Department of the Environment

Nationally Determined Contribution
From MONACO
Update 2020

To the United Nations Framework Convention on Change
Climate and the Paris Agreement

December 2020

Prepared by:
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Pursuant to paragraphs 24 and 25 and Article 4 of Decision 1/CP.21 and Decision 4/CMA.1

Nationally Determined Contribution Direction from The Environment

Revision 2020

SUMMARY

1 National context

The Principality of Monaco is a city-state of 208 hectares, whose diversified economy is mainly based on services, construction, tourism and the banking sector.

Since his accession in 2005, H.S.H. Prince Albert II has made environmental protection a priority of his Government's policy, both nationally and internationally.

The Principality of Monaco ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 20 November 1992 and the Kyoto Protocol on 27 February 2006.

Listed in Annex 1 of the Convention with a commitment to reduce emissions by 8% compared to 1990 under the first period of the Kyoto Protocol, the Principality has fulfilled its obligations by reducing its emissions by 13.18% compared to 19901.

Monaco continued its commitment by accepting the Doha Amendments on 27 December 2013. Monaco's target for the second period of the Kyoto Protocol is an average of 22% emission reductions over the period 2013-2020.

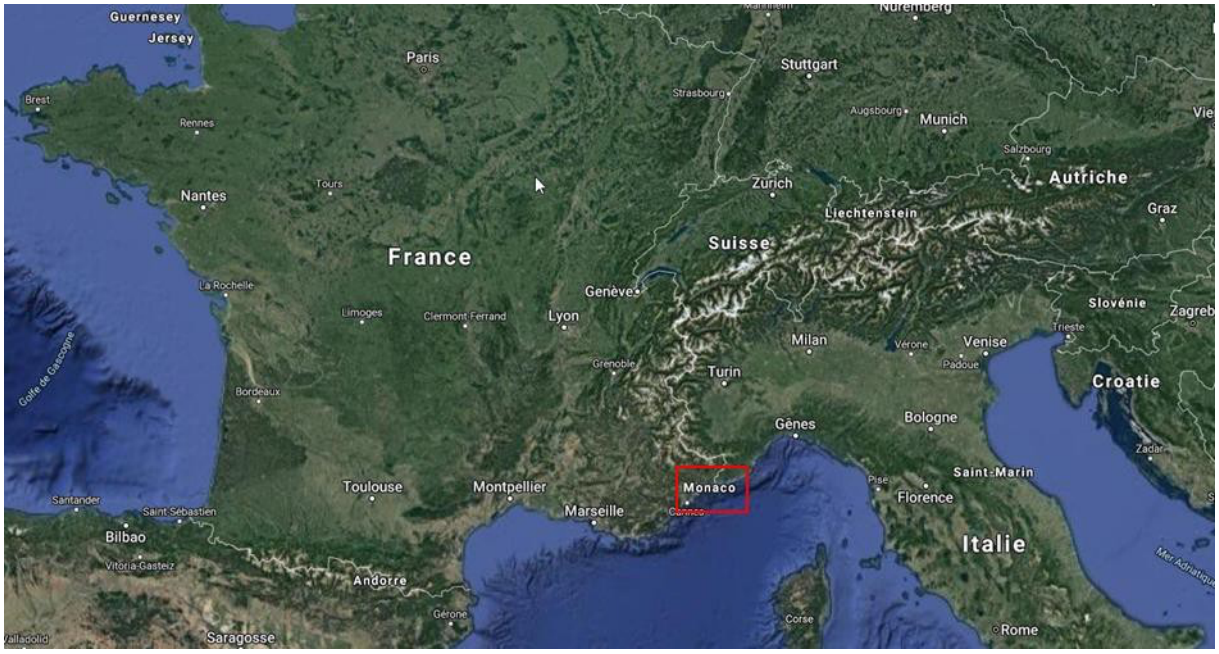
As part of its first Nationally Determined Contribution, the Principality of Monaco has set itself the objective of reducing its greenhouse gas emissions by 50% by 2030.
H.S.H. the Sovereign Prince also pledged that Monaco would achieve carbon neutrality by 2050.

Aware of the eminently collective nature of the challenge of reducing emissions, the Principality of Monaco wishes to make its full contribution to the common effort. It hopes that the commitment of all Parties will achieve the goal of limiting the average global temperature increase to less than two degrees above pre-industrial levels and, to the extent possible, to less than 1.5°C.

[1] National Inventory Report of the Principality of Monaco, submitted on 3 September 2014:
http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php

1.1 Geography

The Principality of Monaco is a state bordering the Mediterranean Sea landlocked in French territory along the French Riviera, halfway between Nice and the Italian border. The territory of the Principality borders four French municipalities in the Alpes Maritimes Department (Cap d'Ail, La Turbie, Beausoleil and Roquebrune-Cap-Martin) and has a frontage on the Mediterranean.



The geographical coordinates of the Principality (at the Oceanographic Museum) are 43°43'49"N and 7°25'36"E.

The territory is in the form of a narrow coastal strip and located at the foot of a 7 km² watershed and surrounded by a cirque of high reliefs. Its area is 208 hectares, of which nearly 40 have been reclaimed from the sea in the last 50 years.

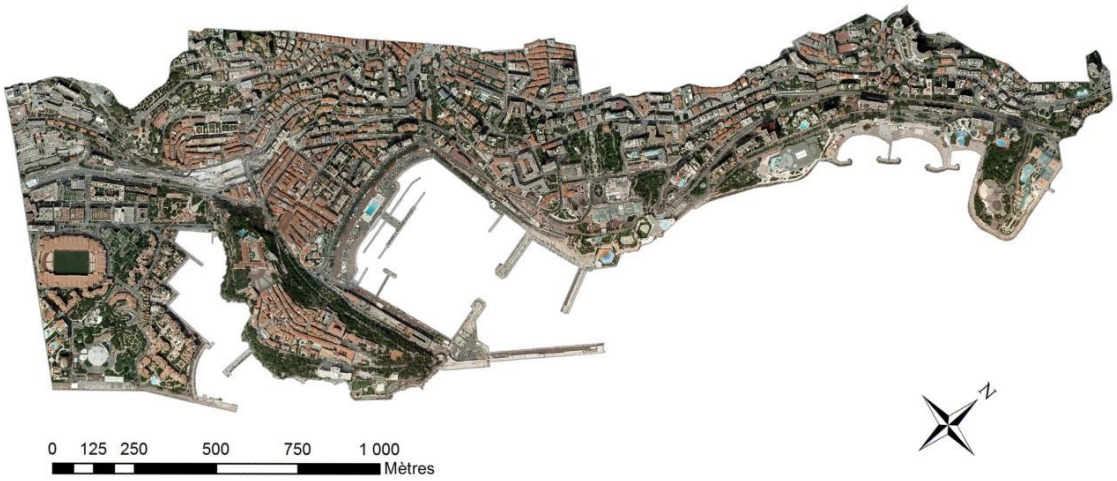
Its territorial waters form a strip that extends 12 nautical miles out to sea and whose width corresponds to the coastal strip of the Principality (approximately 3 km).

The surface area of territorial waters is about 71 km2, which is much larger than the country's land surface.

The Principality is the second smallest independent state in the world, after the Vatican.

The Principality of Monaco is established on a narrow coastal strip. Thus, the buildings are all at a very limited distance from the sea (less than 800 m). This situation, combined with the significant sea depths available near the coast, has contributed to the significant development of seawater heat pumps. The first installation was carried out in 1963 and this technology is now the leading source of local energy production.

Aerial photography of the Monegasque territory – Department of Forward Planning, Urban Planning and Mobility

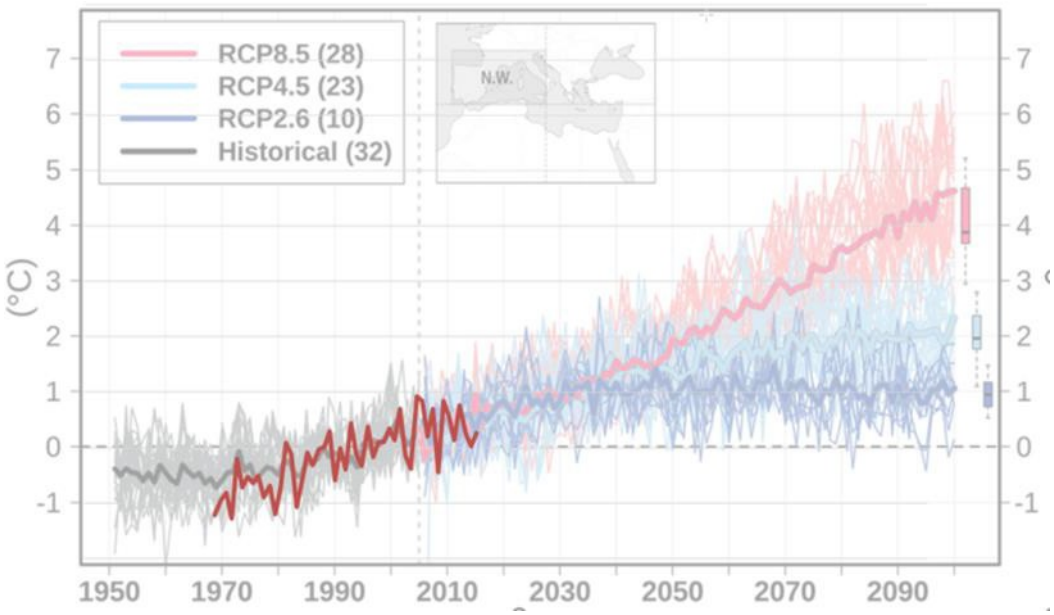


1.2 Climate

Monaco is located in the north of the western Mediterranean and enjoys a temperate climate, which is characterized by hot, dry summers and mild, wet winters.

The territory is at the interface of a vast adret bathed by the sea and dominated by south-facing mountains; Temperatures are under the direct influence of the sea.
The average temperature is 16.5°C (normal 1986-2005) and a seasonal range of less than 15°C. The average annual rainfall is 714.6 mm, with a characteristic distribution of the Mediterranean climate with the highest rainfall in autumn and spring.

All the data collected at the Mediterranean level indicate a warming during the 20th century and an acceleration in recent decades.
At the basin level, average annual temperatures are now 1.5°C higher than at the end of the 19th century. Warming accelerated after the 1980s, and is increasing at a higher rate than the global average (Lelieveld et al. 2012; Lionello et al. 2012a; Zittis and Hadjinicolaou 2017; Cramer et al. 2018; Lionello and Scarascia 2018; Zittis et al. 2019).

