caught in some form of human waste.



RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

- **Augusto**, owner of Hotel Buenavista Lobitos, has a vision of environmental sustainability and shares his views on the need to improve Lobitos' solid waste management system that involves the Lobitos District Municipality and public education.
- **Gino**, owner of the Lobitos Surf School, discusses his involvement in initiatives to clean up the local beaches.
- **Rafael**, Surfer and Touristic Entrepreneur, highlights the need for education around solid waste disposal and an innovative system to treat waste.

SUGGESTED STARTING POINTS

To help get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

Bins to store sorted waste are limited, and recycling facilities are not common. Can you identify why these options are not being used and investigate ideas to utilise existing facilities?

Even if items of potential value are sorted from the waste, there is still residual waste which will end up in landfill. Can you propose any ideas for treating this residual waste so that the impacts are reduced?

The growth and permeation of plastics is a significant issue. Can you come up with innovative ideas for either reusing or recycling these items?

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FOOD

Most of the food supply is imported into Lobitos and Piedritas. Artisanal fishing is an essential component of the local economy, but the industry is currently facing significant challenges. Can you come up with any ideas to help residents increase their access to nutritious food and improve the food systems?

OVERVIEW

In Lobitos and Piedritas, there is a need to improve nutrition and promote sustainable aquaculture and agriculture, whilst minimising the scarcely available fresh water. A changing climate, growing global population, rising food prices, and environmental stressors create a number of challenges for the production and consumption of food. These global changes can be particularly challenging for coastal communities, which often source food from the land and sea. Undernutrition, overweight and obesity are different forms of malnutrition, and it is common to have people with these differing forms living side-by-side in one country, in one community, or even in the same household.

The residents of Lobitos and Piedritas buy most of the food they consume in Talara and transport it at a significant expense. Residents usually make a trip to Talara once and sometimes even twice a week for food and other supplies. In Talara, there is a central market, two supermarkets and a place called La Parada (The Stop), which sell food supplies.

Due to the desert nature of the environment, agriculture only occurs on a subsistence level, and even then, is mostly insufficient. There are no commercial farms in this area, but the valleys of Piura

are known for providing a suitable environment for cultivating bananas, mangos, potatoes and other vegetables. There have been attempts at agroforestry; for example, a bio-orchard near Piedritas has proven successful due to its proximity to a small permanent stream in [Quebrada Pariñas](#).

The groundwater is salty and viewed as unsuitable for farming. Some native trees and perennial grasses actually have a high tolerance to salinity and could be used as fodder for animals such as the carob tree and desert saltgrass or "grama salada" (*Distichlis spicata*), which can grow in the sand dunes very close to the sea.

Artisanal fishing is an essential component of the local economy, but it faces many challenges. These include the purchasers of the fish who impose constraints on the fishers, the effects of larger illegal fishing operations, and oil companies that impose restrictions on where the fishers can fish.

CURRENT SITUATION

There is a small amount of goat herding that occurs in both Lobitos and Piedritas in the nearby dry forests. The goat farmers produce goat milk and cheese, which they sell locally. EcoSwell believes that improvements in the practice of goat herding could have benefits for regenerating the dry forest as well as ecotourism. Historical sources mention that the ancient Tallán culture raised llamas on the coast of Piura, however, these animals are not currently present in either community.

Fishers leave early and work out at sea for over ten hours. Deep sea fishers are away for two or three days at time. Fishers conduct deals with people called "intermediaries," who promise to buy the fish prior to fishers going out to sea. In exchange, the intermediaries provide fishers with fuel for their boats and bait. While these are long standing relationships and sometimes the fishers and intermediaries are family, they can also be exploitative. The intermediaries pay the fishers roughly S/4-5 per kilo, while they sell it to the markets at round S/15-16 per kilo. Intermediaries also require the fishers to not sell directly to the locals, and if they find the fishers to be doing this, they often punish them. Due to these limitations, few fishers take the risk of selling directly to tourists that come to the pier or local restaurants/hotels.

Also, the most common fish that is caught in Lobitos is of darker flesh and has some spines (bones) which Hotels claim are not what tourists want. They say that tourists prefer white fleshed fish with no spines/bones. There are currently no machines for processing fish in a way that gives it a sell on value and also more commercially presented.

Threats to the artisanal fishing industry include large boats, which fish illegally, damaging reefs and killing smaller fish. Some reefs are also inaccessible to fishers due to their proximity to oil platforms.

While most residents in Lobitos have a fridge to store food, only 20% of the households in Piedritas have fridges. Freezers are few and far between in both communities, due to the costs of the appliances and their energy consumption costs. There are currently no refrigeration options or post harvest storage available to the fishers, so all the fish they catch must be immediately sold.

In Lobitos, the regional government owns and oversees the pier, which is central to the fishing industry. The regional government is currently investing in new infrastructure to repair the pier. The local Fisherman's Guild assists fishers in obtaining their fishing licenses and taking training courses and relies on corporate support to do small projects and activities. The fishers use traditional techniques, which vary depending on the type of fish they want to catch. In recent years, the percentage of the population employed in the fishing industry has declined.

The two main types of fishing include nylon or line fishing and net fishing. When at sea, fishers tend to use their boats and fish using a traditional technique called "Pinta". The fisher's anchor their boats and use a green nylon line with two baited hooks and an iron rod as a weight. Experienced fishers typically use two of these lines at a time. Other techniques include motoring slowly with the lines dragging behind the boat to attract fish to the moving bait, or using fishing nets that are put out late at night or early in the morning and returned to after a few hours to pull in the catch.

The fishers recently tried Pearl (clam) farming, but it proved too time intensive. The fishers also piloted scallop farming, which yielded extremely positive results within six months, but the government only paid for the pilot project, and the Fisherman's Guild was unable to secure on-going funding for the project. The guild struggles as a result of long working hours, lack of unity as a group and irregular access to funding.



RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

- **Henry**, Director of Waves for Development and Municipal Councilor, shares his ideas for community initiatives that cultivate vegetable gardens.
- **Juan**, Vice President of the Lobitos Artisanal Fisherman's Guild Association, describes the gear and equipment fishers use, the initiatives that the Fisherman's Guild is currently undertaking, and what additional support is needed to reduce health and safety risks for fishers.
- **Tullio**, Artisanal Fisher and Local Guide for Lobitos Ocean Adventure, describes his vision for the pier that includes aquaculture farms for raising shells, octopuses, lobster and fish that the fishers could live from.



SUGGESTED STARTING POINTS

To help get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

The salty and brackish nature of the groundwater in Lobitos and Piedritas seems to represent significant challenges to growing food. Can you think of solutions that would allow for the growing of crops?

Sustainable farming has been suggested as a way to help regenerate the local natural environment. Can you suggest ways in which this could happen?

Although the fishers of Lobitos and Piedritas face a range of challenges, there could be opportunities for them to benefit from the local tourism industry. Can you propose innovative ways the fishers could process their days' catch to supply tourists and the hotel area with fresh local food alternatives?

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DIGITAL

In recent years, internet access in Lobitos and Piedritas has improved, but it is still limited and expensive. The communities rarely deploy digital technologies, but there are many areas for growth and innovation. What digital solutions can you come up with to improve the quality of life in Lobitos and Piedritas?

OVERVIEW

Internet accessibility has increased for people in Lobitos and Piedritas. The use of digital tools varies widely between residents and tourists. TV is the dominant entertainment medium, while some also use radio. Government administration processes remain largely paper based. Many people in Lobitos and Piedritas do not have email accounts.

Past efforts to use technology to benefit the people of Lobitos and Piedritas have proven valuable when carefully considered. The Willipipe project, for example, is a weekly tide and swell bulletin posted in key areas to increase the productivity and planning capabilities of local fishers. This project involves translating the information into accessible language that the fishers can easily understand. The Willipipe is available online [1] and printed out on posters, which has proved to be very valuable to the fishers.

Other administrative processes like monitoring fishing activity to determine fish stocks are recorded manually.

