CUSTOMER NAME: OCP

Environmental Site Conditions

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Acronyms & Abbreviations

N.N.E	North Northeast
S.S.W	South Southwest
ANP	National Agency of Ports
RGPH	General Population and Housing Census
WHO	World Health Organization
ONEE	National water and electricity office
OCP	Cheriffian phsophates office

1. Introduction

1.1 Document purpose

The purpose of this document is to provide an initial diagnosis and representative assessment of the receiving environment and environmental conditions at the project site.

The objective of this environmental assessment of the project site conditions is mainly based on the knowledge of the initial state of the environment which is essential to determine the most relevant components that could be affected by the project.

Within the framework of this study, the detailed diagnosis of the biophysical and human environments of the project site and its zone of influence can facilitate the comparison of the conditions of the site before and after the exploitation to determine any significant eventual pollution.

1.2 Project location

The SPH/NSP platforms are implemented as part of the project of the OCP **Centrer Axis Program**, a new Safi port will be launched, 5 Km away from the OCP Safi existing site, it will contain new storages and loading and unloading facilities implemented in OCP's dedicated areas.

The location project as follow:

Figure 1 - NSP- SPH platforms Project location

1.3 Project Overview

In front of the new Safi port, a new chemical platform will be implemented to accommodate the new TSP/Phosphate storage facilities, known as SPH platform.

The phase 1 of the Center Axis Program including NSP & SPH platform will start by the end of 2025 with a capacity of 1 MT P2O5/Year and the increase of this capacity to reach 1.5 MT P2O5/Year will be spread over the year 2026.

As part of this study of the **Environmental Site Conditions** project, we limited ourselves to the NSP and SPH platforms of the Center Axis Program. Various facilities are located at SPH & NSP platforms outlined as under.

- **SPH Platform**

Following systems are installed at SPH platform as follow:

- Phosphoric Acid Storage Tanks
- Raw Water Storage Tank
- Potable Water System
- Coating Oil Tanks
- Wash Water Tank
- IA/PA Systems
- Solid Sulphur Storage and Handling
- TSP Storage and Handling
- Phosphate Storage and Handling

- **NSP Platform**

Following systems are located at NSP platform as follow:

- Phosphoric Acid Flushing Tank
- Coating Oil Tanks
- Solid Sulphur Storage and Handling
- TSP Storage and Handling
- MCP and DCP

For more details refer to:

- **Q80130-SPH-S00-PR-BOD-0001**: Basis of Design –NSP & SPH Platforms
- **Q80130-SPH-S00-PR-SPC-0001:** Process Description- NSP & SPH Platforms

2. Site Conditions Summary

Table 1 -Site Environnemental Conditions Summary

Site conditions		*Data*		*Source*
Climatic conditions	Temperature	Average annual maximum temperature	23,30°C	*Direction de la Météorologie Nationale :* Source -Climate-Data.org Safi for the period 1991-2021
		Average annual minimum temperature	14,51°C	
		Average annual temperature	18,39°C	
		Hottest months (average temperature)	August (23.6°C)	
		Coldest months (average temperature)	January (13,2°C)	
	Rainfall	Maximum annual precipitation	Amounts can reach 40 mm in 30 minutes.	Environmental impact study of the construction of a wastewater treatment plant in the city of Safi, Octobre 2020 *Source -Climate-Data.org Safi for the period 1991-2021*
		Average annual precipitation	325 mm	
	Wind	Wind direction	From the North to northeast, with strong Southwest winds occurring in winter	Environmental impact study of the construction of a wastewater treatment plant in the city of Safi, Octobre 2020 Document basis of design JEC-Q80130-NSP-S04-PR-BOD-0001
		Extreme and normal dynamic pressure	Extreme:153.37daN/m² Normal :87.6daN/m²	
		Extreme wind speed	50 m/s	
Seismic conditions	Seismic zones	Seismic velocity zone	Zone III	Environmental impact study of the construction of a wastewater treatment plant in the city of Safi, Octobre 2020
		Seismic acceleration zone Maximum acceleration	Zone 3 Classified in zone with moderate seismicity (0.16 g)	
Biophysical conditions	Water Resources	Surface water	Oued Oum Er-Rbia. The artificial lake has a volume of 48 million m3 / year	ABH- official site
		Groundwater	The groundwater reserves of the Province of Safi are estimated at 88 Mm3	
Socio-economic conditions	Population	Overall population of the Province of Safi	691,983 (RGPH, 2014)	(RGPH, 2014)
	Economic activities	Agriculture	Yes	Monograph of the Commune INRH/DRH 2015. Environmental impact study of the construction of a wastewater treatment plant in the city of Safi, Octobre 2020
		Fishing	Yes	
		Industry	Yes	
		Artisanal sectors and others	Yes	

3. Site Conditions Description

3.1 Physical Environment

3.1.1 Climatic Conditions

- **Climatology**

The project study area of SPH/NSP platforms is part of the province of Safi. The province of Safi includes three distinct climatic zones: the oceanic zone **(coast)**, the semi-arid zone **(Abda)**, and the arid zone **(Ahmer).**

The latter is characterized by a semi-arid climate dominated by a hot and dry summer (from May to October) and a wet and temperate winter (from November to April). This climate is mitigated by the presence of the Atlas Mountains to the east and the Atlantic Ocean to the west, which considerably reduce the heat of the summer.

The Umbro-thermal diagram below presents the monthly variations of climatic variables (temperature, precipitation) of the city of Safi (Historical Data: 1991 - 2021)[1] .