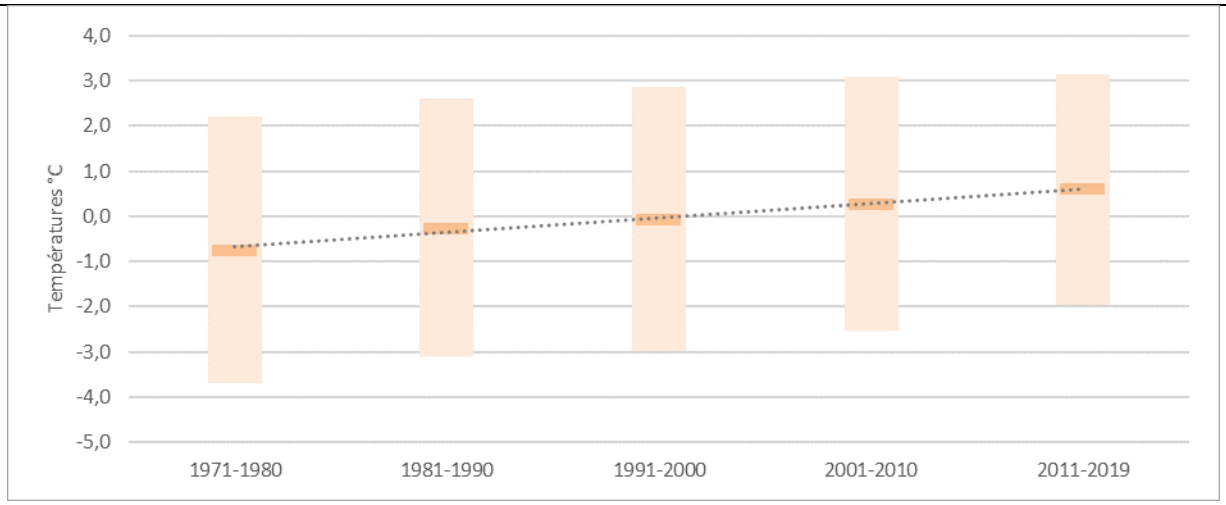


In red - evolution of annual temperatures in Monaco (referenced to Normal 86-05) and in the background - comparison to the RCP2.6 RCP4.5, RCP8.5 2 scenarios of the IPCC AR5 report, derived from a regional climate modelling for the Northwest Mediterranean area, (N.W land only) according to: *A multi-model, multi-scenario, and multi-domain analysis of regional climate projections for the Mediterranean - George Zittis1 & Panos Hadjinicolaou1 & Marina Klangidou1 & Yiannis Proestos1 & Jos Lelieveld1,2.* (Fig3)

The temperatures observed in Monaco since the early 1970s corroborate these observations and show a steady rise of 0.3°C per decade. This rise is more noticeable on minimum temperatures (+0.4°C) than on maximums. In addition, the warmest years were all observed after 2000.

[2] RCP: Representative Concentration Pathway

Decadal average temperatures in Monaco from 1971 to 2019 – Department of the Environment

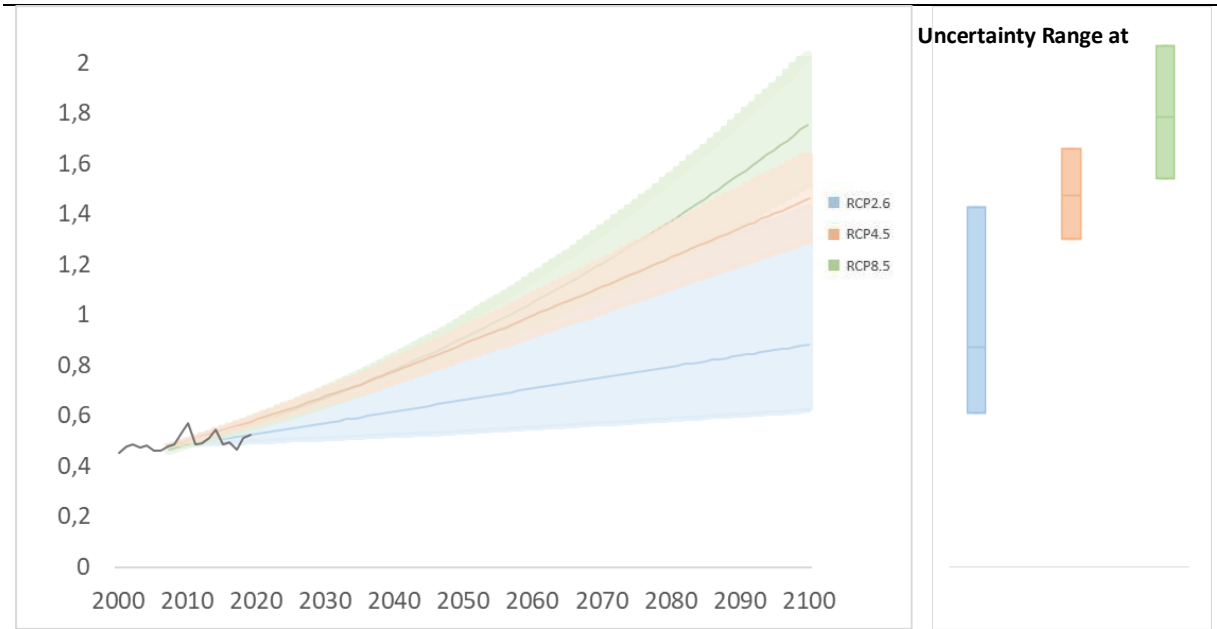


Ten-year average of temperatures observed in Monaco from 1971 to 2019. Relative to the normal value 1986-2005.

1.3 Sea level rise

With its maritime character and coastline, the Principality of Monaco is directly exposed to a rise in the level of the Mediterranean Sea due to global warming. The height of the marine waters has been measured since 1999 by a digital coastal tide gauge operated by the Department of the Environment in collaboration with the Hydrographic and Oceanographic Service of the French Navy (SHOM).

Projection of sea level rise in Monaco (in metres) – Department of the Environment

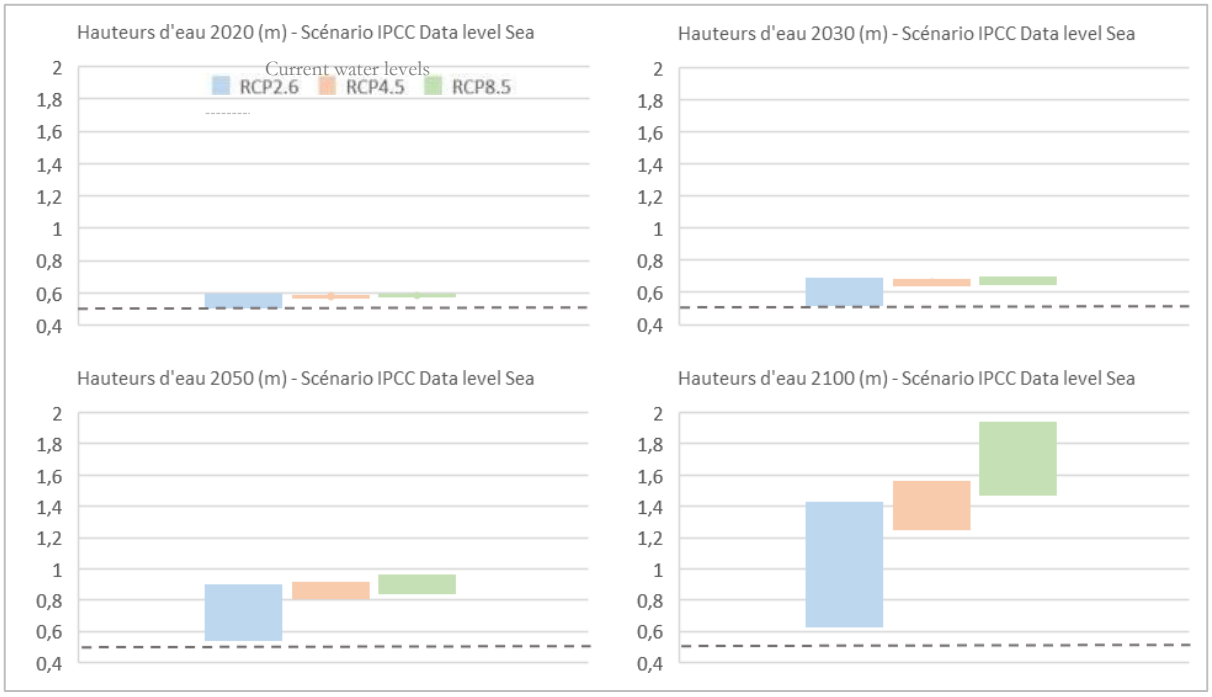


Projection of sea level rise in Monaco until 2100 according to the *IPPC SROCC – Projected rise in global mean sea level* methodology. Projections are made for three concentration pathways (RCP3).

[3] RCP: Representative Concentration Pathway

On the northern coast of the western Mediterranean, a rise of 1 to 2 mm/year was observed between 1970 and 2004. The Ocean and Climate Platform Report indicates that sea level rise has accelerated by 3.6mm per year since the 1990s, compared to 1.4mm per year previously.
The recordings made in Monaco confirm this trend, the measured rise is of the order of

3.5mm per decade since 2000. Despite a rise that slowed down over the decade 2010-2020, current water levels are on the trend predicted by the IPCC's increase scenarios.



Projection of sea level rise in Monaco until 2100 according to the *IPPC SROCC – Projected rise in global mean sea level* methodology. Projections are made for three concentration pathways (RCPs) and compared to current levels.

According to projections, the mean sea level in the Mediterranean would be in the range 20 to 110 cm higher at the end of the 21st century than at the end of the 20th century (Special Report on Ocean and Cryosphere - SROCC Oppenheimer et al. 2019, Le Cozannet et al. 2019; Thiéblemont et al. 2019) depending on the emission level, with local deviations of up to +10 cm (Carillo et al. 2012; Adloff et al. 2015, 2018) relative to the basin average.

1.4 Population

The Monegasque population (resident and non-resident) is 9,486 (31 December 2019).

The resident population in Monaco, recorded in June 2016, was 37,308 inhabitants. It is estimated at 38,100 inhabitants on 31 December 2019. The population is cosmopolitan, with about 120 nationalities including 8,675 nationals (Monegasques).

The largest community is the French, representing 24.8% of the population, followed by the Italians with just over 21.9% and the British with just over 7.5%.

