

**The Second Communication
of the Republic of San Marino
to the United Nations
Framework Convention
on Climate Change**



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Foreword

Since climate change, which we all witness, is an urgent matter to be dealt with seriously, it deserves agreed international action. All States must play a role in combating the disastrous outcome of this change, according to their common, although different, responsibilities, their respective capacities and their national features. Climate stability cannot be connected with the interests of individual States or with the mere intervention of political or economic powers. Climate is and must be considered a common good. Biosphere crisis inextricably involves all countries in the world. Today, "national" interest is increasingly intertwined with the concept of "global common good" and with the idea that a rapid and, most of all, joint action is necessary to face the challenge of climate change.

For this reason, also a small State like the Republic of San Marino can and must do its utmost to promote the affirmation of a global policy of the Earth, an Earth which is now more than ever injured, violated and even humiliated, but which must again be considered as "Mother Earth" of all peoples living on it. Combating climate change means first of all promoting a cultural change, which starts from individuals and then gradually extends to societies, States, continents and the entire world. This means recognising that all forms of life are intertwined, as well as supporting a new alliance between man and nature.

The Republic of San Marino, one of the first States to sign the Framework Convention on Climate Change, has been strongly committed, over the last years, to reducing its greenhouse gas emissions, both by complying with the undertakings it made in ratifying the Convention, and by adopting Laws that promote energy saving and the use of renewable resources.

In September 2009 the first National Communication was completed and since then other important steps forward have been taken, such as the ratification, in April 2010, of the Kyoto Protocol. This last step has contributed to the completion of a process started in 1992 with the signing of the Convention. In the meantime, a permanent technical working group has been established to exclusively deal with issues concerning climate change. This working group also compiled the second National Communication.

Today, I have the honour and the privilege of introducing the Second National Communication of the Republic of San Marino and to share, in this way, with the other parties to the Convention the objectives concerning reduction of greenhouse gas emissions in our country, as well as the strategies to strengthen policies aimed at mitigating the effects of climate change. Although we are not among the countries obliged to specifically reduce their emissions, and despite our very low levels of emissions compared with those of the rest of the world, our commitment in terms of reduction is constant and continuous.

The second Communication is for us a privileged point of reference to carry on the process already started: the building of a new fairer and mutually supportive development model is and remains among the priorities of the political agenda of our small but tenacious Republic.

The Minister of Environment and Territory

Matteo Fiorini

1

Executive summary

1.1 National circumstances

The Republic of San Marino is a European State located in the Italian peninsula. The City of San Marino is the capital and Italian is the official language. With a surface of 61.19 square kilometres and a population of 31 887 inhabitants, the Republic of San Marino is among the smallest and less populated member States of the Council of Europe and of the United Nations. The territory includes about 10 km² of forests and 28.6 km² of agricultural land.

The Republic of San Marino is a parliamentary republic, which is independent since the thirteenth century. According to tradition, it was founded on 3 September 301 A.D., when Saint Marino established a small Christian community on Mount Titano.

The executive power lies with the Congress of State (Government), composed of a maximum of 10 Ministers (called Secretaries of State). Among these, the Minister of Environment and Territory is responsible for the environmental policies of the State.

San Marino economy, although diversified, is mainly based on manufacturing industry, tourism and services. In 2010, the GDP of the Republic of San Marino was equal to 1 492 million euro, corresponding to 44 998 euro per inhabitant. San Marino economy is important in terms of employment for the entire region; one fourth of the labour force is indeed made up of cross-border workers.

In 2010, energy consumption was equal to 272 GWh of electricity and to 108 Gg of fuels. The Republic of San Marino is totally dependent on energy imports since it has neither fossil fuel sources nor energy production plants. Only in 2011 has the production of middle-size photovoltaic plants effectively started.

Almost all waste produced is sent to disposal and recycling plants based in Italy since San Marino has no such plants.

1.2 National greenhouse gas inventory

Greenhouse gas emissions of the Republic of San Marino in 2010 amount to 267.28 Gg of CO₂ equivalent, corresponding to 8.4 tons of CO₂ equivalent per inhabitant. Taking also into account removals, total emissions decrease to 256.80 Gg of CO₂ equivalent, corresponding to 8.1 tons of CO₂ equivalent per inhabitant. (Table 1.1).

| <i>Category</i> | <i>CO₂</i> | <i>CH₄</i> | <i>N₂O</i> | <i>Total</i> | <i>Percent.</i> |
|--|--|-----------------------|-----------------------|---------------|-----------------|
| | <i>CO₂ equivalents (Gg)</i> | | | | <i>%</i> |
| 1. Energy | 262.74 | 0.67 | 0.47 | 263.88 | 98.7% |
| 2. Industrial processes | 0.00 | 0.00 | 0.00 | 0.00 | |
| 3. Solvents and other product use | NE | | NE | | |
| 4. Agriculture | | 2.12 | 1.28 | 3.40 | 1.3% |
| 6. Waste | NO | NO | NO | | |
| Total emissions | 262.74 | 2.79 | 1.75 | 267.28 | 100.0% |
| Percentage excluding absorption | 98.3% | 1.0% | 0.7% | 100.0% | |
| 5. Land-use and forestry change | -10.48 | | | -10.48 | -3.9% |
| Total including absorption | 252.26 | 2.79 | 1.75 | 256.80 | 96.1% |
| Percentage including absorption | 98.2% | 1.1% | 0.7% | 100.0% | |

Table 1.1: Emissions in CO₂ equivalent per sector and per gas in 2010 (NE=not estimated; NO=not occurring).

