

CLEANTECH IN PERU

A diversified and growing market (Part 2)



Official Program Partner

Cleantech in Peru A diversified and growing market.

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List of Abbreviations

AC	Alternating Current
ANA	Peruvian National Water Authority
ATU	Urban Transport Authority for Lima and Callao
B2B	Business to Business
B2C	Business to Customer
BEV	Battery Electric Vehicle
C&I	Commercial & Industrial
CCI	Cotton Council International
CCSP	Swiss Chamber of Commerce in Peru
CENAGRO	National Agricultural Census
CINTYA	Nacional Program for Environmental Science and Technology
CO	Carbon Monoxide
CO2	Carbon dioxide
CONCYTEC	Nacional Council for Science, Technology and Technological Innovation
DAA	Declaration of Environmental Adequacy
DGEE	General Directorate of Energy Efficiency
DIA	Environmental Impact Statement
DIGESA	Ministry of Health - General Directorate of Environmental Health and Food Safety
EAE	Strategic Environmental Assessment
EIA	Environmental Impact Studies
EIA-d	Detailed Environmental Impact Study
EIA-sd	Semi Detailed Environmental Impact Study
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FISE	Energy Social Inclusion Fund
GDP	Gross Domestic Product
GgCO2eq	Gigagrams of Carbon Dioxide Equivalent
GHG	Greenhouse Gas
HEV	Hybrid Electric Vehicle
HORECA	Hotels, Restaurants and Catering and Retail
IDB	Inter-American Development Bank
IIMP	Institute of Mining Engineers of Peru
INACAL	National Quality Institute
INDECI	National Institute of Civil Defense
INGEI	National Greenhouse Gas Inventory
INGEMMET	Geological, Mining and Metallurgic Institute
IoT	Internet of Things
ISO	International Organization for Standardization
kVA	Kilovolt-Amperes
LPG	Liquefied Petroleum Gas
MIDAGRI	Ministry of Agrarian Development and Irrigation
MINAM	Ministry of the Environment
MINEM	Ministry of Energy and Mines
MINSA	Ministry of Health
MRE	Ministry of Foreign Affairs

MRL	Maximum Residue Limits
MTC	Ministry of Transport and Communications
N2O	Nitrogen Oxide
NGV	Natural Gas Vehicle
Nox	Nitrogen Oxides
OEFA	Environmental Evaluation and Oversight Agency
OTASS	Technical Organization for the Administration of Sanitation Services
PAMA	Adaptation and Environmental Management Program
PENP	Peru's National Energy Policy
PHEV	Plug-in Hybrid Electric Vehicle
PI	Municipal Management Improvement Incentive Program
PLANAE	Concerted National Plan for the Promotion and Development of Organic or Ecological Production
PPP	Purchasing Power Parity
PRODUCE	Ministry of Production
PROINVERSION	Private Investment Promotion Agency
PV	Photovoltaic System
REEV	Range Extended Electric Vehicle
RER	Renewable Energy Resources
RO	Reverse Osmosis
RPMV	Public Stock Exchange Registry
SEDAPAL	Lima Potable Water and Sewerage Service
SEIA	National Environmental Impact Assessment System
SENACE	National Environmental Certification Service for Sustainable Investments
SENACE	National Certification Service
S-GE	Switzerland Global Enterprise
SIMIM	Society of Mining and Metallurgy of Peru
SNI	National Society of Industries
SINACYT	National System of Science and Technology and Technological Innovation
SINEFA	National System for Environmental Assessment and Enforcement
SMEs	Small and medium-sized enterprises
SMV	Peruvian Securities and Exchange Superintendency
SNMPE	National Society of Mining, Oil and Energy
SRI	Sustainable Recycling Industries
SUNARP	National Superintendence of Public Registries
SUNARP	National Superintendence of Public Registries
SUNASS	According to the National Superintendence of Sanitation Services
SUNAT	National Superintendence of Customs and Tax Administration
TDS	Total Dissolved Solids
UNDP	United Nations Development Programme
VIVIENDA	Ministry of Housing, Construction and Sanitation
WEEE	Waste of Electrical and Electronic Equipment

1. FOREWORD

The Swiss Chamber of Commerce in Peru has elaborated this report on Cleantech in Peru with the support of Switzerland Global Enterprise (S-GE). The Chamber thereby fosters and promotes the free-market system and encourages trade and investment within a framework of social responsibility, strong values and business ethics.

Aware of the significant needs of Peru for Cleantech products and services, this report seeks to identify business opportunities for Swiss firms addressing the following questions:

- What are the Cleantech technologies of Swiss SMEs addressing key energy and climate challenges?
- What are the major issues faced by Peru that could be alleviated with Swiss Cleantech technologies?
- What is the legal regulatory framework in the main areas subject to Cleantech products and services?
- How to deal with logistics and distribution?
- What is the potential of the Peruvian market for Swiss Cleantech products and services and what are the main challenges to succeed?

The analysis is qualitative because only a few Swiss firms are present in Peru to offer Cleantech products and services and because trade statistics cannot be used as both Cleantech and non-Cleantech products are generally classified in the same tariff positions. A Report on Peru is nevertheless fully warranted: due to very important needs, the Peruvian market for Cleantech products and services will grow at a very strong pace in the coming years.

Several firms active in the Swiss and Peruvian Cleantech sectors are to be thanked for valuable contributions through interviews and videos. We are also grateful to Mrs. Andrea Baldeon and Mr. Diego Guevara for undertaking the research, data analysis, elaborating the figures and tables and writing the various chapters.

Special gratitude is expressed to Dr. Philippe G. Nell for designing the project, selecting the main categories of Swiss Cleantech products and services, writing the Factsheets document on 33 Swiss Cleantech SMEs and various parts of the report as well as for the overall direction and detailed review of the report.

The Swiss Chamber of Commerce in Peru is confident that this report will increase the awareness of Swiss firms for Cleantech business opportunities in Peru confirming our mission of being the main reference for trade and investment relations between Peru and Switzerland.

We wish you an instructive and pleasant read of the report on Cleantech in Peru.

Lima, February 2022

Corinne Schirmer
General Manager
Swiss Chamber of Commerce in Peru

2. EXECUTIVE SUMMARY

Peru is a middle-income country with a GDP per capita at PPP of US\$12,555 and a relatively large population (33 million). A significant part of the population lives in the large cities of Lima (9.5 million), Piura (1.9 million), La Libertad (1.8 million), Arequipa (1.4 million) and Cusco (1.2 million). The differences in the standard of living are considerable, with a poverty rate of 27.5%.

As elsewhere in the world, clean technologies can be a source of growth for the economy and simultaneously contribute to solving important environmental and social problems in the context of the United Nations 2030 Sustainable Development Goals.

Peru's needs in clean technologies are considerable and appropriate solutions must be proposed corresponding to the financial, social and technological capacity of absorption.

Market overview: Based on the Swiss cleantech product offering and a S-GE study identifying Swiss cleantech firms present in Peru or interested in establishing themselves there, the following eight areas were identified for this report:

- Sustainable agriculture and counterfeit agrochemicals
- Sustainable water management
- Sustainable mining and protection from natural disasters
- Resource and material efficiency (including waste management and recycling)
- Sustainable mobility and energy efficiency
- Renewable energies
- Environmental technology services
- Environmental technology for textiles

In each of these areas, some Swiss SMEs have developed cleantech technologies addressing agriculture and energy issues as well as climate change. They hold a highly-specialized and impressive know how and seek to further expand abroad. The technology of more than 20 firms is briefly presented in the report and an additional document "FACTSHEETS" showcases 33 Swiss Cleantech SMEs.

Swiss technology could contribute significantly in alleviating problems in Peru such as greenhouse gas emissions, water scarcity in agriculture, waste management and recycling in cities and in the countryside, natural disaster protection in mining, pollution, clean energy and counterfeit in agrochemicals.

Regulatory overview: Peru has adopted legislation to promote sustainability. Particular measures are foreseen for conservation and sustainable use of water, environmental management of mining, overall waste management including plastic packaging, disposal of electric and electronic equipment, transition toward electric mobility and Renewable Energy Resources (RER) to improve the quality of life of the population and protect the environment. Legislation on RER covers energy resources such as biomass, wind, solar, geothermal and tidal.

A regulatory framework has also been established on single-use plastic, other non-reusable plastics and disposable containers or packages made of expanded polystyrene for food and beverages for human consumption.

The Environmental Management Regulation for the Manufacturing industry aims at a sustainable development of natural resources in the manufacturing industry and at promoting environmental protection procedures and measures.

Opportunities and challenges: Peru offers great opportunities for Swiss firms in agronomy with meteorology analysis, drones to spray crops, animal feed to reduce greenhouse gas emissions and systems to irrigate dry areas with less water, higher productivity and restoration of salt-saturated soils, and water platforms for vegetable production.

Opportunities are also identified for water treatment and purification for consumption; in mining to protect against rockslides; in waste management to recycle tyres and to build efficient plants to segregate material and eliminate waste; in renewable energy, to produce solar energy; in mobility, to improve fuel efficiency and introduce electric vehicles.

Business faces significant challenges with complex administrative procedures and a climate of political uncertainty with constant changes of ministers. According to the 2020 World Bank's "Doing Business" report, Peru ranks 73rd overall but only 133rd for starting a business. Taxes obligations are very time-consuming (rank 121st). Cross-border trade is slow and costly (rank 102nd).

Important market players: Through its regulatory power, the government plays an important role for business. Specific ministries are in charge in each area. It is essential to know them as well as their regulations. Regional and local governments also hold some responsibilities for instance for water management. Academia and civil society are active in particular in waste recycling as well as the private sector with important firms in waste electrical and electronic equipment (WEEE), in electricity, in renewable energy and in textiles.

Logistics and distribution: Logistics in the Cleantech sector is handled differently according to the business models in each specific field. For important projects, environmental studies must be presented to the authorities. Usually, the products must be imported in Peru and foreign firms must provide services related to installation and after-sales service. Depending on the development of the business, the foreign provider may work with a local distributor or establish its own firm under various company structures.

Case studies: Cleantech technologies bring significant benefits to society by addressing key challenges in various areas. The case studies illustrate business in solar energy, in the production and exports of food under internationally-recognized organic certifications using cleantech technologies such as drones and solar energy, in producing agricultural brands using efficient cleantech irrigation systems including AQUA4D, in enabling access to energy in remote areas off-grid and in managing waste at a company and at a municipality level.

Conclusion: Peru's needs in Cleantech technologies will grow exponentially over the coming years to meet big challenges associated with climate change, pollution, energy, waste and water. Swiss SMEs are well positioned in all these areas with high-quality, highly-performing and reliable Cleantech products and services. Market entry will continue to require major efforts to overcome procedural barriers, understand local culture and choose the best local partners.

3. MARKET OVERVIEW

Swiss firms have developed cleantech technologies to address energy issues and climate change and seek to expand abroad. They could contribute significantly in alleviating important problems in Peru such as emissions in cattle raising and transportation, water scarcity in agriculture, waste management and recycling in cities and in the countryside, natural disaster protection in mining, pollution, renewable energy sources and counterfeit in agrochemicals.

Peru is a middle-income country with a GDP per capita at PPP of US\$12,555 and a relatively large population (33 million). A significant part of the population lives in the large cities of Lima (9.5 million), Piura (1.9 million), La Libertad (1.8 million), Arequipa (1.4 million) and Cusco (1.2 million). The differences in the standard of living are considerable, with a poverty rate of 27.5%.

Geographically, the country has several distinct regions: the Pacific desert coast, the Andes, the central jungle and the jungle. Their climate differs with specific challenges to maintain and constantly improve the quality of life of the inhabitants.

The country's needs in the areas of education, health and infrastructure are considerable. In addition, there are multiple pressures related to high population growth in recent years, reinforced by large immigration from Venezuela (about 1 million).

As elsewhere in the world, clean technologies can be a source of growth for the economy and simultaneously contribute to solving important environmental and social problems in the context of the United Nations 2030 Sustainable Development Goals.

Water is a very important strategic asset, especially for daily use by the population, mining and agriculture. Climate change is affecting the country, particularly with the melting of glaciers and the increasing scarcity of water.

Pollution from traffic is affecting the health of the population, especially in the large coastal cities, which are largely deprived of sunlight and live under a stratus cloud nine months a year.

Waste disposal and separation are huge challenges. Waste affects the health of the poor population and has a negative impact on the environment.

Renewable energies are more and more necessary to meet the needs for electricity and to limit air pollution.

In this context, on the one hand the needs of Peru in clean technologies are considerable for the whole economy, and on the other hand appropriate solutions must be proposed corresponding to the financial, social and technological capacity of absorption.

3.1. What is cleantech¹?

Cleantech refers to sustainable production methods that respect resources and include technologies, manufacturing processes and services that help to protect and preserve resources and natural systems. All links in the value-added chain are involved, from research and development to exports and the production of capital goods.

¹ Source: Masterplan Cleantech en Suisse. Federal Department of Economic Affairs, Education and Research, Federal Department of the Environment, Transport, Energy and Communications, October 2011, p. 13. Available on line: [Microsoft Word - 101031_MP_CLEANTECH_VERSION 8 DC_F_printdef.doc \(admin.ch\)](#) Accessed 19/10/21

Cleantech includes the following areas

- Renewable energies
- Energy efficiency
- Energy storage
- Renewable materials
- Resource and material efficiency (including waste management and recycling)
- Sustainable water management
- Sustainable mobility
- Sustainable agronomy and forestry management
- White, green and yellow biotechnology
- Environmental technology in the strict sense of the term (including measurement technology, remediation of contaminated sites, filter technology, etc.)

3.2. Which Cleantech products can Switzerland offer to Peru?

Switzerland has a large offer of Cleantech products covering several sectors of the economy. Most of them cannot be identified precisely in trade statistics because product categories that include cleantech products also include other products. For example, customs classifications do not yet distinguish between electric vehicles (cleantech), gas and petrol vehicles.

Nevertheless, it is possible to identify some cleantech products corresponding to specific sectors. In some areas, it is feasible to quantify the economic dimension of the field and the potential for cleantech to gradually increase its relative share.

In this context, based on the Swiss cleantech product offering and a S-GE study identifying Swiss cleantech firms present in Peru or interested in establishing themselves there, the following areas and products were identified:

- Sustainable agriculture and counterfeit agrochemicals
- Sustainable water management
- Sustainable mining and protection from natural disasters
- Resource and material efficiency (including waste management and recycling)
- Sustainable mobility and energy efficiency
- Renewable energies
- Environmental technology services
- Environmental technology for textiles

3.3. Swiss trade in Cleantech relevant products

The Cleantech products manufactured by Swiss firms are classified under the following tariff positions:

Table 1. Cleantech Swiss exports to Peru
(In million Swiss francs; tariff positions include non-Cleantech products)

HS tariff number	Name	Exports to Peru	Year
3302.90	Mixture of substances	3.420.092	2018
7314.41	Netting, fences	767.398	2019
8412.90	Parts, non-elect. engines	5.858	2018
8421.21	Filtering, purifying water	220.260	2018
8436.80	Agricultural machinery	-	-
8474.10	Waste management plant	153.679	2017
8504.32.10	Transformers	21.813	2020
8504.40	Static converter	3.612.894	2019
8504.50	Inductors	218.071	2016
8504.90	Parts electrical transformer	222.949	2016
8506	Batteries	57.801	2019
8536.90	Elect. app. for switching elect. circuits	222.298	2019
8541	Diodes, photovoltaic cells	116.456	2018
8713.90	Electric vehicles	-	-
8802	Drones (helicopters)	-	-
9030.33	Instruments for measuring voltage	103.009	2015

Source: SwissImpex, Swiss Customs Administration. The year features the highest Swiss exports (2015-2020).

3.4. What are Peru's needs in the Cleantech area?

By the end of 2019, the Peruvian economy had achieved more than 20 consecutive years of GDP growth. Thus, Peru has doubled the size of its economy during the last two decades.

This growth had a strong impact on the environment. This section will highlight key issues that require cleantech technologies. Business opportunities for Swiss companies in Peru will then be identified in Chapter 5.

3.4.1. Sustainable agriculture and counterfeit agrochemicals

Agriculture - crop farming, livestock, hunting and forestry- plays an important role in the Peruvian economy, especially in terms of employment and through its linkage with other economic activities, such as tourism, hotels and restaurants. In 2018, agriculture contributed to 6.1% of GDP and grew at an average of 3.4% between 2014 and 2018. Its contribution to employment was much greater with 24.1% (2017). Agricultural activities occupy 30.10% of the national territory (38.7 million hectares) of which the coast represented 11.5%, the jungle 30.1% and the highlands 57.5%².

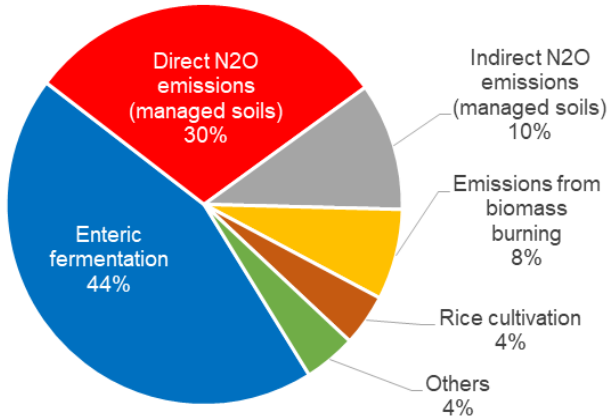
Peru produces a wide variety of agricultural goods including sugar cane, oil palm, grapes and coffee. The main fruits are banana, orange, pineapple, mandarin and mango.

² Source: National Agricultural Census (CENAGRO), 2012. Available on line: www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1177/resumen.pdf

Greenhouse gas (GHG) emissions from agriculture include two categories: first, livestock with enteric fermentation (methane emissions) and manure management. Second, aggregate sources and non-CO2 emission sources on land composed of the following six subcategories: emissions from biomass burning, urea application, direct and indirect N2O emissions from managed soils, indirect N2O emissions from manure management, and rice crops³.

In 2016, GHG emissions from these two categories were 25,910.29 GgCO2eq (Gigagrams of Carbon Dioxide Equivalent), representing 12.6% of total emissions nationwide. The main source of emissions is enteric fermentation from cattle, representing 44.2% of the total, followed by direct N2O emissions from managed soils, representing 29.8%. These two subcategories represent 74% of total emissions in agriculture (see figure 1).