Entel, a mobile data company, used to offer a 100GB package, costing S/80 and providing speeds of between 8-10MB/second, but this package failed due to network congestion. The company only promoted and offered the package for a very short time (one to two months) and then discontinued it due to bandwidth constraints. The lower-end mobile plans include multi-day options, and internet access remains costly and limited in use.

[1] [The Wilipipe Bulletin - Tide and Wave Charts](#)

CURRENT SITUATION

Lobitos and Piedritas are small communities that rely heavily on word-of-mouth communication and have less dependence on digital infrastructure. There are opportunities to use digital systems to help address some of the challenges within other areas of this design brief. At the moment, the use of digital systems is limited within Lobitos and Piedritas but this is ever changing and the younger population is growing up, meaning soon most people will have smartphones.

There are opportunities, especially considering the current need for social distancing, to consider ways in which people can continue doing their day to day activities or even enhance their day to day activities. Some note that the tourism industry could be better served by use of digital technologies. There are currently no interactive maps, or a digitised directory of all local businesses or ways to source local fish, vegetables or meat.

COMMUNICATIONS AND INTERNET ACCESS:

- While digital and electronic technologies like mobile phones and internet usage is growing in Lobitos and Piedritas, it is still very limited. One of the reasons for this is the lack of internet connectivity.
- There are limited bandwidth capabilities, so companies do not openly sell internet routers/plans. The only companies offering this service (Entel and Bitel) usually run credit checks before taking in new clients and many people do not meet the requirements.
- Entel and Claro are two companies offering internet connection. There are no landline (fibre/copper) internet options in Lobitos and Piedritas, and the internet is accessed exclusively through mobile telecom providers (3G and 4G networks).
- Bitel provides unlimited GB costing S/9 for three days. These mobile packages restrict hotspotting, however, and have severely limited speeds.

- Word-of-mouth remains a key way to communicate.
- The fishing community typically uses feature phones (not smartphones), and they rely on these mostly for making calls and sometimes for SMS communication. A very high percentage of tourists use smartphones. These tend to be lower to middle range Android type phones, by manufacturers like Huawei. Popular apps used on these phones include Facebook and Whatsapp. Only thirty to forty percent of the fishing community (usually the under 35 year olds) have smartphones, but those that do make use of Whatsapp and Facebook.
- Facebook is also used by the local municipality to communicate selected information with residents. Older systems of digital communication are still used, although less frequently than before.
- Two megaphone systems exist in Lobitos and Piedritas, which broadcast messages over loudspeakers. Residents pay a small amount (S/1) to have their messages read out to the community.
- Occasionally, residents are required to print out forms or type out letters. To address this, a few "internet cafes" exist, which usually consist of a single computer and printer in someone's home. Computers are few and far between in Piedritas, but are a little more widely used in Lobitos.
- Most households in Lobitos and Piedritas have TVs, which residents use to watch government TV channels as well as channels available via satellite dishes through a monthly subscription, which many houses have now installed.
- Hotels have successfully used Airbnb and Booking.com platforms to encourage tourists to come to Lobitos and Piedritas.



RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

- **Manuel**, Director of the Santa Elena de Piedritas School, describes the challenges with using digital platforms to support the education of primary school students during the coronavirus (COVID-19) pandemic.
- **Marlyne**, Secretary and Treasurer of the Piedritas Tourism Committee, shares her insights on the need to attract the interest of younger generations in the reforestation efforts.
- **Nicolás**, co-founder of Coast2Coast and Lobitos Cinema Project, discusses the general digital challenges in Lobitos and the need for accessible digital spaces to support his community storytelling projects.
- **Tullio**, Artisanal Fisher and Local Guide for Lobitos Ocean Adventure, discusses his use of the Internet and social media to promote his guided fishing boats tours.

SUGGESTED STARTING POINTS

To help get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

Digital tools could assist administrative processes within the fishing community. Can you think of ways to introduce digital tools in a thoughtful manner to the fishing community, taking into account their comfort levels with smartphones?

Independent renewable energy generation is limited in Lobitos and Piedritas. There is no digital pay as you go renewable energy scheme/programme for residents. Can you think of ways of structuring this to be cost effective and encourage growth in renewable energy initiatives?

How to use digital systems to promote a local economy and not be overdependent on Talara, knowing businesses in Talara have been impacted heavily by the large numbers of COVID-19 cases in the city?

The Willipipe project indicates that there is a need to deliver important information available on the internet to the people of Lobitos and Piedritas. Can you think of what other types of information might be valuable to them, and how might it be delivered?

Do you think there are ways to assist telecom companies to reduce data costs while increasing the quality of the access available to residents?

Facebook and Whatsapp are growing in popularity in Lobitos and Piedritas, even being used by the municipality. However, these platforms come with their own downsides. Can you think of how these downsides could affect these communities and how they might avoid them?

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TRANSPORT

What ideas can you come up with to improve transportation on land or at sea to meet current and future needs? What ideas do you have to prepare for the imminent growth of tourism and the planned La Costanera highway? Artisanal fishing is a key industry that faces issues with boats and maintenance. Can you think of ways to improve these or other transportation options?

OVERVIEW

The residents of Lobitos and Piedritas use several forms of land transportation, including motorbikes, mototaxis (3 wheelers), cars and larger 7-9 seater taxis. A common form of transport for locals and tourists includes for-hire van service between Lobitos and Talara to accommodate shopping needs. Lobitos is located 17km from Talara, and traveling to Talara is an essential trip, providing the majority of food and other supplies. Within Lobitos, some roads have been recently paved, which has improved transportation between neighbourhoods. Very few residents own a car, and some 20% of the population owns a motorcycle.

Transport is also critical during water shortages to ensure drinking water can be delivered to individuals, hotels, and businesses.

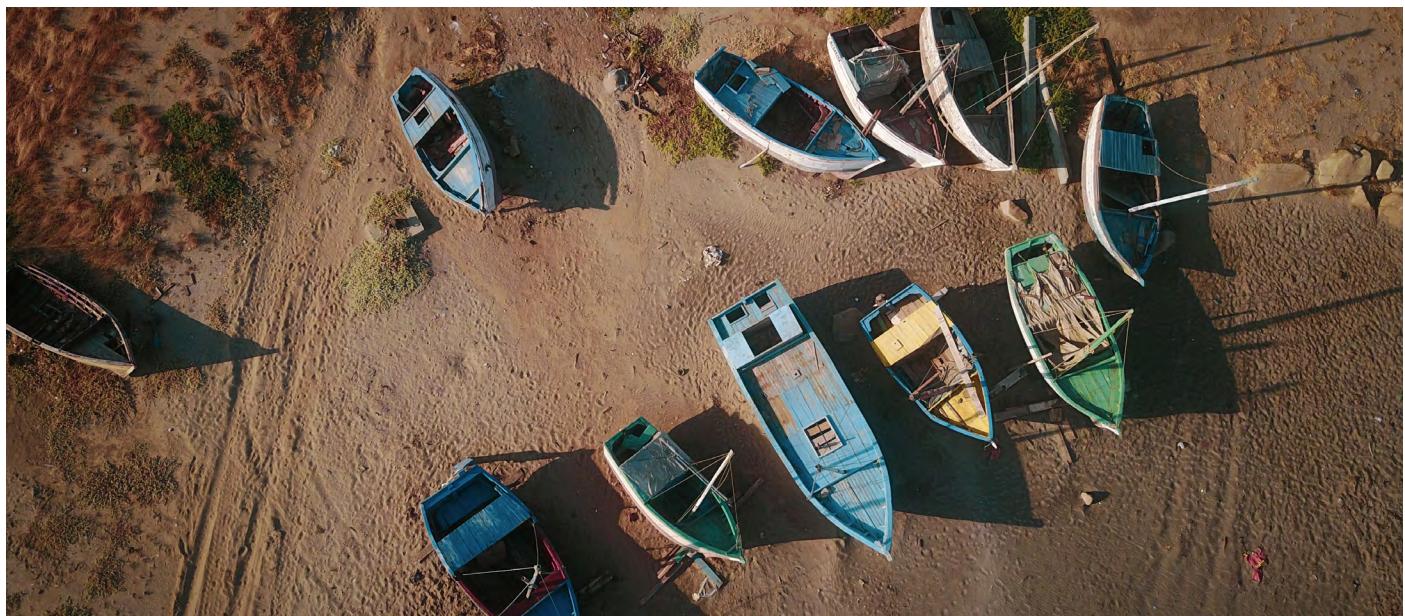
The road to Talara is in poor condition, being partially paved and partially dirt road. It is especially vulnerable to being washed away. During an El Niño event, this road is usually washed away entirely in some places, almost cutting Lobitos off from other towns. During these times, it takes a significant amount of work and time to restore the ability to travel to Talara in the same time and manner as normally is the case. Piedritas is on the other side of [Quebrada Pariñas](#) and usually maintains access to Talara throughout an El Niño event.