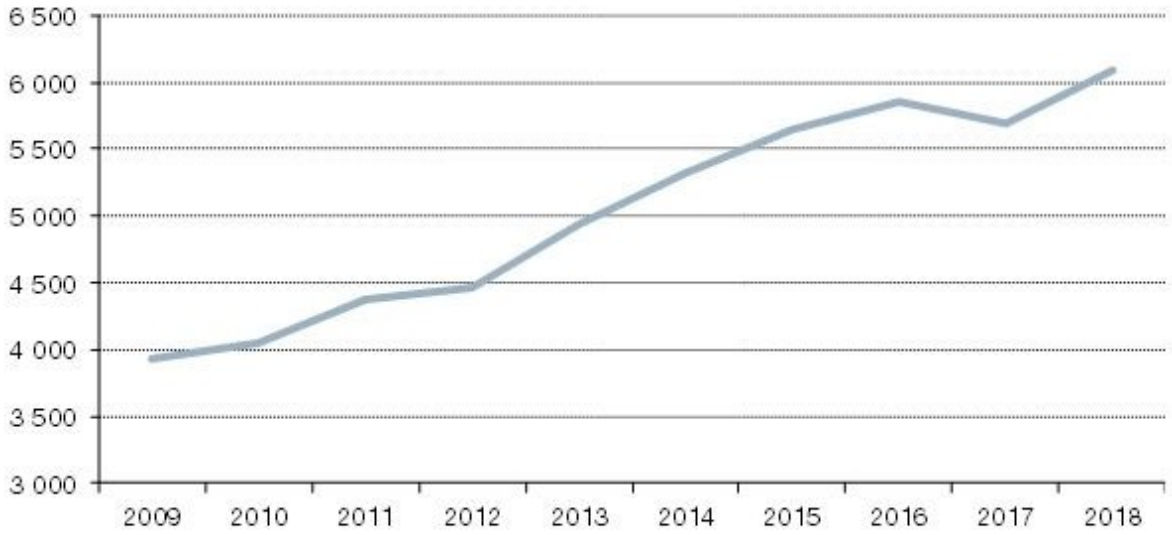
1.5 Economy

The Principality is a centre of economic expansion that has grown strongly over the past ten years. It is an important employment area for the French and Italian border regions.

Monaco's GDP for 2018 amounted to €6.087 billion, an increase of 6.1% compared to 2017.

After the slowdown observed in 2009, GDP continued to grow, even if it tended to decline in 2015.

Evolution du PIB en millions d'euros courants



Source : IMSEE
Unité : million d'euros

The situation of the Principality of Monaco is atypical as regards its resident population on the one hand and its salaried population on the other. Indeed, for 38,100 residents, there are nearly 58,000 employees, 87.8% of whom are domiciled outside Monaco. This very unique situation makes comparisons difficult and the inappropriate use of certain traditional international indicators. This is particularly the case for the classic indicator of GDP per capita.
In order to situate the Principality in its environment and in its international context, two types of GDP per individual are calculated: on the one hand, a "per capita" GDP, calculated since 2005, and on the other hand, a GDP per employee calculated since 2010.

GDP per capita is more specifically intended for international comparisons. The population used to calculate it is the sum of residents and non-resident employees of Monaco. It was 85,876 individuals in 2018 The GDP per capita amounted to 68,858 euros in 2015 in current value.

This value can be compared to that of northern European countries, reflecting a high standard of living of the population.

GDP per employee is an indicator that compares the productivity levels of countries. It amounted to 108,112 euros in 2018.

More than half of Monaco's GDP (53.4%) is produced by 4 sectors:

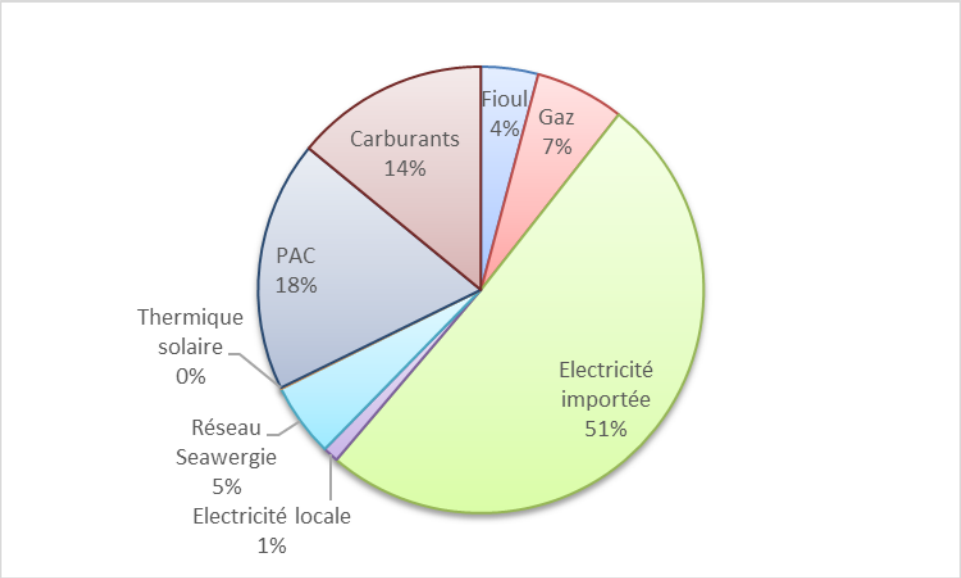
- Scientific and technical activities, administrative and support services (17.9%);
- Financial and insurance activities (15.9%);
- Real estate activities (10.0%);
- Construction (9.5%).

The activity of the Principality is relatively homogeneous. The next eight sectors weigh between 3.4% and 9.3%. These include wholesale trade, accommodation and catering, and retail trade.

1.6 Energy

The Principality of Monaco is a net importer of energy. No production is resold outside.
The total final energy consumption in 2018 was around 1073 GWh.

Breakdown of total final energy consumption in 2018 – Department of the Environment



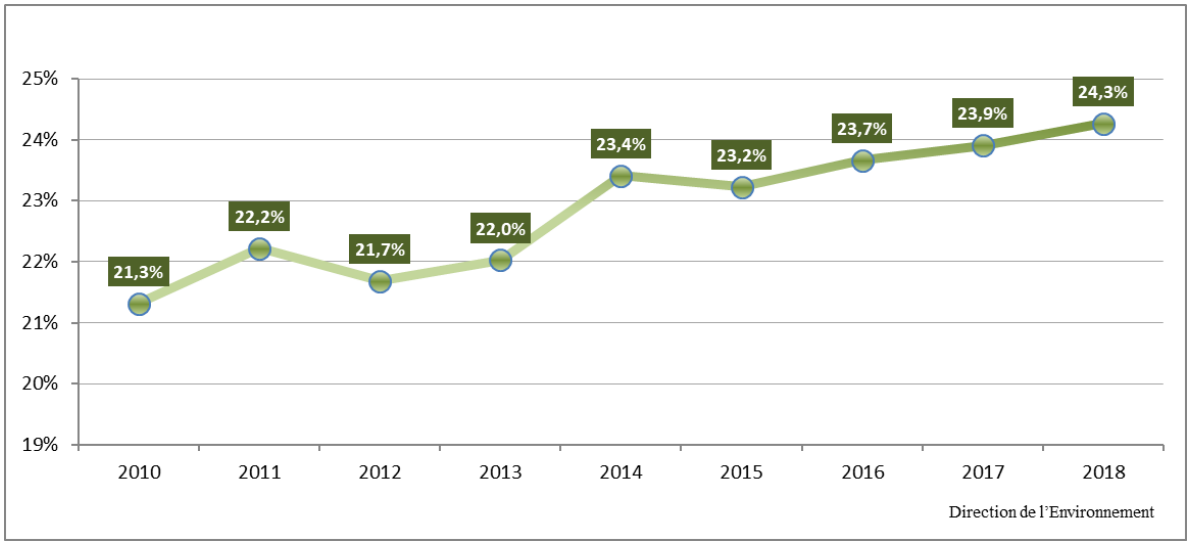
Half of the total energy consumed in Monaco is attributable to electricity used for private and public uses, mainly homes, commercial and industrial facilities, public buildings and facilities (hospitals, schools, etc.), as well as urban lighting.

The consumption of fuels for transport is the second largest item of energy expenditure (14%). This is the sale of petrol and diesel in the territory.

Then come heating and cooling expenses with heat pumps, domestic fuel oil and natural gas consumption.

The energy produced in Monaco comes mainly from heat pumps and the waste-to-energy plant. Although incidental, photovoltaic electricity production is increasing sharply.
In 2018, 24.3% of Monaco's total final energy consumption was covered by local renewable production.

Share of local energy production in relation to total consumption - Department of the Environment

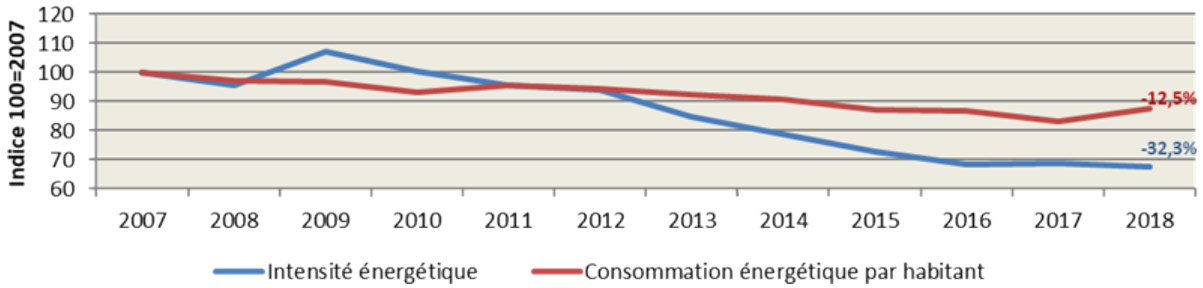


In order to assess the effect of policies and measures in terms of reducing the Principality's energy consumption, two indicators are monitored: energy intensity and energy consumption per capita.

- Energy intensity refers to the ratio of final energy consumption to gross domestic product (GDP). A decrease in energy intensity corresponds to better energy efficiency and means that the country can produce more with the same amount of energy.
The Principality's energy intensity has been falling steadily since 2011, reaching a decrease of 32.3% in 2018 (compared to 2007).

- The second indicator, energy consumption per capita, refers to the ratio between final energy consumption and the resident population.
The amount of energy consumed by the resident population has been steadily decreasing since 2007, reaching a decrease of 12.5% in 2018.