Figure 1. Distribution of emissions by greenhouse gas categories
(Agricultural sector, 2016)



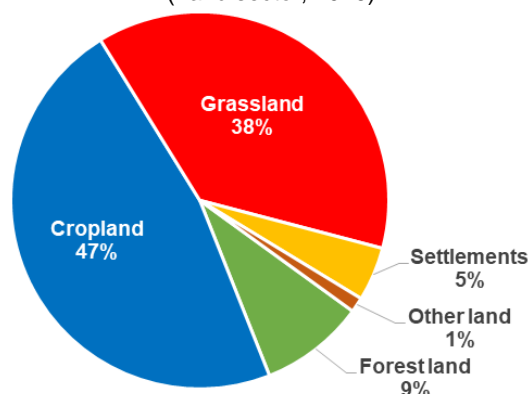
Source: INGEI, 2016

One of the major drivers of CO2 levels is changes in land use and forestry with: forest land, cropland, pastures, settlements, and other land. Forest land includes changes in forest carbon stocks due to human activities (establishment of forest plantations, commercial logging, harvesting of wood for use as fuel, etc.). For the other land types, the estimation of GHG emissions and removals due to changes in living biomass, dead organic matter and soil organic carbon is included.

In 2016, GHG emissions from changes in land use and forestry were 108,991.29 GgCO2eq, representing 53.1% of total emissions nationwide. The main source of emissions was cropland representing 47.2% of total emissions in the sector. The second most important source of emissions is pastures, representing 37.9% of total emissions in the sector.

³ National Greenhouse Gas Inventory conducted in 2016. Available on line: https://infocarbono.minam.gob.pe/wp-content/uploads/2021/06/INGEI_2016_Junio-2021_Final.pdf

Figure 2. Distribution of emissions by greenhouse gas categories
(Land sector, 2016)



Source: INGEI, 2016

Illegal trade in agrochemicals (counterfeit, adulterated and smuggled) is increasing in Peru⁴. The sale of smuggled agrochemicals amounts to US\$10 million. Cultivida's executive director, Carlos Rodríguez Koch, indicates that "what they use for adulteration are containers recycled in the field. Containers that can cost between 20 and 50 soles, depending on their state of conservation. These products are marketed at over S/. 400 per liter, so the profitability is quite high". Low-cost products (such as pyrethroid or phosphorous products whose value is around 50 soles) are generally used with the label of a high-value product and sold between 300 and 400 soles, a 60% discount from official value. Agrochemical smuggling enters Peru through all borders, the northern one being the most active. Agrochemicals most likely to be adulterated are insecticides.

3.4.2. Sustainable water management

Water resources available in Peru can be classified into three watersheds: Atlantic or Amazon (2.4 million Hm³⁵), Pacific (37 thousand Hm³) and Titicaca (6 thousand Hm³). In the case of the Atlantic watershed, 78% of the water is available on the surface and 22% subway. Likewise, for the Pacific and Titicaca watersheds, surface water represents 92% and 91%, respectively⁶.

In 2019, consumptive use of surface water, i.e. water removed from available supplies without return to a water resource system, was mainly used by agriculture (89%) and households (9%), followed by mining and industrial activities (2%). Likewise, the non-consumptive use of surface water (water with return to the water system) is largely represented by the energy sector, which represents 97.6% of this type of use at the national level.

The intensive use of water by agriculture is by far the driving force in the market for technological products that offer an efficient use of water resources.

According to the National Water Resources Plan, irrigation water efficiency is 35%, indicating a significant waste of water. Moreover, only 12% of crops are irrigated under irrigation systems, while the rest use gravity irrigation. Irrigation infrastructure is undoubtedly one of the main factors explaining low productivity. Out of 55,237 kilometres of canals evaluated, only 15% were covered like a pipe or a canalization.

⁴ Available on line: <https://andina.pe/agencia/noticia-venta-agroquimicos-contrabandeados-alcanza-los-10-millones-peru-822652.aspx>

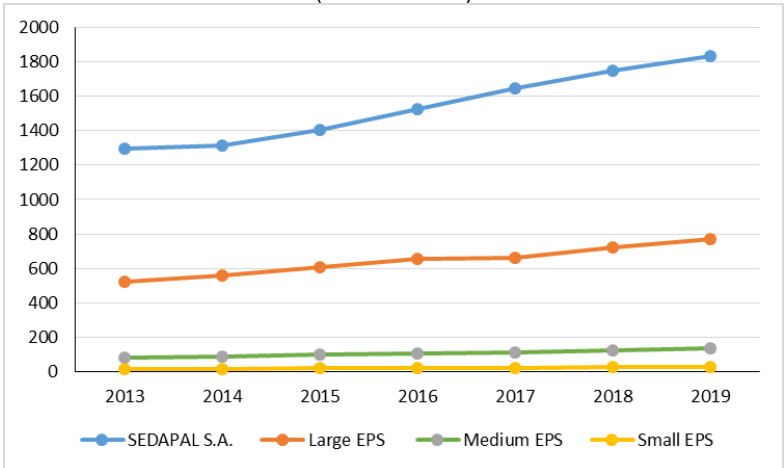
⁵ Hm³ (cubic hectometres) = 1 million cubic meters.

⁶ Source: Peruvian National Water Authority (ANA).

The Food and Agriculture Organization of the United Nations (FAO) points out that food production could increase considerably with economically effective methods for storing water before critical crop stages and applying it during periods of low rainfall⁷.

The sale of drinking water in Peru has increased substantially in recent years (44%). According to SUNASS, SEDAPAL S.A. has billed 1.8 billion soles in 2019 for sanitation services, a 41% increase from 2013; other large companies grew by 46%, and the medium and small companies by 61% and 62% respectively.

Figure 3. Drinking water sales, by size of sanitation service provider, 2013-2019
(Millions soles)



Source: INEI, Yearbook of environmental statistics 2020

A key element in understanding the importance of drinking water quality is the free residual chlorine that remains in the water upon supply to consumers or for use to neutralize new contamination. If the water has traces of chlorine, it means that most of the dangerous organisms have been removed and that the water is safe to drink.

In Peru in 2019, the departments with inadequate levels of residual chlorine in water were Pasco, Amazonas, Apurimac, Puno and Cajamarca.

52.8% of households in urban areas have adequate levels of residual chlorine, but only 3.8% in rural areas. This situation leads to the need to implement technologies for the treatment and purification of water for human consumption.

Finally, with respect to wastewater, conditions have been improving, although there is still much to be done. According to the National Superintendence of Sanitation Services (SUNASS), untreated domestic wastewater discharges (cubic meters) have decreased by 41% between 2013 and 2019. However, at the national level, the situation is diverse. The departments with the highest increase in untreated domestic wastewater were Ica (371%), Tacna (42%) and Apurimac (32%), while the cities that reduced the number of untreated discharges were Moquegua (-91%), Arequipa (-90%), Lambayeque (-83%) and Lima (-63%).

3.4.3. Sustainable mining, protection from natural disasters

Peru has a significant geological potential in the Andean mountains. Mineral wealth has played an important role in growth and economic development. Between 2010 and 2019, most of the metallic products have featured robust growth with copper almost doubling production (+97%),

⁷ The irrigation infrastructure gap in the agricultural and livestock sector, By Marco Vinelli on March 2, 2021. Available on line: www.esan.edu.pe/conexion/actualidad/2021/03/02/la-brecha-de-infraestructura-de-riego-en-el-sector-agropecuario/

molybdenum (+79%), iron (+67%), lead (+18%) and silver (+6%). On the other hand, production declined for tin (-41%), gold (-22%) and zinc (-4%).

Table 2. Mineral Production in Peru 2010-2019
(Thousands)

Metal	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gold (kg fines)	164.1	166.2	161.5	151.5	140.1	146.8	153.0	152.0	140.2	128.4
Silver (kg fines)	3640.5	3418.9	3480.9	3674.3	3768.1	4101.6	4375.3	4418.0	4160.2	3860.3
Zinc (MT)	1470.4	1256.4	1281.3	1351.3	1315.5	1421.2	1337.1	1473.1	1474.4	1404.4
Copper (MT)	1247.2	1235.3	1298.8	1375.6	1377.6	1700.8	2353.9	2445.6	2437.0	2455.4
Lead (MT)	262.0	230.2	249.2	266.5	277.3	315.5	314.4	306.8	289.1	308.1
Iron (MT)	6042.6	7010.9	6684.5	6680.7	7192.6	7320.8	7663.1	8806.5	9533.9	10120.0
Molybdenum (MT)	17.0	19.1	16.8	18.1	17.0	20.2	25.8	28.1	28.0	30.4
Tin (MT)	33.8	28.9	26.1	23.7	23.1	19.5	18.8	17.8	18.6	19.9

Note: MT metric tons

Source: Ministry of Energy and Mines (MINEM), Mining Statistical Bulletin. Available on line: www.gob.pe/institucion/minem/colecciones/6-boletin-estadistico-minero

Peru is among the world's and Latin America's leading producers of various metals (gold, silver, zinc, copper, lead, iron, tin, molybdenum, etc.).

Table 3. Peru's position in world metal production, 2019

Mineral	World Ranking	Latin America Ranking
Gold (g fines)	8	1
Lead (MT)	3	1
Selenium (MT)	10	1
Tin (MT)	4	1
Zinc (MT)	2	1
Cadmium (MT)	9	2
Copper (MT)	2	2
Molybdenum (MT)	4	2
Silver (kg fines)	2	2
Mercury (MT)	5	3

Source: U.S. Geological Survey, 2021, Mineral commodity summaries 2021: U.S. Geological Survey. Available on line: <https://doi.org/10.3133/mcs2021>

In 2019, export of metallic mining products amounted to US\$28.1 billion with copper (49%), followed by gold (30%) and zinc (7%). Mining was the main contributor to exports (60.2%) with metallic minerals (58.9%) and non-metallic minerals (1.3%).

In 2019, investments in mining amounted to US\$5.9 billion.

Figure 4. Value of exports by mineral product, 2019
(Percent)

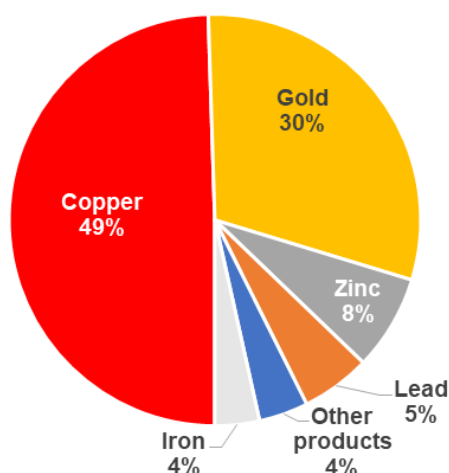
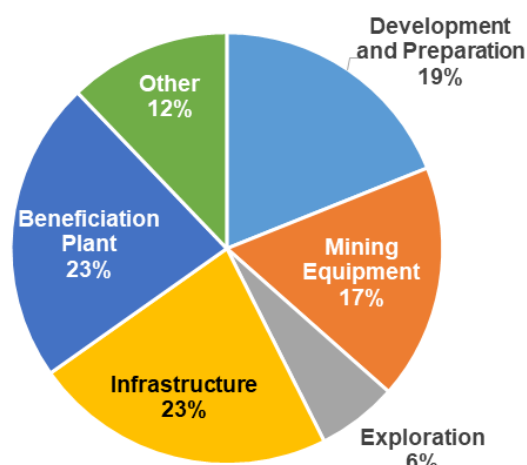


Figure 5. Mining investments by item, 2019
(Percent)



Source: Central Reserve Bank of Peru (BCRP)

While the mining sector makes a significant contribution to the Peruvian economy, it has also a significant impact on the environment leading to serious social conflicts. The pressures that mining activity exerts on the environment include⁸:

- Air, water and soil emissions and contamination
- Mercury contamination
- Environmental impact of informal and illegal activities
- Risks and dangers associated with environmental liabilities
- Socio-environmental conflicts

Peru is located in an area known as the Pacific Ring of Fire, which is characterized by natural disasters, such as seismic movements, in the form of tremors or earthquakes. In addition, there are rainy seasons in most regions, which generate flooding and overflowing of rivers. This increases the risk of possible rockfalls from nearby streams and valleys. For the International Society of Mining and Metallurgy of Peru (SIMIM), it is important that mining companies learn from natural disasters that have occurred, so that they can take the necessary precautions⁹. The importance of having the right technology to avoid or mitigate the damage caused by natural disasters is absolutely necessary in Peru.

3.4.4. Sustainable waste management and recycling

Peru faces a great challenge for solid waste management. In 2016, 7 million tons of municipal solid waste were generated. Out of them, 18.7% were inorganic recyclable waste which can generate employment through businesses treating paper, cardboard, PET plastic, hard plastic, glass, tetra-pak, metals and electrical and electronic waste - WEEE¹⁰.

⁸ Comisión Económica para América Latina y el Caribe (CEPAL)/Organización de Cooperación y Desarrollo Económicos (OCDE), Evaluaciones del desempeño ambiental: Perú, Santiago, 2017.

⁹ Available on line: <https://forpost-sz.ru/es/a/2021-10-05/principales-fenomenos-naturales-que-afectan-la-actividad-minera>

¹⁰ Available on line: www.minam.gob.pe/notas-de-prensa/en-el-peru-solo-se-recicla-el-1-9-del-total-de-residuos-solidos-reaprovechables/

In Lima, capital and country's largest city with almost 10 million inhabitants, around 8,500 tons of waste are generated on a daily basis. This corresponds to 47% of the total produced nationwide and only 4% is recycled¹¹. City with the highest ecological footprint in Peru, Lima exceeds the ecologically permissible parameters.

Municipalities are responsible for the collection, transport and safe final disposal process of solid waste from their residents. Waste management presents great deficit, as about 30% of the rubbish is left on streets and more than 50% does not reach a sanitary landfill, which is a space for safe final disposal.

Source: MINAM

The majority of municipalities have been disposing the district garbage in unauthorized places. Hospital waste has been detected in them and 75% of the municipalities do not have a plan for garbage collection routes and others do not follow their solid waste management plans. What is more, 31% of municipalities do not provide safety equipment to waste collectors¹².

Waste picker associations play a key role in the collection of the valuable part of waste; small-scale waste pickers operate as collectors. The Ministry of Environment seeks to support them in forming larger associations to integrate them into value chains¹³. Larger recyclers help to reintegrate waste into the market as an input into other processes; they are key players since they help making the recycling value chain to work.

According to the Ministry of Environment, in September 2021 there were 64 landfills (7 in Ayacucho, 6 in Lima, 5 in Amazonas), 7 landfills with safety cells (repository designed to contain substances potentially hazardous to human health and the environment)¹⁴, 3 of which are located in Lima¹⁵.

The amount of municipal solid waste disposed in sanitary landfills grew from 3.4 million tonnes in 2014 to 3.7 in 2018, an increase of 9%¹⁶. It must be noted that according to the Ministry of Environment, Arequipa, Madre de Dios, Moquegua and Tacna departments do not have sanitary landfills¹⁷.

Public investment in solid waste treatment projects increased significantly (+180%) between 2012 (114 million soles) and 2018 (320 million soles)¹⁸.

¹¹ Available on line: www.wwf.org.pe/?uNewsID=328101

¹² Available on line: <https://blogposgrado.ucontinental.edu.pe/como-se-manegan-los-residuos-solidos-en-el-peru>

¹³ Available on line: www.minam.gob.pe/gestion-de-residuos-solidos/nueva-ley-de-residuos-solidos/

¹⁴ The difference with a sanitary landfill lies in the drainage system and the number of layers of geomembranes applied of regulated thickness. Safety landfills are usually rectangular cube-shaped and have access for heavy vehicles into the interior. The waste is distributed by being separated by cells according to their chemical compatibility. Available on line: www.towerandtower.com.pe/diferencias-entre-relleno-de-seguridad-y-relleno-sanitario/

¹⁵ Available on line: www.gob.pe/institucion/minam/informes-publicaciones/279709-listado-de-rellenos-sanitarios-a-nivel-nacional

¹⁶ Available on line: <https://sinia.minam.gob.pe/informacion/estadisticas>

¹⁷ Available on line: www.gob.pe/institucion/minam/informes-publicaciones/279709-listado-de-rellenos-sanitarios-a-nivel-nacional

¹⁸ Available on line: <https://sinia.minam.gob.pe/informacion/estadisticas>

Regarding solid waste, 61% of the collectors for Waste from Electrical and Electronic Equipment (WEEE) are located in Lima (there are 157 in Peru), followed by La Libertad with 9 collection centres, Arequipa (8), Piura (6), Ancash and Cusco (5)¹⁹.

In 2017, only 22% of municipalities disposed solid waste in landfills, 79% in dumps, 28% did some recycling and 14% buried it. It must be pointed out that the expenditure for municipal solid waste management in Peru has increased by 1,595% between 2012 (99 million soles) and 2018 (1,671 million soles).

Source: National environmental information system (SINIA)

Over the last years, production and consumption have increased significantly, and therefore, generation of waste²⁰.

The Peruvian government is fully aware of the problems raised by waste management. Commitments were made during the past years to improve the situation to set up an adequate waste management system. It will be facilitated by introducing environmental tools and technologies that are proven to work in developed countries. Peruvian authorities must make important efforts to realize an adequate and sustainable waste management system²¹.

3.4.5. Sustainable mobility and energy efficiency

a) Sustainable mobility

Over the past decades, the significant growth of the Peruvian economy has led to a steady increase in the vehicle fleet from 1.5 million (2007) to 2.9 million (2018). According to the Ministry of Transport and Communications (MTC), in 2018, Lima and Callao had the largest number of vehicles (65.9%) followed by Arequipa (7.3%) and La Libertad (7%).

In 2016, GHG emissions from transport were 21,041.94 GgCO₂eq, representing 10.3% of total emissions nationwide. The main source of emissions is land transportation (91.7%) followed by civil aviation (5.2%). The remaining categories (railroads, maritime and river navigation and others transports) contribute for 3.1%.

The use of fossil fuels by public transportation has a major impact on pollution in Peru; the death of 14 people per 100 000 inhabitants is due to environmental pollution²².

According to the "Air Quality Life Index" of 2019, or AQLI²³ of the Energy Policy Institute of the University of Chicago,

Lima is one of the cities with the worst air quality on the continent reducing life expectancy by 4.7 years. The main cause of pollution is vehicles that consume fossil fuels.

Air Quality Life Index" of the Energy Policy Institute of the University of Chicago.