Almost all emissions (98.7%) are from the energy sector (10.9% from manufacturing industry and building sector; 59.6% from transports; 28.1% from other sectors, energy consumption in residential, institutional and commercial buildings). Compared to 2005, emissions have increased by 19.4% due to an increase in the energy sector, in particular in transports (+33%). In other areas of the energy sector emissions remained fairly stable (industry, +1.5%, other sectors, +3.2%), while in the agricultural sector decreased (-12.9%). CO₂ emissions are equal to 262.72 Gg, corresponding to 98.3% of total emissions, and are all from the energy sector.

Fluorinated greenhouse gas emissions have not been calculated. The contribution of these gases to total emissions in percentage terms should be very similar to that of Italy, that is 1.3% of total emissions.

1.3 Steps taken or envisaged to implement the Convention

The compilation of the first National Energy Plan (2008-2011) has paved the way for the adoption of a series of laws focusing on energy efficiency and reduction of dependence on external sources. Worth mentioning in this regard is Law no. 72 of 7 May 2008 – “Promotion and enhancement of energy efficiency in buildings and of renewable energy use in the civil and industrial sectors” – and all implementing decrees. Other law provisions concerned incentives to buy low environmental impact vehicles (Delegated Decree no. 4 of 23 January 2009), waste management (Delegated Decree n. 23 of 4 March 2009), exploitation of biomass and production of energy from RES in the agricultural sector (Delegated Decree no. 158 of 21 September 2010).

All relevant legislation is very recent and therefore it is difficult to make accurate projections about their impact. However, the NEP 2012-2015 envisages the installation, by 2015, of the following:

- about 6 MWp photovoltaic plants, so as to meet 2,6% of electricity requirements;
- about 2,500 square metres of solar collectors, corresponding to the non-emission of 0.5 Gg of CO₂.

The Budget Laws of 2010 (no. 194) and of 2011 (no. 200), confirmed the allocation of considerable sums of money to cover financial commitments following policies that promote and encourage the use of energy from renewable sources.

1.4 Vulnerabilities and adaptation

According to the data recorded by the meteorological station of San Marino, the trend of the San Marino climate is in line with the global one, namely increase in average temperatures and higher frequency of extreme events.

Over the last 20 years, average temperatures have significantly increased, particularly in summer. Trend analysis over the period 1932-2011 shows that the annual average temperature has increased by 2.9°C. As shown in Figure 1.1, this increase is higher during spring and summer months (+3.3 and +3.2°C) compared to autumn and winter months (+2.3 and +2.8°C).

Over the same period, the average annual amount of precipitation shows a clear tendency towards a decrease. The trend analysis over the period 1924-2011 indicates that the cumulative annual precipitation has decreased by 24.3%. This decrease is particularly sharp during spring months (-40.4%). On average, snowfall has become less frequent and less abundant and the number of days with below-zero temperatures has considerably decreased (annual average of 55 days from 1931 to 1960, 45 from 1961 to 1990, 33 from 1991 to 2010).

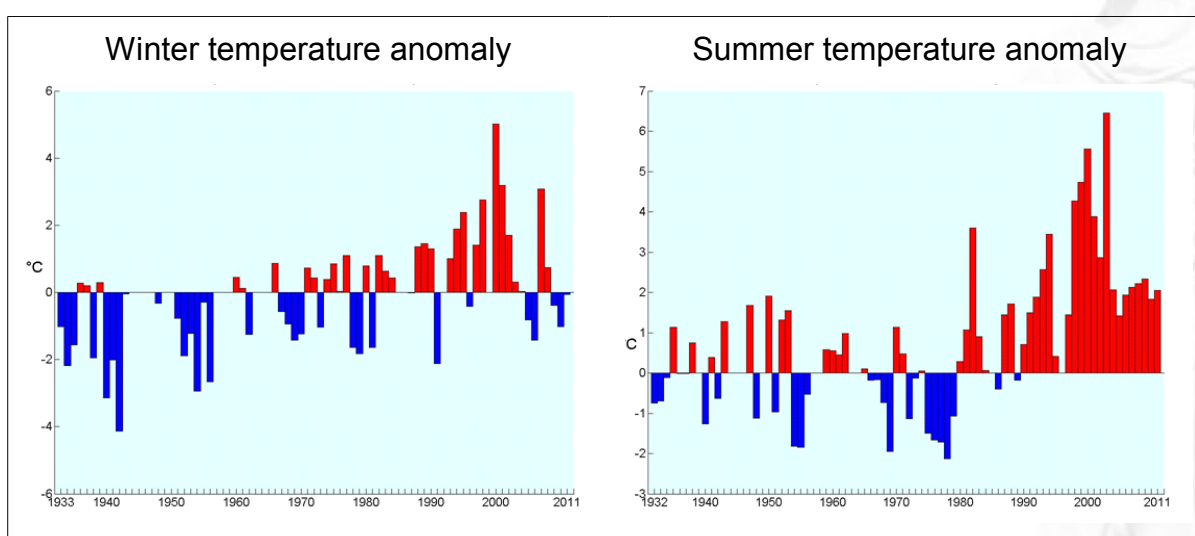


Figure 1.1: Observed winter and summer temperature anomalies; zero corresponds to the average over the period 1961-1990.

The frequency of extreme meteorological events, such as intense or absent precipitations and thermal anomalies, has considerably increased over the last years. In particular, periods characterised by little or no precipitation and hot temperatures, leading to heat waves and droughts, are becoming more and more frequent.

So far, the Republic of San Marino has not carried out any comprehensive assessment of the vulnerability of its territory to global warming. Notwithstanding this, it is possible to assess the general implications of temperature increase and of precipitation decrease in various fields:

- for human health, temperature increase may rise the frequency of heat waves and food infections, which pose serious risks, especially for the weakest groups of the population; moreover, it may favour the spreading of infectious diseases transmitted by vectors;
- with regard to water supply, in the context of a substantial decrease in precipitation San Marino is very vulnerable, since it already strongly depends on external sources,
- in relation to agriculture, rising temperatures and summer droughts have a generally negative impact on the main crops in the territory;
- for forests and ecosystems, the degradation of woodland and the increase in fires are the most probable effects of climate change in the ecosystems of the San Marino territory.