A new infrastructure project may significantly impact the tourism industry in Lobitos. The La Costanera highway will pass through Lobitos and connect the town to other coastal towns that are popular tourist destinations. The hotel owners are excited about this

project because it could dramatically boost the hotels' occupancy rate and revenue. In contrast, some of the residents of Lobitos are worried about the impact this project will have on the identity of the town and its sense of peace and isolation. While the highway will bring much needed infrastructure to the region, there is a need to develop additional infrastructure for basic services such as waste and wastewater management, energy, and healthcare. However, this has been a much talked about project over the last six to seven years, and some residents are sceptical as to whether it will materialise within the next five years. The project also faces some opposition from the oil companies that worry that increasing tourism will hamper oil operations. This friction between oil interests and tourism is an on-going one that has shaped the transportation options (and much else) in Lobitos and Piedritas.

In Lobitos, the regional government owns and oversees the pier, which is central to the fishing industry. They face challenges maintaining boats and equipment. The regional government is currently investing in new infrastructure to repair the pier.

There are no piers or boats along the coastline of Piedritas (the beach in Malacas). The people who fish in the area do so with basic methods, including lines with hooks while standing in the sand.



CURRENT SITUATION

The cost of using a large taxi to go to Talara from Lobitos is around S/4 per person during the week and S/5 per person during the weekend. Commuters are required to wait until the taxi is full before it will leave Lobitos for Talara. For commuters from Piedritas, getting to and from Talara is challenging because taxis that are full do not stop in Piedritas and continue on to Talara (or Lobitos in the opposite direction). The increasing costs of this trip are also a major concern, particularly for residents.

Taking a general taxi (car) to and from Talara is very expensive, costing around S/30-50. For this reason, local residents do not use them, and tourists typically use general taxis that the hotels organise and manage.

Like many places in the world, a few taxi associations dominate the taxi industry. In the case of Lobitos and Piedritas, there are two taxi associations that essentially control the taxi routes and capture the majority of the business. This monopoly makes it difficult for new entrants in the transportation sector.

Within Lobitos, several roads have been paved within the last few years, improving transport between the neighbourhoods of the town. These improvements occurred after the last El Niño phenomenon, which resulted in the Peruvian government providing funding for the upgrading of rural infrastructure. This has improved transport significantly within Lobitos, but residents worry that because these roads were built without water run-off drainage, they could be damaged again during the next El Niño event.

Within Piedritas, there are no paved roads and only three dirt roads.

There is no refueling station in Lobitos or Piedritas, but some people sell diesel and petrol in one gallon quantities. Very few people use bicycles, and while people walk around a fair amount, they tend not to walk about during the middle of the day due to the heat.

There are not many transportation alternatives for tourists, they are either forced to walk in the scorching sun (get heavily sunburned) or try to flag down a mototaxi. There are also no eco friendly transportation alternatives for Lobitos e.g. bike sharing, electric scooters.

The boats used by the fishers are fairly rudimentary in construction, powered usually by old car engines and using sails made of potato sacks sewn together. Due to the cost of boat engines, only a few boats actually have one. Some boats do not even have an engine and work either with their sails or rowing. Previous attempts to train fishers to build boats with fibreglass (lightweight) were unsuccessful, and there are now only two fibreglass boats in Lobitos. Fishers barely get by and this made fiberglass too expensive for building with. Moreover, there aren't any local experts that know how to work with fiberglass. The fishermen association did start a project to build their own fiberglass boat and even managed to get some private companies to donate some materials for that, but they never got everything they needed to start building.

Some of the fishers own their boats, while some fishers lease them from other people. There are a few larger boats, mostly owned by fishers from Talara, which include a simple crane to pull in the fishing net. Fishers often complain about the costs of boat maintenance.



RELEVANT CASE STUDIES

Take a look at the following case studies for more information and ideas:

- **Augusto**, owner of Hotel Buenavista Lobitos, highlights the importance of providing ecological transport options such as bicycles to tourists.
- **Darío** is a transport worker who discusses why the road to Talara is one of the biggest issues in Lobitos.

SUGGESTED STARTING POINTS

To help get you started, we've outlined some initial starting points. These are only suggestions, and you can come up with your own if you have identified another issue from the design brief or your own research.

Reducing the time, energy and costs involved in traveling to and from Talara is a key concern of residents. Can you think of any solutions that make it easier or cheaper to do this regular and essential trip?

An alternative to improving transportation between Lobitos and Piedritas and other towns, is improving the supply chains between these places in other ways. Can you generate ideas that could make existing trips to Talara more efficient and valuable?

The Fisherman's Guild recently received money to upgrade their pier. Can you think of ways to improve the boats or pier that the fishing community rely on for its livelihoods?

REMEMBER:

Consider the overall context of the social, environmental and economic factors in Lobitos and Piedritas. This is part of our marking criteria and is key to the success of any engineering intervention you come up with. We recommend you read all the other Challenge Area pages and our guidance pages on getting started. You will need to conduct your own research beyond the information available here to show your depth of understanding. Additional information can be found in the pages about Lobitos and Piedritas and online at www.engineering-for-people.org.