¹⁹ Available on line: www.gob.pe/institucion/minam/campa%20C3%B1as/133-manejo-de-residuos-de-aparatos-electricos-y-electronicos

²⁰ Available on line: www.mastercardcenter.org/content/dam/mc-cjg/uploads/Inclusive-Waste-Mgmt-in-Peru-March-2018.pdf

²¹ Available on line: <https://repositorio.unican.es/xmlui/bitstream/handle/10902/15350/EnvironmentalPerformanceofPeruvian.pdf?sequence=1&isAllowed=y>

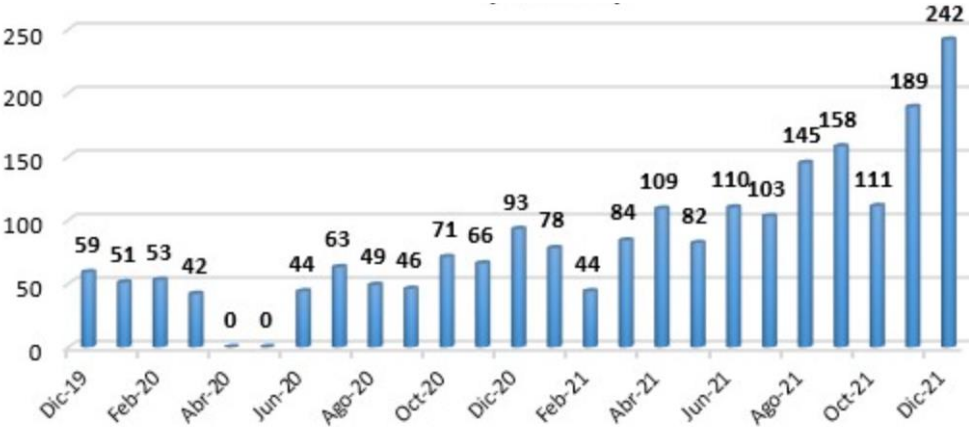
²² Source: Report presented by the WHO in 2016, called "Ambient Air Pollution: A global Assessment of exposure and burden of disease. Available on line: <https://apps.who.int/iris/bitstream/handle/10665/250141/9789241511353-eng.pdf?sequence=1&isAllowed=y>

²³ Available on line: <https://aqli.epic.uchicago.edu/the-index/>

An important regional summit on cleaner and more efficient fuels and vehicles for Latin America was held in Lima in May 2019. Jorge Alvarez (UNDP Environmental Sustainability Officer) stated that "If only 5% of the total fleet of used cab cars were changed, approximately 100,000 tons of CO2 could be reduced, a figure with great impact in a city like Lima where 70% of air pollution comes from the vehicle fleet"²⁴.

Sustainable transport is key to protecting the health of millions of people, as well as being fundamental to climate action. According to the Peruvian Automotive Association²⁵, in 2021, 1,455 eco-friendly vehicles were sold -including hybrids and electric vehicles-, which was 151.7% more than in 2020. The most sold eco-friendly vehicles in 2021 were conventional hybrids or HEV (Hybrid Electric Vehicle; 1,364 units), followed by plug-in hybrids or PHEV (Plug-in Hybrid Electric Vehicle; 58 units) and pure electric or BEV (Battery Electric Vehicle; only 33 units).

Figure 6. Sales of hybrid and electric vehicles Dec. 2019 - Dec 2021
(Units)



Source: Peruvian Automotive Association

The development of the electric car market is a source of new job opportunities with the setting of recharging stations. Presently, there are around 50 electric charging stations in operation in 17 departments, Lima being the city with the largest number (around 30 stations).

3.4.6. Renewable energies²⁶

Peru is traditionally low-carbon electricity generation country due to the importance of hydroelectric power. Electricity production has grown at an annual rate of 7% over the last 21 years (12 170 GWh to 50 817 GWh between 1997 and 2018). The Camisea Project (2004) has contributed to increase electricity production with natural gas. Its share was then reduced by the introduction renewable energy resources (RER) plants, which have reached a 7.2% share in 2018.

²⁴ Available on line: www.pe.undp.org/content/peru/es/home/presscenter/articles/2019/peru-avanza-hacia-un-transporte-mas-limpio.html

²⁵ Available on line: <https://aap.org.pe/sunarp-vehiculos-electricos-elecromovilidad-ventas-record-aap/>

²⁶The information in this section has been sourced from the document "Energías renovables: experiencia y perspectivas en la ruta del Perú hacia la transición energética" (Renewable energies: experience and perspectives on Peru's path towards energy transition) published by the Energy and Mining Investment Supervisory Agency – Osinergmin in 2019. Available on line: www.osinergmin.gob.pe/seccion/centro_documental/Institucional/Estudios_Economicos/Libros/Osinergmin-Energias-Renovables-Experiencia-Perspectivas.pdf

The installed capacity for RER power plants²⁷ has grown at an annual rate of 9.3% from 2008 to 2018 with wind power plants having the highest share (2.9%). In 2018, 11 new RER plants entered into operation, especially in solar and mini-hydroelectric plants, which grew from the preceding year by 197% and 59%, respectively.

Current production of RER power plants

a) Solar production

Peru currently has seven solar power plants with photovoltaic technology located in the regions of Arequipa (2), Moquegua (4) and Tacna (1). The largest (Rubí), started commercial operation in 2018 with an installed capacity of 144.5 MW. The plant has the capacity to generate 440 GWh annually, which is equivalent to the consumption of 350,000 Peruvian households, avoiding the annual emission of more than 209 thousand tons of CO².

The main challenges of the solar energy sector in Peru are to provide information and to increase awareness of private companies, SMEs and energy suppliers on the use of renewable energies.

There is still much to be done in this market. The Swiss know-how and international standards with which SOLEOL works are an important advantage. In order to raise awareness among the population, SOLEOL's communication is done through the media and networks

SOLEOL

b) Mini-hydro production

Peru is a traditionally hydroelectric country with 25 mini-hydro plants with a total installed capacity of 298.86 MW in 2018. Seven of them started operations that year (Renovandes H1, HER I, Angel I, II and III, Carhuac and Zaña), increasing the installed capacity by 110.66 MW. In 2018, mini-hydro plants were concentrated in the departments of Lima, Junín and Cajamarca and their electricity production was 1290.9 GWh in 2018.

RER Potential in Peru

The main renewable energy source is hydroelectric energy (69,445 MW) followed by solar energy (25,000 MW). Peru has a large potential for electricity generation with renewable energies, which has been thus far little exploited.

The Inter-American Development Bank (IDB) expects the total installed capacity to reach 24,976.9 MW by 2040, with a share of RER plants of 4,321 MW (17.3% of the total)²⁸. This would require an investment of approximately US\$8.8 billion, which presents a great challenge for regulation authorities and the regulatory framework.

²⁷ Sum of the energy capacities that can be produced and delivered by each power plant under ideal conditions.

²⁸ Inter-American Development Bank, Elaboration of the new sustainable energy matrix and strategic environmental assessment as planning instruments, Lima.

Table 4. Renewable energy resources: power plant potential

Renewable energy resources	Technical capacity available (MW)	Installed capacity (MW)	Percentage
Total hydraulic	69,445	4,942.40 (*)	7.12%
Wind	20,493	375.46	1.83%
Solar	25,000	285.02	1.14%
Biomass	[450 - 900]	70.90	7.88% (**)
Geothermal	2,859.40	0	0%

Notes. (*) Includes installed capacity of mini-hydro plants.

(**) Estimated value with respect to the upper limit of the usable technical potential.

Sources: Halcrow Group Consortium and OIST (2011), Consorcio Barlovento and Vortex (2016), Minem (2016), Vilcaña (2018), COES (2019) and Elliot (2019). Prepared by: GPAE-Osignermin.

Adapted by: CCSP

a) Solar energy potential

Due to its proximity to the equator, Peru is located in a privileged area for the development of solar energy. In almost the entire Peruvian territory there is excellent energy availability due to its uniformity and abundance throughout the year. According to the World Bank (2019), Arequipa, Moquegua and Tacna departments have the best conditions for photovoltaic and solar thermal technologies. In these three regions, located in the south of the country, the global horizontal irradiation²⁹ belongs to the 6.8 kWh/ m² and 7 kWh/ m² interval, and for normal direct irradiation³⁰ it is in the 7.5 kWh/ m² and 8.5 kWh/ m² interval.

b) Wind energy potential

For the development of both onshore and offshore wind energy, the greatest potential is on the coast, especially in Piura, Lambayeque, La Libertad, Ancash, Ica and Arequipa departments, with average wind speeds of 6 and 12 m/s (at an average wind turbine height of 100 m)³¹. As for the highlands, the wind speed is between 6 and 9 m/s, with Cajamarca being the most outstanding department as it has a similar potential as the coastal ones. On the other hand, the jungle has a lower potential.

3.4.7. Environmental technology services

Technology is a key element in speeding up processes and increasing productivity. In an increasingly globalized world, the need to have faster and more efficient companies is a basic condition to compete in the market to be profitable and sustainable. The sectors mentioned in this chapter require different types of technological solutions to optimize their processes, reduce manual work and errors.

For example, in many industries it is vital to optimize the resources used during the life cycle of a product, i.e. from the time it enters the market until it leaves it. It is important to use efficiently the resources for the manufacture of goods as well as to manage the waste of the industry. Digitalization and automation can make important contributions.

²⁹ The total amount of shortwave radiation received from a point elevated by a horizontal surface to the ground.

³⁰ The component of solar radiation that directly reaches the surface.

³¹ Source: 2016 Wind Atlas of Peru

3.4.8. Environmental technology for textiles

The textile and apparel industry (textiles, garment, leather, and footwear) is the third largest non-extractive activity with 6.4% of manufacturing production in 2019³². It generated around 400,000 direct jobs in 2019.

The need to automate processes in the Peruvian textile industry is becoming more and more a necessity to compete internationally as firms use robots in the different production processes.

According to George R. Schofield Bonello (Industrial engineer with more than 65 years of experience in the manufacturing industry, teacher and union leader) if Peruvian companies do not adopt new technologies, they will not be able to compete³³; robots are not only needed in the textile industry but must work together with human beings and complement tasks.

In textiles, one of the most complex production stage is dying because a wide variety of dyestuffs and auxiliary agents are used.

Although there is no precise data on the use of water by the Peruvian textile industry in its dyeing and finishing operations, it is estimated that around 100-150 liters are used to process 1 kg of textile material³⁴. These facts point to the need to reduce the use of water with more efficient processes.

“The textile sector faces the challenge of being sustainable in the medium and long term, which implies managing its water and carbon footprint, implementing a circular economy, using renewable energies and eco-labels.”

National Society of Industries of Peru

³² Source: Institute of Economic and Social Studies of the National Society of Industries SNI of Peru; available on line: <https://sni.org.pe/wp-content/uploads/2021/03/Presentacion-Textil-y-confecciones-IEES.pdf>

³³ Available on line: <https://aptp Peru.com/la-industria-tiene-que-incorporar-la-automatizacion-por-la-via-de-cobots-y-robots/>

³⁴ Available on line: <https://aptp Peru.com/tenido-disperso-sin-agua/>

4. REGULATORY OVERVIEW

Peru has adopted legislation to promote sustainability in all the areas covered by this report. Particular measures are foreseen for conservation and sustainable use of water, environmental management of mining, overall waste management including plastic packaging, production up to disposal of electric and electronic equipment, transition toward electric mobility with charging stations and Renewable Energy Resources to improve the quality of life of the population and protect the environment.

This chapter is subdivided into the categories analyzed in the study. The main Peruvian regulations applicable to each of them are presented below.

4.1. Sustainable agriculture and counterfeit agrochemicals

Several important decrees and norms apply to agrochemicals and the development of organic production.

Supreme Decree N° 001-2015-MINAGRI (Title III) on the registration of pesticides for agricultural use, specifies the registration procedures, evaluations and technical opinions, details the national registry of pesticides for agricultural use and the confidentiality of information. Title IV details sanitary authorizations. It came into force in 2015³⁵.

Norm N° 128-MINSA/2016/DIGESA is a Sanitary Standard that establishes the maximum residue limits (MRL) of pesticides and agrochemicals for agricultural use. It includes a table with the MRL of pesticides for agricultural use allowed in food intended for human consumption expressed in mg/kg or ppm. This table is not exhaustive since not all plant matrices are covered and MRL are subject to change. It came into force in 2016³⁶.

Supreme Decree N° 011-2021-MIDAGRI established the concerted National Plan for the promotion and development of organic or ecological production - PLANAE 2021-2030. This Plan is intended to achieve a sustainable agriculture and deals with agricultural resources³⁷.

Agribusiness technology must comply with the basic norms and electrical and/or hydraulic standards established by national authorities.

It is important to note that foreign authorizations and certifications, in general, are not recognized in Peru; rather, they are commercial barriers to entry. Clients may or may not request these credentials depending on their requirements.

Javier Bustamante, member of ASAP TRADING AGRO

³⁵ Available on line: <https://busquedas.elperuano.pe/normaslegales/decreto-supremo-que-aprueba-el-reglamento-del-sistema-nacion-decreto-supremo-n-001-2015-minagri-1194460-1/>

³⁶ Available on line: https://cdn.www.gob.pe/uploads/document/file/192686/191407_RM-N1006-2016-MINSA.pdf20180904-20266-f9oqn5.pdf

³⁷ Available on line: <https://busquedas.elperuano.pe/normaslegales/decreto-supremo-que-aprueba-el-plan-nacional-concertado-para-decreto-supremo-n-011-2021-midagri-1966256-10/#:~:text=N%C2%B0%20011%2D2021%2DMIDAGRI,-EL%20PRESIDENTE%20DE&text=La%20implementaci%C3%B3n%20y%20el%20cumplimiento,recursos%20adicionales%20al%20Tesoro%20P%C3%ABlico>

4.2. Sustainable water management

Two laws from 2013 and 2014 apply to water conservation and modernization of sanitation services.

Law N°. 30045 - Law for the Modernization of Sanitation Services aims to establish measures to increase coverage and ensure the quality and sustainability of sanitation services at the national level, promoting development, environmental protection and social inclusion³⁸. It came into force in 2013.

Law N° 30215 - SUNASS Law of Payment Mechanisms for ecosystem services was approved by the Supreme Decree N° 009-2016-MINAN and came into force in 2014. This law promotes the regulation and supervises payment mechanisms for ecosystem services that derive from voluntary agreements which establish conservation actions and sustainable use of water to ensure the permanence of ecosystems³⁹.

4.3. Sustainable mining, protection from natural disasters

A Sector Plan and a Regulation apply to disaster prevention and attention and to different processes of the mining sector.

The Sector Plan for Disaster Prevention and Attention⁴⁰ specifies that all mining activities carried out in Peru are regulated by the General Mining Law (Single Ordered Text, approved by Supreme Decree N° 014-92-EM⁴¹ in force since 1992) and its respective regulations, among which the Mining Procedures, Mining Safety and Hygiene, Environmental Protection in the Mining and Metallurgical Activity and Technical Standards for Mining Expert Operations stand out.

The Regulation for Environmental Protection in Mining (Supreme Decree N° 016-93-EM in force since 1993) deals with the obligations of mining firms and actors, the adequacy and environmental management of the mining industry, environmental impact studies, environmental standards, environmental quality, inspections and sanctions⁴².

4.4. Sustainable waste management and recycling

Since 2012, decrees and laws have been adopted for Waste Electrical and Electronic Equipment, solid waste management and single-use plastic and disposable containers.

In 2012, the National Regulations for the Management and Handling of Waste Electrical and Electronic Equipment (WEEE) (Supreme Decree N°. 001-2012-MINAM) were approved. They establish the rights and obligations for the adequate management and handling of WEEE through different stages: generation, collection, transport, storage, treatment, reuse and final disposal, involving the different actors in responsible management in order to improve living conditions, mitigate the impact on the environment and people's health⁴³.

³⁸ Available on line: <https://sinia.minam.gob.pe/normas/ley-modernizacion-servicios-saneamiento#:~:text=La%20presente%20Ley%20tiene%20por,ambiental%20y%20la%20inclusi%C3%B3n%20social>

³⁹ Available on line: www.minam.gob.pe/wp-content/uploads/2017/04/Ley-N%C2%B0-30215.pdf

⁴⁰ Available on line: <http://sinpad.indeci.gob.pe/UploadPortalSINPAD/Plan%20Sectorial%20Energ%C3%ADa%20y%20Minas.pdf>

⁴¹ Available on line: www.minem.gob.pe/minem/archivos/file/Mineria/LEGISLACION/TUO%20.pdf

⁴² Available on line: www.minem.gob.pe/legislacionM.php?idSector=1&idLegislacion=4755

⁴³ Available on line: www.minam.gob.pe/calidadambiental/wp-content/uploads/sites/22/2013/10/REGLAMENTO-RAEE-X5.pdf

In 2016, Law N°. 27314 established rights, obligations, powers and responsibilities of the society as a whole to ensure a sanitary and environmentally suitable management and handling of solid waste, subject to the principles of minimization, prevention of environmental risks and protection of human health and welfare. It applies to the activities, processes and operations of the management and handling of solid waste, from generation to final disposal, including the different sources of generation of such waste, in the economic, social and household sectors. It also includes the activities of internment and transit through the national territory of solid waste⁴⁴.

In 2018, Law N°. 30884 regulating single-use plastic and disposable containers or packages was adopted with an entry into force foreseen for December 2021⁴⁵.

The purpose of this law is to establish the regulatory framework on single-use plastic, other non-reusable plastics and disposable containers or packages made of expanded polystyrene (tecnopor) for food and beverages for human consumption.

In 2020, the Law on Integrated Solid Waste Management, Legislative Decree N°. 1278, as amended by Legislative Decree N°. 1501, was approved. It proposes to consider solid waste as an input for other industries, promotes the industrialization of recycling and the involvement of various actors⁴⁶. The amendment of some articles of Legislative Decree N°. 1278 refers to the use of discarded material from productive, extractive and service activities in public entities⁴⁷.

The legislation also states that municipalities should take greater action in terms of solid waste management in their jurisdiction including the following⁴⁸:

- Ensure adequate provision of cleaning, collection and transport of waste in their jurisdiction, ensuring adequate final disposal of waste.
- Regulate the management of solid waste services, in accordance with the provisions issued by the provincial municipalities.
- Issue the license to operate municipal and non-municipal waste management infrastructure according to their useful life.
- Sign inter-district agreements for the integration of services under criteria of economy of scale and efficiency of solid waste services.
- Implement programs of source segregation and selective collection of solid waste facilitating the recovery of waste and ensuring technically adequate final disposal.
- Promote the formalization of waste picker associations.