San Marino has already implemented some adaptation measures to climate change in the field of human health and is working towards the application of measures in the field of water supply and agriculture. It is also under study a national strategy for adaptation to climate change.

1.5 Other information useful to achieve the objectives of the Convention

San Marino schools have been active already for several years in the field of environmental and sustainable development education. Environmental knowledge is indeed an integral part of curricula of all school grades.

The purpose of environmental and sustainable development education is to substantially change individual and collective behaviours and attitudes. The activities proposed are based on two common elements:

- to live the environment in order to be able to appreciate it;
- to recognise the impact of everyday behaviour on the environment.

Concepts and knowledge are not fixed in themselves and therefore specific methods and instruments are chosen to promote and favour voluntary processes of change through action. This is why environmental education topics are often presented through hands-on activities and experiments.

Moreover, over the last years public attention has focused more on climate change issues, thanks to the activities carried out by several institutional and non-governmental bodies. This has increased the knowledge of the population about the negative effects of climate change on human beings and nature.



2

National circumstances relevant to greenhouse gas emissions and removals

The Republic of San Marino is a European State located in the Italian peninsula. The City of San Marino is the capital and Italian is the official language. San Marino is among the smallest and less populated member States of the Council of Europe and of the United Nations.

In 2008, the historic centres of San Marino and Borgo Maggiore and Mount Titano were included in the UNESCO World Heritage List according to the following statement:

"San Marino and Mount Titano are an exceptional testimony of the establishment of a representative democracy based on civic autonomy and self-governance, with a unique, uninterrupted continuity as the capital of an independent republic since the 13th century. San Marino is an exceptional testimony to a living cultural tradition that has persisted over the last seven hundred years."

2.1 Government system and main institutional bodies

The Republic of San Marino is a parliamentary republic. Its constitutional order is based upon the Declaration on the Citizens' Rights and Fundamental Principles of San Marino Constitutional Order (Law no. 59 of 8 July 1974 and following amendments), which is the fundamental law of the State, a function normally performed by the Constitutional Charter. The Declaration sets forth a number of provisions regulating the fundamental powers of the State, as well as the competences thereof.

2.1.1 The Great and General Council (Consiglio Grande e Generale)

The Great and General Council is the main legislative body of the Republic of San Marino. It is a unicameral parliament composed of 60 members and is elected every 5 years.

The Great and General Council exercises the legislative power through the issuance of laws, decrees and regulations in force for the entire community. Moreover, the Great and General Council appoints the Congress of State (Government), approves the budget laws, ratifies international treaties and has recourse to control measures over the Government's actions (i.e. questions and interpellations).

2.1.2 The Captains Regent

The Captains Regent exercise the office of Head of State in accordance with the principle of collegiality, as such they represent the State in its unity and they are also the supreme guarantors of the constitutional order of the Republic. They are elected by the Great and General Council among the citizens by origin, aged at least twenty-five years. They hold their office for a six-month term and cannot be re-elected before three years have passed from the end of the previous term.

The Captains Regent convene and chair, without the right to vote, the sessions of Great and General Council and coordinate the Congress of State. They also govern other bodies, based on specific law provisions and in respect for the separation of powers.

As Heads of State, they promulgate laws passed by the Great and General Council, as well as decree-laws, delegated decrees and regulations adopted by the Congress of State. They adopt and issue Regency decrees provided for by specific rules. They also promulgate parliamentary decrees, with which the international agreements ratified by the Great and General Council are implemented.

Furthermore, the Captains Regent receive the so-called *Istanze d'Arengo* (a form of popular petition), referendum proposals and popular legislative initiatives, and they supervise over the proper completion of the relevant procedures.

2.1.3 The Congress of State

The Congress of State is vested with the executive power; it is a collegial body and as such it shall be responsible for its decisions. The Office of Prime Minister or Head of Government is therefore not envisaged.

The Congress of State is composed of a maximum of ten Ministers, called Secretaries of State; they are appointed by the Great and General Council and, with regard to their actions, they are subject to ordinary justice in case of criminal and civil procedures. They cannot remain in office for more than 10 years.

The Congress of State is also vested with the power of legislative initiative, through the issuance of Delegated Decrees, to be ratified by the Great and General Council.

2.1.4 The judicial power

The jurisdictional power is exercised only by the state. Magistrates are independent from the executive and administrative power; they are directly responsible to the Great and General Council, by which they are appointed and possibly reconfirmed.

In the San Marino constitutional order, magistrates shall not only interpret and apply the law; indeed, their judgement shall also take account of the previous sentences applicable to the single case (case-law). The ordinary courts consist of three instances.

The Guarantors' Panel on the Constitutionality of Rules is composed of three effective members and three substitute members, who are appointed for a four-year term by the Great and General Council. The Guarantors' Panel on the Constitutionality of Rules shall:

- verify the conformity of laws with the fundamental principles of the constitutional order;
- decide on the acceptability of referenda proposals;
- decide in case of conflicts between constitutional bodies;
- act as "Regency Syndicate" at the end of the Captains Regent's mandate.

2.1.5 The Council of the Twelve

The Council of the Twelve is a collegial body, whose members are appointed by the Great and General Council from among its members at the beginning of each legislature and shall hold office for the duration of the same. It is presided over by the Captains Regent, who do not have the right to vote.