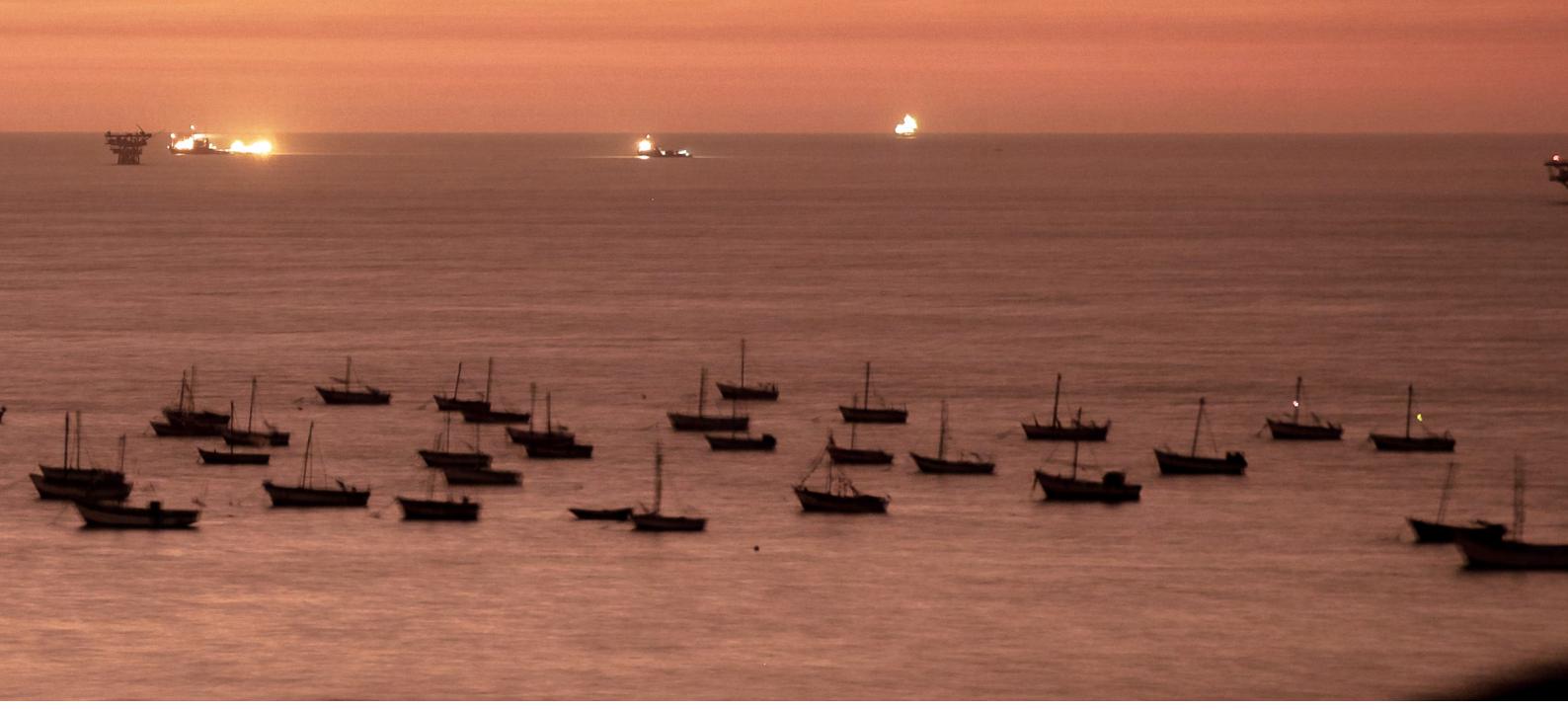
OVERVIEW: CASE STUDIES

These case studies feature a diverse range of people and businesses in Lobitos and Piedritas, interviewed in May 2020. The case studies set out a perspective from the community and highlight the unique challenges brought on by the coronavirus (COVID-19) pandemic.

Each case study gives you an idea of other issues you could address as well as additional information on the main challenge areas. As part of understanding the context, it is important to review the case studies and look for opportunities to collaborate with various people, or other stakeholders, within Lobitos and Piedritas. The case studies are listed alphabetically.

Additional information, including video interviews, is available at
www.engineering-for-people.org.

Coast2Coast, a local NGO worked with EcoSwell and Engineers Without Borders to provide the video interviews and photographs for the Engineering for People Design Challenge. Filming was not possible for all of the interviews due to the quarantine restrictions in Lobitos and Piedritas at the time of these interviews. For interviews conducted in Spanish over the phone, a written transcript and translation to English is provided.



AUGUSTO CORREA

Owner, Hotel Buenavista
Lobitos

JUAN ECHE

Vice President, Lobitos
Artisanal Fisherman's Guild
Association

QUENNI CARREÑO

Artisan and Administrator,
EcoSwell House

DARÍO CARREÑO

Transport Worker

JUSTO BLAS

Master Builder and Member,
Piedritas Tourism Committee

RAFAEL ARAMBURÚ

Surfer and Tourism
Entrepreneur

ECOSWELL

Sustainable Development
NGO based in Lobitos

LEAH DONATIELLO

Executive Director, High Tides
International

TEÓFILO ERAZO

President, Piedritas Community
Council

GINO PÉREZ

Owner, Lobitos Surf School

MANUEL VÁSQUEZ

Director, Santa Elena Piedritas
School

TULLIO CHAPILLIQUÉN

Artisanal Fisher and Local
Guide, Lobitos Ocean
Adventure

HENRY ESPINOZA

Director, Waves for Development and Councillor,
Lobitos District Municipality

MARLYNE GUERRERO

Secretary and Treasurer, Piedritas Tourism
Committee

JACKY ECHE

Former Employee, Lobitos District Municipality

NICOLÁS LANDA

Co-Founder, Coast2Coast and Lobitos Cinema
Project

AUGUSTO CORREA

OWNER, HOTEL BUENA-VISTA LOBITOS

The Hotel Buenavista Lobitos is one of the largest and newest hotels in Lobitos. The hotel incorporates eco-friendly practices into its daily operations and is dedicated to promoting a vision of environmental sustainability.

ABOUT

Augusto Correa is the owner of the Hotel Buenavista Lobitos. He is originally from Lima, Peru and has a background in zootechnical engineering and textile production. Augusto previously owned a hotel in Miraflores, a suburban district of Lima. Before becoming the owner of the Hotel Buenavista Lobitos, Augusto and his sons, who are professional surfers, frequently traveled to Lobitos to train and felt like the town lacked comfortable lodging. The idea for the Hotel Buenavista Lobitos was born from wanting to create a comfortable place where visitors and families could stay while surfing and enjoying the beach of Lobitos.

The hotel generates 95% of its energy from solar panels and uses a recycling system to reduce waste. Augusto installed biodigester and reverse osmosis systems to purify and recycle the water the hotel uses for drinking, bathing, cooking, and cleaning. These systems are especially important in Lobitos because the local hotels often face water shortages. Augusto grows organic fruits and vegetables in his garden, including papayas, pineapple, and passion fruit, which provide healthy ingredients for guests' meals. The hotel also has several bicycles that guests can use to travel around Lobitos.



ISSUES AND IDEAS

- The Hotel Buenavista Lobitos is one of the only hotels in Lobitos that promotes environmentally sustainable business practices. Can you propose ideas for how to promote and improve environmentally sustainable business practices within the Lobitos Hotel Association?
- Lobitos is known for its windy conditions, which can create structural design challenges for local hotels. Can you come up with an innovative way to help local hotels build wind resistant structures that also provide guests with a comfortable experience?
- Lobitos lacks a proper solid waste management system, and there is a lack of education on proper waste disposal and recycling. Can you come up with an innovative way to improve Lobitos' solid waste management system that involves the Lobitos District Municipality and public education?

Find out more from Augusto in his interview, available at www.engineering-for-people.org.

"We have to work a lot with our community to promote ecological transportation such as the bicycle, promote recycling so that the residents themselves prepare their compost and care for their vegetable gardens. That should be the world of the future." — Augusto Correa

DARÍO CARREÑO

TRANSPORT WORKER

Darío Carreño was born and raised in Lobitos. He has surfed since he was nine years old, started working at the age of 15 and currently works as a freelance taxi driver. Darío trained as a chef and would love to return to cooking professionally, but there are limited opportunities to do so locally.

ABOUT

Previously, Darío was a member of Lobitos Transport Workers Association, working long hours and making frequent trips to Talara. Now, he works as a freelance driver and has more freedom over his schedule. Due to the coronavirus (COVID-19) pandemic, the transportation industry is facing new challenges. The fares have increased, Darío spends more time cleaning his van and more money on cleaning supplies, and the frequency of trips has dramatically decreased from four rides in a day to a maximum of four trips per week.

Darío's usual journey involves driving people to Talara so they can do their shopping. The road connecting Lobitos to Talara is not fully paved, which causes vans that should last eight years in good condition to break down within one year and require regular replacement of tires. This road also rapidly deteriorates and floods during El Niño season. In Lobitos, people rely on this road to buy vegetables, chicken, and meat, which are unavailable locally.

Dario shared that during the current health crisis, some people have died because they could not reach the hospital in Talara in time. This journey could be completed in ten minutes with paved roads, but it takes 20 to 25 minutes due to the current condition. Unfortunately, many accidents happen along the road, and Darío believes that properly repairing the road would save lives and increase tourism.



ISSUES AND IDEAS

- Darío believes that one of the biggest issues in Lobitos is the road to Talara. Can you propose ideas for how to improve the transportation infrastructure and ensure that it is suitable for the local conditions?
- Lobitos and Piedritas have no well-equipped bus stops and limited public spaces. Many people openly defecate in the area surrounding the bus stop because there are no public toilets. Do you have ideas to enhance the community's transportation infrastructure and built environment?

Find out more from Darío in his interview, available at www.engineering-for-people.org.

"Perhaps because of where I live, I do not have the means to study at a University. Like any child, I had dreams of excelling, of studying something that I love [...] So to you that have the chance, make the best of it. Grow day by day, make progress, travel, and enjoy life! May you enjoy this world that is great and wonderful!" — Darío Carreño



ECOSWELL

SUSTAINABLE DEVELOPMENT NGO BASED IN LOBITOS

EcoSwell is a sustainable development non-governmental organisation (NGO) that promotes a vision for a future in which people and nature can thrive in unison. Childhood friends Alejandro Pizarro, Andres Bustamante, Diego Almendrades and Michael Alderson co-founded the organisation in 2012 after being inspired by the surfing, people, natural beauty and wildlife of northern Peru.