According to Decree N°. 009-2019-MINAM of the Ministry of Environment both the distributor and the marketer of Electrical and Electronic Equipment (WEEE) must have free of charge, collection points for users or generators⁴⁹.

⁴⁴ Available on line: <https://sinia.minam.gob.pe/normas/ley-general-residuos-solidos>

⁴⁵ Available on line: <https://busquedas.elperuano.pe/normaslegales/ley-que-regula-el-plastico-de-un-solo-uso-y-los-recipientes-ley-n-30884-1724734-1/>

⁴⁶ Available on line: www.minam.gob.pe/gestion-de-residuos-solidos/nueva-ley-de-residuos-solidos/

⁴⁷ Available on line: www.minam.gob.pe/gestion-de-residuos-solidos/nueva-ley-de-residuos-solidos/

⁴⁸ Available on line: <https://busquedas.elperuano.pe/normaslegales/decreto-legislativo-que-modifica-el-decreto-legislativo-n-1-decreto-legislativo-n-1501-1866220-2/>

⁴⁹ Available on line: <https://peru21.pe/peru/minam-tiendas-deberan-establecer-puntos-de-acopio-gratuitos-para-residuos-de-aparatos-electronicos-noticia/>

4.5. Sustainable mobility and energy efficiency

Decrees issued in 2018 and 2020 deal with various issues referring to vehicle import, registration and charging facilities.

In 2018, the National Vehicle Regulation was modified through Supreme Decree N°. 019-2018-MTC⁵⁰, which specifies that SUNAT (National Superintendence of Customs and Tax Administration) and SUNARP (National Superintendence of Public Registries) in charge of customs control and vehicle registration respectively, could properly incorporate vehicles and auto parts imported or produced in the country, as appropriate.

Peru aims to have 5% of the total number of light vehicles and buses operating in the country using electric energy by 2030, and to this end the regulation will allow charging infrastructure establishments to access the free electricity market, obtaining competitive prices for their investment.

Source: web portal - www.pv-magazine-latam.com

The aim was to "modify the regulation in view of the important production of electric vehicles worldwide" and "to incorporate definitions that allow a better understanding and comprehension of the administered regarding the new technologies and designs of the vehicles"⁵¹. The most important provisions of this law are described below:

1. Definition of the types of electric vehicles:
 - Electric vehicle (EV or BEV (Battery Electric Vehicle)): vehicle propelled solely by one or more electric motors powered by one or more batteries that are recharged connected to the electric grid.
 - Conventional hybrid vehicle (HE) or non-plug-in hybrid: vehicle powered by a heat engine and one or more electric motors powered by batteries that are recharged by a generator driven by the heat engine and by the regenerative braking system.
 - Plug-in hybrid vehicle (PHEV): vehicle powered by a heat engine and one or more electric motors powered by batteries that are recharged from the electric grid.
 - Electric vehicle with extended range (REEV): vehicle whose batteries are recharged connected to the electric grid and also has a backup heat engine that drives an electric generator to recharge its batteries and increase its autonomy.
2. Concerning the technical requirements for taxi service vehicles, the minimum autonomy must be 200 km or maximum power of not less than 80 kW.
3. Establishment of an implementation schedule for vehicle homologation.

In August 2020, the Ministry of Energy and Mines (MINEM) approved, through Supreme Decree N° 022-2020-EM, the provisions to implement the future charging and energy supply infrastructure for electric mobility. This decree establishes that electric vehicle charging facilities will also operate in liquid fuels refueling stations, Liquefied Petroleum Gas (LPG) gas centers or Natural Gas Vehicle (NGV) sales establishments. It also opens the option of allowing private charging of vehicles for non-commercial purposes, which implies setting up charging in homes, workplaces, multi-family buildings, commercial premises and private parking lots⁵².

⁵⁰ Available on line: https://cdn.www.gob.pe/uploads/document/file/376966/DS_019-2018-MTC.pdf

⁵¹ Available on line: <https://movelatam.org/entrada-de-vehiculos-electricos-al-peru/>

⁵² Available on line: www.pv-magazine-latam.com/2020/08/24/peru-aprueba-una-nueva-normativa-para-la-infraestructura-de-carga-de-vehiculos-

The aim is to strengthen the electric vehicle market, including hybrid models and those with extended autonomy to use energy that does not damage public health and is environmentally friendly, in addition to improving the vehicle fleet and reducing dependence on oil.

4.6. Renewable energies

In 2010, the General Directorate of Energy Efficiency (DGEE) was created by Supreme Decree N° 026-2010-EM⁵³. It is a technical regulatory body responsible for proposing and evaluating energy efficiency policy and non-conventional renewable energies, promoting the formation of a culture of rational and efficient energy use, as well as conducting energy planning. It is also responsible for proposing and issuing, as appropriate, the necessary regulations in the area of its competence.

Supreme Decree N° 064-2010-EM⁵⁴ on Peru's National Energy Policy (PENP) for the long term (2010 - 2040) was also approved in 2010.

Between 2012 and 2013, important measures were taken to strengthen energy security and boost the development of the natural gas industry in all economic activities through the following legislation:

- a) Law N° 29852⁵⁵ which creates the Hydrocarbon Energy Security System and the Energy Social Inclusion Fund (FISE).
- b) Law N° 29970⁵⁶ which strengthens energy security and promotes the development of a petrochemical pole in the south of the country.
- c) Universal Energy Access Plan 2013-2022⁵⁷.
- d) Law N° 28832⁵⁸ to ensure the efficient development of Electricity Generation.

A National Energy Plan covering the 2014-2025⁵⁹ period refers to the above-mentioned Decrees and Laws that promote energy development at a national level.

In 2018, the Legislative Decree N° 1002 on the Promotion of Investment for the Generation of Electricity with the Use of Renewable Energies was approved.

Decree N° 1002 promotes the use of Renewable Energy Resources (RER) in order to improve the quality of life of the population and protect the environment by encouraging investment in electricity production. RER covers energy resources such as biomass, wind, solar, geothermal and tidal.

[electricos/#:~:text=Per%C3%BA%20tiene%20el%20objetivo%20de,precios%20competitivos%20para%20su%20inversi%C3%B3n](#)

⁵³ Available on line: https://cdn.www.gob.pe/uploads/document/file/176519/DS_026_2010_DM.pdf

⁵⁴ Available on line: www.minem.gob.pe/minem/archivos/DS_%20N%C3%82%C2%BA%20064-2010-EM.pdf

⁵⁵ Available on line: www.minem.gob.pe/archivos/legislacion-mfz7aqa22azcqv5u-10-Ley_N%C2%BA_29852_-_Ley_que_crea_el_Sistema_de_Seguridad_Energ%C3%A9tica_en_Hidrocarburos_y_el_Fondo_de_Inclusi%C3%B3n_Social_Energ%C3%A9tica.pdf

⁵⁶ Available on line: <https://cdn.www.gob.pe/uploads/document/file/890658/Ley-29970.pdf>

⁵⁷ Available on line: www.fise.gob.pe/acceso-a-la-energia4.html

⁵⁸ Available on line: www.osinergmin.gob.pe/seccion/centro_documental/PlantillaMarcoLegalBusqueda/Ley%20N%C2%B0%2028832%20-%20LASE.pdf

⁵⁹ Available on line: www.minem.gob.pe/minem/archivos/file/institucional/publicaciones/InformePlanEnerg%C3%ADa2025-%20281114.pdf

In the case of hydraulic energy, the Ministry of Energy and Mines (MINEM) is the competent national authority in charge of promoting projects that use RER when the installed capacity does not exceed 20 MW.

4.7. Environmental technology services

In 2016, the Ministry of Environment and the Nacional Council for Science, Technology and Technological Innovation (CONCYTEC) established the National Program for Environmental Science and Technology 2016-2021. Its objective is to promote a strong and effective science, technology and innovation system to face the country's environmental challenges in the social, productive and ecosystem spheres. This Program focuses on the following main areas⁶⁰:

Table 5. National Program for Environmental Science and Technology

National Program for Environmental Science and Technology			
Climate Change	Environmental Quality	Ecosystems and Natural Resources	Risk Management
<ul style="list-style-type: none"> • Future climate scenarios and their consequences • Adaptation • Mitigation 	<ul style="list-style-type: none"> • Recovery of degraded environments • Environment Quality and Human Health 	<ul style="list-style-type: none"> • Sustainable management of biological resources • Water, Energy and Geological resources 	<ul style="list-style-type: none"> • Natural Disaster Prevention

Source: CONCYTEC
Adapted by: CCSP

In 2015, the Congress adopted Law N° 30309 which promotes Science, Investigation, Technological Development and Technological Innovation. In addition, this law provides tax benefits applicable to expenditures on scientific research projects, technological development and technological innovation⁶¹. The law defines:

- Scientific Research: all basic or applied research, original and planned, whose purpose is to obtain new scientific or technological knowledge.
- Technological Development: application of the results of research or any other type of scientific knowledge, to a particular plan or design for the production of materials, products, methods or processes before the start of their production or commercial use.
- Technological Innovation: interaction between market opportunities and a company's knowledge base and capabilities. It involves the creation, development, use and dissemination of a new product, process or service and significant technological changes in it.⁶²

4.8. Environmental technology for textiles

The following regime applies to fabric production and textile manufacturing:

Since the launch of the “U.S. Cotton Trust Protocol” program (2020) by the International Cotton Council (CCI) to reduce the environmental impact of the textile process from its earliest stage, Peru has set new standards for more sustainable cotton production.

⁶⁰ Available on line: <https://portal.concytec.gob.pe/index.php/programas-nacionales-transversales-de-cti/programa-cintya>
⁶¹ Available on line: http://bt.concytec.gob.pe/images/descargas/ley30309_03_2015.pdf
⁶² Available on line: <http://bt.concytec.gob.pe/index.php/presentacion>

According to the U.S. Cotton Trust Protocol, the members insure that they are sourcing responsibly produced quality fiber and drive continuous improvements in land use, water management and energy efficiency. Ten Peruvian textiles companies have adopted this Protocol generating a reduction of 82% in the water used for production of cotton by May 2021⁶³.

Environmental legislation for the textiles sector

In 2015, Supreme Decree N° 017-2015-PRODUCE⁶⁴ approved the Environmental Management Regulation for the Manufacturing industry. Its purpose is to promote and regulate the environmental management and the sustainable development of natural resources in the manufacturing industry, which includes the textiles sector, and promote environmental protection procedures and measures.

Responsibilities and obligations of textile companies⁶⁵

- a) The owner is responsible for the emissions, noises and waste resulting from its activities.
- b) In case of change of ownership of a project or activity that has already been granted environmental permits, the new ownership must comply with environmental commitments and obligations.
- c) Submit the environmental management instruments, EIA (environmental impact studies), for review by the competent authority.
- d) The owner has to adopt the necessary measures for handling dangerous residues or materials and maintain an inventory of those materials.

4.9. Customs tariffs

Peru has eliminated customs tariffs on 1085 subheadings⁶⁶ implying that 70% of the tariff universe has an ad valorem rate of 0%. It covers almost all capital goods and a large part of inputs (including chemical inputs⁶⁷), chemical products⁶⁸, metallic products, and 98% of machinery and equipment (except those for domestic use: 6% or 11%)⁶⁹.

⁶³ Available on line: <https://elcomercio.pe/economia/peru/industria-textil-mas-de-10-empresas-peruanas-ya-participan-de-programa-para-reducir-el-impacto-ambiental-cotton-usa-noticia/?ref=ecr>

⁶⁴ Available on line: www.senace.gob.pe/wp-content/uploads/2016/10/NAS-4-7-01-DS-017-2015-PRODUCE.pdf

⁶⁵ Available on line: www.senace.gob.pe/wp-content/uploads/2016/10/NAS-4-7-01-DS-017-2015-PRODUCE.pdf

⁶⁶ Effective as of 12.18.2014 according to D.S. 314-2014-EF

⁶⁷ From chapters 28 and 38, except for chapters 27 and 22

⁶⁸ Chapters 04, 12, 13, 14, 17, 19, 21, 23, 25, 26, 27, 29, 31 and 35 of the Customs Tariff (with slight exceptions).

⁶⁹ Available on line: https://ogeiee.produce.gob.pe/images/oeo/docTrab_Textil.pdf

5. OPPORTUNITIES AND CHALLENGES

Peru offers great opportunities for Swiss firms in agronomy with meteo analysis, drones to spray crops, animal feed to reduce greenhouse gas emissions and systems to irrigate dry areas with less water, water treatment and purification for consumption as well as water platforms for vegetable production ; in mining to protect against rockslides; in waste management to recycle tyres and efficient plants to segregate material; in renewable energy, to produce solar energy; in mobility, to improve fuel efficiency and introduce electric vehicles. Business faces significant challenges with complex administrative procedures and a climate of political uncertainty with constant changes of ministers.

5.1. Opportunities

This section matches significant issues in Peru with Swiss clean technologies. These technologies are highly specialized. Some have been developed over more than 10 years by SMEs that grow year after year. Some are still at the start-up level.

These technologies could make substantial contributions to alleviating big problems in Peru. Due to the fact that cleantech is still a new area and that these technologies are usually in the hands of a single firm, the identification of business opportunities makes a link between the issues, the technologies and the firms.

This methodology has been chosen because the number of Swiss firms active in the various cleantech areas discussed in this report is limited and because each technology can briefly be presented with its firm in a FACTSHEETS document joined to this report.

5.1.1. Sustainable agriculture

a) Reduction of Greenhouse gas emissions

In agriculture, the main source of emissions is enteric fermentation from cattle, representing 44.2% of total agricultural emissions (See chapter 3, 3.5.1).

Against this background, **Agolin's** technology, for example by improving the digestive function of ruminants, would allow Peruvian dairy farmers to reduce greenhouse gases, while providing cows with an average 4% higher energy yield from feed (For more information, see FACTSHEETS DOCUMENT: 1.1 Agolin).

b) Better planning with Meteo analysis

The analysis of past and future climate is of vital importance in identifying trends under different scenarios. **Meteotest**⁷⁰'s services may efficiently contribute to planning agricultural activities. Peru has 38 types of climates, according to the Warren Thornthwaite Climate Classification method, distributed throughout the country according to temperature, precipitation and evapotranspiration, geographical position⁷¹. This situation requires, among other things, detailed weather forecasts to manage irrigation.

⁷⁰ Meteotest is a leading company in weather, climate, environment and computer science. It is characterised by a high customer focus, expertise and technical competence. Information available on line: [We are Meteotest | Meteotest](#)

⁷¹ Available on line: <https://sinia.minam.gob.pe/inea/wp-content/uploads/2021/07/CAPITULO-2.pdf>

c) Drones to treat crops

The agricultural sector presents different faces and many producers still use inefficient production means, especially in the highlands. Facing an increasing food demand, the need for modern agriculture is becoming urgent, especially to improve the management of resources, to reduce costs and to increase productivity.

For organic farming, drones can be very useful because they incorporate specific software to know exactly what each crop needs (water, nutrients, pesticides...) saving thereby resources and improving productivity⁷².

PRONATUR use drones to take periodic aerial photographs to see the development and monitor the plantations in order to carry out the correct fertilization and application of pesticides.

Jan Bernhard, CEO Pronatur

Aero41 specialises in crop spraying by drone for farmers and winegrowers. (For more information, see FACTSHEETS DOCUMENT: 1.2 Aero41).

In Peru, there is an attractive market for the Swiss technology in Pisco, where an alcoholic beverage distilled from grapes is produced. In 2021, there were 524 companies in this sector located in Arequipa (58), Ica (237), Lima (199), Moquegua (17), and Tacna (13)⁷³.

d) Agrochemical's counterfeit

Counterfeit agrochemicals will not be effective in controlling the pest and also the chemical load and composition may be inadequate, affecting crops and food safety⁷⁴.

To address this issue, the Swiss biotech **Lonza** and the start-up **Authena** have developed one of the first blockchain-based digital technologies in the industry. This provides not only proof of the authenticity of the chemical products being sold, but also full traceability and transparency throughout the value chain. (For more information, see FACTSHEETS DOCUMENT: 1.3 Authena).

Illegal trade in agrochemicals (counterfeit, adulterated and smuggled) is increasing in Peru.

The sale of smuggled agrochemicals alone amounts to US\$10 million.

Cultivida

5.1.2. Sustainable water management

a) Systems to reduce water use for crop irrigation

In Peru, irrigation water efficiency is 35% indicating a significant waste of water. In this context, this report showcases two Swiss companies that provide clean technology solutions that prioritize water efficiency in agriculture.

⁷² Available on line: www.bbva.com/es/sostenibilidad/drones-los-aliados-de-la-agricultura-de-precision-y-la-industria-alimentaria/

⁷³ Source: National Institute for the Defense of Competition and the Protection of Intellectual Property (INDECOPI) Available on line: <https://ogeiee.produce.gob.pe/index.php/en/shortcode/oe-directorio/directorio-productores-pisco>

⁷⁴ Available on line: <https://andina.pe/agencia/noticia-venta-agroquimicos-contrabandeados-alcanza-los-10-millones-peru-822652.aspx>

First, **Aqua4D** offers precision irrigation, saving resources, and pursuing a more regenerative approach to agriculture. AQUA4D® is a clean technology allowing irrigation water savings (~30% average), restoring salt-saturated soils, and saving resources - sustainably and without any chemicals. The technology is efficient, operational, scalable worldwide, and is fully complementary to existing irrigation infrastructure and e-monitoring. The main advantages of using this technology are: water conservation, reducing agricultural CO2 emissions, saving electricity, restoring salinized lands while saving water, reducing chemical use and fertilizers, producing more with less, while improving quality. **Aqua4D** develops presently important projects in Chile. (For more information, see FACTSHEETS DOCUMENT: 2.1 Aqua4D).

Regarding the current situation of the cleantech market in sustainable water management in Peru, there is a lot of expectation in having new technologies, which generate a lot of opportunity.

However, there is a lack of promotion and education on these products. Training is usually provided one-on-one and through field work with demonstrations and adaptations. Companies are curious about new environmental solutions but often do not choose to innovate their processes.