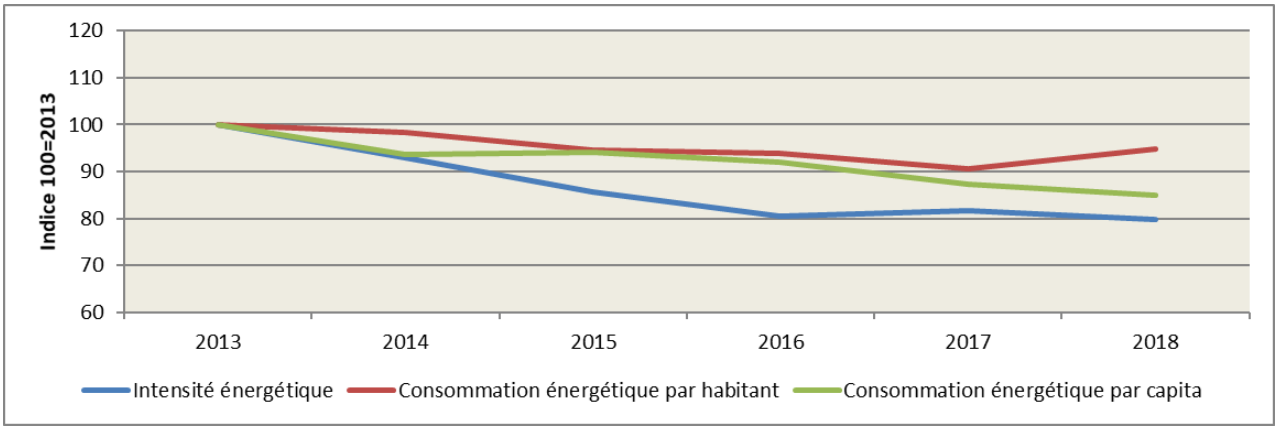
Energy indicators between 2007 and 2018 (base 100=2007) - Department of the Environment



As explained in Chapter 1.5 Economy, the proportion of commuters is extremely high. Also, a reference population has been calculated since 2013.

If we compare the energy consumption per capita and per capita indicator, the decrease observed is greater for the latter. Economic activity has a constant tendency towards electro-efficiency.

Energy indicators between 2013 and 2018 (base 100=2013) - Department of the Environment



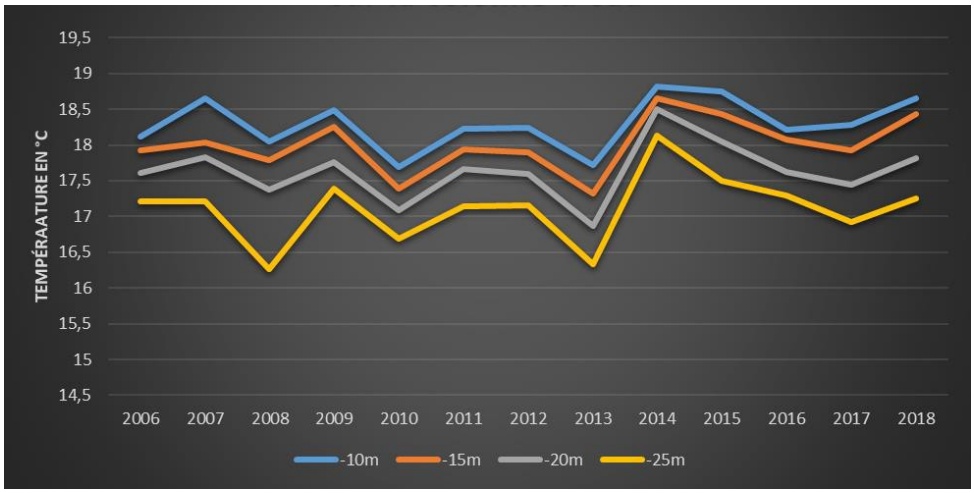
1.7 Biodiversity and habitats

1.7.1 Fauna and Flora Monitoring

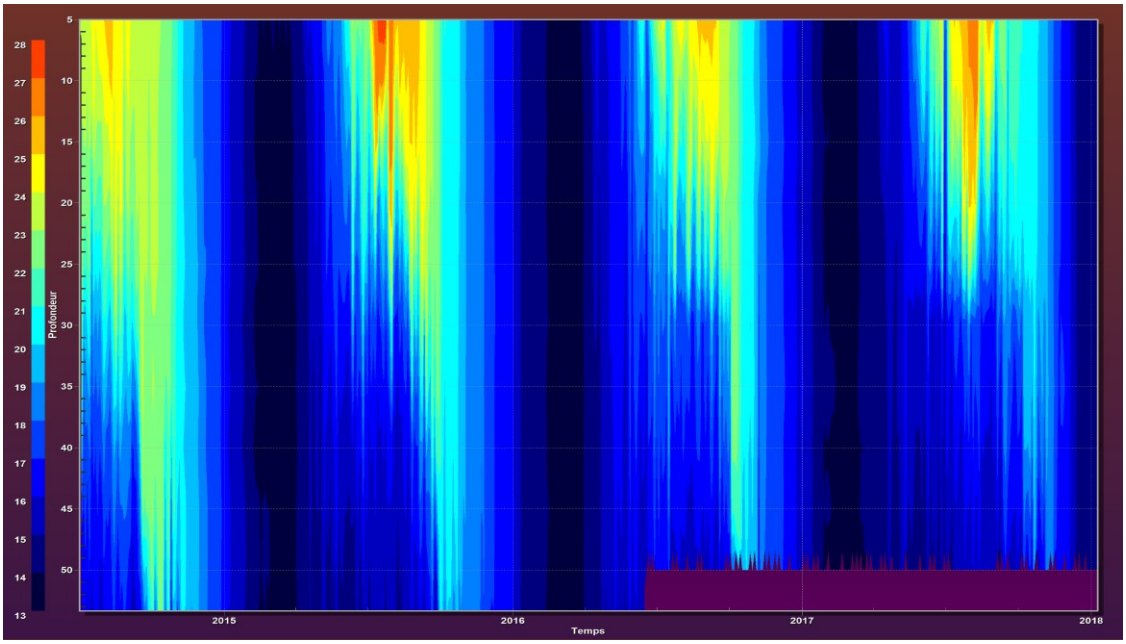
The late 90s and early 2000s were marked by a succession of positive thermal anomalies, which caused mass mortalities with local population extinctions, or proliferation of harmful species (dinophytes and filamentous algae).

Since 2003, the Principality has been constantly monitoring the temperature of the water column and is a pioneer in this area.

Annual averages of temperatures on the water column between 2006 and 2018 - Direction de l'Environnement



Daily temperature measurements on the water column between 2014 and 2018 - Direction de l'Environnement



Disappearances of temperature-sensitive species have already been observed, following abnormal thermal episodes. The gorgonians present on the Spélugues drop-off (-9m to -37m) have been strongly impacted, the majority of the purple gorgonians have died. The disappearance of these gorgonians, a filter-feeding species, has had a strong impact on the species living nearby. The species is now found under 45m deep.

Abnormal episodes in the temperature of water masses have also led to a significant quantitative decrease in Monegasque red coral. Laboratory studies carried out by the Monaco Scientific Centre show that this temperature-sensitive species is also impacted by ocean acidification. This thermal modification results in other impacts that lead to the modification of the physico-chemical parameters of water masses.

Thus, the modification of the environment induces either the disappearance of certain species, or the establishment and naturalization of others, or migrations... Although the Mediterranean is not very productive in terms of plankton, the impacts of these thermal changes on these living beings are also poorly understood and their effects will have to be studied.

At the end of 2018, all the populations of large mother-of-pearl on the Monegasque coast were impacted by the epizootic raging on the Mediterranean coast, and none of the mother-of-pearl present withstood these massive mortalities.
Faced with this observation, the Monegasque State wished to develop an experimental programme aimed at trying to reconstitute the disappeared populations. This program is based on the installation of traps allowing the capture of large pen larvae. Once these larvae have been captured, they will be taken from the natural environment and reared in an aquarium until they reach a stage that allows them to be reintroduced into the environment. A first attempt to capture these larvae has been scheduled for the summer of 2019 and continues in 2020.

At the terrestrial level, the inventory of the terrestrial vascular flora indigenous to the Principality of Monaco has led to the identification of 347 taxa (species and subspecies) currently present, divided into 79 plant families. However, at least 49 taxa formerly mentioned by botanists have not been found and they can now be considered extinct.

1.7.2 Invasive species and new species

The presence of certain invasive species has increased in recent years, in particular with the presence of the *Aedes albopictus* mosquito and the *Ostreopsis ovata algae*.

The Principality of Monaco is highly exposed to the appearance of the *Aedes albopictus mosquito*. The exotic plants present in the Principality, such as the balisier, are conducive to its development. These mosquitoes appear earlier in the year and disappear later. Their diapause is therefore getting shorter and shorter. At the same time, there has been a decrease in the presence of Culex mosquitoes, in competition with "tiger" mosquitoes. In 2006, the European Centre for Disease Prevention and Control (ECDC) observed for the first time the presence of the *Aedes albopictus* mosquito on Monegasque territory.

This mosquito is one of the 100 most invasive species in the world. Chikungunya is now considered a "re-emerging" disease. Climate projections on Monegasque territory show an increase in the number of months when conditions would be favourable to the transmission of the virus, i.e. 4 to 5 months in the Principality.

Since 2007, a monitoring system and preventive management of the risk associated with the presence of the algae *Ostreopsis ovata* have been put in place. The appearance of the algae has been noted in the Mediterranean, however, the thresholds of risk to public health have never been reached in the Principality.

The observation of jellyfish on the coast, especially *Pelagia noctiluca*, has increased since the 90s. The apparent increase in their numbers, which remains to be confirmed, is linked to a combination of several factors that promote their proliferation: increase in water temperature, the strength and direction of currents, or overfishing of fish that prey on jellyfish and other planktonic species.

For coastal jellyfish, *Aurelia aurita*, the general increase in temperatures would thus tend to promote this proliferation by extending their reproduction period. Finally, plastic could serve as a feeder for them. According to the Oceanological Observatory of Villefranche-sur-Mer (France), about one in 200,000 people develops hypersensitivity and an immediate allergic reaction that can lead to anaphylactic shock.

In addition, some species of exotic fish are now found in Monegasque waters, such as the flutefish (*Fistularia commersonii*). Native to the Indian and Pacific Oceans, this fish was first reported in the Mediterranean on the Israeli coast in 2000. The flutefish is a species associated with rocky reefs, of minor importance for commercial fishing. It is one of the species that colonized the Mediterranean the fastest. It was observed in 2010 in Monegasque waters. However, even if individuals, mostly adults, have arrived, none have settled permanently.

Even if no exotic species of fish have yet settled permanently in Monegasque waters, it is certain that the arrivals of Lessepsian fish will continue and will probably intensify in the western Mediterranean in the years to come.