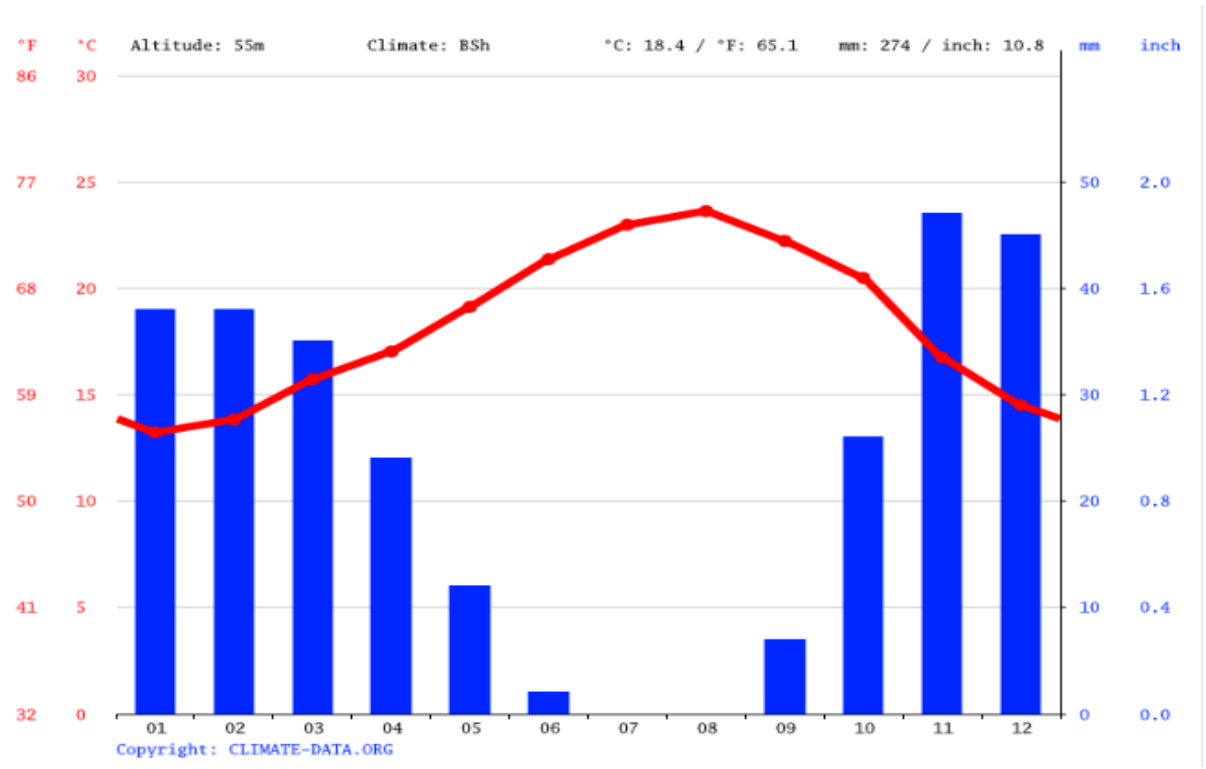


Figure 2 -Umbro-thermal diagram of Safi for the period from Historical Data: 1991 – 2021

[1] **[climate-Data.org]: https://fr.climate-data.org/afrique/maroc/safi/safi-882275/#climate-graph**

The main characteristics of the climate of the city of Safi where we have the project location are the following:

- **Temperature**

Temperatures are moderate in the areas near the sea, and more contrasted in the interior. The temperature parameter presents an intra-annual variability and remains little variable from one year to another.

The table below presents the **Tmax, Tmin,** and **Tmoy** (data from 1991-2021)[2] .

Table 2 -Temperature of SAFI for the period 1991-2021 (Source: Climate-Data.org Safi)

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual average
T° Average °C	13,2	13,8	15,7	17	19,1	21,4	23	23,6	22,2	20,5	16,7	14,5	18,39
T° Minimal °C	9,4	9,9	11,7	13	15	17,3	19	19,7	18,5	16,8	13,1	10,8	14,51
T° Maximal °C	18	18,7	20,7	21,9	24	26,4	28,2	28,9	27,1	25,3	21,3	19,2	23,30

The analysis of these data allows the following conclusions:

- The average annual temperature is around 18.39°C with a maximum of 28.9°C and a minimum of 9.4°C .

- The hottest months are July and August with average temperatures of 23 and 23.6°C respectively.

- The coldest months are January and February with average temperatures of 13.2°C and 13.8°C respectively.

- The temperature is high especially on days when the "Chergui" wind blows (hot desert wind from the East).

Note :

In this study , the following temperatures are utilized for the design of the facility are:

- **Minimum air temperature (95% exceedance) :**0°C
- **Maximum air temperature (99.5% exceedance + 3°C):** 48°C
- **Average Annual Temperature:** 26°C

For more details (refer to the document JEC-Q80130-NSP-S04-PR-BOD-0001 basis of design).

[2] **[climate-Data.org]: https://fr.climate-data.org/afrique/maroc/safi/safi-882275/#climate-graph**

- **Barometric pressure**

The following temperatures are utilized for the design of the facility are:

- **Maximum Barometric pressure:** 1017 mbar
- **Minimum Barometric pressure:** 950 mbar

Note : for more détails refer to the document JEC-Q80130-NSP-S04-PR-BOD-0001 basis of design.

- **Relative air humidity**

The relative humidity of this study area is as follows:

Table 3- Variations of relative humidity for NSP-SPH platforms (SAFI)

Relative Humidity		
Maximum	**Average**	**Minimum**
100%	**75%**	**30%**

- **Rainfall**

In this study , the following rainfall are utilized for the design of the facility based of **(JEC-Q80130-NSP-S04-PR-BOD-0001 basis of design)** are:

- **Average annual rainfall:** 325 mm
- **Maximum rainfall** amounts can reach 40 mm in 30 minutes.

NB: Storm-water drainage system network should be sized according to this occurrence.

As Below is a history of average rainfall data in Safi-city (data from 1991 to 2020)[3]:

Table 4-Safi-Average rainfall (data from 1991-2020)

Month	Quantity (mm)
Jan	**60**
Feb	**30**
Mar	**30**

[3] **https://www.climatsetvoyages.com/climat/maroc/safi**

Apr	25
May	15
Jun	3
Jul	3
Aug	0
Sept	3
Oct	30
Nov	60
Dec	60
Year	325

- **Wind**

The dominant annual wind from the province of SAFI is from the North to northeast, with strong Southwest winds occurring in winter, see below the compass rose:

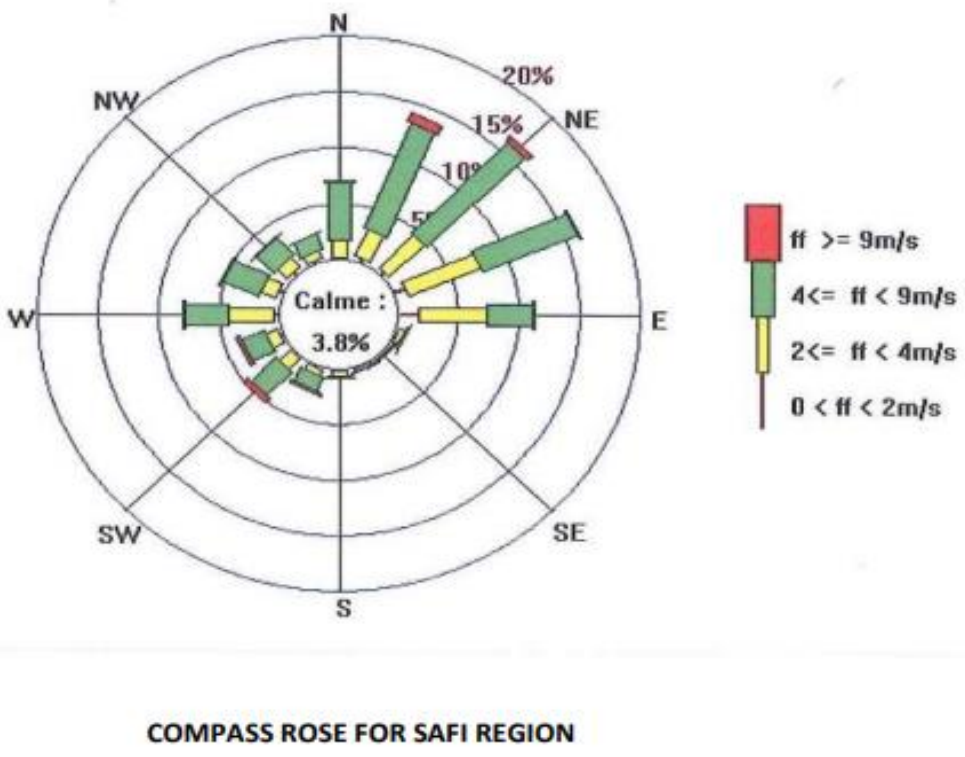


Figure 3 - Wind rose of the Province of Safi

the analysis of this figure as follows:

- The prevailing winds in the Province of Safi are from the North-West to North-East with a frequency of nearly 65%. These winds are very violent during the winter season. Two periods can be considered in the year:
    - **Summer:** The North-East trade winds generally prevail, although they are deflected towards the North-West during the day by the action of the sea breeze.
    - **Winter:** North/North-East winds are always frequent but are often interrupted by South-West to West winds associated with disturbances.
- The extreme wind speed for SAFI is 50 m/s, exposed site, parameters to be considered for wind calculations.
- The extreme dynamic pressure is 153.37daN/m² and the normal one is 87.6daN/m².

Note:

-Design calculations should be based on French Regulation NV65 latest update: Ed. 2009, "French code zone: région III – Site exposé" to consider for SAFI site.

- For more details refer to the document JEC-Q80130-NSP-S04-PR-BOD-0001 basis of design.

- **Geomorphology -Topography**

The territory of the province of Safi is characterized by a relatively flat or slightly undulating topography, whose highest points hardly exceed 500 m altitude. Geologically, the province is divided into three areas:

- Sahel
- Plain
- Hills and mountains of Mouissates

- **Inundation**

The project area is dominated by small watersheds with streams (some very large) converging on the ocean. Others converge into depressed areas forming endoreic lakes. The runoff accumulates in depressions were it infiltrates and evaporates to a large extent.

Since the development of the area of solid land, under the responsibility of the **ANP (National Agency of Ports)**, provides a scheme of protection against flooding of the latter, the project area is then protected against this hazard.

All the complementary investigations of the ground as well as the technical study necessary for the protection of the building site and the works against the risks of flood, are to be undertaken.

- **Tsunami**

The risk related to the phenomenon of tsunami in Morocco is very rare, since it is generated only by earthquakes of very high magnitudes (M>6 on the Richter scale).

In the area of the project NSP -SPH platforms in SAFI, the magnitude of earthquakes does not historically exceed the value of 5.9 on the Richter scale. Therefore, the risk of Tsunami is very low [4].

3.1.2 Seismic Conditions

The aera study of NSP-SPH platforms in Safi is classified in zone III with moderate seismicity (0.16 g), as illustrated in the following map[5]:

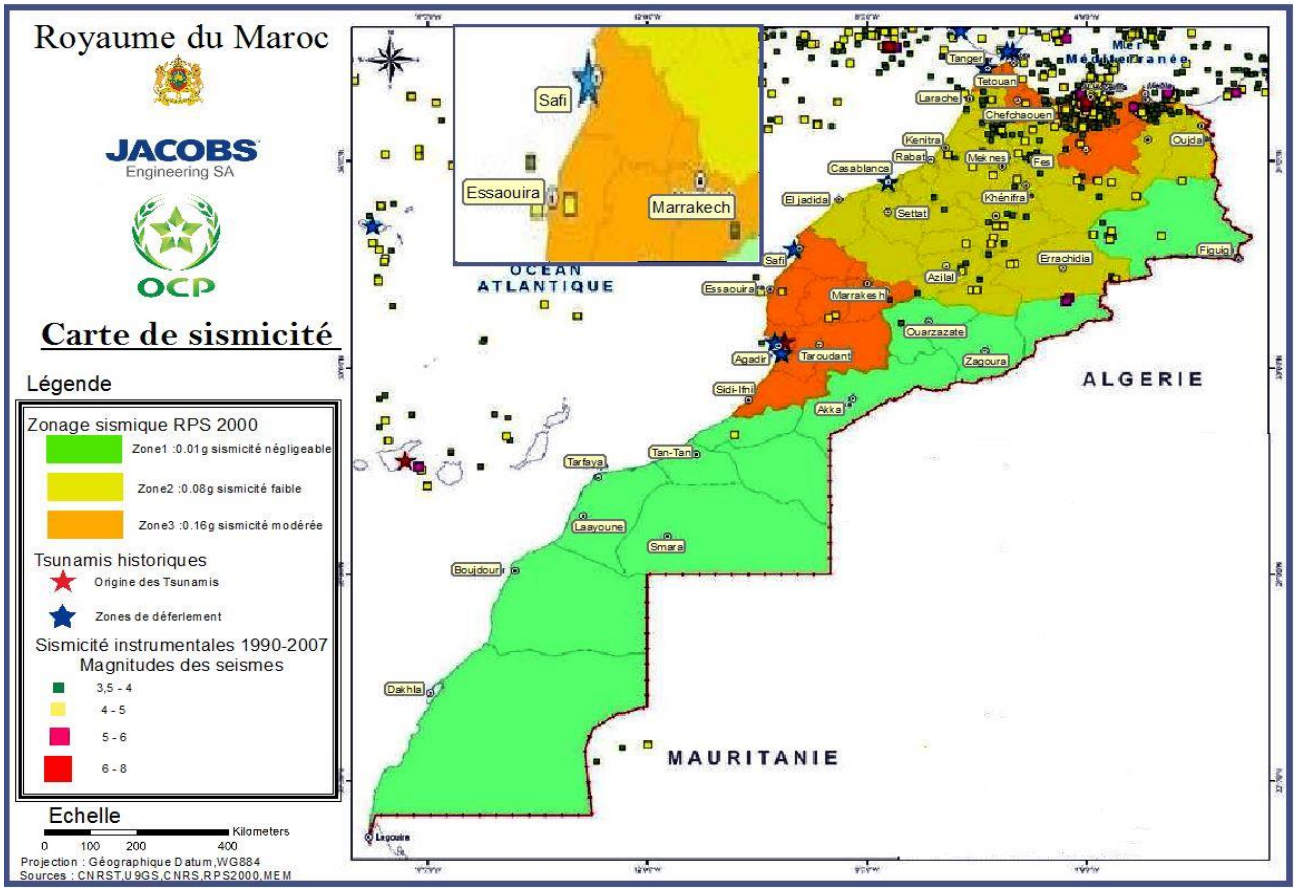


Figure 4- Seismic map of Morocco showing the seismic hazard at the study area (RPS2000,2014)

[4] **Document of OCP Center Axis Program (M'zinda Phosphate Hub Project Site Conditions (Mzinda - Safi)**

[5] **Environmental impact study of the construction of a wastewater treatment plant in the city of Safi, October 2020**

3.2 Biophysical Environment

3.2.1 Air quality

The main sources of pollution affecting the quality of the air in the city of Safi that may affect air quality in the project area are related to:

- Gaseous discharges from the industrial zone located near the southern entrance to the city of Safi, including existing facilities within the OCP site.
- Emissions from the pottery kilns located at the level of the potter's hill and the road Si Issa.
- The dust emitted by the quarries and gypsum factories.
- Olfactory emissions from food processing units (canned food and fish meal) located in the industrial area south of the city of Safi.