Javier Bustamante, member of ASAP TRADING AGRO

Second, **CleanGreens** focuses its services on small-scale agriculture. It offers a highly productive system (80 kg per square metre compared to three under conventional methods). Using conventional farming methods, one kilo of lettuce requires 250 litres of water to grow to maturity. Grown on CleanGreens's mobile aeroponics platforms, it needs just seven. Furthermore, 10 to 12 harvest cycles can be grown per year in the facility, compared to just one or two out in the field. (For more information, see FACTSHEETS DOCUMENT: 2.2 CleanGreens).

b) Water treatment and purification for consumption

Water quality is also a big issue in Peru (See Chapter 3, 3.5.2)

In this context, **Trunz Water Systems** provides efficient solutions for drinking water supply in challenging applications (such as remote areas, mobile applications, defence and disaster missions). Moreover, Trunz strongly promotes sharing and transfer of knowledge and therefore supports clients with additional services such as engineering support, installation assistance, technical trainings and after-sales support.

Likewise, its ultrafiltration units remove organic contaminants, viruses, bacteria, cysts, etc. down to a size of 0.02 micron without requiring toxic chemical treatment. Raw water is filtered under pressure through a high-technology hollow fibre membrane. This process remains the natural minerals in the water. (For more information, see FACTSHEETS DOCUMENT: 2.4 Trunz).

c) Water and wastewater treatment plants and piping systems

The wastewater situation in Peru is precarious in most departments. It is therefore necessary to introduce more efficient technologies. **WABAG Water Technology** Ltd. is a large supplier of water and wastewater treatment plants in Switzerland. It specializes in the planning and construction of drinking water/wastewater treatment plants at both a national and international level. Its services include planning, design, execution, commissioning, and customer service – for everything from system components through to complete turnkey plants. (For more information, see FACTSHEETS DOCUMENT: 2.5 WABAG Water Technology).

Fimars is specialized in the design, development and manufacture of metering pumps, polymer preparation systems and emulsions. Its diverse fields of application include water and wastewater treatment, through dissection, flocculation, deodorization, pH control, metal removal, dosing of anionic and cationic polymers, sludge treatment and industrial laundries. (For more information, see FACTSHEETS DOCUMENT: 2.3 Fimars Metering Pumps).

AVEHO provides an innovative and environmentally friendly water dispenser. The company has also other products to offer everyone the opportunity to drink pure water in an economic and ecological way. (For more information, see FACTSHEETS DOCUMENT: 2.6 Aveho).

GF Piping Systems aims to improve water quality to reduce its impact on processes and the environment. GF Piping Systems meets these challenges with a comprehensive offering of piping systems, fittings, valves and the ideal joining technology as well as a selection of components optimally matched to automation technology. (For more information, see FACTSHEETS DOCUMENT: 2.7 Georg Fischer).

5.1.3. Sustainable mining, protection from natural disasters

Mining activity in Peru stands out because its production (gold, silver, zinc, copper, lead, iron, tin, molybdenum, etc.) is among the largest in the world and in Latin America.

Faced with the difficulties of carrying out mining activities, adequate safety measures need to have the most sophisticated mechanisms and tools to avoid or mitigate the damage caused by natural disasters that are frequent in Peru.

Rockslides, landslides, alluviums, floods, avalanches and glacial lakes threaten mines, roads and inhabited areas. **Geobruigg's** wire-mesh nets are used to provide protection from avalanches, from rockfalls, land- and mudslides and avalanches. These meshes are also used for safety applications in mining and tunnel construction. They contribute to mitigate the effects of climate change. (For more information, see FACTSHEETS DOCUMENT: 3.1 Geobruigg).

Geotest offers innovative and pragmatic solutions in geology, natural hazards, geotechnics, geophysics, environment, geoinformatics, maintenance of structures as well as measurements and controls. **Geotest** major clients include mining companies. **Geotest** works closely with Geopravent that proposes sensors to detect a variety of natural hazards and algorithms to process data. In case of an event, alerts are automatically triggered - affected people are informed, and roads and highways are closed within seconds. (For more information, see FACTSHEETS DOCUMENT: 3.2 Geotest).

Wyssen Avalanche Control⁷⁵ offers a reliable and effective remote avalanche control system. By 2020, the company will have installed over 550 Wyssen avalanche towers worldwide.

5.1.4. Sustainable waste management and recycling

a) E-waste and recycling facilities

There is currently a deficient management of electronic waste in Peru. In 2019, Peru generated about 204 kt (kilotons) of electronic waste, and collected, recycled and processed only 2.7 kt (2017 data).

⁷⁵ Wyssen became the market leader in Switzerland, Austria and in Norway. Meanwhile, Wyssen Towers protect ski resorts, roads and mines in Canada, USA and Chile too. Available on line: www.wyssenavalanche.com/en/aboutus/

Facing today's e-waste management challenges, **Sofies**⁷⁶ has developed a unique expertise in the waste electrical and electronic equipment (WEEE), household waste and various industrial waste sectors.

WeeeSwiss also provides technological tools to process e-waste as a pioneer of WEEE (Waste Electrical & Environmental Equipment) Recycling Technology. The company transfers operational and market know-how to customers worldwide. WeeeSwiss designs, builds and operates turnkey WEEE Recycling Plants from small to large scale capacities. Its cutting-edge Swiss made designs provide the highest economic output and yields of reclaimable materials. (For more information, see FACTSHEETS DOCUMENT: 4.2 WeeeSwiss Technology).

SELFRAG does not deal with electronic waste. The company has industrialised a process that uses pulses of high-voltage electricity to break down materials into their component parts. It is a disaggregation process to separate waste. Almost 100% of metals and low-polluting construction waste can be reclaimed from slag. (For more information, see FACTSHEETS DOCUMENT: 4.1 Selfrag).

b) System to recycle tires and waste facility

The Environmental Evaluation and Oversight Agency (OEFA)⁷⁷ determined that in 2018 there were around 1585 informal dumps in Peru.

Regarding the final disposal of end-of-life tires, there is no precise information on the amount of waste, but the number of informal dumps provides an idea of the magnitude of the problem.

The technology of **Tyre Recycling Solutions SA** (TRS) could contribute to alleviate this serious problem. TRS recycles tires into a unique specialty chemical – TyreXol™ rubber powders. TRS commercializes the rubber powders in specific market applications. (For more information, see FACTSHEETS DOCUMENT: 4.3 TRS Tyres Recycling Solutions).

The amount of unprocessed waste is also a business opportunity for several companies. For example, **SID** (Société Industrielle de la Doux⁷⁸) designs, manufactures and erects a wide range of machinery and installations for waste treatment and process technologies. SID is today the leading company for the planning and construction of complete shredding installations.

c) Production of biogaz/methanisation

According to MINAM, in 2016, approximately half of the household waste was composed of organic material: food waste, fruit peels, vegetables, etc. **EREP SA**⁷⁹ provides an efficient solution to this environmental problem; organic household waste and paper difficult to recycle are "biodegradable". This company offers a consultancy specialized in the valorisation of organic waste and effluents, with specific expertise in the application of the methanization process and, more specifically, in the production and utilization of biogas.

⁷⁶ Sofies is headquartered in Geneva and specialized in land resource development and Eco Industrial Parks, organisation sustainability, production and value chains, waste management and alternative energy systems. Information available on line: [About - Sofies \(sofiesgroup.com\)](http://www.sofiesgroup.com)

⁷⁷ Available on line: www.oefa.gob.pe/oefa-identifica-1585-botaderos-informales-nivel-nacional/ocac07/

⁷⁸ This company is established in Saint-Sulpice, canton of Neuchâtel. Information available on line : [SID SA - Société Industrielle de la Doux](http://www.sid-sa.ch)

⁷⁹ Erep is an engineering and consulting firm specialized in the valorization of waste and organic effluents, with a specific expertise in the application of the methanization process and more particularly in the production and use of biogas. Information available on line: <https://erep.rwbgroup.ch/>

EREP also accompanies farmers throughout their recycling projects (management of animal manure and vegetable waste) with the following tasks: state of the art and technological development; information and advice to start a project; technical and economic feasibility studies; assistance in setting up a project; carrying out environmental impact studies, etc.

5.1.5. Sustainable mobility and energy efficiency

a) Electric vehicles, engines, cable cars and gas injection system

The use of fossil fuels by public transportation has a major impact on pollution in Peru.

With respect to substituting polluting energies, **Kyburz** supplies Swiss Post with three-wheeled electric delivery vehicles for its entire fleet. The company also offers a lightweight 600 kg electric sports car as well as fleet management software that companies, cities and municipalities can use to manage their vehicle fleets in an energy-efficient and cost-effective way. (For more information, see FACTSHEETS DOCUMENT: 5.1 Kyburz).

To reduce CO₂ emissions, **CombiFuel** has developed a globally unique and patented retrofit system that can reduce up to 80% of emissions and save up to 40% of fuel costs. (For more information, see FACTSHEETS DOCUMENT: 5.4 CombiFuel).

Another company that also specializes in pollution mitigation is **Ganser CRS**, which has developed the Common Rail injection technology. It is an engine-internal measure to reduce the environmental impact in contrast to exhaust after-treatment systems, which are added components on the engine. (For more information, see FACTSHEETS DOCUMENT: 5.5 Ganser).

Another attractive alternative to address CO₂ emissions is provided by the cable cars of **Doppelmayr/Garaventa**⁸⁰. To date, the Group has built more than 15,100 installations in 96 countries. The company is well equipped to meet the challenges of traditional and new markets with flexibility, know-how and pioneering spirit. Its installations offer comfort and safety – in summer and winter tourism regions as well as in the urban transit sector. Its material transport systems and ropeways for preventive avalanche blasting offer efficiency and performance.

b) E-charging stations

The development of the electric car market requires recharging stations. Presently, there are around 50 electric charging stations in operation in 17 departments, Lima being the city with the largest number (around 30 stations). This is a very important market niche as it offers the opportunity to establish the necessary business foundations to have a solid position in the market, as this sector will continue to grow very rapidly in the coming years.

Green Motion designs and manufactures electric vehicle charging points, from domestic installations to public charging stations. It has also developed a software platform to manage charging networks which features a charge invoicing system. (For more information, see FACTSHEETS DOCUMENT: 5.2 Green motion).

c) Batteries

The market using electricity as a source of energy is growing. Many companies have shown an interest to develop business in Latin America. For instance, **Libattion**, a young Zurich-based company, focuses on integrating innovative cutting-edge technologies into industrial

⁸⁰ Doppelmayr/Garaventa (ropeway engineering) operates production plants as well as sales and service centers in 50 countries worldwide. Information available on line: www.doppelmayr.com

vehicles, electromobility and connectivity to accelerate the global transition to a more sustainable storage technology with new and second life battery products.

Its goals for sustainable business development are: improving circular economy by intelligent production and reuse of lithium batteries; lower cost of service by increased reliability of batteries; lower cost of product by intelligent management of batteries for extended lifecycle and both responsible consumption and production. (For more information, see FACTSHEETS DOCUMENT: 5.3 Libattion).

Another company that also specializes in lithium batteries is **Swiss Battery**⁸¹. Its high-performance battery materials and chemicals help to improve relevant battery metrics of the industry such as energy density and power density. Its products are designed for batteries which are frequently used in the mobility, transportation sector and in stationary high-power applications.

d) Energy management technology

Energy Vault⁸² develops sustainable energy storage solutions that are transforming the world's approach to utility-scale energy storage for grid resiliency. Its Energy Management System software and Gravity-based Energy Storage Technology are intended to help utilities, independent power producers and large industrial energy users to significantly reduce energy costs while maintaining power reliability. Energy Vault uses eco-friendly materials with the ability to integrate waste materials for beneficial re-use.

Smart-me⁸³ connects to the cloud via Wi-Fi and provides real-time data. The energy measuring devices and their output can be controlled using automated cloud commands. The smart-me energy meters deliver real-time data in order to optimally control, easily bill and optimize the energy.

e) Other solutions for energy efficiency

Brugg Cables advises customers world-wide on new cable systems, as well as on expanding or converting their existing systems. It focuses not only on technical excellence but also on achieving efficiency in operation and upkeep. (For more information, see FACTSHEETS DOCUMENT: 5.6 Brugg Cables).

Sensile Technologies is a forerunner on the Internet of Things (IoT) market. It is a leading provider of solutions for remote monitoring of tanks and meters for the oil & gas industry. Sensile offers optimized logistics and optimized purchases of fuel, gasoline, LPG, and lubricants. It has more than 100,000 systems installed on tanks in over 70 countries. (For more information, see FACTSHEETS DOCUMENT: 5.7 Sensile).

Bathan specializes in ceramic lubricants which reduce wear and minimize downtime. Engines and gears have lower power losses. BATHAN ceramic greases guarantee smooth operation with extended lubrication intervals and ensure sustainability by reducing the quantities used. Bathan has been advising well-known companies worldwide for the use of high-performance lubricating greases and additives, assisting with maintenance planning and, taking care of the

⁸¹ Swiss Battery® is a new battery manufacturing company located in the northwest of Switzerland developing a green battery technology. Information available on line: www.swissbattery.com/about-swiss-battery-2021-beyond

⁸² Energy Vault develops sustainable energy storage solutions that are transforming the world's approach to utility-scale energy storage for grid resiliency. Available on line: <https://www.energyvault.com/>

⁸³ Smart-me delivers technology for monitoring, controlling, billing and optimising energy. Smart-me energy metering devices combine with cloud platform functions to form a comprehensive energy management system. Available on line: <https://web.smart-me.com/en/about-us-2/>

plant maintenance independent of manufacturer and in original equipment manufacturer (OEM) quality. (For more information, see FACTSHEETS DOCUMENT: 5.8 Bathan).

5.1.6. Renewable energies

The importance of renewable energies has been growing very rapidly in Peru during the last decade. The technology and the expertise of several Swiss companies could respond to very interesting business opportunities.

a) Solar panels

Almost the entire Peruvian territory offers excellent conditions for solar energy. The industry has grown rapidly with big projects.

Soleol is a leader in Switzerland in the realization and operation of photovoltaic solar installations. The services of SOLEOL are aimed at private and industrial customers, farmers, but also at public authorities and all the actors of the real estate sector (architects, management companies, general contractors). SOLEOL has also a subsidiary in Peru with 17 employees and has realized important projects. (For more information, see Chapter 8 and FACTSHEETS DOCUMENT: 6.1 Soleol).

PRONATUR has been using solar panels for more than 30 years to pump water from the subsoil. Its systems do not have energy accumulators; instead, the pumps are designed to operate only during the day.

Jan Bernhard, CEO Pronatur

CleanFizz technology pushes up the dust and sand and moves them off the surface of solar panels. The operation is monitored by built-in sensors which measure the luminosity, humidity, temperature of the surface and other key parameters. Cleaning is fully automatic and triggered by the integrated sensors and artificial intelligence (AI) controllers any time of the day, thus eliminating the need for human intervention. (For more information, see FACTSHEETS DOCUMENT: 6.2 CleanFizz).

It is also possible to install mobile solar panels. **Dhp Technology** has developed a support structure that uses cables to enable the photovoltaic modules to fold out over built surfaces and fold up again when required. This makes it possible for large photovoltaic solar power systems deployed over wastewater treatment tanks to generate maximum outputs ranging from 150 to several thousand kilowatts and then to be safely stowed away whenever operational imperatives or bad weather dictate. The idea of installing photovoltaic modules over the treatment tanks of a wastewater treatment plan is based on the fact that they offer vast surface areas that can be used to generate solar power. The electricity produced can immediately be used locally. (For more information, see FACTSHEETS DOCUMENT: 6.3 Dhp Technology).

b) Contact systems

Studer Innotec develops and manufactures inverters, inverter/chargers and solar controllers. One application is for example a complete solar system combining an inverter with the "solar charge controller" function. Thus, only one device is needed to supply the alternating current and to charge the battery.

Studer Innotec has realized several projects in Peru (For more information, see FACTSHEETS DOCUMENT: 6.4 Studer Innotec).

c) Solar and energy efficiency projects

Peru has a very large potential in renewable energy. In this respect, Switzerland and Peru have signed in 2020 a carbon offset deal. Peru will get finance for carbon sustainable development projects, while Switzerland will get credit for greenhouse gas emissions cuts.

The Swiss firm **Ongresso Energy** has obtained a mandate to identify renewable energy projects in Peru (Firm Energy Program Peru, FEPP). These solar energy and hydropower projects will replace diesel generators in off-grid zones and contribute commercial and industrial off takers with clean energy supply by replacing non-renewable sources.

At this stage, Ongresso Energy works with partners to establish a program for Peru. The calculation models for CO2 emission savings are presently developed by a specialized local partner. In the next phase, the energy projects will be identified with the support of an engineering firm. A tender may take place to raise awareness and interest in the FEPP. For the Swiss payments to take place, the program will have to be approved by the Peruvian and the Swiss government. The investments required will provide numerous opportunities for Swiss suppliers of Cleantech products and services. (For more information, see FACTSHEETS DOCUMENT: 6.5 Ongresso Energy).

5.1.7. Environmental technology services

a) Support for life-cycle projects, digitalization, automation

Aveny GmbH analyses and optimizes the sustainability performance of companies and their products through sustainability consulting (processes, products and services, along the entire value chain); strategy development; environmental management (ISO-compliant); and software (collaborative software to effectively assess the environmental footprint of companies and their products). (For more information, see FACTSHEETS DOCUMENT: 7.1 Aveny).

b) Exploration and validation

Innoveto offers strategic solutions for different types of sectors. It accompanies businesses in the development of innovations. Innoveto has been intensively involved in design thinking and lean start-ups since 2011. (For more information, see FACTSHEETS DOCUMENT: 7.2 Innoveto).

c) Protection solutions and renewable energy

FirstClimate is a service provider of climate protection solutions and renewable energy. It supports private and public sector organizations in achieving their climate and sustainability objectives. Its core competencies cover products and services relating to carbon neutrality, green energy, green investments, and project development. For public sector clients, FirstClimate provides consulting for industry best-practice as well as emissions trading services. (For more information, see FACTSHEETS DOCUMENT: 7.3 FirstClimate).

5.1.8. Environmental technology for textiles

Dyeing of fabrics and yarns is one of the most complex stages in textiles, since a wide variety of dyestuffs and water are used. Including finishing operations, around 100-150 litres of water are used to process 1 kg of textile material.