2 Mitigation measures

2.1 Evolution of greenhouse gas emissions from 1990 to 2018

2.1.1 Evolution of global emissions

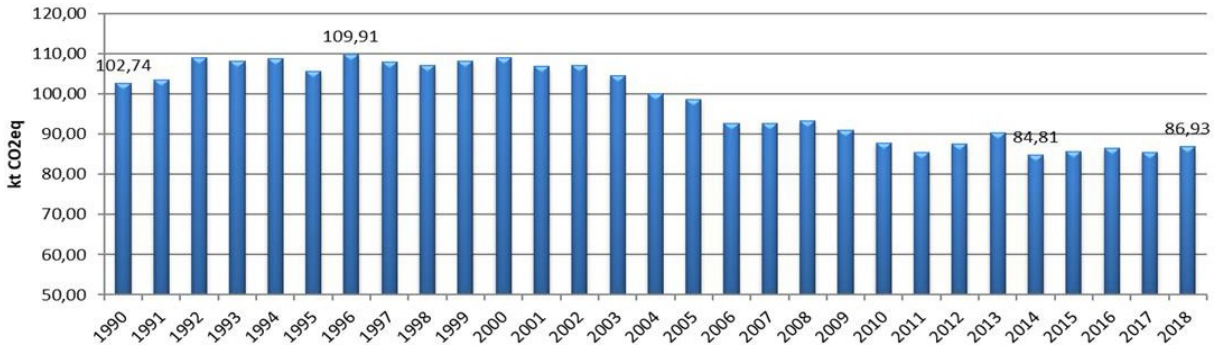
Monaco's overall greenhouse gas emissions[4] increased from 102.74 kt[5] CO2 equivalent in 1990 (base year for CO_2, CH4 and N_{2O} and 1995 for fluorinated compounds, LULUCF excluded) to 86.93 kt CO2eq[6] in 2018.

This change in emissions represents a decrease of 15.4%.

Over this period, there was first of all an increase in emissions from 1990 to 2000. The maximum was reached in 1996 with emissions of 109.91 kt CO2eq. Then, from 2000 onwards, the trend was generally decreasing until 2018, despite some rebounds.

The agricultural sector is non-existent in Monaco. There is no agricultural activity or cattle breeding.

Evolution of global GHG emissions from 1990 to 2018 – Department of the Environment



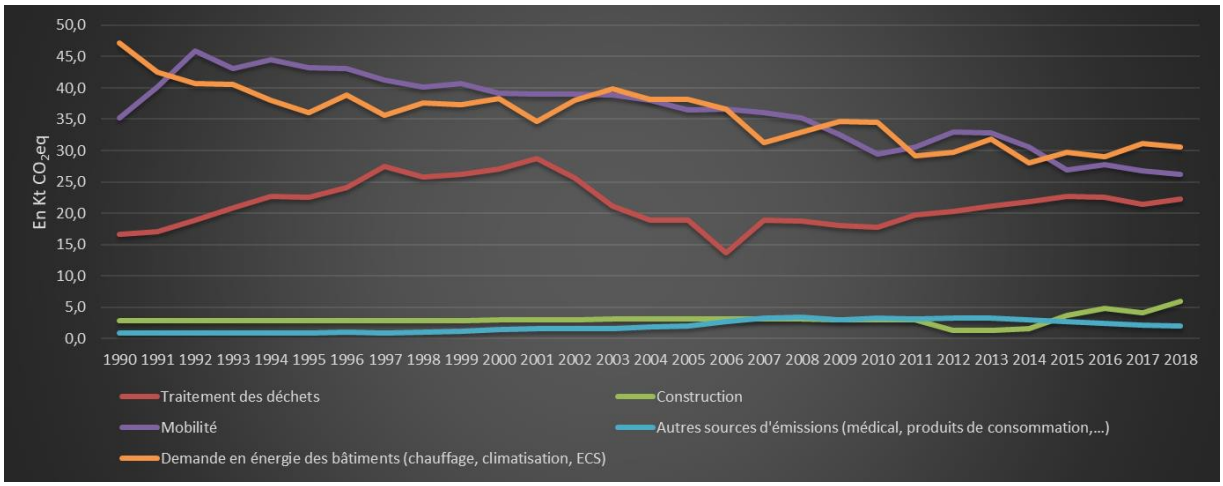
[4] National Inventory Report 2020 – Department of the Environment - Monaco

[5] kt: kiloton

[6] kt CO2eq: kiloton carbon dioxide equivalent

2.1.2 Evolution of emissions by major sectors of activity

2.1.2 Evolution of emissions by major sectors of activity between 1990 and 2018 – Department of the Environment



This graph shows the evolution of greenhouse gas emissions by major sectors of activity as detailed below:

Building energy demand: includes emissions from the combustion of heating oil and natural gas for heating and domestic hot water, heavy fuel oil and natural gas from the SeaWergie network, gases from stationary air conditioners, gases from electrical transformers and losses from the natural gas network.

Emissions from this sector fell by 35% between 1990 and 2018.

Waste treatment: integrates emissions related to waste incineration into the UIRUI
Emissions from this sector increased by 34% between 1990 and 2018.

Mobility: includes emissions from road fuels, domestic and national aviation fuels, automotive air conditioning gases, and automotive lubricants and additives
Emissions from this sector decreased by 26% between 1990 and 2018.

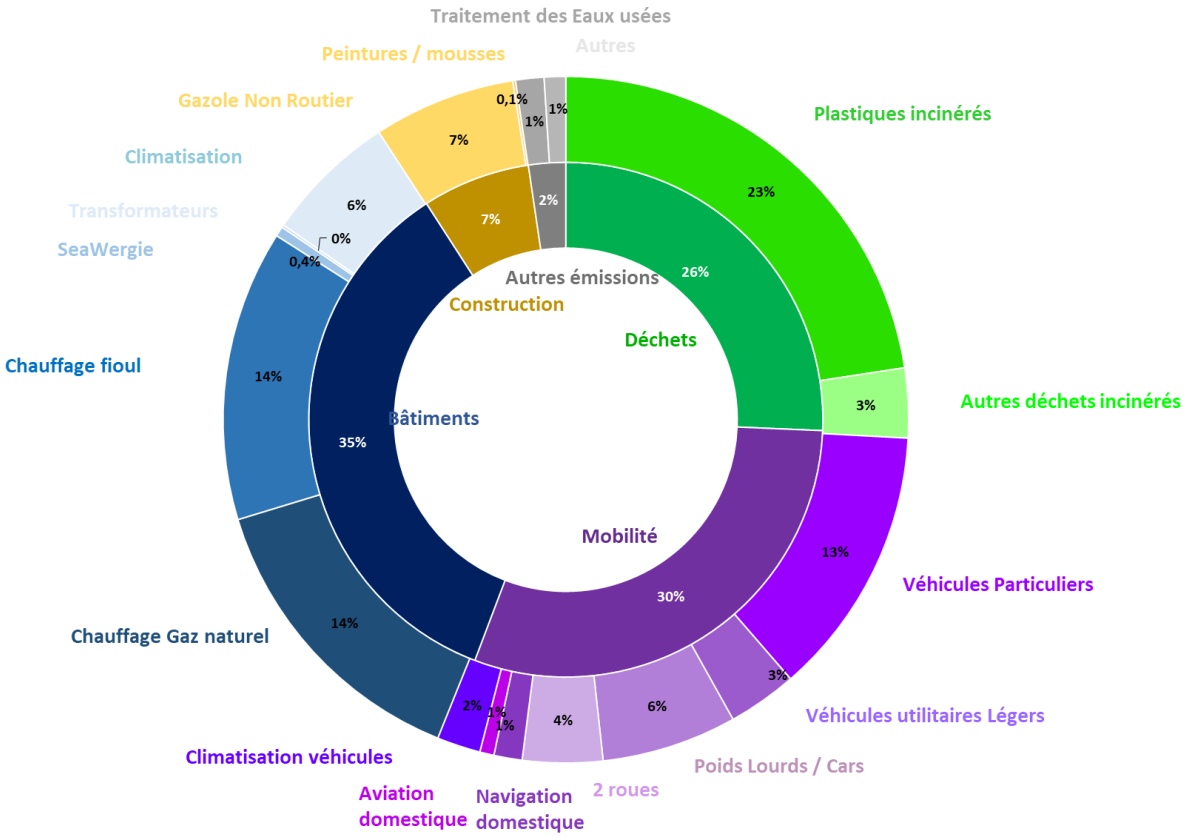
Construction: includes emissions from off-road diesel, paints, foams, bitumen and wood treatments.

Emissions from this sector increased by 107% between 1990 and 2018.

Other: includes emissions related to gases from refrigerators, gases from medical inhalers and particle accelerators, dry cleaners, pressurized containers such as whipped cream, glues, paraffin and printing inks.

Emissions from this sector increased by 115% between 1990 and 2018.

2.1.3 Breakdown of greenhouse gas emissions from major sectors of activity in 2018



Répartition des émissions GES en 2018

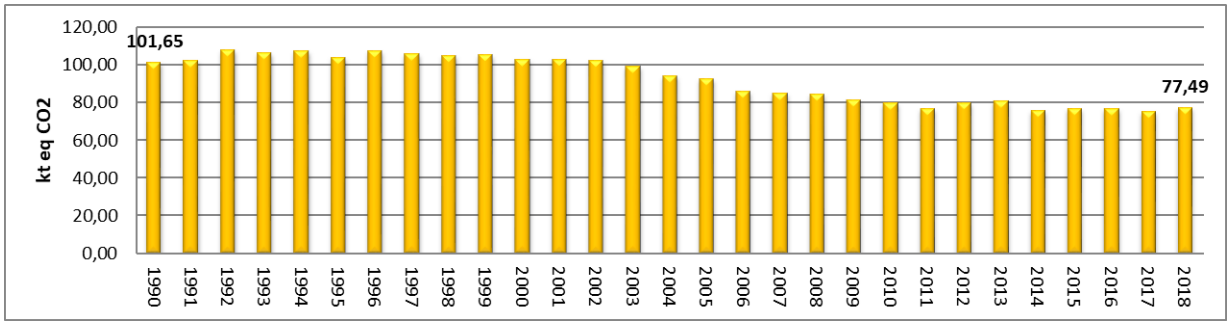
Source: Rapport National d'Inventaire 2020 - CCNUCC- Direction de l'Environnement

The graph above shows the repair of greenhouse gas emissions in 2018 by major sectors of activity (indoor) and by sub-category (outdoor).

2.1.4 Evolution of emissions from the Energy sector

Emissions from the Energy sector increased from 101.65 kt CO2eq in 1990 to 77.49 kt CO2eq in 2018, an evolution of -23.76%.