Currently, the Council of the Twelve has the power to:

- authorise foreigners or legal persons incorporated under San Marino law (commercial companies or housing cooperatives, foundations, associations and non-profit organisations) to register real estate in their own name;
- control and supervise the management of foundations, associations and non-profit organisations;
- grant legal aid in civil proceedings;
- legal recognition of Communities of San Marino citizens living abroad.

2.1.6 Foreign relations and international treaties

The Republic of San Marino has joined the following multilateral environmental treaties:

- International Convention for the Regulation of Whaling (Washington, 1946) and Its Protocol of 1956
- IMO Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Mexico City, London, Moscow, Washington, 1972)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES (Washington, 1973);
- Vienna Convention on the Protection of the Ozone Layer (Vienna, 1985) and Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987)
- United Nations Framework Convention on Climate Change (New York, 1992) and its Kyoto Protocol (2010)
- United Nations Convention on Biological Diversity (Rio de Janeiro, 1992)
- United Nations Convention to Combat Desertification (Paris, 1994)
- European Landscape Convention of the Council of Europe (Florence, 2000)

2.2 Population

In 2010 San Marino resident population was 31 887 people, of whom 15.3% were foreigners (mainly Italians), with an average density of more than 500 inhabitants per square kilometre. In addition, more than 12 000 San Marino nationals live in foreign countries, in particular about 8 000 in Europe and most of the remaining part in the Americas. Since the end of the 18th century, when there were less than 3 500 inhabitants on the entire territory, the population has increased steadily and at the beginning of the 20th century this figure had increased to 10 000 (Figure 2.1).

Life expectancy is one of the highest in the world. In 2010 it was 81 years for men and 86 years for women.

2.3 Geography, geology and land use

The Republic of San Marino is located in the Italian peninsula between 43°54' and 43°59' north and between 12°24' and 12°31' east; it has an extension of 61.19 km² and it is an enclave within the Italian territory with no direct access to the sea, between the provinces of Rimini (Western, Northern and Eastern borders) and Pesaro-Urbino (Southern border)(Figure 2.2). San Marino is the third smallest State in Europe after Vatican City and Monaco. The air distance from the capital city (San Marino) to the Adriatic Sea is 18 km.

The height of the territory ranges between 53 m AMSL (Northern part) and 739 m AMSL (Mount Titano). Its South-Western half is made of a number of calcareous rock formations, while the North-Eastern half is covered by hills smoothly degrading to the coast, mainly made of clayey and sandy formations.

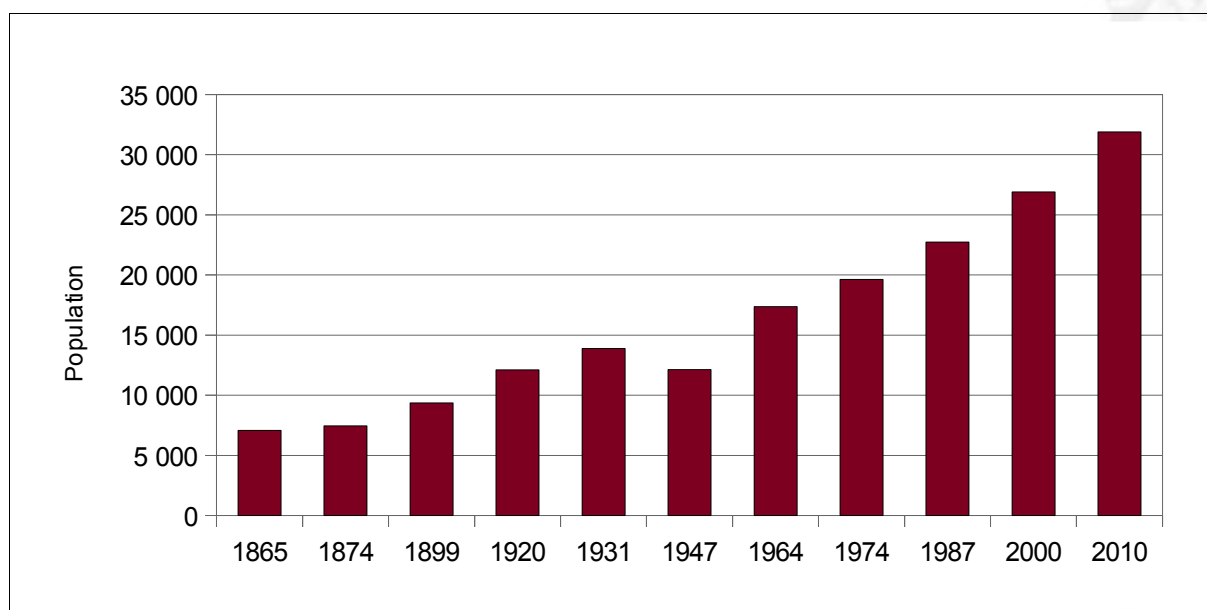


Figure 2.1: Evolution of the population of the Republic of San Marino from 1865

All watercourses present on the territory of San Marino are torrents which remain dry during most of the summer. The three main watercourses are: Torrent Ausa and Torrent Marano, flowing into the Adriatic Sea near Rimini, and Torrent San Marino, which is a right tributary of river Marecchia.

The San Marino territory, despite its limited extension, is characterised by a considerable environmental variety and different micro habitats, including woods, shrubbery, glades, cultivated land, calcareous cliffs, small valleys, small watercourses and urban areas. Thanks to this variety and the considerable number of ecotonal zones (i.e. transitional areas from one type of environment to the other), the San Marino territory provides the ideal conditions for the settlement of several animal species.

In 2010, land use in San Marino was as follows: urban, built-up and other artificial surfaces, 18%; cultivated land, 47%; badlands, 18%; woods and shrubbery, 16%; water courses, 1%.