ABOUT

The co-founders of EcoSwell are a multidisciplinary team of professionals who have experience working in different industries and countries around the world. Now, over 30 professionals, from various nationalities, careers and backgrounds support EcoSwell to make a positive impact in vulnerable coastal communities in northern Peru.

EcoSwell is implementing the United Nations Sustainable Development Goals through the following projects:

- **Surf Tourism, Valuing the Waves:** An economic study to evaluate the importance of Lobitos' waves to help the locality apply for the title of World Surfing Reserve provided by Save the Waves organisation and influence public policy.
- **Pilot projects:**
 - » EcoSwell built a dry (waterless) composting toilet unit in Lobitos, which saved more than 15,000 litres of water and can produce close to 2,000 litres of high-grade compost per year. The feedback and test of the 2+ year pilot project has been successful, but encountered issues with the number of flies in and around the structure.

- » EcoSwell installed two 300W PV panels and a 7,000 litre biodigester at the Lobitos Fisherman's Guild Community Hall. The biodigester has a capacity for primary treatment of sewage before it filters safely into the ground.
- » EcoSwell trialled solar distiller units for seawater desalination to produce more than 5L of freshwater a day.

For additional information on the projects listed above, visit EcoSwell's website (www.ecoswell.org/project-areas) and the Further Resources section of the Design Challenge website (www.engineering-for-people.org).

ISSUES AND IDEAS

- Due to limited resources, EcoSwell needs to consider carefully which projects to scale up from a pilot phase. Can you propose any ideas to support EcoSwell in achieving its vision of a future in which people and nature can thrive in unison?
- EcoSwell is passionate about supporting ecotourism initiatives in Lobitos and Piedritas to preserve the natural environment and attract more visitors to the area. What ideas do you have to promote ecotourism in Lobitos and Piedritas?

GINO PÉREZ

OWNER, LOBITOS SURF SCHOOL

Gino Pérez is from Iquitos, the largest city in the Peruvian Amazon, and has lived in Lobitos for 15 years. Originally, he came to Lobitos on military service, and following his time in the army, founded a surfing school in 2012.

ABOUT

Prior to the coronavirus (COVID-19) pandemic, Gino used to teach surfing every day and tourists, usually from Talara or Lima, booked lessons online using Facebook. At the moment, he is generating little income because the current health crisis has severely impacted domestic and international travel to Lobitos. Local NGOs have arranged financial and food donations to support those in need as there is limited governmental support.

Before the quarantine, many people from outside of Lobitos used to visit the beach on Sundays. Unfortunately, these visitors would leave a lot of rubbish (plastics, glass bottles, and food packaging) on the beach. Gino motivates others by organising beach cleanups with children in exchange for free surf lessons. A Talaran company donates the bags used to collect the rubbish. He has cleaned the beaches in Las Capullanas, Tres Cruces, Lobitos and Piscinas, and even with the limited number of visitors in recent times, he collects approximately two bags of rubbish on Lobitos beach each week.

Gino has aspirations to grow the surfing school and organise regional and international competitions, including other sports such as skating, basketball and bicycling. Over time, his vision is that Lobitos would have a surf training centre, training gym and enhanced social spaces.



ISSUES AND IDEAS

- An event, a surfing competition or some other sports activity could attract tourism. The biggest barriers to these types of activities include the lack of water, transportation to and from Talara and issues with sewage spills. What ideas do you have to enhance the infrastructure required for events to be held in Lobitos?
- Gino organises frequent beach cleanups, but Lobitos has limited waste disposal facilities. There is an informal garbage dump by Punta Panama, 1 km north from Lobitos, but solid waste from this site continues to fly away into the surrounding communities and sea. Do you have any ideas to help manage and reduce waste?

Find out more from Gino in his interview, available at www.engineering-for-people.org.

"Although I don't have much, I continue to share what I have. I am 30 years old, and have been a teacher for 10 years. I have been through many things in my life. [...] everything is possible in life, it is never too late. You have to keep going, always do serious things, never lie. The most important thing is honesty, sincerity." — Gino Pérez

HENRY ESPINOZA

DIRECTOR, WAVES FOR DEVELOPMENT AND COUNCILOR, LOBITOS DISTRICT MUNICIPALITY

Henry Espinoza grew up in Lobitos in a family of fishers and started surfing at a young age through his involvement with the non-governmental organisation (NGO) Waves for Development. He has a keen interest in photography and uses this skill to understand the history of Lobitos and the experiences of local residents through their own eyes. Henry is the Director of Waves for Development as well as a Municipal councilor for the Lobitos District Municipality.

ABOUT

Henry is deeply invested in Lobitos in two ways. Firstly, he serves as the Director of Waves for Development, a NGO that believes that surf travel should benefit the people and communities where it happens. In his role, he coordinates the organisation's activities and programmes, which include initiatives for community outreach, environmental health and entrepreneurship empowerment. Although the coronavirus (COVID-19) pandemic has affected the organisation's operations and activities, Henry is confident that activities will carry on as normal when leisure and international travel open up again.

Secondly, as a Municipal Councilor for the Lobitos District Municipality, Henry facilitates communication between the local community and the Municipality. This includes presenting the community's issues to the local mayor and presenting suggested projects and solutions to the community. Henry is committed to advocating for effective solutions to address the sanitation, water, solid waste disposal, built environment and education issues facing Lobitos.



ISSUES AND IDEAS

- Henry is passionate about developing environmentally sustainable practices to promote growth and development in Lobitos such as installing solar panels, using dry toilets, and cultivating vegetable gardens. What ideas can you propose to promote sustainable development in Lobitos?
- Henry emphasises the importance of education in fostering community empowerment and awareness. Do you have any ideas to help support youth education and develop infrastructure for schools?

Find out more from Henry in his interview, available at www.engineering-for-people.org.

"I see that in Lobitos, education is crucial for the development of the community. I always believe that we as organisations work on educational issues in the community for environmental purposes, to ensure that the community lives in a healthy environment." — Henry Espinoza

JACKY ECHE

FORMER EMPLOYEE, LOBITOS DISTRICT MUNICIPALITY

Jacky Eche was born and raised in Lobitos. Until recently, she worked in the Environmental Department of the Community Services team for the Lobitos District Municipality. She also is a mother of three young girls and looks after her elderly parents.

ABOUT

Jacky completed primary and secondary school in Lobitos and went on to study a Technical Administrative Assistant career at an institute in Talara. The technical skills she gained at the institute were useful for her to work at the Lobitos District Municipality. Jacky worked for the municipality during three different administrations, most recently serving as the Secretary of the Community Services Directorate. In her role, she supported several departments, including the Environmental Department.

Shortly before the coronavirus (COVID-19) pandemic disrupted local life, she stopped working for the municipality. Jacky now spends her time caring for her children and elderly parents.

Jacky would like to see the Municipality, local business leaders, and the community work together to address these issues and to improve the education sector in Lobitos. Jacky believes that Lobitos is urgently lacking proper infrastructure for nursery school (kindergarten) children.



ISSUES AND IDEAS

- Recently, a new nursery school (kindergarten) was built on the site of an oil well, which made the ground unstable and the classrooms unsafe. Because of the dangerous conditions, the school is now housed in temporary classrooms, which are small and poorly ventilated. Can you propose innovative ways to improve the education infrastructure in Lobitos?
- Jacky's house, as well as the houses adjacent to hers, have no toilet or sewer connection. People openly defecate in the area next to the houses. Do you have ideas to provide dignified sanitation and prevent local contamination?

Find out more from Jacky in her interview, available at www.engineering-for-people.org.

"My vision is that we first raise awareness in the community, from the children to the adults, and work towards forming good leaders that aspire to become authorities and work for the people, creating wellbeing. Not leaders that want to make money from the community and seek only their wellbeing."