Air pollution measurements carried out by the World Health Organization **(WHO)** in Safi set the concentration of small particles in the air at 21 µg/m3, three times lower than the concentration found in the city of Casablanca which is 61 µg/m3. For comparison, the maximum annual threshold tolerated by the WHO is **20 µg/m3** [6]**.**

3.2.2 Soil and land occupation (Pedology)

The study area of this project in the province of Safi is characterized by a diversity of soils. The different types of soils encountered are the following:

- The soils little evolved erosion.
- The soils little evolved of alluvial contribution.
- The soils little evolved colluvial contribution.
- Vertisols.
- Calcimagnesic soils ,Isohumic soils and Soils with iron sesquioxides.

[6] **https://www.libe.ma/Classement-sulfureux-Le-Maroc-parmi-les-pays-les-plus-pollues-par-le-dioxyde-de-soufre_a111046.html, Aout 2019**

The figure below shows the map of soil distribution in the center of Safi:

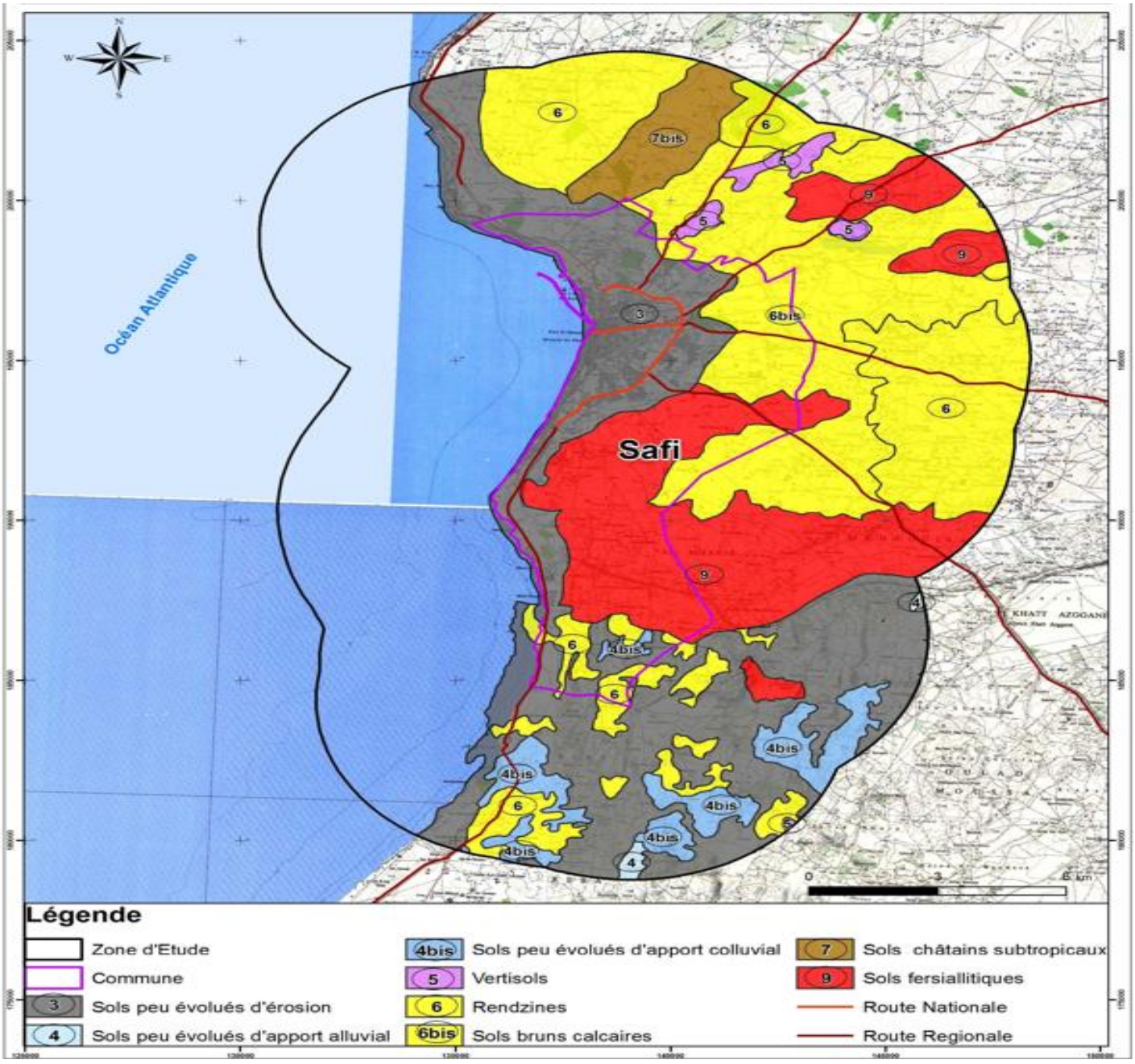


Figure 5- Map of distribution of soil groups in the center of Safi (Study of the impact of urbanization on agricultural land and the development of an action plan for the protection of agricultural land around urban and rural centers)

We find the raw mineral soils (limestone crust, sands...) which occupy the Sahel north of Safi, the rocky outcrops in the slopes of Mouissates and the dune sands at the level of the Oued Tensift [7].

[7] **Environmental impact study of the construction of a wastewater treatment plant in the city of Safi, October 2020**

Note: Therefore, we recommend that the client launch an underground/geotechnical survey for the selected location as soon as the layout is fixed.