2.4 Climate

The Republic of San Marino is included in the Adriatic-Padan climate zone, with a sub-coastal temperate climate, characterised by hot summers, rainy autumns and cold winters, with sporadic snowfall at low altitude.

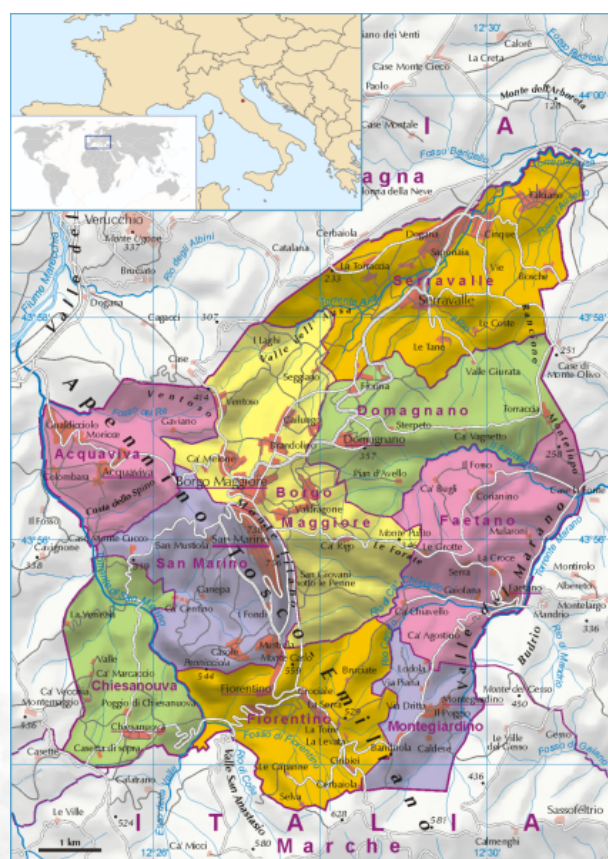


Figure 2.2: Map of the Republic of San Marino.

The meteorological station located in the capital city, at 652 m AMSL, has recorded rainfall data since 1924 and temperature data since 1932. In 2010, the average maximum annual temperature was equal to 14.4°C while the minimum average annual temperature was equal to 9.0°C. Always in 2010, the amount of precipitation was higher than the average, for a total of 1 261 mm per year, of which 23% snowfall. According to historical data, over the last decades temperatures have increased (Figure 2.3) and the amount of precipitation has decreased (Figure 2.4).

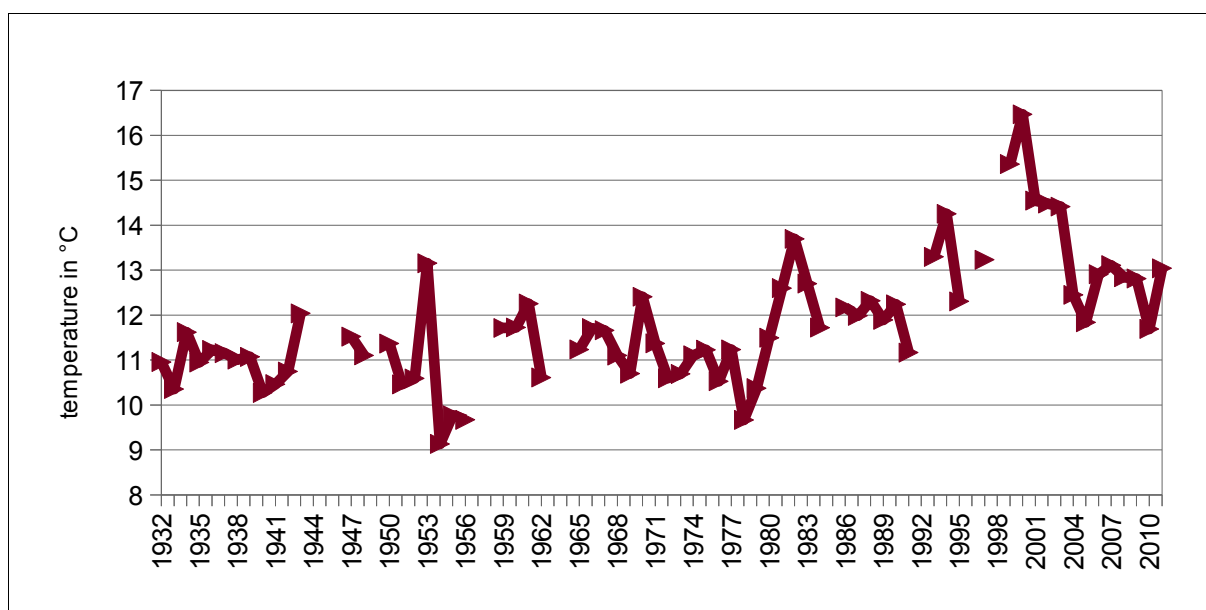


Figure 2.3: Annual average temperature recorded by the meteorological station of San Marino from 1932 to 2010.