— Jacky Eche

JUAN ECHE

VICE PRESIDENT, LOBITOS ARTISANAL FISHERMAN'S GUILD ASSOCIATION

Juan Eche was born in Lobitos in 1947 and started working at an early age to support his family and nine siblings. After completing primary school in 1960, he learned how to fish and navigate a vessel. Heavily involved with the Lobitos Artisanal Fisherman's Guild Association since 1975, he has served five terms as Director.

ABOUT

Juan's father worked for the British oil company in Lobitos, and he attended a British-run primary school. He expresses the importance of the education he received at school, in strengthening his character and teaching him how to be a respectful citizen.

Trained by his grandfather, Juan and his brothers learned to fish on rafts, then sailboats and then motorised boats. The wooden boats are heavy, requiring more energy to maneuver, have a high draft, leading to excessive extraction of fish, and also fishers struggle with wood moths damaging the boats. Fishers can experience poor health at a young age due to fishing at night with colder conditions and having nowhere to take shelter on the boat. The types and diameter of mesh in fishing nets can lead to over extraction of fish.

In 1978, the Lobitos Artisanal Fisherman's Guild Association was approved on the registry of artisanal social grassroots institutions with the Ministry of Fisheries. The Guild gained legal status in the 1990s with the benefit of being able to work with government and private entities. In December 2019, a redevelopment project began, deconstructing a large part of the pier, however, the project was halted due to the coronavirus (COVID-19) pandemic. With the pier unfinished, there are health and safety risks for fishers trying to continue to fish, and the Guild is seeking support from the Municipality to complete the work.



ISSUES AND IDEAS

- The Artisanal Fisherman's Guild struggles to access up-to-date gear, equipment, and technology. Adopting safe practices and developing new infrastructure is key to limit the over extraction of fish and pollution and to mitigate the risk of contracting or spreading the coronavirus (COVID-19). Do you have any ideas to help ensure fishers have access to the latest knowledge, tools, resources, and guidance?
- There is a need for a slipway or dry dock to aid boats to be taken out of the water for repairs and maintenance. Do you have ideas to ensure safety in leaving and returning to the pier, delivering products to grocery stores, and for storing fish or preventing post harvest loss, either to be used temporarily whilst the pier is reconstructed or with a permanent use?

Find out more from Juan in his interview, available at www.engineering-for-people.org.

"Seeing that my father could not continue providing me with secondary education, being a large family and as I already possessed knowledge and principles of what fishing was like, I set out to sea. I went to work directly out to sea."

— Juan Eche

JUSTO BLAS

MASTER BUILDER AND MEMBER, PIEDRITAS TOURISM COMMITTEE

Justo Blas arrived in Piedritas with his wife, whose entire family, including her great grandparents, have lived in the community as ranchers. As an experienced construction worker, he manages his own projects and supervises other labourers. As a member of the Piedritas Tourism Committee, he maintains the hiking trails and forest routes and regularly checks on signaling and signs.

ABOUT

Justo built the Information Centre in Piedritas, the hiking route infrastructure (huts) and homes, including his own. In the past, he has managed some larger projects with several laborers. Due to the coronavirus (COVID-19) pandemic, construction workers can no longer work, as many of the sites are closed.

One project that Justo would like to see built is a community hall. The Santa Elena primary school currently serves as a community gathering space, but when residents want to use it, they have to open the entire school. Justo believes it is imperative to have an independent space big enough for 300 people with bathrooms for locals and tourists to use. This would be beneficial both to receive tourists and hold meetings. If the community hall was just one story high, it could be built with Guayaquil cane and pressed cane, which is similar to bamboo yet antiseismic, insulating and cheaper than concrete.

Justo notes the community also lacks a functioning sewerage system, and most houses do not have their own toilets.



Finally, Justo would like to see the construction of a medical centre in Piedritas. Having a reliable medical centre and providers in Piedritas is relevant now more than ever. In Talara, there are queues of up to 400 people at the pharmacy waiting to buy medicine and other supplies.

ISSUES AND IDEAS

- Justo describes how the entrance to Piedritas is unwelcoming, which discourages visitors. There are no welcome signs and the road is in poor condition with no greenery. Can you propose ideas to improve the transportation and aesthetics of Piedritas?
- Justo strongly advocates for the construction of a community hall to host meetings, events, and visitors. What ideas do you have to develop a physical space where the community could meet?

Find out more from Justo in his interview, available at www.engineering-for-people.org.

"I believe that the first thing that needs to be done is the construction of the Communal House or Centre. The school is always lent to us, but it's not the same as having a proper communal centre to have meetings."

— Justo Blas

LEAH DONATIELLO

EXECUTIVE DIRECTOR, HIGH TIDES INTERNATIONAL

High Tides International is a non-governmental organisation (NGO) that supports children in the Primavera neighbourhood by offering after-school educational activities four afternoons a week. The organisation focuses on reading, but also offers activities such as playing, colouring, building with blocks, yoga and doing crafting activities. Leah Donatiello came to Peru in 2013 with the intention to stay for a year, but ended up staying in Lobitos permanently because she formed strong connections with the community and was passionate about supporting early childhood education.

ABOUT

Prior to the coronavirus (COVID-19) pandemic, Leah met the children who participated in the after-school activities at the local park in the afternoon after their school day was finished.

Leah uses the park for the activities because other than the Fisherman Guild's Community Hall, there are no available community meeting spaces. In summer, it is very hot and in winter, it becomes very windy, making this an impractical location to run the after-school activities. Leah would like to see the development of a community centre that provides a safe space and resources for children to continue to learn and play outside of the traditional school day.



Due to the coronavirus (COVID-19) pandemic, groups are not allowed to gather, so the after-school activities have been put on hold. To support the children during this challenging time, Leah has made educational activity packages and personally delivered them to each child's household. She also has started a Facebook group and WhatsApp group to encourage communication and connection between the children.

ISSUES AND IDEAS

- The facilities at the local park where Leah runs the after-school programme need upgrading. Can you propose ideas to improve the public spaces in the area?
- Both Lobitos and Piedritas lack a community centre for meetings, events, and activities. Do you have any ideas to support the development and construction of a community meeting space?

Find out more from Leah in her interview, available at www.engineering-for-people.org.

"Things that are just simple, easy to use can benefit this community in so many ways... It has to be something that other people can learn and take on and make their own. If people don't feel like it's theirs, they're not going to care about it. If people don't feel like it will benefit them or their family or their community, they're not going to care about it."

— Leah Donatiello

MANUEL VÁSQUEZ

DIRECTOR, SANTA ELENA PIEDRITAS SCHOOL

Manuel Vásquez is a primary education teacher with a master's degree in Education Management. He started teaching at the Santa Elena primary school in 2004 and is now the first Director. The school provides primary education for over 100 children, often from poorer communities in Piedritas, Sicchez, Lobitos and Talara.

ABOUT

The Santa Elena primary school is the first and only primary school in the locality and serves as an important gathering space for community meetings, activities, and events. The school is available for the community to use and plays a critical role in supporting Piedritas' growth and development.

Manuel's vision is to have a school that provides high quality public education and produces professional, competitive students. Although the school is located in a rural area, it provides the same standard of education as urban schools and has also won local competitions.

In 2006, part of the school was built out of wood. The engineer involved wanted to maintain the character and traditions of the area. In 2010, Enel Generación Piura won a Community Impact Competition, and Architecture for Humanity, an international non-governmental organisation (NGO), constructed five new classrooms. Manuel would like to build a psychomotricity room, which is a space where children can develop their motor skills with equipment like balance beams, yoga balls, jump ropes and swings.



Usually, students eat breakfast at school, have their lessons and go home at 1:00pm. However, due to the coronavirus (COVID-19) pandemic, courses and activities are now done virtually via TV channels, radio, online platforms like Zoom and WhatsApp. It is challenging because not all of the parents have cell phones, laptops, Internet access and the technology to support virtual learning.

ISSUES AND IDEAS

- The Santa Elena primary school has not benefited from the Talara Municipality's support like other schools. Hence, the school still has parts of the playground, courtyard and platform that do not have a roof to provide shade and protect the children from the sun. Can you propose ideas to improve the school's infrastructure so children can learn and play safely outside?
- The school needs good sanitary facilities with sinks and liquid soap dispensers, especially during the current health crisis. Do you have any ideas to improve the school's sanitary facilities?