The figure below presents the soil mapping units of the province of Safi:

Unités	classe	groupe	Familles et séries des sols
1 2 3 4 5 6	minéraux bruts	érosion apport éolien érosion	- *dalle calcaire* - *régosolique* - *grés calcaire encroûté* - *gypse* - *calcaire dur du jurassique* - *schiste*
7 8 9 10	peu évolués	apport alluvial	- *croûte sur encroûtement* calcaire profond - *sur schiste* peu profond - *alluvions limoneuses* très profond - *alluvions sableuses* moyennement profond
11 12 13 14 15 16	peu évolués d'érosion	érosion éolienne colluvial	- *sable sur colluvions calcaires* moyennement profond - *sable sur sol châtain* moyennement profond - *sable* très profond - *colluvions calcaires* moyennement profond - moyennement profond, très caillouteux - *limon rubéfie* très profond
17 18 19 20 21 22 23 24 25	calcimagnésiques	rendzines	- *croûte calcaire sur encroûtement* -peu profonde, très caillouteuse -peu profonds, très caillouteuse sur pente forte. - moyennement profonde, faiblement caillouteuse. -*blocs calcaires* - moyennement profonde, moyennement caillouteuse. - peu profonde, très caillouteuse. - peu profonde, très caillouteuse sur pente forte. -*dalle calcaire* peu profond, moyennement caillouteux. - *sur calcaire dur jurassique gypseux* profonde, caillouteuse. - croûte sur encroûtement
26 27 28 29 30 31	calcimagnésiques	bruns calcaires	- sur calcaire dur jurassique gypseux - moyennement profond, caillouteux à moyennement caillouteux - moyennement profond - sur encroûtement nodulaire - profond - très profond - sur encroûtement calcaire tendre -recouvert par un apport limoneux, très profond. -très profond
32 33 34	vertisols	à structure arrondie	- *sur argile a taches et concrétions calcaires*. Très profond, texture fine. - *sur argile a taches et concrétions calcaires*. Très profond, texture fine. - *sur argile a taches et concrétions calcaires*. Très profond, texture fine.
35 36	vertisols	à structure arrondie	- *sur argile a taches et concrétions calcaires*. Très profond, texture fine. - *sur argile a taches et concrétions calcaires*. Très profond, texture fine.
37 38 39 40 41 42 43 44	isohumiques	châtains bruns isohumiques siérozemes	- sur croûte calcaire. – moyennement profond. - sur croûte calcaire. – très profond. - sur argile a taches calcaires. - ensablé, profond à très profond. - sur croûte calcaire. Moyennement profond - sur croûte et encroûtement calcaire. Très profond. - sur croûte et encroûtement calcaire. Moyennement profond à profond -sur argile a taches calcaires. Profond à très profond - sur encroûtement calcaire. Profond, texture limoneuse
46 47 48	sesquioxydes de fer	à réserve calcique	- sur encroûtement calcaire, très profond, recouvert par un apport limoneux. - sur encroûtement calcaire, très profond, texture fine. - sur encroûtement graveleux, très profond, texture fine.
49	sesquioxydes de fer	sans réserve calcique	- argile rouge, très profond et ensablé.

Figure 6- Soil mapping units in the province of Safi (National Institute of Agronomic Research, 2000)

3.2.3 Water Resources

- **Groundwater**

The study area of this project in the province of Safi, is characterized by a formation of the Lower Cretaceous, recognized by the **Dridrate** limestone which represents the main exploited aquifer of the Safi province.

The various sources of groundwater in the area are presented as follows:

The Upper Jurassic water table is very deep, the limestone material is permeable and rainwater infiltrates to the marl level. The underground flow is of karstic type with an East-West direction.

In the Abda plain, the water table is very deep and of low flow, the geological substratum is made of Jurassic limestone, it is covered by silt with low permeability.

In the Sahel, the perched water tables of the Plioquaternary and Lower Cretaceous have a limited extension due to the existence of an impermeable clay level that constitutes a floor for the Abda Mouissate water table.

As for the coastal strip, the wells are located between Cap Bedouza and Oualidia and in some synclines between Safi, Had Hrara and Tnine Rharbia.

The groundwater reserves of the Province of Safi are estimated at **88 Mm3 of which 50 Mm3** are exploited for agricultural or domestic purposes. These waters are located at significant depths, generally separated from the earth's surface by clay and marl layers, which make their exploitation difficult but protect them from pollution from the surface of the ground.

Note: The **Abda Mouissate** water table is exploited by the National Office of Water and Electricity (ONEE) for the supply of the city of Safi from the **Ain R'tem** spring, the **Ain El Ghor** spring, and the boreholes.

- **Surface water**

The city of Safi has an artificial lake **(Safi canal)** which is fed from a canal linked to the Imfout dam, on the course of the wadi **Oum Er-Rbia**. The artificial lake has a volume of **48 million m3 / year** to supply the chemical industries, some urban centers of the province (city of Safi, Jemâa Shaim, Tlet Bouguedra and Sebt Gzoula centers) and the irrigated area of the rural town of Sidi Aissa.

The city of Safi also has a dam, 330 m long and 9 m high, located 4 km northwest of the city and commissioned in 1965. The dam of Safi is irrigated by the Chaaba wadi, a tributary of the Oum Errabii watershed. It has a storage capacity of about **2 600 000 m3**. This reservoir fed from the canal allows to serve:

- The OCP chemical complex through 3 pipes of 500-, 600- and 800-mm diameter.
- The city of Safi by means of 2 pipes of diameter 400 mm (unitary flow: 75 l/s) and one pipe of diameter 800 mm (flow: 500 l/s).

3.3 Biological environment (Biological Conditions)

3.3.1 Terrestrial Biological Environment

- **Forest - Vegetation**

However, due to climatic conditions and strong pastoral pressure, the **sclerophyllous forests** have suffered a strong regression. Thus, the natural high woody vegetation has almost entirely disappeared. Rare representatives of forest formations that once occupied the Sahel South Doukkala are currently found only in a few cemeteries or marabouts. Nevertheless, there are some eucalyptus and pine plantations in the province of Safi, such as on the edges of the OCP phosphate complex.

- **Terrestrial Fauna**

The Safi Province project area is predominantly agricultural, leaving little room for wildlife. These agricultural areas, although open, do not appear to be favorable to nesting avifauna because of the disappearance of natural tall woody vegetation.

- **Mammals**

Mammals and especially carnivores are rare, except for rodents and insectivores. In a global way, among the Mammals at the level of the region and its hinterland, we can meet the following species:

Table 5: Major mammals in the region

Mammals Species
• Atlantoxerus getulus (Barbary squirrel) • Erinaceus algirus (Algerian hedgehog) • Hystrix cristata (Porcupine) • Lepus capensis (Hare) • Mus spretus (Wild mouse) • Gerbillus campestris (Country gerbil) • Vulpes vulpes (Fox) • Mustela nivalis (Weasel) • Genetta genetta (Genet)

For reptiles, among the most characteristic of the area including the project we can mention:

Table 6: Major Reptiles in the region

Reptiles Species
• Chamaeleo chamaeleon (Common chameleon) • Testudo graeca (Moorish tortoise) • Psammodromus microdactylis (Green Psammodromus) • Chalcides pseudostriatus (Moroccan striped seps) • Acanthodactylus lineomaculatus (Lineacanthodactylus) • Trogonophis elegans (Purple Trogonophis) • Vipera mauritanica (Mauritanian viper)

- **Birds**

At the level of the project site, most breeding birds are of low abundance, but some wintering populations **(Brown Gulls, European Starlings)** and migratory populations **(Swallows and Kingbirds)** may be significant.

The site and its immediate surroundings are therefore of little interest to breeding birds, given that the natural environment can be greatly disturbed by various human activities.