HeiQ Materials AG has developed the “HeiQ Clean Tech” system, which is used in the dyeing of polyesters. It not only saves time for textile manufacturers, but also reduces their water and

energy consumption by 30% compared to standard processes. HeiQ has supplied the process to customers in countries as far afield as Turkey and China. The innovative technical process earned the company the Environmental Business Award from the Swiss Environmental Foundation in 2019. (For more information, see FACTSHEETS DOCUMENT: 8.1 HEIQ).

We consider that both the buying habit and the consumption habit have changed. The sales channels (online sales) have changed, and on the consumer side, people are looking for sustainable garments for their use.

The group of millennials is concerned, primarily, about the sustainability in their garments, rather than the price or quality of the product. In Peru, they represent 50% of consumption today.

Faced with this demand, we have improved our production processes. For example, 50% of energy comes from our solar park, while 40% of the water is reprocessed with a microfiltration and reverse osmosis plant. We also use nitrogen in the dyeing process – in search of consuming less water – and have a recycling plant to reuse the fabric balances.

Juan José Córdova, General Manager, Textil del Valle

El Comercio, Lima, May 20, 2020

5.2. Challenges to do business in Peru

Peru offers a framework for trade and investment characterized by administrative procedures often somewhat complex. According to the World Bank's 2020 "Doing Business" report⁸⁴, Peru ranks 76th overall. Economic actors face some important challenges in doing business.

- Starting a business is a bureaucratic process (133th rank). It takes around 24 days and eight procedures to set up a business. The heaviest procedures are the deed of incorporation before a notary public and filing it online with the Public Registry (SUNARP), which takes 8 days, and obtaining a technical inspection of building safety (ITSE) and the operating license (15 days). If the shareholders are from abroad, the incorporation process usually takes much more time.
- Peru ranks 121st for paying taxes. It involves eight payments per year and 260 hours. Profit (22.7%) and labour (11%) taxes are the main ones, with corporate tax at 29.5%. An 18% value-added tax (VAT) is added to most goods for sale, particularly imported items.
- Trading across borders is a slow and expensive process (102th rank). The time required for border compliance is 72 hours with a cost of US\$700 and 48 hours with a cost of 80 dollars for documentary compliance.

Macroeconomic soundness is one of Peru's strength with a rigorous monetary and fiscal policy over many years. This has contributed to achieving one of the highest growth rates and lowest inflation in Latin America during the past decade. However, the current political situation, characterized, among other things, by constant changes of ministers, has generated uncertainty for business. This political landscape embodies risks that may discourage investment and business, slowing down the growth of the economy.

⁸⁴ Doing Business 2020 is the 17th in a series of annual studies investigating the regulations that enhance business activity and those that constrain it. Doing Business presents quantitative indicators on business regulations and the protection of property rights that can be compared across 190 economies. Available on line: <https://espanol.doingbusiness.org/content/dam/doingBusiness/country/p/peru/PER.pdf>

In Peru, corruption is a very big issue. The most famous case involves a large Brazilian construction company, which admitted paying bribes in various Latin American countries, including Peru. Peruvian legislation recognizes the corporate criminal liability applicable to bribes, so companies need to maintain open, honest and compliant business practices which are fully transparent with the law.

“Foreign firms are being forced to forego important business opportunities because they refuse to make illicit payments to officials of public institutions”.

6. IMPORTANT MARKET PLAYERS

Through its regulatory power, the government plays an important role for business. Specific ministries are in charge in each area. It is essential to know them as well as their regulations. Regional and local governments also hold some responsibilities for instance for water management. Academia and civil society are active in particular in waste management and the private sector in waste management and recycling, in electricity, in renewable energy and in textiles.

This chapter presents succinctly the major public entities in charge of developing sustainable policies and implementing legislation. They are key partners to enter the Peruvian market with Cleantech technologies.

In a few areas, the major private companies active in offering specific services are briefly presented. They hold an extensive expertise and knowledge of the market and its regulations.

Peru has a **National Certification Service, SENACE** (www.gob.pe/senace) which evaluates the environmental viability of the most complex investment projects, with technical soundness and promotes effective citizen participation, generating public confidence in the environmental assessment process.

6.1. Sustainable agriculture and counterfeit agrochemicals

Public Sector

- **Ministry of Agrarian Development and Irrigation (MIDAGRI)** strengthens agricultural organizations and promotes their integration under the focus of managing watersheds and production chains. It is the body in charge of creating Agrarian Policies like the Maximum Residue Limits and the registration of pesticides for agricultural use allowed in Peru (www.gob.pe/midagri).

6.2. Sustainable water management

Public Sector

- **Ministry of Housing, Construction and Sanitation (VIVIENDA)** is in charge of sanitation and water management. Its program “Miagua” has been created to facilitate access to water to the less developed areas (www.gob.pe/vivienda).
- **National Superintendency of Sanitation Services (SUNASS)** is a public regulatory body that guarantees the provision of sanitation services. SUNASS works with the OECD to guarantee the quality of regulation through effective public policies to improve sanitation services in Perú⁸⁵ (www.sunass.gob.pe).
- **Technical Organization for the Administration of Sanitation Services (OTASS)** is an organization attached to the Ministry of Housing, Construction and Sanitation that contribute to improving the quality of sanitation services and the sustainability of providers. It also provides technical and financial assistance to companies regarding

⁸⁵ Available on line: www.sunass.gob.pe/lima/sunass-implementara-lineamientos-de-la-ocde-para-mejorar-servicios-de-agua-y-saneamiento-en-el-peru/

sanitation services in urban areas⁸⁶. OTASS regulates the sustainable water management of companies providing these services (www.gob.pe/otass).

- **Lima Potable Water and Sewerage Service (SEDAPAL)** is a Peruvian State Company created in 1981, which provide drinking water and sanitation services to the urban sector of Lima and the drinking water supply of Lima and Callao. It guarantees the quality and continuity of 24 hours of the sanitation services it provides. For the purpose of this document, SEDAPAL would regulate the sustainable water management of the Swiss companies (www.sedapal.com.pe).

6.3. Sustainable mining, protection from natural disasters

Public Sector

- **Ministry of Energy and Mines (MINEM)** promotes the preservation of the environment by energy and mining companies as well as encourage the harmonious relations between companies in the sector, consumers and society. Also, in work with the INDECI create the regulation in mining safety and hygiene, environmental protection in the mining and metallurgical activity (www.gob.pe/minem).
- **Geological, Mining and Metallurgic Institute, (INGEMMET)** is a specialized technical public organization attached to the Ministry of Energy and Mines, whose work is the investigation of basic geology, subsoil resources, geological risk and the geo-environment, as well as, conducting the ordinary mining procedure that means the INGEMMET its responsible of granting mining concessions in the country. For the purposes of this document, the INGEMMET has important information on operation processes (www.gob.pe/ingemmet).
- **National Institute of Civil Defense, (INDECI)** is a public organization attached to the Ministry of Defense whose work is to ensure an optimal response from society in the event of natural disasters, supervising the attention of the people affected by them and for the purpose of this research it coordinates with MINEM, to attend the emergency, create preventive plans for possible disasters and can provide relevant information on the security situation in the different risk zones of the country (www.gob.pe/indeci).

6.4. Sustainable waste management and recycling

The “Residuos Electrónicos América Latina-PREAL” (e-waste Latin America-PREAL) project considers the following main actors in the sector⁸⁷:

Public Sector

Several ministries are active in waste management.

- The major one is the **Ministry of the Environment (MINAM) - General Directorate of Solid Waste Management** in charge of coordinating, promoting, advising and agreeing with the sectorial, regional and local governments the implementation of regulations regarding the management of solid waste, within the scope of its competence. (www.minam.gob.pe/gestion-de-residuos-solidos).
- Other ministries include the **Ministry of Energy and Mines (MINEM) - General Directorate of Electricity Environmental Affairs** (www.gob.pe/7787-ministerio-de-

⁸⁶ Available on line: www.gob.pe/institucion/otass/informes-publicaciones/1095909-que-es-el-otass

⁸⁷ Available on line: <https://residuoselectronicosal.org/peru/#1574975087439-6ac6306c-32b6>

[energia-y-minas-direccion-general-de-asuntos-ambientales-de-electricidad](#)), the **Ministry of Energy and Mines (MINEM) - General Directorate of Energy Efficiency** (www.minem.gob.pe/detalle.php?idSector=12&idTitular=3011&idMenu=sub3001&idCateg=716), the **Ministry of Health (MINSA) - General Directorate of Environmental Health and Food Safety**. (www.digesa.minsa.gob.pe), the **Ministry of Production (PRODUCE) - General Directorate of Environmental Affairs of Industry**. (www.produce.gob.pe/index.php/dgaami/dgaami) and the **Environmental Assessment and Control Agency (OEFA)** (www.gob.pe/oeфа) and the **National Environmental Certification Service for Sustainable Investments (SENACE)** (www.senace.gob.pe).

- The companies operating in the solid waste sector must be registered in the Authoritative Registry of Solid Waste Operating Companies (Registro Autoritativo de Empresas Operadoras de Residuos Sólidos), which is administered by the Ministry of Environment⁸⁸. 119 Solid Waste Service Providers (EPS-RS) can be found in Peru, being Lima the department with the biggest number (56), followed by Arequipa (9), the Constitutional Province of Callao (8), Ucayali (8), Piura (7) and La Libertad (6). These companies are in charge of carrying out the different processes inherent to solid waste management, from the initial selection process to the disposal or neutralization process⁸⁹.

Private Sector

- **RAEE Perú** is an instrument for communication and dissemination of information on the WEEE value chain at the metropolitan and national levels (www.raee-peru.pe).
- **San Antonio Recycling S.A. (SAR)** is a solid waste trading and service provider located in San Juan de Lurigancho, Lima. It is dedicated to close the environmental cycle of management and handling of WEEE (www.sar.pe).
- **COMIMTEL** performs the recovery and final disposal of solid waste and waste electrical and electronic equipment (WEEE). It seeks to guarantee the traceability of its services, complying with current regulations, generating environmental awareness, reducing risks, and promoting corporate social responsibility (www.comimtel.com).
- **Compañía Química Industrial del Pacífico SA (COIPSA)** develops recycling activities specializing in WEEE. It is committed to the preservation of the environment, dedicated to prevent electronic waste from ending up in landfills or informal landfills, recycling this waste in a safe, socially ethical and responsible processes (<https://perurecicla.net/>).
- Other major players include **ALMI** (www.eco-almi.com), **Peruvian Association of Actors for Waste Management (ASPAGER)**. (<https://aspager.org.pe>), **RECOLEC** (<https://recolec.com.pe>) and **RLG** (<http://latam.rlgamericas.com>).

Academia / Civil Society

The academy seeks to conduct research that provides solutions to real problems and therefore plays a very important role in the development and implementation of environmental policies. Civil society, on the other hand, applies the policies implemented on a day-to-day basis.

⁸⁸ Available on line: www.gob.pe/institucion/minam/informes-publicaciones/274465-listado-de-empresas-operadoras-de-residuos-solidos-autorizadas-por-el-minam

⁸⁹ Available on line: <https://ecoduo.org/>

- **Swiss Cooperation in Peru.** The Swiss Agency for Development and Cooperation (SDC) and the State Secretariat for Economic Affairs (SECO) have developed various programs for waste management and the preservation and sustainable use of natural resources (www.cooperacionsuiza.pe).
- **Promotion of Sustainable Development (IPES).** It is a private development organization active in Urban Environmental Management (Integrated Solid Waste Management, WEEE Management, Environmental Education, Water and Sanitation Management); Territorial Economic Management (Urban Agriculture, Competitive Markets); Transversal Axes (Gender Equity, Capacity Building, Knowledge Management) (www.ipes.org).

6.5. Sustainable mobility and energy efficiency

Public Sector

- **Ministry of Transport and Communications (MTC)** has assumed the commitment to promote the use of clean energy sources for transport carried out through motor vehicles (www.gob.pe/mtc).
- **Ministry of Energy and Mines (MINEM)** creates the provisions to implement the future charging and energy supply infrastructure for electric mobility. One of its objectives is to promote the preservation of the environment by energy and mining companies (www.gob.pe/minem).
- **Urban Transport Authority for Lima and Callao (ATU)** is preparing a proposal Law to Promote Electromobility to encourage the use of vehicles and the use of clean energies in the country⁹⁰ (www.gob.pe/atu).

6.6. Renewable energies

Public Sector

- **Ministry of Energy and Mines (MINEM)** seeks to promote the preservation of the environment by promoting energy sources as well as encourage the harmonious relations between companies in the sector, consumers and society (www.gob.pe/minem).
- **Energy Social Inclusion Fund (FISE)** aims at bringing less polluting energy to the most vulnerable populations in the country. One of its objectives is to promote access to LPG through social compensation. This fund works as an initiative to promote the use of renewable energies and provide access of the use of gas to the less favoured sectors (www.fise.gob.pe).

Private Sector

- **Luz del Sur** is a private electricity distribution company serving more than one million customers in the southeastern area of Lima, capital of Peru. It is one of the main electricity distributors in Latin America. (www.luzdelsur.com.pe/es).

⁹⁰ Available on line: <https://gestion.pe/peru/atu-planteara-propuesta-para-incentivar-uso-de-vehiculos-electricos-en-lima-y-callao-ley-de-fomento-de-la-electromovilidad-nndc-noticia/?ref=gesr>

- **Enel Perú** Enel Group is a leader in electricity distribution and generation. It operates in renewable energies through Enel Green Power, with a projected investment of almost US\$400 million. It has been awarded three mega projects for 332 MW tendered in Wind 132 MW, Photovoltaic 180 MWp, and Hydroelectric 20 MW (www.enel.pe).

Civil Society

- **National Society of Mining, Oil and Energy (SNMPE)** is a business organization constituted as a non-profit Civil Association seeking to promote the development of mining, hydrocarbon and electricity activities through the sustainable use of natural resources, contributing to environmental conservation and social development; (www.snmpe.org.pe).

6.7. Environmental technology services

Public Sector

- **Ministry of Environment (MINAM)** is active for the management of solid waste. The MINAM in collaboration with the CONCYTEC presented the Nacional Program for Environmental Science and Technology (CINTYA) 2016-2021⁹¹ (www.gob.pe/minam).

Private Sector

- AGQ Labs is a Chemical Technology Center that, based on analysis laboratories, advanced tests and specialized chemical engineering, offers value solutions and services aimed at the Agronomic, Food, Environmental, Mining and Health and Safety sectors. AGQ Labs makes new investments in advanced environmental monitoring equipment⁹² (<https://agqlabs.pe/conoce-agq-labs/#>).

6.8. Environmental technology for textiles

Public Sector

- **Ministry of Production (PRODUCE) - General Directorate of Environmental Affairs of Industry** seeks to protect the environment and promote the sustainable use of natural resources in the development of industrial manufacturing activities (www.produce.gob.pe/index.php/dgaami/dgaami).
- **National Society of Industries (SNI)**, is a private organization that brings together the Peruvian manufacturing industry, including textiles (<https://sni.org.pe/>).
- **Environmental Assessment and Control Agency (OEFA)** performs direct environmental supervision, enforcement and sanctioning functions, and exercises regulatory and oversight functions for environmental enforcement entities, national, regional or local environmental control. It can provide valuable information on regulation (www.gob.pe/oefa).

Private sector

In 2019, textile and apparel exports and imports amounted to US\$1.4 billion and US\$2 billion respectively.

⁹¹ Available on line: <https://www.minam.gob.pe/notas-de-prensa/minam-y-concytec-presentan-oficialmente-el-programa-nacional-de-ciencia-y-tecnologia-ambiental-cintya-2016-2021/>

⁹² Available on line: <https://agqlabs.pe/2019/12/20/nueva-tecnologia-de-monitoreo-ambiental/>

According to the Peruvian Association of Textile Technicians⁹³, the top 10 exporters of textiles products (cotton fibre not included) in 2019 were: DEVANLAY PERU S.A.C., MICHELL Y CIA S.A., SOUTHERN TEXTILE NETWORK S.A.C., TEXTILES CAMONES S.A., ONFECCIONES TEXTIMAX S A, TEXTILE SOURCING, COMPANY S.A.C, INCA TOPS S.A., INDUSTRIAS NETTALCO S.A., HILANDERIA DE ALGODON PERUANO S.A. and TOPY TOP S A.

⁹³ Available on line: <http://aptp Peru.com/estadisticas-sector-textil-confecciones/>

7. LOGISTICS AND DISTRIBUTION

Logistics in the Cleantech sector is handled differently according to the business models in each specific field. For important projects, environmental studies must be presented to the authorities. Usually, the products must be imported in Peru and foreign firms must provide services related to installation and after-sales service. Depending on the development of the business, the foreign provider may work with a local distributor or establish its own firm under various company structures.

7.1. Environmental Management Instruments⁹⁴

The National Environmental Impact Assessment System (SEIA) is a unique and coordinated system for the identification, prevention, monitoring and early correction of negative environmental impacts. It includes policies, plans and programs at the national, regional and local levels that generate significant environmental implications, as well as public investment projects or mixed capital projects that could cause significant negative environmental impacts.

The owner of a project or investment that is included in the list of investment projects of the SEIA must present the following Environmental Management Instruments (EIA)⁹⁵:

- a) Environmental Impact Statement (DIA)
- b) Semi Detailed Environmental Impact Study (EIA-sd)
- c) Detailed Environmental Impact Study (EIA-d)

The Corrective-Type Environmental Management Instruments that are presented by the owner for the adaptation to environmental regulations are:

- a) Declaration of Environmental Adequacy (DAA)
- b) Adaptation and Environmental Management Program (PAMA)

The Environmental Management Instruments of planning, promotion, follow up and others are:

- a) Strategic Environmental Assessment (EAE)
- b) Cleaner Production Agreement
- c) Environmental Report
- d) Closing Plan and others established in the General Environmental Law

The owners of investment projects or activities in progress of micro or small companies, located in the same geographical area that generate similar impacts may request the competent authority that the management of environmental instruments can be fulfilled by a group of owners.

Investment Projects subject to the National Environmental Impact Assessment System include sectors such as Agriculture; Communications; Housing, Construction and Sanitation; Domestic Trade; Mining Exploration; Solid Waste; Industry; Fishing and Aquaculture; Justice, Education and Culture⁹⁶.