Find out more from Manuel in his interview, available at www.engineering-for-people.org.

"I hope you see the necessity to make beautiful designs [...] that improve the quality of life and education."

— Manuel Vásquez

MARLYNE GUERRERO

SECRETARY AND TREASURER, PIEDRITAS TOURISM COMMITTEE

As a resident and part of the Piedritas Tourism Committee, Marlyne Guerrero is driven to enable Piedritas to become a key tourist destination. In her role, she runs projects and organises meetings to assess the community's progress towards this aspiration. She also assists tourists by providing information on hiking routes and connecting them with local guides. In the mid-20th century, Marlyne's parents were amongst the first inhabitants to arrive in Piedritas, where she and her nine siblings were born and raised.

ABOUT

In recent years, many more tourists have come to see the Peruvian Plantcutter and explore the wetlands, thanks to the community's ongoing partnerships with EcoSwell and Enel Generación Piura, facilitated through the Tourism Committee.

Although logging has diminished in recent years, decades of tree cutting have significantly reduced the size of the native dry forest. For Marlyne, having more green areas and a healthy dry forest is crucial for tourism to grow. She would also like to see younger generations invested in this project.

She believes it is important to give the hiking routes a better appearance and clear signposts. Currently, there are rocks painted in white along the trail to mark the route, but they are not very visible. Marlyne also sees the possibility of building more infrastructure along the routes, such as lookout points like the one currently at the top of the hill, to allow people to rest and take photographs.



ISSUES AND IDEAS

- Reforestation efforts will play an important role in the development of Piedritas' ecotourism industry. Can you think of a reforestation project that involves the youth as well?
- Hiking and birdwatching are important components of Piedritas' ecotourism plan. Can you think of a way to improve the hiking trails and make them easily accessible to all?
- Piedritas' ecotourism activities have largely stopped because of the coronavirus (COVID-19) pandemic. Can you think of a way the community can still move forward with its ecotourism plan and continue to protect and preserve the local environment?

Find out more from Marlyne in her interview, available at www.engineering-for-people.org.

"I would love for us to have many green areas and for tourism to continue to grow. I don't just want one or two people to visit us, I prefer to think big and dream of a lot of people coming to Piedritas to enjoy our forest. I hope to always think this way and dream big. I hope that in 10 or 15 years the younger generations keep improving our project, the project EcoSwell started."

— Marlyne Guerrero

NICOLÁS LANDA

CO-FOUNDER, COAST2COAST AND LOBITOS CINEMA PROJECT

Nicolás Landa started the Lobitos Cinema Project, and later co-founded Coast2Coast, to tell the stories of and give a voice to marginalised groups of people. The two organisations communicate these stories, with particular interest in the history and traditions of the fishing community in Lobitos.

ABOUT

Through his work with the Lobitos Cinema Project and Coast2Coast, Nicolás shares the stories of community members by conducting workshops for primary and secondary students. Together with the school and the community, they have created audiovisual storytelling with documentaries, murals, stop-motion productions, and photo essays. One student they worked with has gone on to win awards at an international film festival.

Nicolás believes that the history, traditions, and stories of the fishing community represent a culture in danger of extinction. However, the lack of a dedicated physical space, for example, hinders the ability of the community to collaborate, experiment and grow their reach and storytelling.

In addition, Nicolás identifies the patriarchal and "macho" cultural norms in the community that prevent women and girls from attending sporting activities (e.g. surfing lessons) and sharing their stories. Nicolás' project 'Women and Water' aims to address gender inequality. The initiative has on-going practical challenges like equipment shortages and intermittent electricity supply, and everyday poverty within the community impacts the ability of people to engage in this initiative.



During the coronavirus (COVID-19) pandemic, the two organisations have focused on Virtual Marine Coastal Voice Map, a project which uses maps to tell the evolving stories of the fishing community over the last six years. Being virtual, the project is not subject to the same constraints as their other initiatives.

ISSUES AND IDEAS

- Can you think of ideas to improve Coast2Coast and Lobitos Cinema Project's access to a physical space that they can use to collaborate and grow their community initiatives?
- Given current coronavirus (COVID-19) pandemic restrictions and general digital challenges in Lobitos, how might these organisations leverage their past work to continue telling the stories of the community virtually?

Find out more from Nicolás in his interview, available at www.engineering-for-people.org.

"Go [and] live for a month, two months in a place where water is a problem, where transport is a problem, where the internet is a problem, where the wind is a problem, so that you can truly feel the problems and not only think about them. Because I think these are the things that make the difference."

— Nicolás Landa

QUENNI CARREÑO

ARTISAN & ADMINISTRATOR, ECOSWELL HOUSE

Quenni Carreño is a 31-year-old woman who lives in Lobitos. Along with a team of 30 other artisan women, she makes crafts out of local materials, such as shells and bones, which are sold as souvenirs to tourists. She also runs local tours for tourists and provides administration support to EcoSwell, maintaining the work space and accommodations.

ABOUT

Quenni is concerned about the impact of the coronavirus (COVID-19) pandemic on the tourism industry and the resulting restrictions on travel. Due to the ongoing health crisis, tourists have been unable to visit the area, and conditions are unlikely to improve until travel restrictions ease. Since the artisan group has lost its main customer base and is not selling souvenirs, she cannot contribute to her household's income. Quenni believes that the artisan group could engage in more marketing and promotion of its services and souvenirs to improve its visibility in the market and increase sales.

As a resident of Lobitos, Quenni has many concerns about infrastructure, which affect both her and the local community, as well as tourism to the area. Some of her concerns about the local area include the poor sewerage system, inconsistent potable water supply, and the school infrastructure collapsing.

Despite the infrastructure problems, Quenni stresses that Lobitos is a tranquil and quiet place, where there is no crime and the community members all know each other. She notes when tourists visit the town, they enjoy the beaches and natural beauty of the area and take interest in the history and culture.



ISSUES AND IDEAS

- The coronavirus (COVID-19) pandemic has severely impacted Quenni and the other artisan's ability to produce and sell local crafts to tourists. Can you propose ideas to help the team of 30 women promote and market their goods to domestic and international audiences?
- The sewage system in Lobitos presents health hazards to the local residents and creates unsightly spills and smells that give tourists a negative impression of the town. Do you have any ideas to rebuild the collapsed sewerage system and reduce environmental contamination in Lobitos?

Find out more from Quenni in her interview, available at www.engineering-for-people.org.

"Peace and tranquility are what characterises Lobitos. I wouldn't want that to change. I like to live in this place because you can sleep feeling tranquil and there isn't much crime, and in general the tourists who come are good tourists. I would like to conserve that."

— Quenni Carreño

RAFAEL ARAMBURÚ

SURFER AND TOURISM ENTREPRENEUR

Rafael Aramburú's story in Lobitos began in 2000, when he would surf there with his uncle. After studying Hotel Management in Lima, he decided to set up a lodge in Lobitos. He gains support from being a member of the Association of Hotels and Entrepreneurs.

ABOUT

Rafael sees the potential of a unified tourism industry in Lobitos with a common vision. Although the beach and surfing are the main tourist attractions in Lobitos, he wants to encourage diversifying the tourism industry to include other activities aimed at attracting tourists interested in cycling, kite surfing, trekking and birdwatching.

To turn this vision into reality, financial support is needed to develop an alternative ecotourism industry, as well as education around the opportunities of tourism as a source of income. He is also seeking to collaborate with the local government. For now, he regularly speaks and collaborates with hotel and restaurant owners.

The coronavirus (COVID-19) pandemic has deeply affected tourism in Lobitos, and he believes it will take until at least 2021 for the sector to recover. Even once the quarantine in Peru ends, he believes that the number of visitors will not be enough to sustain many hotels and hostels in the near future.

The tourism industry is currently facing several major infrastructure barriers, including the unpaved, dirt access road from the highway to Lobitos as well as a lack of water supply and treatment systems. Businesses are currently forced to pay for expensive water deliveries, which significantly increase prices for tourists.