According to studies and statutes carried out by IUCN [8], we note that:

- Of the endemic populations, one is considered a game species (Gambra Partridge). The Great Moroccan Cormorant and the Riggenbach's Crested Cormorant make only occasional appearances in the site or its immediate vicinity because their nesting sites (which would need to be protected) are not located in the vicinity of the project site, as the cliffs are not suitable for nesting of these birds.
- Therefore, the site and its immediate surroundings do not host any threatened species.
- Note that, among the heritage species, only the Garden Bulbul and the Sahara Bunting (widespread and common species) can be found within the phosphate complex.

[8] **Global list of birds recorded in the site of the city of SAFI or in its immediate surroundings with their phenological status and the conservation status of remarkable species (according to El Agbani & Qninba 2011 and/or the IUCN)**

- As far as local breeding birds are concerned, the Starling and the House Sparrow can use the hollow boxes of lamp posts or other hollow metal structures, the Turtle Dove and the Cinereous Serin can use the eucalyptus and pine trees as nesting supports.

Figure 7-Major Birds in the region

Migration corridor bordering the project site:

The project site is located on the Atlantic coastline, which is on one of the most important bird migration routes in the world, the East Atlantic Flyway.

This coastline is used by hundreds of thousands, if not millions, of Western Palearctic birds during their two migrations (fall and spring) from their Eurasian breeding grounds to their sub-Saharan wintering grounds.

The project site area is still well frequented by migratory populations, Swifts and Martinets (terrestrial migrants) migrate in broad fronts and do not concentrate along predefined corridors, but seabirds and waterfowl closely follow the shoreline. Based on the observations made in the framework of the impact studies relating to the site of the Safi Thermal Power Plant but also in the areas close to the project site, the coastal zone in the vicinity of the project site is presented as a set of capes (**the most spectacular of which is that of Cape Beddouza).**

Indeed, this study estimated that at the level of the Capes, migratory seabirds (including the Balearic Shearwater in Critical Danger of Extinction) can approach within 200 meters of the coast (they can even fly over Cape Beddouza) but transit, at the level of small bays, at more than 800 meters. Some migratory or wintering seabirds **(mainly the brown gull)** have taken the habit of establishing their resting places on the corrugated roofs of buildings of the phosphate complex.

Note that the flight altitude of the migrants is very variable but remains relatively low, from one to a hundred meters.

3.3.2 Biological Marine Environment

The marine environment of the Safi City site is composed of 2 main marine habitats: sand and rock/sand mixture.

The marine environment of the site is characterized by a coastline subject to strong-wave and current conditions, the water column is well mixed and free of petroleum hydrocarbon contamination[9].

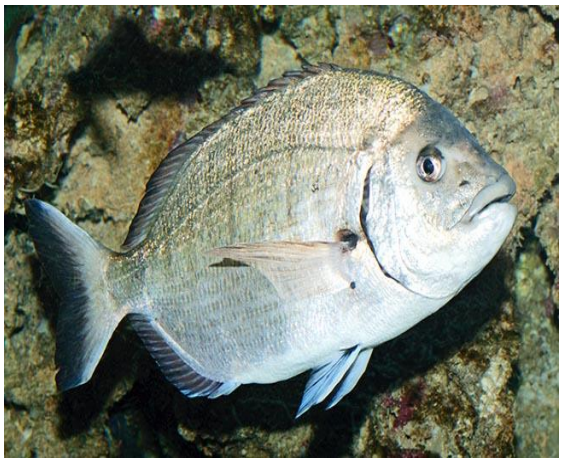
The biological communities at the site consist primarily of:

- Sediment-dwelling organisms, including (relatively dense, low diversity) crustaceans, bivalve mollusks, and annelids.
- Rock communities of photophilic algae (generally shallow water) and sciaphilic algae (tolerant, low light, high agitation).
- The fish community: relatively dense.

The figure below illustrates the existing and more abundant biological communities of the marine environment site at Safi.

[9] **EIA (Environmental Impact Assessment) for the Safi Thermal Power Plant**

Displodus vulgaris



Displodus saragus

Trisopterus luscus

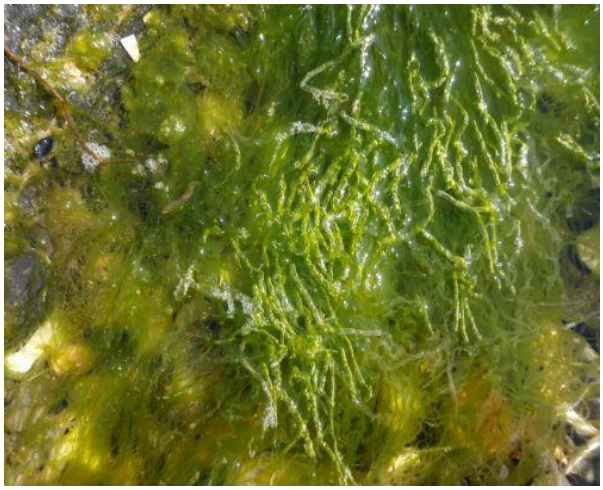
Figure 8- Existing biological communities in the marine environment of Safi

- **Marine flora**

An expertise in marine biology [10], has been launched to characterize the marine environment in the project study area. From the port of Safi to Souiria Qedima, the marine flora is relatively undiversified and poor in numbers. The flora is largely dominated by ulva (Ulva Rigida) and enteromorphs (Enteromorpha intestinalis), which are recognized as nitrophilic species and indicative of habitats rich in organic matter.

[10] **EIA (Environmental Impact Assessment) for the Safi Thermal Power Plant**

Ulva Rigida



Enteromorpha intestinalis

Figure 9-Nitrophilic species

In addition, the region of Safi has a large deposit of Gelidium algae (1 to 2 kg/m²) which is harvested. Besides these algae, several plant organisms live, including algae in dense clumps (Gigartina acicularis, caulancantus) or scattered (corallina elangata, jania rubens, codium tomentosum, codium adherens, bifurcaria tuberculata, lithophylum tortuosum, lithophylum incrustans, cystoseira).

Gigartina acicularis

Corallina elangata

Figure 10 -Algae and plants of the marine flora in Safi

- **Marine Fauna**

The study area is characterized by the following marine fauna:

- Between - 1 and - 5 m, we find mainly sponges, echinoderms (sea urchins, holothurians), ascidians and anemones.
- Between - 9 and - 10 m, the dominant species are echinoderms (sea urchins, brittle stars, holothurians), ascidians and polychaete annelids.
- Towards - 14 m, one finds mainly cnidarians, hydraires, gorgonia and sponges.

Spongiaires

Espèces d'ascidies

Oursin de mer

Holothurie

Figure 11- Marine fauna present at shallow depths in Safi

3.3.3 Physical Marine Environment

- **Littoral**

The littoral of Safi, belonging to the Atlantic facade of Morocco, presents an important morphological and landscape diversity (located between longitudes 9°1'50. 01O and 9°27'41.77O and latitudes 32°44'40. 11N and 31°55'8. 37N). It contains some of the highest cliffs in Morocco (up to 153 m altitude at Borj Nador).