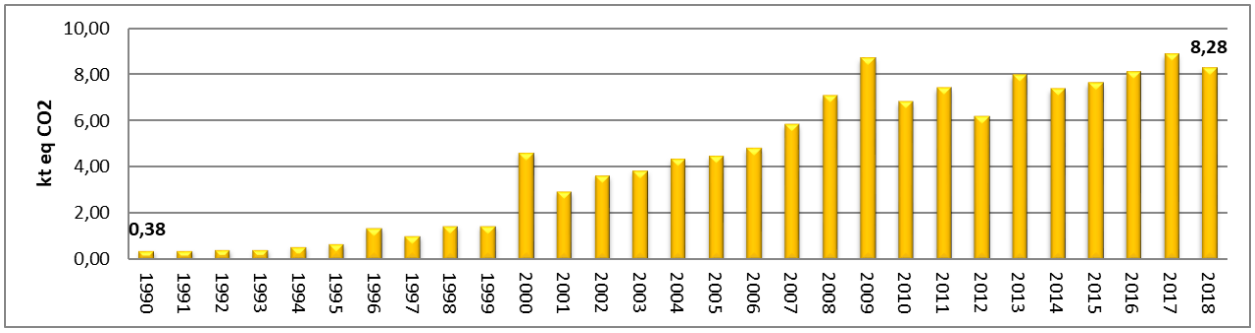
Evolution of GHG emissions from the Energy sector from 1990 to 2018



2.1.5 Evolution of emissions from the industrial sector

Emissions from the Industry sector (excluding transport) have increased from 0.38 kt CO2eq in 1990 to 8.289 kt CO2eq in 2018, an increase of 2060%.

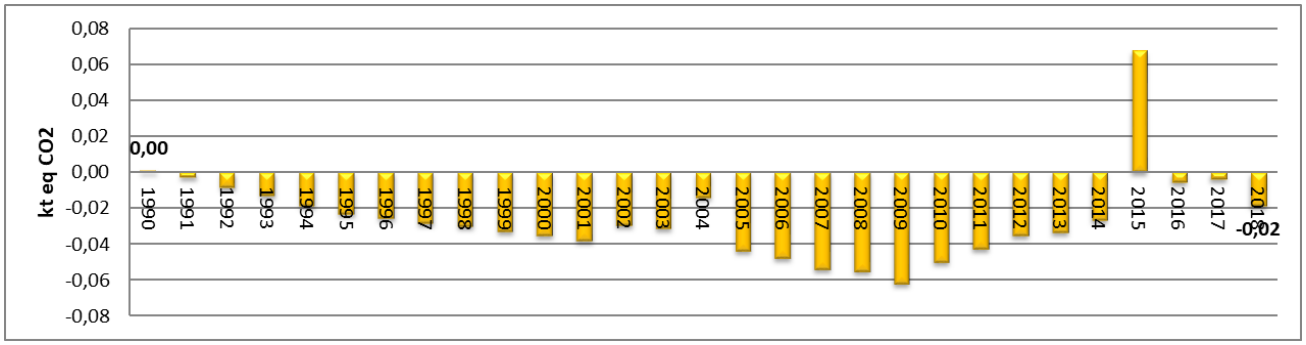
Evolution of GHG emissions from the Industry sector from 1990 to 2018



2.1.6 Evolution of emissions from the UTCATF7 sector

Emissions from the Land Use, Land Use Change and Forestry sector increased from 0.00 kt CO2eq in 1990 to -0.02 kt CO2eq in 2018, an evolution of -1286%.

Evolution of GHG emissions from the LULUCF sector from 1990 to 2018

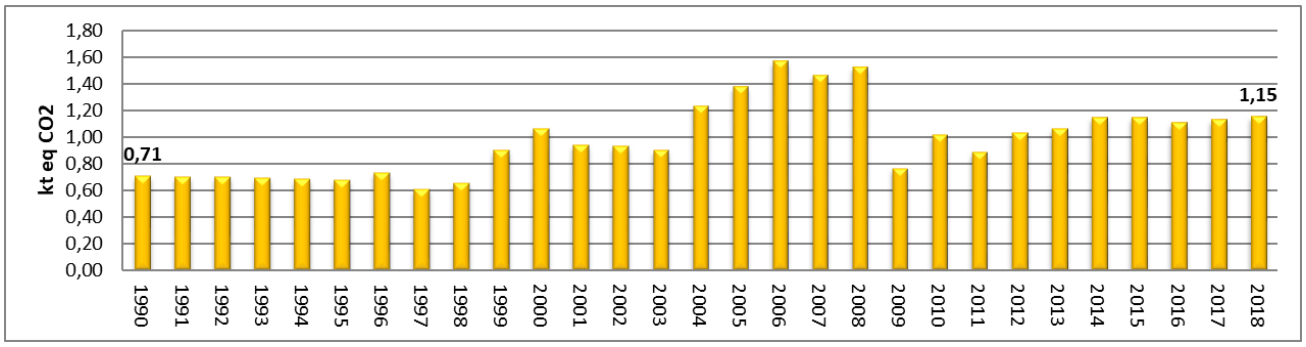


[7] LULUCF: Land Use, Land-Use Change and Forestry.

2.1.7 Evolution of emissions from the waste sector

Emissions from the waste sector have increased from 0.71 kt CO2eq in 1990 to 1.15 kt CO2eq in 2018, an increase of 63%.

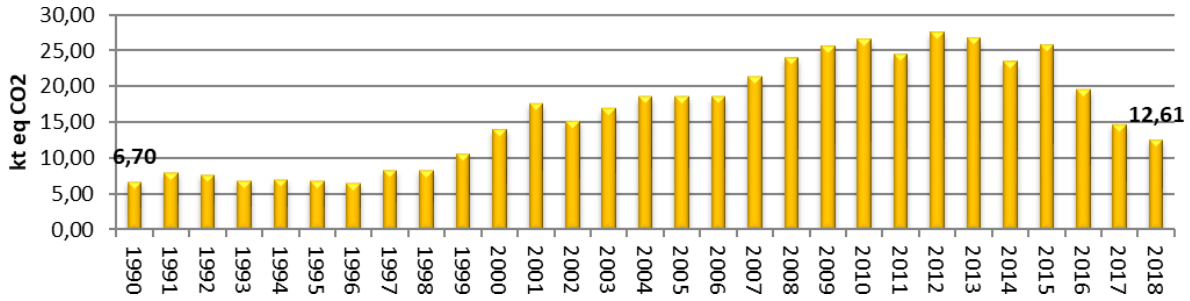
Evolution of GHG emissions from the waste sector from 1990 to 2018



2.1.8 Evolution of International Balance sector issues

Emissions from the Soultes Internationales sector have increased from 6.70 kt CO2eq in 1990 to 12.61 kt CO2eq in 2018, an increase of 88%.

Evolution of GHG emissions from the International Balance sector from 1990 to 2018



2.1.9 Evolution of greenhouse gas emissions by gas

Carbon dioxide is the main greenhouse gas emitted in the Principality. In 2011, the values and percentages of emissions of the various greenhouse gases were as follows (excluding LULUCF):

Carbon dioxide CO2 - The main gas emitted in 2018 remains CO2, which accounts for 86% of global emissions. Between 1990 and 2018, $CO_{2\ emissions}$ increased from 98.23 kt to 74.76 kt.

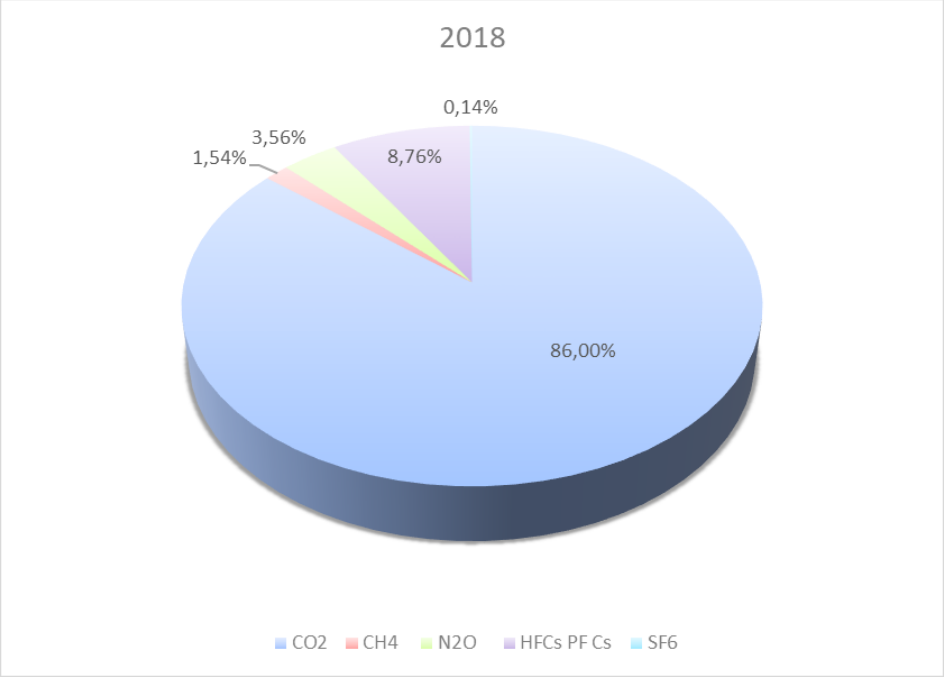
CH4 methane - CH4 emissions have decreased from 0.09 kt in 1990 to 0.05 kt in 2018.

N2O nitrogen oxide - N2O emissions have decreased from 0.007 kt in 1990 to 0.01 kt in 2018.