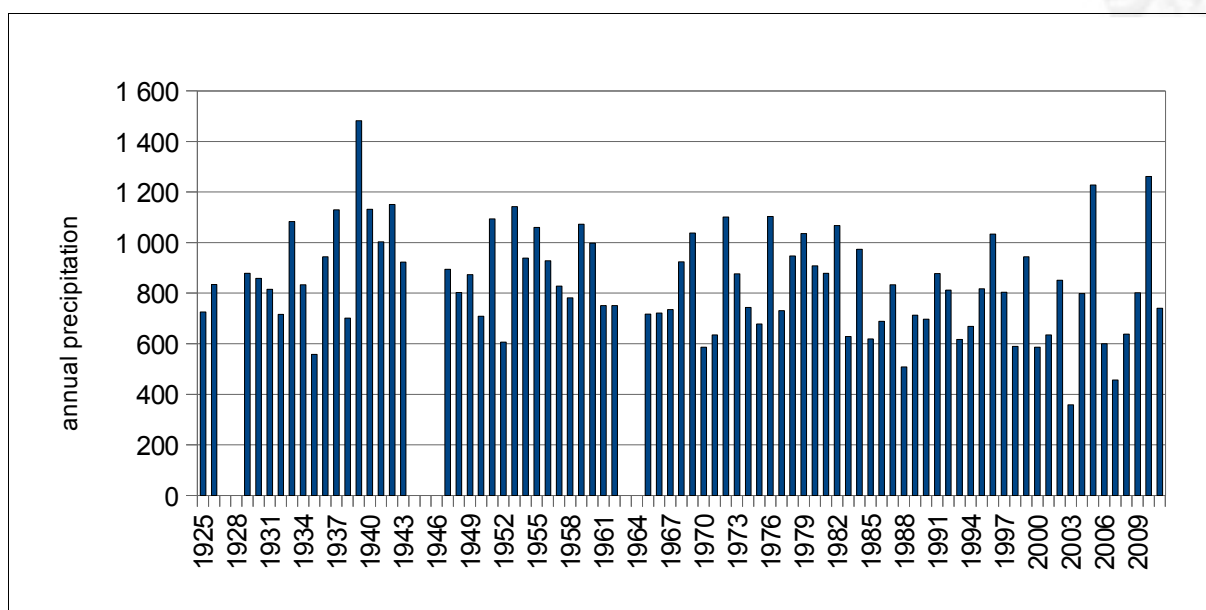


Figure 2.4: Annual average precipitation from 1924 to 2010.

2.5 Economy

The Republic of San Marino, a small State surrounded by Italy, is inextricably linked to its large neighbour. San Marino has concluded numerous economic agreements with Italy and has signed agreements with the European Union in the customs, tax and monetary fields. The lack of explicit customs barriers facilitate trade and the movement of people; indeed, the largest volumes of imports and exports are with the Italian Republic.

San Marino economy relies mainly on manufacturing industry, tourism and, increasingly, the service sector and partly on the financial sector. Generally lower income tax rates and more favourable social contributions have promoted business opportunities and job creation, also attracting a high number of cross-border workers (around 5 000, that is almost a quarter of the workforce).

Data provided by the Office of Economic Planning (UPE) show that in 2010 San Marino's GDP - recalculated according to the new methodology for the compilation of national accounts statistics based on expenditure and introduced with the assistance of the IMF technical mission - was equal to 1 492 million euro. The breakdown by productive sector is illustrated in Figure 2.5.

According to the data provided by the San Marino Chamber of Commerce, in 2010 the total turnover of 3 844 firms, out of approximately 5 500 firms doing business in San Marino, was equal to 3 855 million euro (Table 2.1). These data do not include several consortia and cooperatives, as well as all sole proprietorships.

Among the enterprises taken into account by the Chamber of Commerce, the service sector (mainly finance, real estate, business services, transport and communications) is the most represented, while production and manufacturing activities account for

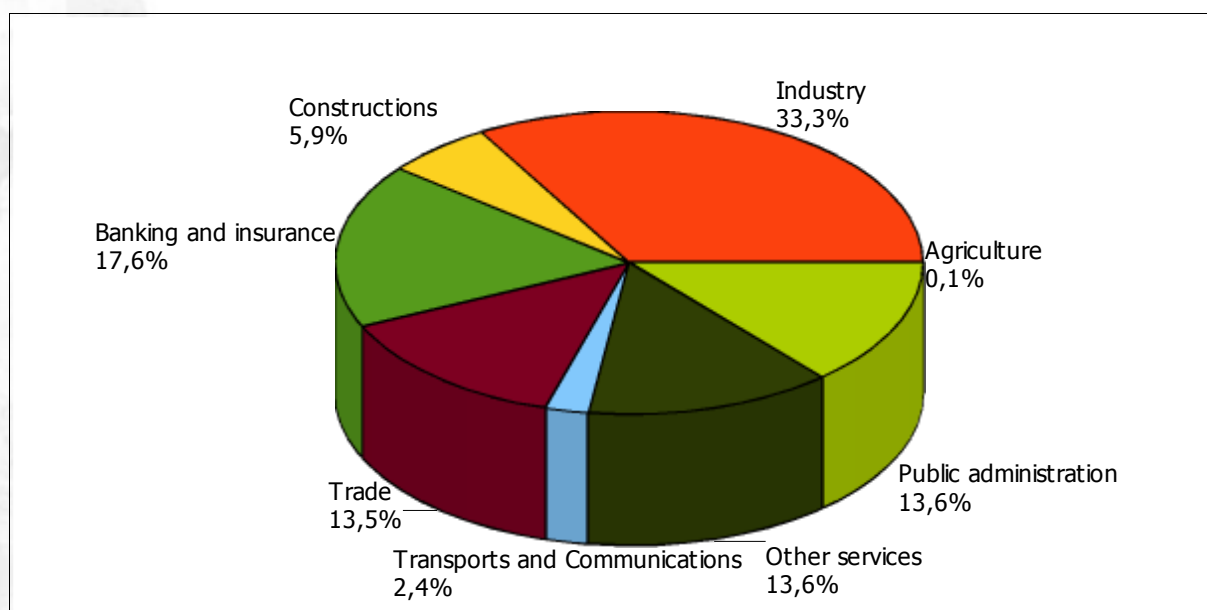


Figure 2.5: Breakdown of 2010 GDP by economic sector.

| <i>Sector</i> | <i>Number of companies</i> | <i>Total turnover (€)</i> |
|------------------------------|----------------------------|---------------------------|
| Agriculture | 2 | 355 782 |
| Production and manufacturing | 429 | 1 235 227 582 |
| Construction and building | 274 | 178 932 919 |
| Wholesale and retail | 964 | 1 346 383 737 |
| Hotels and restaurants | 98 | 30 307 549 |
| Other services | 2 080 | 1 064 229 053 |
| Total | 3 844 | 3 855 436 622 |

Table 2.1: Breakdown by sector of the number of enterprises monitored by the Chamber of Commerce of the Republic of San Marino and relevant turnover in euro in 2010.

more than a third of the total turnover. The three main sectors, namely productive activities, trade and services, account for 95% of the total turnover.