The cliffs in this area are generally oriented NNE-SW and NW-SE. From Cape Cantin to Labdahja, the cliffs consist only of Cretaceous limestone, and then from Labdahja to Safi, where the sedimentary rock, mixed with calcite (CaCO3) and clay is formed with a high elevation, up to 153 meters in Borj Nador. Some sandy beaches are interspersed in sheltered areas between these high cliffs.

In the bay of Safi, the beach of the city, also called the beach of Sidi Bouzid, is the most representative of this coastline. It has a length of more than 700 meters and an average width of 120 meters, in low tide, with an average slope of about 6 ° on the foreshore.

- **Swells**

The oceanographic measurements made in the region have allowed to classify the swell regime into three categories:

- Storm swells from the SW sector, gales, having an erosive effect on the coast of Safi.
- The strong swells are oriented NW - W with an amplitude exceeding 3 meters before breaking. They generate swell currents, episodic but violent, in the direction corresponding to the obliquity of the swell on the general direction of isobaths. The swell currents cause coastal transfers. These movements lead to a degradation of the high foreshore to the benefit of the shallows.
- The weak and average swells from NW to W have an amplitude that does not exceed 2 meters.

In general, the height and strength of the waves varies according to the intensity and direction of the wind that produced them. The area is exposed to the dominant NW swell (75% of the time).

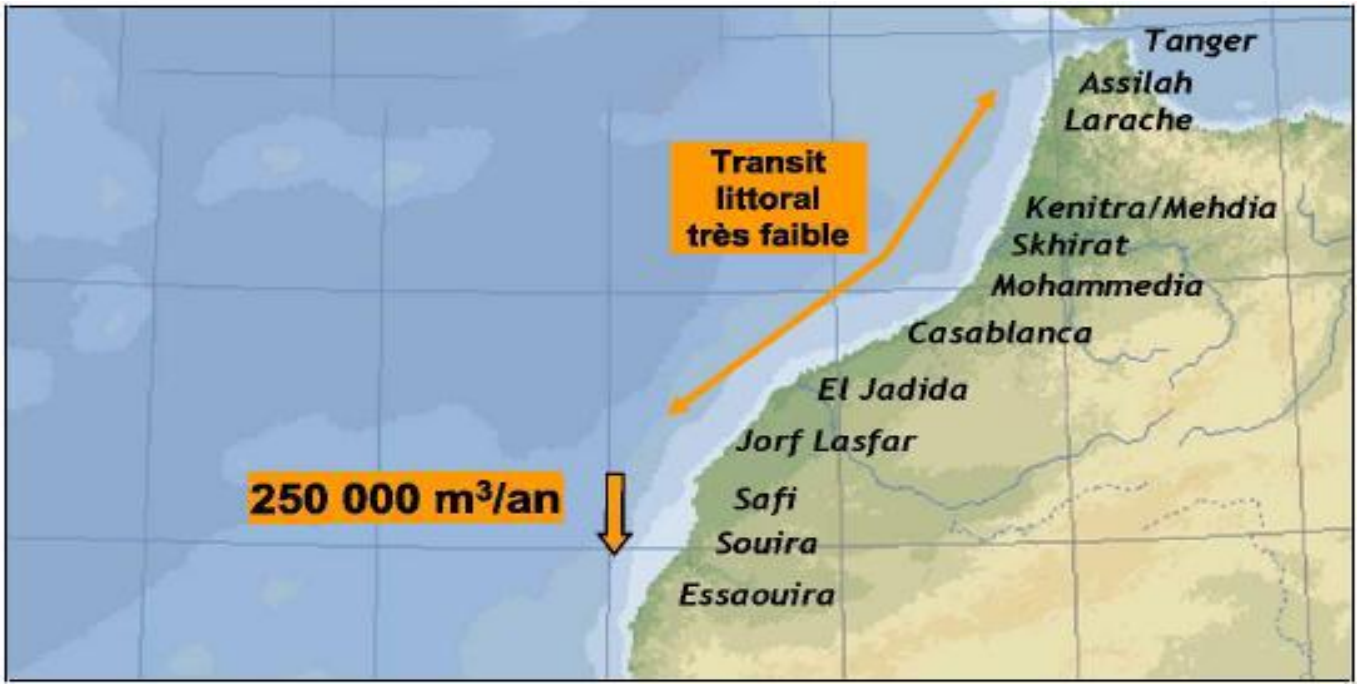


Figure 12- Coastal transit of the Moroccan North Atlantic coast (Identification study of potential port sites by DPDPM, 2011)

In the Safi area, the phenomenon of upwelling (rising of the underlying water to the surface) occurs during the summer

This phenomenon of upwelling leads to a richness of nutritive salts at the surface of the water, and the proliferation of phytoplankton. Consequently, we observe a richness in pelagic fish.

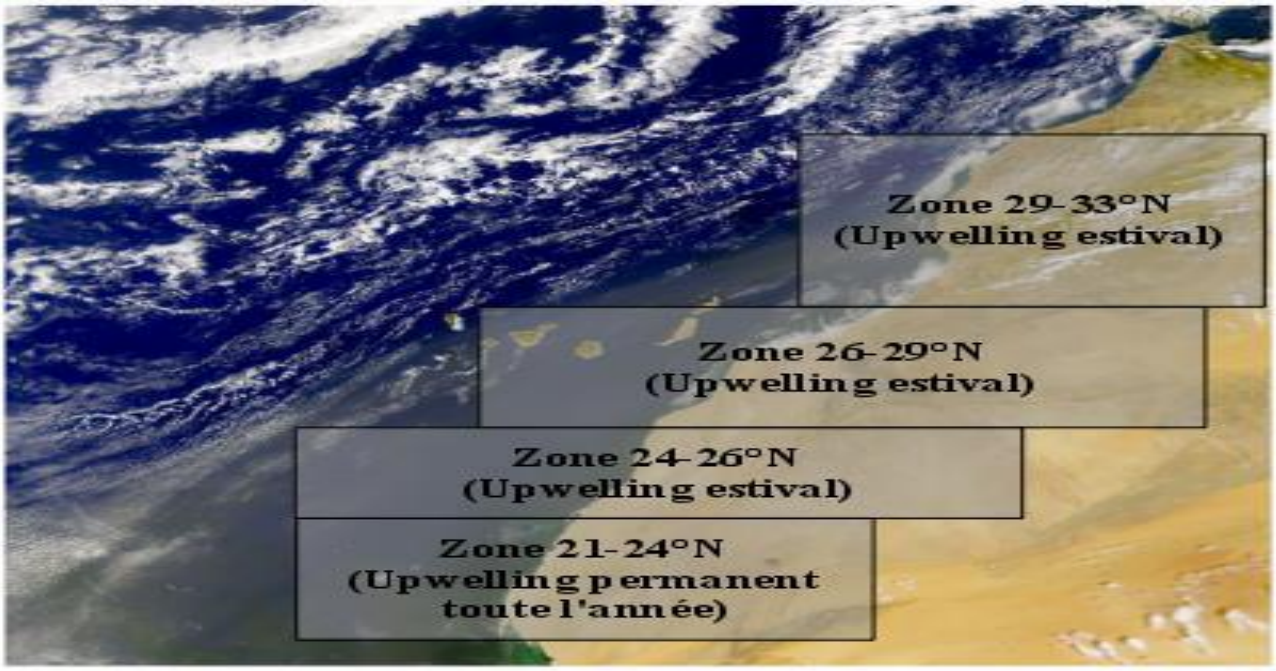


Figure 13 Upwelling areas of the Moroccan Atlantic coast (DOA/URDO/LOP satellite image)