⁹⁴ Available on line: www.minam.gob.pe/seia

⁹⁵ Available on line: <https://cdn.www.gob.pe/uploads/document/file/376994/Listado%20del%20SEIA.pdf>

⁹⁶ Available on line: www.gob.pe/institucion/minam/informes-publicaciones/308471-listado-de-inclusion-de-proyectos-de-inversion-sujetos-al-seia

7.2 Company structures

To distribute its products in Peru, an exporter has several options. He can seek a local distributor, establish one or a full-fledged firm. This section presents the different types of companies in Peru and the requirements for their creation according to the General Law of Companies⁹⁷.

The main aspects of these types are outlined hereunder based on Ernst & Young's Peru's Business and Investment Guide 2021⁹⁸.

a) Joint Stock Companies

These companies require a minimum of two shareholders. The non-domiciled shareholders must designate an attorney in Peru to sign off on the bylaws. The funds must be deposited in a local bank and can be in local or foreign currency for the initial capital contribution (there is no minimum amount required but financial institutions generally require PEN 1,000 - approximately US\$300). The capital stock is represented by shares, which are represented by certificates or book entries in return. The Trade Name must include "Sociedad Anónima" or the abbreviation "S.A." and, Shareholders' liability is limited to the shares they hold and partners are not personally liable for the corporate debts.

b) Closely Held Corporations

These corporations resemble limited liability companies. They must have between two and twenty shareholders. Shares cannot be listed on the Public Stock Exchange Registry (RPMV) of the Peruvian Securities and Exchange Superintendency (SMV). The corporate name must include "Sociedad Anónima Cerrada" or the abbreviation S.A.C. Shareholders' liability is limited to the shares they hold, and partners are not personally liable for the corporate debts.

c) Publicly Held Corporations

Publicly held corporations are intended to be companies with a large number of shareholders (more than 750), for which debts can be converted into shares, an Initial Public Offering has been made, or more than 35% of the capital stock belongs to 175 or more shareholders. These shares must be listed on the Public Stock Exchange Registry (RPMV) of the Peruvian Securities and Exchange Superintendency (SMV). These corporations must include the indication "Sociedad Anónima Abierta" or the abbreviation S.A.A. Shareholders' liability is limited to the shares they hold. Partners are not personally liable for the corporate debts. These companies are subject to the supervision of the Peruvian Securities and Exchange Superintendency (SMV), and the transfer of shares is completely free (no restrictions or limitations are permitted).

d) Limited Liability Companies

These companies are established with a minimum of two and a maximum of twenty partners. This type of company will not issue shares. The incorporation procedures will be the same as those for the other corporations. Its capital is divided into ownership interests, which are accumulative and not divisible. Its name must include "Sociedad Comercial de Responsabilidad Limitada" or the abbreviation "S.R.L." and partners are not personally liable for the corporate obligations.

⁹⁷ Available on line: <https://diariooficial.elperuano.pe/pdf/0004/2-ley-general-de-sociedades-1.pdf> (Accessed on 09/11/21)

⁹⁸ Available on line: www.ey.com/es_pe/entrepreneurship/peru-business-investment-guide (Accessed on 09/11/21)

e) Branches

Branches, either national or foreign, carry out activities in different location than its principal place of business. They do not have their own separate legal standing. The parent company is liable for the branch's obligations. For branches established by foreign corporations, the agreement for the establishment of a branch by the parent company need to be notarized by the Peruvian consulate and certified by the Ministry of Foreign Affairs (MRE) in Peru, or be apostilled in its country of origin for it to be put into the form of a notarially recorded instrument and registered in the Public Records Office. Brand registration requires, among other things, a certificate of good standing of the parent company, duly notarized or apostilled, as applicable. According to the General Law of Companies, branches of foreign companies may be transformed so as to be incorporated in Peru under any corporation type regulated by the General Law of Companies.

8. CASE STUDIES

Cleantech technologies bring significant benefits to society by addressing key challenges associated i.a. with energy, waste, water. This chapter illustrates business in solar energy, in the production and exports of food under internationally-recognized organic certifications using drones and solar energy, in producing agricultural brands using efficient irrigation systems including AQUA4D, in enabling access to energy in remote areas off-grid and in managing waste at a company and at a municipality level.



SOLEOL Energy Systems is specialized in renewable energies for the realization and operation of **photovoltaic solar installations**.

Solar energy is the energy that comes from the light and heat of the sun and can be used by different technologies. The sun is a clean, free and infinite source of energy. Solar energy production reduces **gas emissions** that increase global warming. It is a **clean** and **green energy** and **cost effective**. Solar panels that capture solar energy are made of reliable and durable materials, require very little maintenance. They encompass high technology, aesthetic systems and innovative accessories.

SOLEOL provides the following products and solutions:

Photovoltaic installation: Photovoltaic solar collectors are assemblies of solar cells. Solar cells are made of silicon (often bluish in colour) and have the capacity to absorb photons in sunlight. The contact between photons and silicon excites electrons, which travels through the cell and thus creates electricity!

When your solar panels (photovoltaic panels) are exposed to sunlight, they produce electricity. The electrical current is transported via electrical cables to the inverter which adapts the current into the norm of 230V.



Our suppliers produce their own photovoltaic cells with the latest technologies. The uniform blue and anti-reflective solar panel allows for a greater absorption of light in all weather conditions. Thanks to its surface structure BSF (Black Surface Field), solar cells optimally transform sunlight into electricity.

This type of panel is most commonly used in electricity supply systems for detached homes (self-autonomous or not), pumps, telecommunications, as well as for stations connected to the electrical grid.

Hybrid installation: Standard photovoltaic panels produce electricity optimally at a temperature of approximately 20°C and become less effective as they heat up.

The addition of a hydraulic circuit under the photovoltaic panels provide two benefits: on the one hand the circuit allows to cool the photovoltaic panels and maintain a better electrical yield; on the other hand the heat produced by the panels can be used to preheat domestic hot water instead of letting it simply dissipate into the air, thus reducing the cost of heating water.

As such, PVT collectors allow to produce simultaneously electricity and heat with solar panels more homogeneous in appearance and more compact in terms of surface area.



The Swiss firm SOLEOL⁹⁹ has a subsidiary in Peru since 2010 with 17 employees. Soleol's main customers in Peru are companies (B2B), home owners (B2C) and the agricultural sector.

SOLEOL enables to save resources, preserve the environment and produce one's own energy to benefit from cheaper electricity prices and consumers are proud to consume energy that does not pollute. What is more, according to the interview, Soleol's clients believe that having this Swiss technology gives them a high differentiating value compared to competitors in their sectors.

In Peru, renewable energies are on the rise and solar radiation is one of the best in the world.

However, about 10% of the population (3.3mio) do not have access to the electricity grid. Peru is a growing market with a turnover of around \$2 million. With the solar potential, the cost of energy, the care of the environment and, the change of laws in favor of renewable energies, the business volume will grow between 50 and 100% annually in the next 10 years.

It should be noted that the new law on energy generation and distribution would allow the sale of energy of consumers to the electric web system. The law has not yet been enacted and only the Regulation for the Generation of Electricity with Renewable Energies is available¹⁰⁰. This is why SOLEOL products do not require an authorization for being commercialized.

The main challenges of the solar energy sector in Peru are to provide information and to increase awareness of companies, private companies, SMEs and energy suppliers on the use of renewable energies.

There is still much to be done in this market. The Swiss know-how and international standards with which SOLEOL works are an important advantage. In order to raise awareness among the population, SOLEOL's communication is done through the media and networks.

⁹⁹ Information on SOLEOL is available on line: www.soleol.ch/es

¹⁰⁰ Available on line: www.osinergmin.gob.pe/seccion/centro_documental/PlantillaMarcoLegalBusqueda/DS-012-2011-EM.pdf

Soleol Suiza S.A.C.'s photovoltaic installations in Peru¹⁰¹

1. **XIMA HOTELS in Cuzco:** Installation of 280 solar panels with a power of 54kW. This long-established Peruvian hotel chain, which started operations in the department of Puno, opted for a green image and savings on its electricity bill.
2. **AUTONORT TRUJILLO S.A.C. in Trujillo:** Installation of 146 solar panels with a power of 50 kW. Autonort, Toyota's representative in the city of Trujillo is committed to continue offering a better service accompanied by good energy practices, offering a positive change in the environment of Peru.
3. **ANDINO CLUB HOTEL in Huaraz:** Installation of 111 solar panels with a power of 33 kW. Andino Club Hotel, since 2018, offsets its carbon footprint by supporting projects that promote and protect biodiversity in Peru.
4. **TOMONORTE in Trujillo:** Installation of 88 solar panels with a power of 24 kW. Tomonorte is a company with more than 30 years of experience in the service of diagnostic imaging in the north of the country that has aimed to reduce its consumption of public electric energy, replacing it with solar energy.
5. **ROMANO RINCON CRIOLLO S.A.C in Trujillo:** Installation of 84 solar panels with a power of 23 kW. El Romano Criollo is an emblematic restaurant in the city of Trujillo, which was one of the first companies to install solar panels in its facilities.
6. **MANNUCCI DIESEL in Trujillo:** Installation of 46 solar panels with a power of 12 kW. Mannucci Diesel is the first dealership in Trujillo to reduce its carbon footprint through the installation of solar panels.
7. **CHANIS PASTRY in Chiclayo:** Installation of 30 solar panels with an output of 10 kW. The solar panels can be installed on the roof or on elevated structures. Chanis Pastry Shop did not have enough roof surface to install the panels, so Soleol built an elevated surface on which the photovoltaic panels were installed.
8. **ACCOUNTANTS' COLLEGE LA LIBERTAD in Trujillo:** Installation of 32 solar panels with a power of 8 kW. The college of public accountants of La Libertad has taken a step towards sustainability and the use of renewable energy.
9. **ROSATEL in Chiclayo:** Installation of 30 solar panels with a power of 8 kW. Rosatel is part of the Soleol family, having joined the environmental care through photovoltaic installation.
10. **PRIVATE RESIDENCE in Trujillo:** Installation of 16 solar panels with a power of 7 kW. Solar panels are not only for large or small companies but also for households. On this occasion they have been installed in a residence in Moche, Trujillo.
11. **GUERRA SALAS NOTARY in Trujillo:** Installation of 24 solar panels with a power of 7 kW. Solar panels are an excellent saving option for companies that have offices, of which La Notaría Guerra Salas is aware.
12. **CORCUERA NOTARY in Trujillo:** Installation of 24 solar panels with a power of 7 kW. The Corcuera Notary's Office, observing the excellent results of the Guerra Salas Notary's Office, has invested in a photovoltaic installation.

¹⁰¹ Information provided by Soleol's team

13. **ROSATEL in Chimbote:** Installation of 18 solar panels with a power of 5 kW. Rosatel Chimbote wishing to combine creativity plus the use of renewable energies, decided to realize a photovoltaic installation forming the word LOVE as an expression of the attention to detail that defines the brand



ANDINO CLUB HOTEL in Huaraz



ROMANO RINCON CRIOLLO S.A.C in Trujillo



TOMONORTE in Trujillo



ROSATEL in Chimbote



PROMOTORA DE AGRICULTURA NATURAL - PRONATUR SAC¹⁰² is an agricultural producer, trading and exporting company working with cleantech technologies. They promote the development of organic and sustainable agriculture, implementing a comprehensive program with emphasis on ecological sustainability and the identification of producers with their environment. Its operations are located in the northern coast, northern highlands and northeastern jungle of Peru. They include the departments of Piura, Lambayeque, La Libertad, Amazonas, Cajamarca and San Martin.

PRONATUR is involved in agribusiness with its companies Frutosa and Pulpagro and in agriculture with Agricasa, Agrícola and Colibrí. The Group employs 700 full-time people and between 600 and 700 seasonal employees.

PRONATUR exports green coffee beans and fresh fruits (banana, mango, avocado, passion fruit, pomegranate and ginger) as well as twenty exotic products.

Its products have the following certifications which are applied to export markets: 4C (Common Code for the Coffee Community), Bio Suisse (Switzerland), Bird Friendly – Smithsonian, Demeter Certification (Biodinamic agriculture), EU organic (European Union), Fair Trade, FDA Certification (United States), Global G.A.P., GRASP – Global G.A.P., JAS Certification (Japan), Korean Certified Organic (Korea), Naturland Certification (Germany), Rain Forest Alliance, Starbucks Coffee C.A.F.E. Practices, USDA Organic (United States) and, UTZ Certification.

In order to achieve this, PRONATUR produces its own phytosanitary inputs with local plants.

Its customers are mainly located abroad (HORECA - Hotels, Restaurants and Catering and Retail) in Europe, the United States, Japan and Korea. The domestic market is delivered only in small quantities.

Good climatic conditions in Peru allow to produce throughout the year. In addition, Peru has good quality fresh water, compared to other countries, especially in the region.

PRONATUR has been using solar panels for more than 30 years to pump water from the subsoil. Its systems do not have energy accumulators; instead, the pumps are designed to operate only during the day.

In addition, PRONATUR use drones to take periodic aerial photographs to see the development and monitor the plantations in order to carry out the correct fertilization and application of pesticides.

¹⁰²This case study is based on an interview on February 16, 2022 with Mr. Jan Bernhard, CEO. Information on Pronatur is available on line: <https://es.pronatur.com.pe/>

Some PRONATUR web pictures¹⁰³



¹⁰³ Available on line: <https://es.pronatur.com.pe>



ASAP TRADING - AGRO is the Agro division of ASAP TRADING SAC, a Peruvian company established in 2012 that specializes in the commercialization and representation of brands and products. The company provides consulting services in product and market development for companies in different industries (agriculture, automotive, textile - apparel).

Mr. Javier Bustamante, member of ASAP TRADING provided the following information to the Swiss Chamber of Commerce in Peru.

The products of ASAP TRADING - AGRO contribute to the protection of the environment and of resources. In Peru export-oriented modern and competitive agriculture uses efficient irrigation systems. Around 250,000 hectares use drip irrigation¹⁰⁴, which represents only 31% of the total irrigated area on the coast and around 5% of the total agricultural area, despite the fact that technified irrigation was introduced in Peru in the 1970s.

ASAP TRADING has experience with the following technologies:

- AQUA4D - Switzerland, hardware for treatment of saline water and salty soils, development and implementation.
- Bioiberica - Spain, special fertilizers of natural origin and clean recycled fertilizers, development and sales in Peru.
- IkoHydro - Italy, concentrated salt-free fertilizers, low cost in transportation and handling, efficiency; development and sales in Peru.
- Agraquest - USA, biopesticides for pest management in agriculture and livestock, replacement of polluting chemical molecules, development and sales in Central America and the Andean Region.
- RC/KN - USA, reusable washable filters for vehicles, development and sales in Latin America.

The volume of business in Peru is low and growing slowly, considering that there is a relative concern for the environment and good use of irrigation water. The use of technology in agriculture is a long-term issue. ASAP TRADING - AGRO believes strongly in sustainability and focuses on locating opportunities in the short and medium term. Clients seek to save resources and also to preserve the environment.

It is very important for companies in the sector to have a technical team in agronomic analysis, hydraulic, electrical and rural construction design that allows them to make good decisions to optimize processes and resources.

¹⁰⁴ Drip irrigation is a type of localized irrigation that consists of supplying water in the form of drops to the root of each plant, through systems with small drippers

Regarding the current situation of the cleantech market in sustainable water management in Peru, ASAP TRADING - AGRO considers that there is a lot of expectation in having new technologies, which generate a lot of opportunity. However, there is a lack of promotion and education on these products. Training is usually provided one-on-one and through field work with demonstrations and adaptations. Companies are curious about new environmental solutions but often do not choose to innovate their processes.

Agribusiness technology must comply with the basic norms and electrical and/or hydraulic standards established by national authorities. It is important to note that foreign authorizations and certifications, in general, are not recognized in Peru; rather, they are commercial barriers to entry. Clients may or may not request these credentials depending on their requirements.

ASAP TRADING consider that they have no real direct competition. In Peru there is technical capacity for installation but little technical capacity to follow up on the implementation. Peruvian producers still continue to use traditional irrigation practices (e.g., watering) due to the low cost of water, the lack of real awareness of limited water, and technically, auxiliary products for manual application of low cost per unit, but higher cost over time (associated with liquidity), reverse osmosis for the "ease" of eliminating the problem of salts but with a large environmental and energy liability against it. The suppliers of hoses for technical irrigation prefer them to be damaged and replaced by customers before their lifetime expires.

Regarding challenges, ASAP TRADING - AGRO emphasizes on:

- the need for financing for innovation, at a good cost, and in line with crop cycles, with the maturation of the field and its seasonal payment opportunities.
- greater and real environmental awareness: there are areas that run out of water and/or their sources are salinized.

ASAP TRADING AGRO also considers that the companies that offer these technologies must have a good financial support to be able to cover this important market.

Pictures of ASAP TRADING – AGRO

The third picture presents the AQUA4D Swiss system





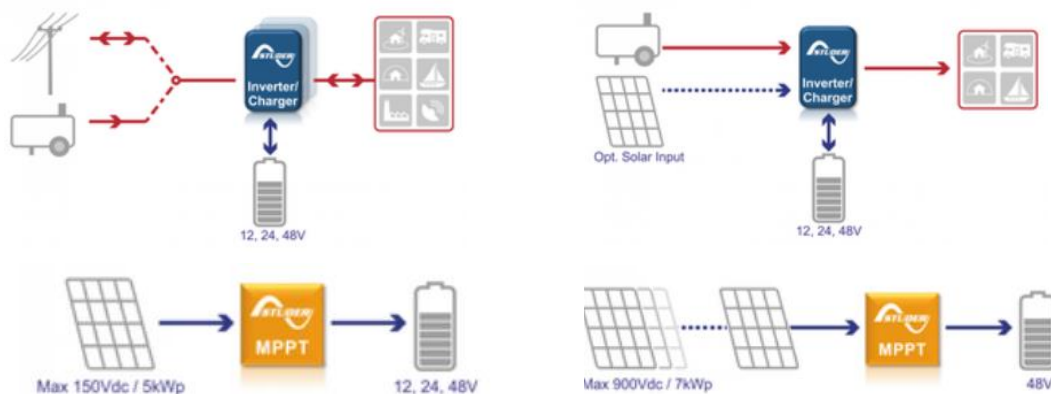
STUDER Innotec S.A.¹⁰⁵ is a Swiss family company located in the Canton of Valais with more than 30 years in the market. It is specialized in energy conversion technologies for the off-grid market. Studer Innotec produce robust devices with higher power outputs of up to 72 kVA and is positioned as leader on the high-end market. Its latest additions to the range, the new generation of smart inverters, offer even higher power and greater connectivity. STUDER has also begun an investment programme to modernise its production lines and the entire manufacturing plant.