The data provided by the Office of Economic Planning and related to import and export of goods and services in 2010 are as follows:

- Import 2010: 2 251 million euro
- Export 2010: 2 769 million euro

Their trend over the last years is illustrated in Figure 2.6.

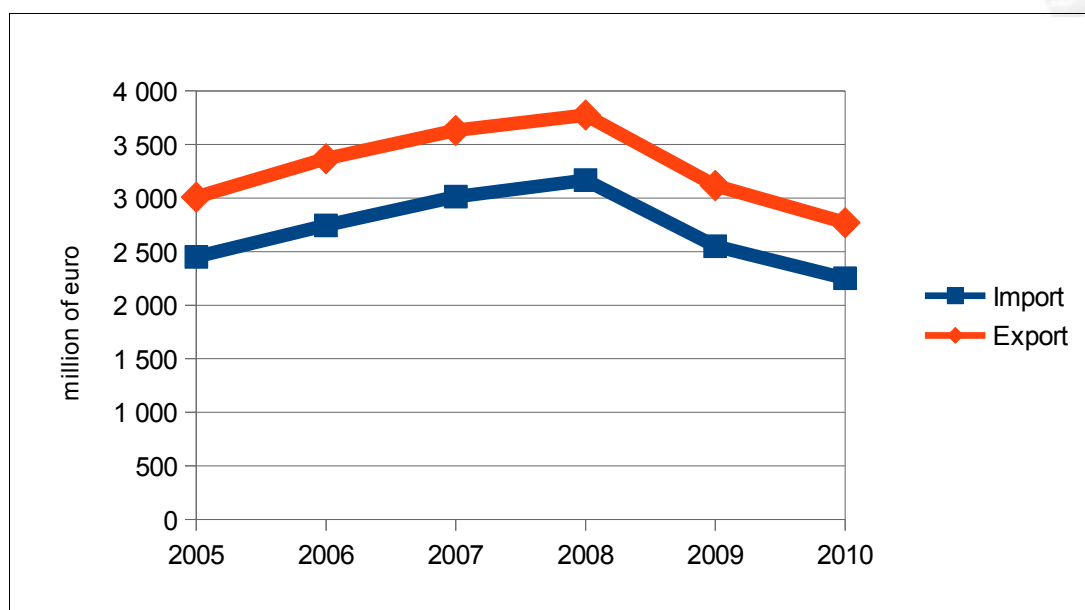


Figure 2.6: Trend of imports and exports in San Marino from 2005 to 2010

2.5.1 Industry

Industry is the most important sector of San Marino economy since it contributes to one third of GDP. In the past, manufacturing activities have always been characterised by a constant growth, but today's international economic crisis has had repercussions also in San Marino, by contracting the economy of this sector.

Its main branches are: mechanical engineering, electronic and pharmaceutical sectors, processing of vegetable products, furniture, packaging, paper, clothing and ceramics. Some branches, such as mining or fishing, are not present in San Marino.

2.5.2 Tourism

Tourism has represented a pillar of the San Marino economy over the last 40 years and it still plays a fundamental role, despite the negative trend in the total number of visitors since 2007 (Figure 2.7).

In 2010, 1 976 481 tourists visited San Marino (source UPE). The majority of the tourists spends only one day in the Republic of San Marino and visits are concentrated in the summer season. The economic sectors mainly involved are shops, hotels and restaurants.

2.6 Energy

The Republic of San Marino is totally dependent on energy imports since it has neither fossil fuel sources nor energy production plants. The imported amount is equal to consumption, since energy is not re-exported.

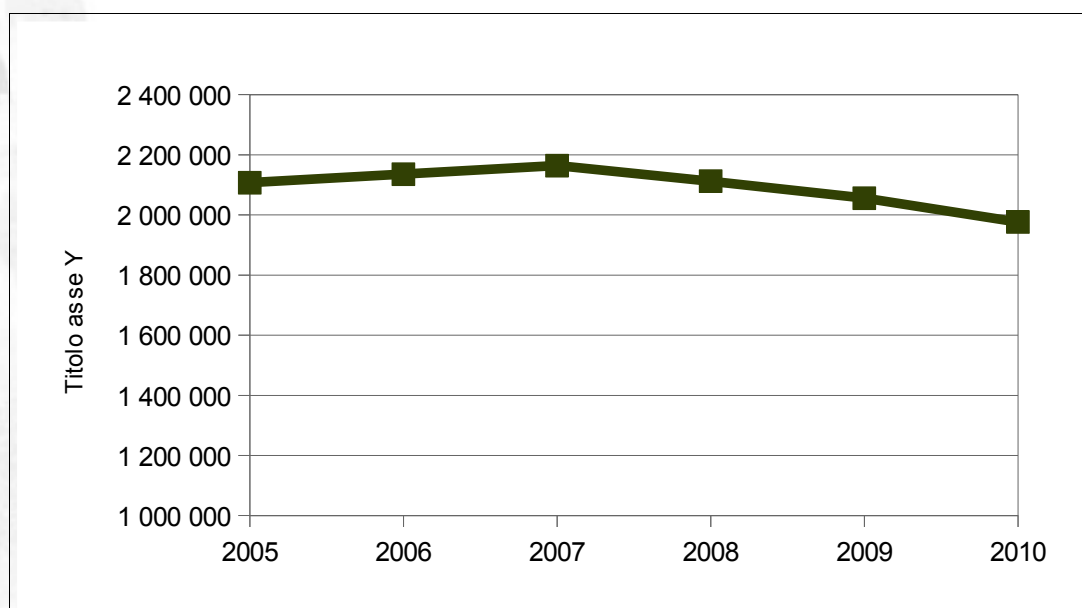


Figure 2.7: Tourist flows, expressed in number of visitors, from 2005 to 2010.