On a rising tide, the water mass moves towards the coast, with a current towards the north-north-east whose intensity offshore is between 0.1 and 0.2 m/s and which is homogeneous throughout the region. In the coastal zone, the intensity is slightly higher, but the currents remain moderate (0.3 m/s).

3.4 Socio-economic conditions

3.4.1 Administrative and geographic location

The Province of Safi is administratively attached to the Region of Marrakech - Safi. It is a junction between this Region and the Region of Casablanca-Settat located further north. It is limited:

- In the North by the Province of Sidi Bennour administratively attached to the Region of Casablanca-Settat
- To the East by the newly created Province of El Youssoufia
- To the West by the Atlantic Ocean
- To the South by the Province of Essaouira

The SPH-NSP platforms are located immediately south of the city of Safi along the Atlantic Ocean.

3.4.2 Demographic (Population)

The overall population of the Province of Safi is **691,983 (RGPH, 2014**), which represents 2% of the country's population. The population of the province is divided in equal parts between the urban population (345,980 inhabitants), and the rural population (346,093 inhabitants). This situation highlights the socio-economic issues that are quite particular and specific to the province, which is oriented towards modernization (for 50% of its population) with a still rural anchorage, and on the other hand, at the level of socio-economic development and basic infrastructure (for 50% of its population) [11].

Table 7- Population of Safi province (RGPH, 2014)

Denomination	Populations
Urban	345 890
Rural	346 093
Total	691 983
Number of households	144 490

3.4.3 Economic activities

- **Industry**

The industrial fabric of the province is diversified. It is dominated by chemical and para-chemical industries. It is also important to emphasize the existence of light industries to meet the needs of consumption. These are mainly fish canning factories concentrated in the city of Safi. There is also a high number of small and medium enterprises (SMEs) in the provincial industrial fabric operating in various sectors such as textiles, leather, construction, and electronics.

The main industrial establishments in the city of Safi and the province are the following:

- The Chemical Complex of OCP
- The FERTIMA factory
- The Cement of Morocco plant
- The gypsum processing and plaster manufacturing plants

[11] **https://www.hcp.ma/region-marrakech/attachment/1361216/**

- Canning factories (sardine, macerals, tuna, estonde and tomato, mainly located in the city of Safi)
- The fish meal factories for animals
- The salt factory of the OCP (deposits located at Lake Zima in Chemaia)
- The flour mills (The Great Mills of Safi, Minoterie El Borj, SABRI FRERES, SEMOS)

In addition, the province of Safi is endowed with a significant mining potential. The main recognized deposits are the following:

- Gantour phosphate deposit located in the North-East of the Province and exploited by OCP SA. It is currently the 2nd production center after Khouribga
- The barite deposit of Jbel Ighoud and the vein deposits of the Chemaïa basin. These deposits have been exploited for a long time by different mining companies

- **Agriculture**

Agriculture is an important activity in the province of Safi. It occupies, in addition to the forest and fishing, it owes its development to a varied natural morphology and the richness of soils consisting mainly of:

- **Tirs:** characterized by its richness in organic debris which explains its fertility. It covers most of the Abda plain and is a privileged part for cereal crops.
- **R'mel:** made up of sand and flint, it covers the entire coastal area of the province.

The crops grown in the province are very diversified. They include cereals, legumes, market gardening, industrial crops, fodder crops and arboriculture.

- **Elevage**

Compared to the country, the province of Safi has 3.7% of all cattle, 3.2% of sheep and 0.7% of goats.

The share of improved livestock represents 68.6% of the provincial cattle population. This share has been steadily improving since 2012 (26%), this is due to the breeding patterns of farmers who rather prefer the improved breed for its performance.

- **Fishing**

The fishing sector with the collection of seaweed has always been a major activity and provides a complementary income to the populations of the coast of Safi.

The coastal fishing fleet in the port of Safi represents 20% of the national coastal fleet. The artisanal fishing fleet, meanwhile, represents 7% of the national artisanal fleet. In Safi, all kinds of marine species are fished, for example:

- White fish which represent 10% of the fish species caught: sole, tongue, hake, scorpion fish, scorpion
- fish, turbot, red mullet, etc
- Pelagic fish, which represent 90% of the fish species caught: sardines, mackerel, horse mackerel, anchovies, tuna, skipjack tuna, bonito, melva, skate, etc
- Cephalopods: squid, cuttlefish, octopus, etc

- Crustaceans

The fishing sector, which occupies an essential place in the provincial economy, is still facing many difficulties for several years, accompanied by a continuous decline in catches.

- **Artisanal sector**

This sector is considered among the main economic activities of the region. It is characterized by its quality and diversity with the dominance of pottery which constitutes an undeniable cultural and tourist heritage for the city of Safi. The production is intended for local or national markets, but a large part of the production is exported.

- **Tourism**

Tourism, despite the potential and assets of the city of Safi and its region (historical remains, speleological and archaeological sites), remains underdeveloped and is a secondary activity.

Indeed, the city of Safi has one of the oldest Islamic mosques in the kingdom, as well as Portuguese monuments dating back more than five centuries such as the Portuguese fortress, two churches located in the old medina, the sea castle and the wall that surrounds the old medina.

The province is also known for its summer resorts (Souira Kdima, Cap Bedouza, Lalla Fatna, Sidi Kouram Daif). On the other hand, the province is distinguished by the speleology which can be exploited for tourism. The area between Cap Bedouza and Kouram Daif is rich in caves.

Handicrafts, mainly pottery, are considered among the main sectors of attraction for visitors to the city of Safi. The hill of the potters and the National Museum of Pottery are considered among the main tourist elements of first category. Safi is also known for its traditional art "AITA".

4. Conclusion

The following document presents the **Environmental Site Conditions** for the SPH/NSP platforms implemented as part of the project of the OCP **Centrer Axis Program** in Safi.

This document aims to a detailed description of the initial state of the project site and its zone of influence shows that certain components of the physical, biophysical, biological, and human environment are sensitive to the planned activities.

Therefore, these environments or receptors require special attention during the next phases of the project to avoid significant impacts and to ensure that appropriate measures are implemented when the impact cannot be significantly mitigated.