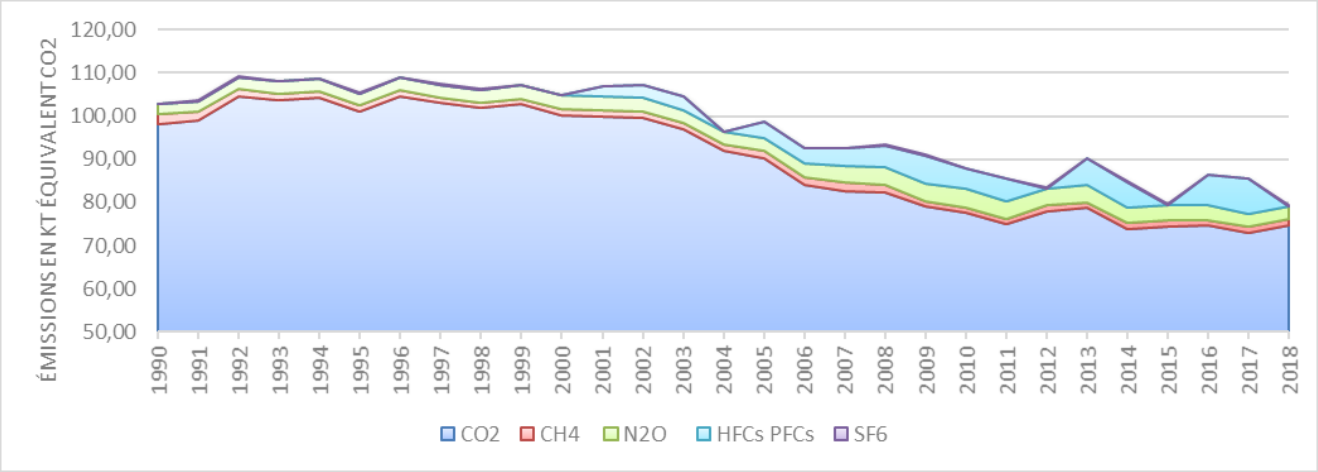
HFCs and PFCs - HFC-PFC emissions have increased from 0.0 kt CO2eq in 1990 (0.29 kt CO2eq in 1995) to 7.61 kt CO2eq in 2018.

SF6 - SF6 emissions increased from 3.6 E-6 kt in 1990 (4.1 E-6 kt in 1995) to 5.4 E-6 kt in 2018.

Distribution of GHG emissions by gas in 2018

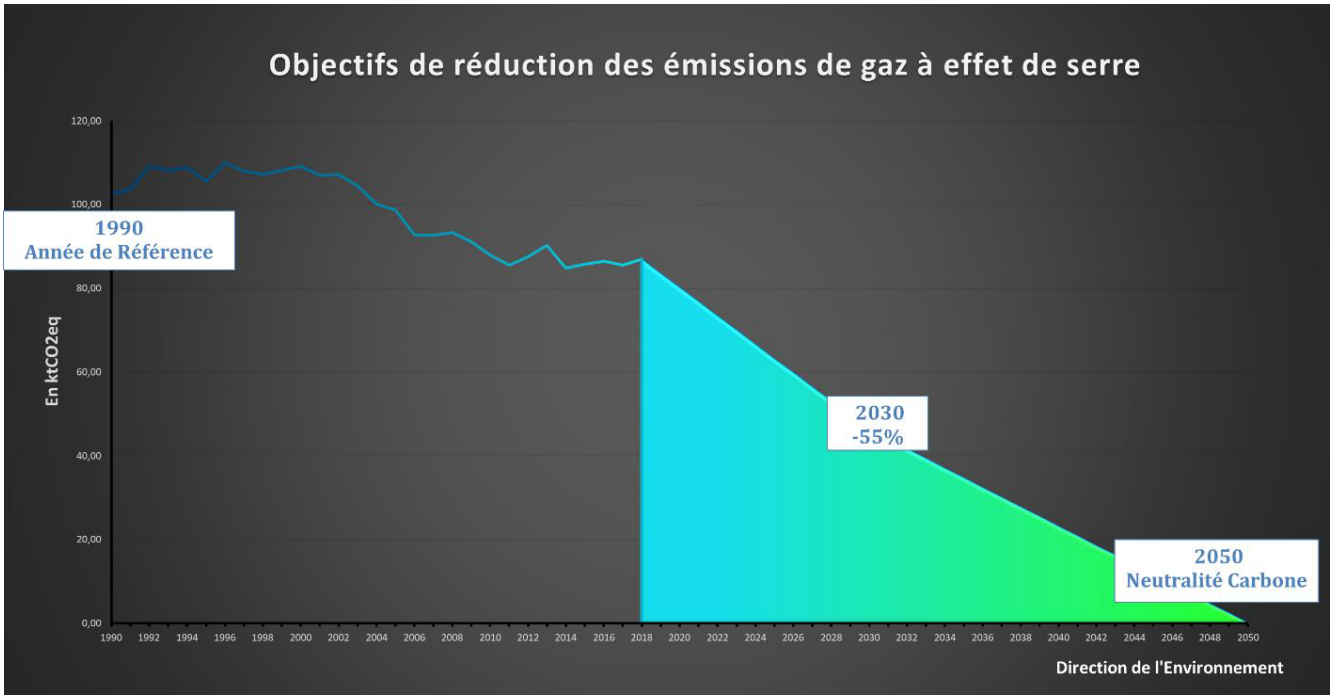


Evolution of GHG emissions by gas between 1990 and 2018



2.2 2030 greenhouse gas emission reduction targets

The Principality of Monaco has set itself the objective, within the framework of this Nationally Determined Contribution, of reducing its greenhouse gas emissions by 55% by 2030.



2.3 Key Policies and Measures

To achieve its objectives for 2030, the Principality of Monaco has already implemented important policies and measures. These policies also aim to put the territory on a trend of reducing greenhouse gas emissions to achieve carbon neutrality by 2050.

Thus, the Principality implements policies and measures covering the three main sectors of energy, transport and waste detailed in the 2030 Climate Air Energy Plan. These policies and measures are organizational, technical, regulatory or incentive-based.

The main actions are detailed below:

2.3.1 Energy

The consumption of fossil fuels in buildings is one of the main sources of greenhouse gas emissions.

The priority areas developed by the Principality in this sector aim to decarbonise the energy consumed by buildings and improve their energy efficiency.

The decarbonisation of fossil fuels is reflected in an increase in the proportion of renewable or recovered energy consumed, in particular through the creation of thalassothermal networks, the recovery of waste energy, as well as through the increase in solar thermal and photovoltaic production at home and abroad (in proportion to the electricity consumed in the country).

In addition, it will take the form of an increase in the biogenic share of fossil fuels, or even the substitution of these fuels by new fuels that are 100% biogenic.

Improving the energy and environmental performance of all existing and future buildings is also essential. The best energy is the energy that is not consumed.

The policies and measures simultaneously target the renovation of the already built heritage (energy envelopes and systems), the uses and changes in behaviour and sustainable construction methods for new buildings (adapted to the Mediterranean climate and the specificities of Monaco) with the aim of optimising the energy efficiency of all buildings.

This optimization requires a gradual strengthening of the regulatory thermal requirements of new buildings and renovations, as well as prioritization and an increase in the annual rate of renovation, supported by financial measures.

In addition, the Government is supporting the adaptation of construction methods to the specific local climate through Monaco's Mediterranean Sustainable Building approach and the training of construction stakeholders in new techniques and technologies.

It should be noted that the Principality of Monaco has a strong interest in "blue energy" and in particular thalassothermal energy in order to replace fossil fuels. With its coastline and significant bathymetry near the coast, this technology is particularly suited to the territory. The studies carried out have also demonstrated a zero environmental impact of the discharge of water on biodiversity.

2.3.2 Transport

Transport policies and measures are mainly concerned with road transport. Monaco also has a heliport and two marinas. Monaco is an important centre of activity adjacent to the French department of Alpes-Maritimes. This economic dynamism generates significant exchanges of assets (commuters with France and Italy), as well as traffic induced by economic activity (external companies, deliveries, etc.).

Monaco's service centre (hotels, sports facilities, education, etc.) leads to a large number of day visitors (local visitors).

Thus, the Principality is pursuing two lines of action in terms of reducing greenhouse gas emissions from road transport, namely the reduction of traffic and the decarbonisation of means of transport.

The priority for action is to reduce the absolute number of kilometres travelled by individual motorised transport, to the benefit of active modes and public transport.
The structuring actions will consist in particular of the creation of park-and-ride facilities at the borders and the multiplicity of alternative mobility solutions (gondolas, support for walking and cycling by strengthening equipment and e-service offers).
Public transport will be gradually replaced to reach 0 CO2 emissions by 2030.

In addition, the Government supports the substitution of internal combustion vehicles by electric vehicles . Although it improves the situation in terms of direct emissions of CO2 and atmospheric pollutants , this substitution does not solve the problems of congestion on travel routes (which primarily condition the possibilities for the development of alternative modes) and is difficult to generalise (very high electricity consumption and power, risk of fire in collective car parks, etc.).

In the context of air transport, efforts are being made to limit the fuel consumption of aircraft. Monaco's heliport is pursuing an Airport Carbon Accreditation certification process Electric helicopters could be put into service by 2030 to operate regular Monaco – Nice (France) routes.

Finally, with regard to navigation, the Principality has banned the use of heavy fuel oil in its territorial waters and is deploying devices for the supply of electricity to ships in ports.
Discussions are being given to the use of hydrogen by ships.

These policies will be supported by a gradual decarbonisation of fuels in line with European policies in this area.

2.3.3 Rubbish

Since 2016, the Principality has been deploying an ambitious strategy to limit the amount of waste produced and to direct waste as a priority towards material recovery.

This strategy has been complemented by a "zero single-use plastic waste by 2030" policy.

In terms of reducing greenhouse gas emissions, Monaco's priority in this area is to reduce plastic waste, the incineration of which is responsible for the majority of emissions from this sector.

However, this must be part of a global and long-term policy that aims both to reduce all types of waste at source and to improve its recovery – material in the first place, energy in the second place – with a view to reducing energy, climate and environmental impacts.

These policies and measures take the form of regulatory measures aimed at prohibiting the placing on the market or distribution of certain products, measures aimed at simplifying sorting and increasing the quantities collected.

2.3.4 Industry

The Principality has no heavy industry on its territory and the industrial sector is very weak. The greenhouse gas emissions reported in the Industry sector mainly concern craft activities.

Policies and measures are mainly aimed at general measures related to energy, pollutant emissions and fluorinated gases.

With regard to fluorinated gases, the Principality intends to severely limit the global warming potential of fluorinated gases used on its territory.

It should be noted that in this respect, the Principality of Monaco benefits from the European Union's regulatory changes on products, due to the Customs Union between the two territories.

2.3.5 Cross-cutting actions

While the Principality has committed to ambitious energy and climate objectives, the Prince's Government cannot achieve them alone. It must be shared with the inhabitants and the public and private actors who animate, work and visit the Principality.

The momentum towards carbon neutrality by 2050 requires profound changes, particularly in the energy, buildings and transport sectors, but above all in everyone's habits and choices.

These transformations are a source of many positive impacts (living environment, jobs, innovation, etc.) but they must be shared and require a commitment from all.

Cross-cutting policies and measures concern both actions to mobilise and raise awareness among local actors, as well as support actions.

As such, Framework Law No. 1.456 of 12 December 2017 on the Environmental Code constitutes the legal basis for the implementation of regulatory actions and financial support.