ISSUES AND IDEAS

- As Rafael mentioned, surfing is not the only tourist attraction in Lobitos. Can you think of a way to support multiple tourism opportunities in Lobitos and encourage local businesses and entrepreneurs to explore new markets?
- The tourism industry needs access to more potable water. Can you think of a way to supply clean, treated water to hotels and local businesses?
- To maintain a clean and inviting environment for tourists, Lobitos must address the issue of solid waste management. Can you think of a project that combines the need for education around solid waste disposal and an innovative system to treat waste?

Find out more from Rafael in his interview, available at www.engineering-for-people.org.

"My vision is very optimistic because Lobitos has plenty of attractions and that will not change. What is missing is education. Offering the community a proper education so they can learn how to take advantage of the opportunities that come with tourism as an alternative income to fishing, which is currently their primary source of income, but is becoming progressively harder due to the presence of oil operations."

— Rafael Aramburú

TEÓFILO ERAZO

PRESIDENT, PIEDRITAS COMMUNITY COUNCIL

Teófilo Erazo arrived in Piedritas 40 years ago. Since 2014, he has served as President of the Piedritas Community Council. In his role, he manages and coordinates community development projects, including an electrification project, whilst holding meetings with residents to debate issues they have raised.

ABOUT

In recent years, local residents have taken important steps to improve the living conditions in Piedritas. As President of the Community Council, Teófilo led the electrification project, which resulted in the electrification of 80% of the households in Piedritas. To date, the final 20% of households have yet to be connected to the national electricity grid.

Teófilo has been trying to enable construction of a community hall, but due to limited budgets and an unfamiliarity with desired materials for the structure, it has not yet been achievable. He hopes that in the future the community hall will be visually appealing, by using by incorporating use of alternative, innovative materials as opposed to relying on only concrete and steel.

Additionally, although areas of Piedritas are now connected to a water supply, there are some areas where water pressure is still an issue. To address this, and to provide water to the houses where the water supply does not reach, the community has implemented a communal standpipe and tap.

Additional projects that Teófilo identifies as important to the community include building a chapel and a playground for children and adding goal posts to the football field.



ISSUES AND IDEAS

- Teófilo emphasises the importance of having a community hall in Piedritas to host meetings, activities, and events. Can you propose a plan to enhance the built environment through the construction of a community hall using locally available materials?
- Only one sector of the households in Piedritas remains without electricity. What ideas do you have to help the Piedritas Community Council ensure that all residents have access to reliable energy and to provide resilience during grid outages?

Find out more from Teófilo in his interview, available at www.engineering-for-people.org.

"I would like Piedritas to one day be a community, a town that has all the basic services: electricity, water, sanitation, [...] a community hall, a church, pretty streets, all that. And, that it would also be a touristic area, where the people that are going to Lobitos stop by for the day."

— Teófilo Erazo

TULLIO CHAPILLIQUÉN

ARTISANAL FISHER AND LOCAL GUIDE, LOBITOS OCEAN ADVENTURE

As a fisher, Tullio Chapilliquén has devoted himself to mastering artisanal fishing methods and now shares his passion through Lobitos Ocean Adventure, a business he founded offering guided fishing boat tours.

ABOUT

Lobitos Ocean Adventure was founded after tourists simply asked if they could fish with Tullio. He enjoys providing a service for tourists to catch fish, view the oil platforms and learn about the local history. Currently, the tours are advertised at some hotels and not online. This business provides him with 20% of his income.

As an artisanal fisher, he cares deeply about conserving fish stocks, after seeing numbers diminish over his lifetime. As former President of the Fisherman's Guild, he supported the locality and fellow artisanal fishers with a business model focused on selling fish, finding markets and protecting their fishing areas. He would like to see Lobitos' coast be protected with a designated conservation status that provides sustainable income for fishers and attracts tourists.

ISSUES AND IDEAS

- Although Tullio has experimented with using Facebook to advertise his guided fishing boat tours, he finds that word of mouth is the best way to attract new customers. Can you think of ways to increase Lobitos Ocean Adventure's internet and social media presence?
- The pier is currently being fixed, but Tullio's vision for it includes aquaculture farms for raising shells, octopuses, lobster and fish that the fishers could live from. He also envisions wind turbines and solar panels integrated in the solution. Can you incorporate Tullio's ideas into a plan to develop and enhance the pier?

Find out more from Tullio in his interview, available at www.engineering-for-people.org.



"Since I was little, I loved the sea, nature, and fishing [...] So I have spent most of my life and my career in artisanal fishing."

— Tullio Chapilliquén



GETTING STARTED

Lobitos and Piedritas are exciting and thriving places with a number of practically challenging engineering issues. This design brief provides you with information on Lobitos and Piedritas to enable you to design solutions for this community. We can't wait to hear about your ideas, passion and approaches to this design challenge.

Before you get started, we suggest you gain an awareness of the Sustainable Development Goals [1]. These are 17 shared goals promoted by the United Nations that world leaders have agreed to. These goals provide a framework for all of us to work together to build a better future for everyone, fighting inequality, ending poverty and stopping the climate crisis.

We now invite you to explore these exciting places and consider engineering design in this rural context. A context shaped by challenges familiar to many all over the world, including the climate crisis and resource shortages. Lobitos and Piedritas' complex past adds a unique local framework to these challenges.

On the following pages we've outlined some steps to help you begin the process and guide you through the different stages of the design cycle. Note that although the steps are numbered one to four, it is an iterative process as the more you learn through the process the more you will find yourself back at the beginning redefining your problem statement and design criteria.

[1] UN Sustainable Development Goals

The purpose of this design brief is for you to demonstrate:

- How you and your team can be the engineers of the future by responding to the challenges the community is facing.
- Your understanding of the context and giving appropriate consideration to all relevant social, environmental and economic factors.
- A reasoned approach to your engineering design.





1. ANALYSE THE CONTEXT

Immerse yourself in the context first by understanding and empathising with people's perspectives, strengths and needs before considering how their problems might be addressed.

Familiarise yourself with as wide a range of information about Lobitos and Piedritas as possible. Start with the information we've provided in the design brief, explore the additional resources online at www.engineering-for-people.org and start planning out what additional research you think would be useful.

Analyse the issues through various perspectives and seek out alternative viewpoints to understand the diverse ways that Lobitos and Piedritas and the opportunities and challenges that exist there are experienced.

2. DEFINE THE PROBLEM AND YOUR CRITERIA FOR SUCCESS

From all your understanding of the context in step one, you should be getting a feel for the key issues present in Lobitos and Piedritas. Start discussing them in your team and keep asking 'why', it's recommended to ask why at least five times (the 5xWhy tool). Through asking why (e.g. why does this happen, why do people do that etc) you're starting to uncover the key issues that are causing the problems. From here you can start to define your own problem statement.

At this point also reflect on the criteria for success, ensure you have criteria that are related to social, environmental and economic objectives or limits, e.g. it must reduce waste, it must be inclusive of the local community, it must cost below X (number in local currency to be defined by you!). These are part of our marking criteria and we're expecting you to define them and demonstrate how you've used them in your decision making throughout the design cycle.

3. EXPLORE LOTS OF OPTIONS

Don't just go with your first idea, explore lots of ideas and think outside the box. Do this in an open manner and don't discount any ideas whilst you are exploring them. When you have a long list, use your problem statement and design criteria to determine the most appropriate ideas to move forwards with.

4. JUSTIFY YOUR RECOMMENDATIONS AND EXPLAIN HOW IT WORKS

To be sure of your chosen proposal, continue to question yourselves and think critically about whether you are meeting the design criteria. Using and questioning your judgement is something you will be relied upon to do as a professional in the engineering sector.

Trial different tools to help keep testing your idea, e.g. sketching, prototyping (we recommend doing this with cheap materials like cardboard and paper), PESTLE analysis and SWOT analysis. These are also helpful in demonstrating the appropriateness and success of your idea to others, be they your peers, academics, members of the community or future investors.

**Produced by a partnership of Engineers Without Borders South Africa,
UK and USA in collaboration with:**



This partnership has been kindly supported by:



Engineers Without Borders UK would also like to thank:



Spirax-Sarco Engineering plc