STUDER Innotec generates around 15% of its turnover in Switzerland and exports its solutions in regions without a reliable electricity grid – mainly in Africa, Asia and India – thus account for 85% of its turnover. Their inverters have proved their worth in remote areas and are also used in onboard systems and emergency power supplies in hospitals and other industries.

STUDER Innotec has the following products:

Inverter / chargers

Inverter/chargers are multi-functional devices that allow to supply an AC voltage from a battery from an AC source and a transfer function when an AC is available.



MPPT Solar Charge Controllers

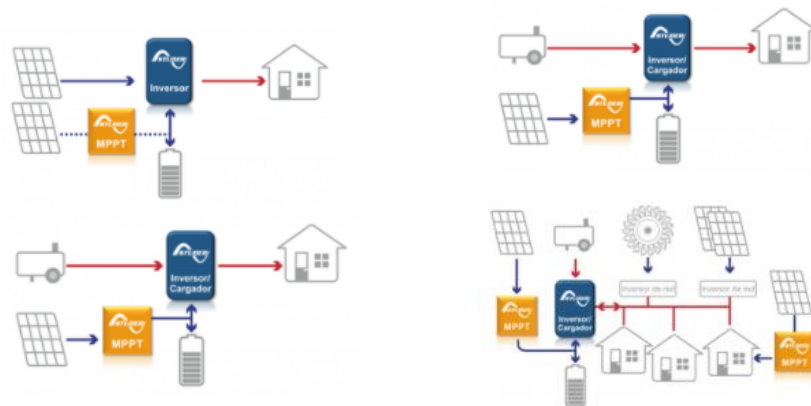
The maximum power available from a solar module is obtained thanks to the MPPT (maximum power point tracking) of these high-quality charge controllers, which offer the highest efficiency and the fastest regulation for similar products on the market. All this, allowing for the longest life possible of the battery.

¹⁰⁵ Available on line: www.studer-innotec.com/en

STUDER Innotec solutions can be applied in:

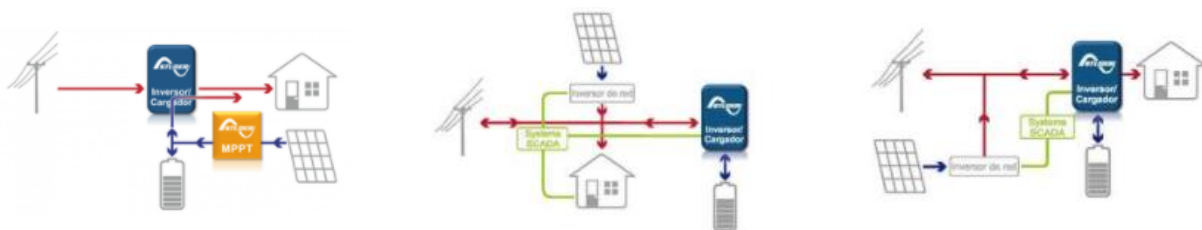
Remote areas

Security and comfort (lighting, heating, household appliances, leisure electronics, telecoms...) can now be provided by autonomous energy systems, when far away from any electrical grid, either by choice or reason. These systems consist firstly of an energy source; normally a genset, a solar generator, a wind turbine or a combination of these; secondly of a battery storage and then thirdly of devices (inverter-charger, battery charger) able to charge the battery from this energy source and to supply users with AC voltage (inverter, inverter-charger).



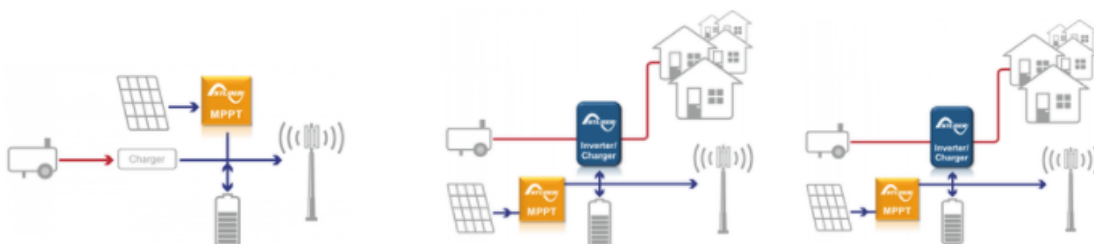
Self-consumption Systems

It is possible to reduce dependence on electrical grid and increase the consumption of energy produced locally by adding battery storage of renewable energy. Various systems meant to optimizing the self-consumption have been developed while integrating Studer Innotec inverters of the Xtender series and are already available on the market.



Telecom applications

Electricity supply is as important as communication for the reliable transmission of information. STUDER Innotec offers a wide range of solutions for off-grid Base Transceiver Stations and Network Operation Centres. With this objective, the hybrid solutions that combine gas or diesel generators and renewable energy are extremely efficient at optimizing system performance. In addition, the synchronization of their inverter/chargers and MPPT solar charge controllers adds significant value to these installations.



Projects in Peru: STUDER Innotec has carried out several projects in Peru, ranging from the petroleum sector to electrification projects in the Peruvian jungle. Some of them are presented thereafter.

- **Oil Company**

An important oil company, through its headquarters in Peru, requested the installation of a Photovoltaic Energy System, with capacity to meet the demand of a stack of transfer pumps that are controlled by a system with which it has total control of the oil plant. The solution was requested to be entirely solar powered, and to provide a constant voltage of 24Vdc. STUDER provided key support with its high-quality charge controllers enabling maximum power point controlling.



- **Empowering Mushuk Lamas**

High in the jungle and inaccessible by motor vehicle, the native community of Mushuk Lamas has yet to be connected to the grid by the Peruvian government.



With community investment and volunteer designers and installers, Twende Solar organized donations of supplies, funds and volunteers to install a 7.2kw off-grid, ground-mount PV system + battery backup that will produce an estimated 9,800 KWH per year. STUDER contributed with power electronics. By producing its own electricity, the community has access to the basic functions of lighting, refrigeration and the internet. Coffee production will be improved and a higher price obtained for the beans with membership in a cooperative.

- **Project Tambos - Peruvian Government**

In Peru there are many remotely situated villages. To get in closer contact with the population there, the Peruvian government decided to set up 27 local "Tambos"¹⁰⁶. They are located in eight regions across Peru, mainly in La Sierra and the Amazon. The program was financed by the Peruvian Ministry of Housing, Construction and Sanitation.



The 27 Tambos are presently covering 100% of their energy demand with the photovoltaic systems. For emergencies they use a generator for backup. Each Tambo daily provides services to the inhabitants in these remote villages, reducing the need to travel to the main cities to do paperwork to fulfill government's obligations. Each system is mounted in an electrical cabinet with its related accessories and electrical protections in accordance with Peruvian regulations. The status of the equipment in the Tambo's photovoltaic system is remotely controlled over the Internet thanks to STUDER's data

¹⁰⁶ A Tambos is a decentralised government unit equipped with lighting and electricity to provide basic services for the inhabitants in surrounding villages. Available on line: www.studer-innotec.com/en/casestudies/peru-project-tambos-peruvian-government-6960

transmission accessories. STUDER products meet the conditions of either very high altitude in the Andean mountains or extreme temperatures and humidity in the Amazon region.

- **Repowering of a Stand-Alone Facility for the Westfalia Children's Village**

The Westfalia Kinderdorf Children's Village is a non-profit charitable institution located in the district of Cieneguilla (Lima) that aims to help children, adolescents and young orphans, victims of family violence, abandoned, with special abilities or in extreme poverty. It currently serves 133 people.



The village is a solar energy user since its inception and has a 20-year power installation. Due to recurring power outages, it is necessary to have a reliable power and control system that would allow remote monitoring to verify its correct operation in solar production and consumption. The customer was familiar with the STUDER brand and the projects carried out by Q-Energy, so they decided to execute the installation with STUDER electronic equipment. STUDER brought to the project its high-quality charge controllers enabling maximum power point controlling, inverters, control system via internet,

- **Photovoltaic Isolated System for Health Center**

Compañía Transportadora del Gas del Perú (TGP) is the company in charge of the design, construction and operation of the pipeline transport system for natural gas and natural gas liquids of the Camisea Gas Project, located in the the Department of Cusco. As part of its social responsibility, TPG attends important needs of the communities located in the area of its operations. TPG contracted Q-Energy Peru for the supply and installation of an isolated photovoltaic system of 680W in 220 Vac to cover the energy needs of the Health Post of the community of Cashiriari,



located in the jungle of the department of Cusco, in Camisea.

The installation of the autonomous energy system allows to meet a load of 2 kWh/day that covers the energy needs of the Health Post. With the lighting and energy needed for the operation of equipment and refrigerators to ensure the cold chain of vaccines, the community will benefit from much better medical service. STUDER brought to the project its high-quality charge controllers enabling maximum power point controlling, inverters and batteries.



San Antonio Recycling S.A. (SAR) is a Peruvian company that was founded in 2009 as a marketer and provider of solid waste treatment services in the district of San Juan de Lurigancho, Lima. SAR is 100% dedicated to closing the cycle of management and handling of waste electrical and electronic equipment (WEEE) through its environmental treatment.

In 2012, with the enactment of the "National Regulation for the Management and Handling of Waste Electrical and Electronic Equipment" (published by D.S. 001-2012/MINAM), the specific regulatory support that outlines the obligations of WEEE operating companies such as San Antonio Recycling, producers of electrical and electronic equipment, generators (households, private companies and public institutions) and other public sector actors such as PRODUCE, MTC and the National Superintendence of State Assets (SBN) was established.

The range of electrical and electronic equipment and the volumes that SAR handles have been growing over the years, initially focused more on computer and related equipment, and now it handles equipment from the 10 categories of electrical and electronic devices.

Currently the company provides comprehensive services whose main purpose is to ensure legal compliance and environmental treatment of WEEE with documented traceability of the entire management chain. The following are some of them:

- Collection and transportation: WEEE is collected by personnel and vehicles of the Company or subcontracted (depending on the volume) duly authorized by the competent municipal and ministerial entities. For this work, the operators have personal protection equipment (PPE) and insurance.
- Treatment: WEEE treatment is an activity that includes the following processes:
 - Dismantling: It consists of disassembling and separating the main components or parts that make up an electrical or electronic device in disuse.
 - Decontamination: This is the most important treatment process and aims to remove parts containing hazardous substances (mercury, cathode ray tubes, nickel, lithium, cadmium, alkaline batteries, etc.) to prevent them from coming into direct contact with people or being released into the environment.
 - Conditioning operations: These are mechanical operations (crushing / pressing / packaging) carried out with the segregated components in order to reduce the volume of the materials for proper storage and transport.
 - Waste valorization: The sorted components of the dismantled equipment can be reused by companies through recycling or to generate energy.
 - Final disposal: Hazardous components that cannot be recovered are stored under appropriate conditions according to their characteristics and then sent to a secure

landfill. Non-hazardous waste that cannot be recovered for recycling is formally disposed of in sanitary landfills.



SAR works with:

- Peruvian Association of Actors for Waste Management (ASPAGER)
Members: Bosch, Panasonic, Carsa, Importaciones Hiraoka, Indurama, Imaco, Supermercados Peruanos (Plaza Vea and Vivanda), Mabe, Epson, Conecta, Whirlpool, Electrolux, Oster.
- Reverse Logistics Group Peru (RLG).
Members: Lenovo, Dell, LG, Ingram Micro, Radiotrans, HP, Celistics, IPNET, Branded Net, Direct TV, Comba Telecomunicaciones del Perú, Intcomex, Oracle Systems, Rockwell.
- Xerox del Perú
- ABB - AT&T
- Maxima International
- Level 3

SAR are representatives in Peru of SIMS RECYCLING INC. and INGRAM MICRO ITAD, transnational companies.



The district of Miraflores, located in the city of Lima, has 99,300 inhabitants (national census, 2017)¹⁰⁷.

The Municipality of Miraflores, seeking to promote a culture of environmental commitment that contributes to the sustainable development of the country, has developed the program of segregation at the source and selective collection "Basura que no es basura" (Garbage that is not garbage), which encourages neighbors to separate and deliver on a weekly basis their recyclable waste such as plastic, cardboard, paper, glass, tetrapack, among others. This program began as a project in 2008 and started operating in 2011. Currently, it recovers more than 60 tons of recyclable solid waste every month¹⁰⁸.

The CCSP has interviewed the Deputy Manager of Environmental Development, Ms. Doris Aspiazu and Katherine Montes from the Environmental Development Suggestion Team of the municipal administration, period 2018 – 2022. They commented that during these years a model of integration of several actions has been carried out so that citizens can adopt the activity of recycling as a habit. Thus, both social networks and web formats were used to train and enrol neighbors in the recycling program in a very short time. They seek to reach the youngest, since there is a greater opportunity for them to apply what they have learned at home.

With regard to the design and development of environmental management systems, Miraflores has acquired underground containers so that people can properly dispose of their usable waste. In addition, alliances have been established with private entities that allow this program to continue to develop and raise awareness among more people. Thus, the Municipality of Miraflores has an agreement with two large associations of recyclers who segregate the waste collected and market it for later recovery.

Miraflores has containers for used vegetable oil and waste electrical and electronic equipment that are located throughout the district in different areas. The inhabitants of the district now recognize what can be placed in these containers, thanks to active awareness-raising by the environmental promoters. Every year the participation and weighing of usable waste grows. Awareness is increasing in the population. This is an indicator that an efficient integrated system is being implemented. Between 2018 and 2021 the percentage of homes and businesses participating in the program increased from 9% to 15% (between 52 and 54 thousand homes and businesses currently). The program is focused on continuing to increase the level of participation of the district's inhabitants based on growing awareness in the population.

¹⁰⁷ Available on line: www.miraflores.gob.pe/la-ciudad/informacion-general

¹⁰⁸ Available on line: www.miraflores.gob.pe/los-servicios/ambiental/programa-basura-que-no-es-basura

The district's solid waste management activities are in line with Goal 3 (Implementation of an integrated municipal solid waste management system) of the "Programa De Incentivos A La Mejora De La Gestión Municipal" (Municipal Management Improvement Incentive Program) of the Ministry of Economy and Finance. The Incentive Program seeks to contribute to improving the effectiveness and efficiency of public spending in municipalities, linking financing to the achievement of results associated with national objectives¹⁰⁹.

The Municipality of Miraflores considers that the technology required in Peru in relation to solid waste should be essentially for sanitary landfills, since there are very few landfills in the country that have state-of-the-art technologies for the amount of solid waste generated. Many of them are not properly disposed of and the waste ends up in landfills or in the sea, affecting the country's flora and fauna.

In this sense, composting techniques could also be carried out, since more than 50% of the waste generated is organic. There are only a small number of companies dedicated to this area. In addition, containers which reduce organic and inorganic waste volume are needed, to be able to transfer them to composting plants or waste operating companies.

In addition, there is waste such as fluorescent lights that are not properly disposed of due to their fragility and the gases they emit when they break. The issue of construction waste is another big problem throughout the country and not much is being done about it.

The different institutions that work on environmental issues in Peru need new technologies to make the best use of waste. It is therefore necessary to make alliances with specialized firms and to attract foreign companies in the country.

One of the biggest challenges is to raise awareness of recycling at the national level, as there is still a large number of people who are uninformed about waste recovery, who do not take environmental conservation into account, or who have difficulties in segregating waste because it seems to them to be a time-consuming task.



¹⁰⁹ Miraflores district is consider a Type C Municipality. Information available on line: www.mef.gob.pe/index.php?option=com_moofaq&view=category&id=904&Itemid=101547&lang=es



Garbage collection schedule in the district of Miraflores:

Miraflores es Único

Programa Municipal de Reciclaje Basura Que No Es Basura

ZONAS

Horarios de recolección

Zonas:

Zona	En domicilios:
1	Jueves (3:00 p.m.)
2	Miércoles (3:00 p.m.)
3	Miércoles y sábado (9:00 a.m.)
4	Martes y viernes (9:00 a.m.)
5	Lunes y jueves (9:00 a.m.)
6	Miércoles y sábado (9:00 a.m.)
7	Lunes (3:00 p.m.)
8	Lunes y jueves (3:00 p.m.)
9	Viernes (3:00 p.m.)
10	Martes (3:00 p.m.)
11	Martes y viernes (9:00 a.m.)
12	Miércoles (3:00 p.m.)
13	Martes y viernes (3:00 p.m.)
14	Lunes y jueves (9:00 a.m.)

Basura que no es basura

9. CONCLUSION / CALL-FOR-ACTION

1. Switzerland has a growing Cleantech sector with a significant innovative capacity.
2. Most firms are fairly young small- and medium-sized enterprises (SMEs) working closely with universities and research centers in niche products and seeking foreign markets for expansion.
3. Peru's needs in Cleantech technologies will grow exponentially over the coming years to meet big challenges associated with climate change, pollution, energy, waste and water.
4. Swiss SMEs are well positioned in all these areas with high-quality, highly-performing and reliable Cleantech products and services.
5. Despite a difficult administrative environment and political instability, Peru should continue to belong to the leading Latin American countries in terms of economic growth with a strong commodity sector and a growing agricultural export sector.
6. Peru's major strength will remain a strong macroeconomic framework with low public deficits, low inflation, balanced foreign accounts, no restrictions on currency convertibility and a fairly stable exchange rate: these are essential for foreign producers' and foreign investors' confidence.
7. Peru's regulatory framework for Cleantech products and services will have to be further developed in several areas to promote the transition toward these technologies.
8. Major efforts will be required for waste management, water, renewable energies and pollution. The introduction of favourable tax regimes and the implementation of efficient resale of unused solar energy should be envisaged.
9. Market entry will continue to require major efforts to overcome procedural barriers, understand local culture and choose the best local partners.
10. The Swiss economic development cooperation in Peru should strengthen its programs addressing Cleantech issues with the participation of Swiss SMEs and the Swiss Chamber of Commerce in Peru should further investigate market conditions entry for the most promising Swiss technologies in close contacts with Swiss SMEs.

Call-for-action

The Swiss Chamber of Commerce in Peru, with 69 years of professional experience and with 150 partners in different business sectors, is an excellent ally in entering the Peruvian market.

With the elaboration of this report, the Chamber of Commerce has developed an exclusive expertise in the Cleantech field for the benefit of Swiss companies.

Swiss firms have a strong reputation and a lot to offer. They should rapidly increase their presence or establish it in Peru, a market for the future!

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