The Government intends to continue and expand support efforts to guide and amplify the transition to action. But this set of measures offered by the Government will only be able to have an effect if there is a collective awareness of the issues, a good appropriation of the objectives and solutions, and above all a federative dynamic around the desire to contribute and succeed together.

Thus, various means are developed through sectoral approaches such as "Engaged Trade" or "Engaged Restaurant", or more global by federating all the actors such as the "National Pact for Energy and Energy Transition".

These approaches are forums for exchange and learning about each other's actions, as well as a space conducive to awareness and mobilization

3 Accommodations

The diagnosis of vulnerability to climate change for Monaco must be understood through the direct effects of climate change; increase in warm periods, change in bioclimatic characteristics, energy stress and sea level rise.

The urban climate is generally characterized by a higher temperature than in the surrounding rural areas (especially at the end of the day and at night), specific winds and the presence of urban pollution.

3.1 Adaptation of urban heat islands

The temperature difference observed in urban heat islands (UHIs) is related to the heat stored during the day in the mineral city and released at night, which will thus prevent the cooling of the air in the city at night. More pronounced at night, this difference is characterized by air temperatures (at different heights) and surface temperatures (temperatures of specific urban materials), and is thus strongly correlated with the variation in urban density, especially building materials.

A study launched in 2020 made it possible to identify heat islands (UHIs) and urban coolness, in order to be able to assess the vulnerability of the territory and the areas with high stakes.

The objective will then be to take into account summer comfort in construction, rehabilitation and building operations, but also in land use planning work. Once finalised, this study will serve as a management tool for the tree species present in the Principality, with the aim of favouring species with a role in thermal regulation, but also in the capture of various air pollutants in correlation with air quality data.

This issue can be felt at two levels: at the scale of the building (indoor thermal discomfort) and at the scale of the neighborhood (urban heat islands). In the Principality, the issue of thermal discomfort in buildings is not predominant. Conversely, the increase in temperatures is expected to have a strong impact on the UHI phenomenon.

3.2 Nature in the city

Strengthening the role of nature is a priority for the Principality in order to improve the living environment and adapt the territory to climate change.
In a context of dense urban environments, environments favourable to biodiversity are rare and must therefore be both preserved and developed. Today, it is a question of proposing a new urban model for Monaco where nature unfolds wherever possible, in the heart of the public space as well as on the buildings.

The Prince's Government, through the National Strategy for Biodiversity 2030, aims to place biodiversity at the service of the Principality of Monaco's living environment and climate policy.

As Monaco is the most densely populated coastal city in the world, climate change will put additional pressure on the territory's populations and biodiversity. It is therefore necessary to prepare the resilient city of tomorrow by integrating the services provided by nature.
These services concern attractiveness, improving the environment and quality of life of the inhabitants, the social need to connect with nature, reducing vulnerability to natural hazards and adapting the Monegasque territory to climate change.

With the ambition of making biodiversity a key component of Monaco's quality of life, a plan to "renaturate" the city has been initiated. Road surfaces represent about 30% of the surface area of Monaco. These areas are opportunities for the integration and development of biodiversity. A target of renaturation of at least 20% of these areas has been set by 2030, i.e. a gain of more than 13 ha of areas favourable to biodiversity.

Finally, this renaturation of the area will improve connectivity between natural areas, which will benefit the development of biodiversity and will contribute to improving the well-being of the Principality's inhabitants and reducing temperature.

The place of trees in the city wants to be strengthened with a major planting programme. An increase of at least 20% in the number of individuals, which represents the planting of 2,400 additional trees on the territory, is envisaged by 2030, in addition to the 12,000 trees already present on the territory. In addition, the development of green infrastructure on the built environment, such as intensive roofs and modular green walls, will be encouraged to "wild" the city with the aim of coexisting a high number of plant species (sown, planted, but also spontaneous), different strata (shrubs, herbaceous plants, muscinals) adapted to local climatic and microclimatic conditions (temperature, humidity, light, wind).

3.3 Adaptation of coastal areas

In the medium term, climate change will lead to changes in the wind patterns that cause the waves, and a rise in mean sea level. The Monegasque coastline will be subject to these changes.

A study has been carried out in the Principality to define the coastal areas most exposed to the risk of submersion, as well as a map to identify the risks of submersion on the entire Monegasque coastline for the current state and by 2100.

As the Principality is largely built on the sea, the risk of submersion is high. Thus, developments and structures will have to be carried out in the future, with:
- In the short term, based on localised raising solutions (embankments, fixed or removable landscape walls depending on the location, crowning beams when possible, etc.) and regulating activities behind structures in exposed areas.
- In the medium term, through the construction of new structures acting as an anti-submersion belt that could eventually serve as an urban extension of the Principality of Monaco if these structures are built at sea and not directly on the coast.

4 Climate finance

True to its tradition of solidarity, the Principality of Monaco fully intends to shoulder its share of responsibility in the collective fight against climate change. In this regard, Monaco will continue to support developing countries and their efforts to mitigate and adapt to climate change.

The Prince's Government's growth strategy for international climate finance provides for a biennial increase of €100,000 from 2020, by 2030.

A cross-cutting approach, linking several sustainable development goals, will continue to be favoured, in particular activities with climate/biodiversity/ocean co-benefits, as these issues cannot be addressed separately.

As in the past, the Principality will continue to focus its efforts on the Least Developed Countries and Small Island Developing States, which are among the first victims of climate change.

The majority of the Principality's international climate finance is channelled through bilateral channels, in particular through the Green Climate Fund, which Monaco has supported since the start of its operations in 2015.

On the occasion of the first reconstruction of the Fund in 2019, the Prince's Government committed to contributing €3.75 million over the period 2020-2023, thus strengthening the Principality's position as a major per capita donor. Through this contribution, Monaco guarantees the equitable allocation of its climate finance resources between adaptation and mitigation, while ensuring that they reach developing country Parties.

Monaco also pays particular attention to how climate change affects human health and threatens the fundamental right of individuals to live in a healthy, clean and sustainable environment. To address this, the Prince's Government is channelling part of its international funding to organisations working to combat the harmful effects of climate change, including the International Civil Aviation Organization (WHO). M.S., through its strategic priority B3, and the Climate and Clean Air Coalition.

Finally, in addition to its traditional climate financing, the Prince's Government conducts numerous international cooperation programmes which, although not dedicated to them, offer "climate co-benefits" for the Principality's partner countries in terms of both adaptation and mitigation. For the year 2021, these projects represented a total of nearly 4.8 million euros, an increase of approximately 87% compared to 2018.

In the future, Monaco plans to further strengthen the integration of climate considerations at the heart of its development cooperation policy, in order to make all this financing more consistent with the low-carbon and resilient development of its partner countries. The medium-term objective is to be able to boast of a fully "climate-compatible" cooperation.

The Principality has delivered all of its funding in the form of grants and intends to continue to do so. Multilateral, regional and bilateral channels will continue to be used according to their ability to produce concrete results on the ground.

5 Market mechanisms

The reduction of the territory's greenhouse gas emissions is primarily the result of national measures.

In the event that these reductions do not make it possible to achieve the objectives set, the Principality may use the market mechanisms referred to in Article 6 of the Paris Agreement.

6 Disclosures to improve clarity, transparency and understanding of Nationally Determined Contributions

6.1 Quantifiable information on the benchmark

Monaco considers 1990 as the reference year for its commitments.

6.2 Implementation Periods

The Principality of Monaco is committed to reducing its emissions by 55% by 2030.
The implementation period is from January 1, 2021 to December 31, 2030.

6.3 Scope and scope

Monaco's commitment covers all territorial emissions, as reported in the National Inventory Reports.

It concerns all sectors: Energy, Industrial Processes and Product Use, Agriculture, Forestry and Land Use and Waste.

Finally, it covers all gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbon (HFC) and perclofluorocarbon (PFC) fluorinated gases, sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3).

The estimation of greenhouse gas emissions from all sectors is carried out in accordance with the 2006 guidelines (GL 2006) of the Intergovernmental Panel on Climate Change (IPCC). The global warming powers used are those published in the IPCC's 4th Assessment Report on Climate Change (IPCC – AR 4 – 2007). The values may be modified as a result of methodological improvements made for the estimation of greenhouse gas emissions.

6.4 Planning process

The preparation of the Nationally Determined Contribution is part of the revision of the Principality of Monaco's energy and climate planning by 2030. In this context, through various bodies, public and private actors were consulted.

The projections and policies and measures determined have been dictated to achieve the 2030 objectives and to put the Principality on the path to carbon neutrality by 2050.

6.5 Assumptions and methodological approaches, including those concerning the estimation and accounting of anthropogenic greenhouse gas emissions and, where applicable, anthropogenic removals

The methodological assumptions and approaches, including those concerning the estimation and accounting of anthropogenic greenhouse gas emissions, are those used in national inventory reports in accordance with the IPCC guidelines.

The implementation of policies and measures will be monitored within the framework of the governance of the Climate, Air and Energy Plan.
Monitoring of greenhouse gas emissions, energy indicators and the impact of policies and measures will be carried out through the preparation of national inventory reports and other reports required under the Convention and the Paris Agreement.

6.6 How the Party considers its nationally determined contribution to be equitable and ambitious in light of its national circumstances

Monaco's commitment to reduce greenhouse gas emissions has been reviewed and increased as part of this Nationally Determined Contribution.

Thus, the quantified commitment to reduce GHG emissions by 2030 has increased from -50% to -55%.

Monaco considers its commitment particularly ambitious in view of its national situation and in particular its 2km² territory, which corresponds to a dense urban environment.

The policies and measures implemented cover all sectors that are the source of greenhouse gas emissions. Support policies are being implemented to support populations in the transitions necessary to meet the commitments set.

6.7 How the Nationally Determined Contribution contributes to the achievement of the objective of the Convention as set out in Article 2 of the Convention

The IPCC8 has determined the trajectory to limit global warming to 1.5°C " *In pathways that limit global warming to 1.5°C with no or minimal overshoot, net anthropogenic CO2 emissions decline by about 45% from 2010 levels to 2030 (interquartile range: 40-60%), becoming equal to zero by 2050* ."

[8] IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Associated Global Greenhouse Gas Emission Trajectories in the Context of Strengthening the Global Response to Climate Change, Sustainable Development and Poverty Alleviation – Summary for Policymakers – paragraph C.1

By deciding to reduce its greenhouse gas emissions by 55% by 2030 compared to 1990, the Principality of Monaco has decided to align its 2030 commitment with this trajectory.

Thus, the Principality of Monaco intends to assume its responsibility to enable ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and that economic development can continue in a sustainable manner by setting its greenhouse gas emission reduction target on the long-term objective as set out in Article 2 of the Convention and specified by Decision 10/CP.21.