In 2010, San Marino was still totally dependent on imports of electricity and natural gas, through supply contracts concluded with ENEL TRADE S.p.A. and ENI GAS S.p.A., as well as of liquid fossil fuels. Only in 2011 has the production of middle-size photovoltaic plants effectively started.

In 2010, energy consumption in San Marino was as follows (source AASS and Tax Office):

| | |
|---------------|--|
| Electricity: | 272.0 GWh, of which |
| | 53.1 GWh for domestic use |
| | 218.9 GWh for other uses, including industry |
| Natural gas: | 42.7 Gg, of which |
| | 20.2 Gg for domestic use |
| | 22.5 Gg for other uses, including industry |
| Oil products: | 65.0 Gg, of which |
| | 15.8 Gg of unleaded petrol |
| | 44.5 Gg of automotive diesel fuel |
| | 0.6 Gg of diesel fuel for agricultural use |
| | 0.9 Gg of diesel fuel for heating |
| | 0.2 Gg of LPG used for combustion |
| | 3.0 Gg of LPG used as automotive fuel |

Over the period 1982-2007, the total demand for electricity has become almost five times higher. Increase in electricity consumption has been particularly relevant starting from the 1990s, with an average increase of almost 10 GWh per year (Figure 2.8). Over the last three years, presumably also due to the worsening of the economic

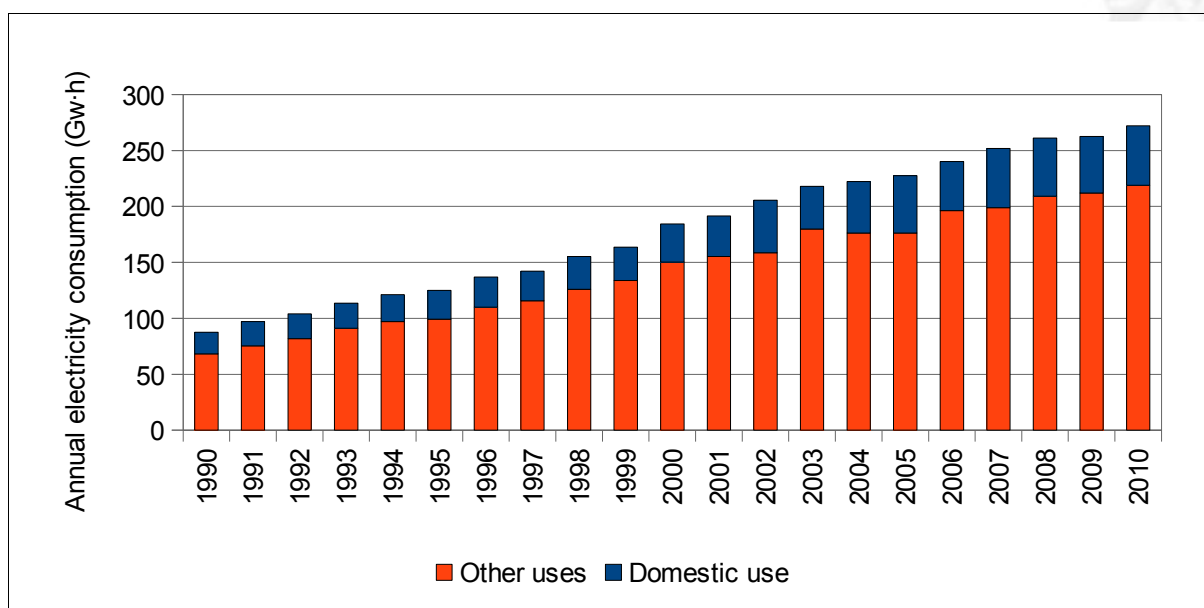


Figure 2.8: Electricity consumption in San Marino from 1990 to 2010.

crisis, the country has experienced a decrease in the trend observed in the previous years.

With regard to the use of natural gas, in the early 1980s the structures present in the Republic of San Marino were almost completely converted to natural gas. Between 1979 and 2010, consumption increased steadily as a consequence of population and economic growth.

In particular, between 1990 and 2005, gas consumption more than doubled, while it slightly decreased in the following 4 years. In 2010, consumption returned to its 2005 levels (Figure 2.9). In 2010, out of 17 367 users, 10% were industrial and 90% domestic users.

Starting from 2000, consumption for other uses has remained more or less the same (about 20 Gg per year), while consumption for domestic use has undergone some changes. Considering the small size of the San Marino territory, these changes are most probably connected with the average winter temperature.

2.7 Water

Since 1962, the Republic of San Marino has its own public aqueduct. Although during the first years it exploited only internal sources, with the increasing population and consumption, San Marino had to rely more and more on water imports from Italy. On average, internal sources only account for 12-15% of the necessary water supply.

In recent years, water demand has remained approximately the same (Figure 2.10). In 2010, the overall water withdrawal was 3 761 939 m³; domestic users accounted for 65% of the overall water billed.

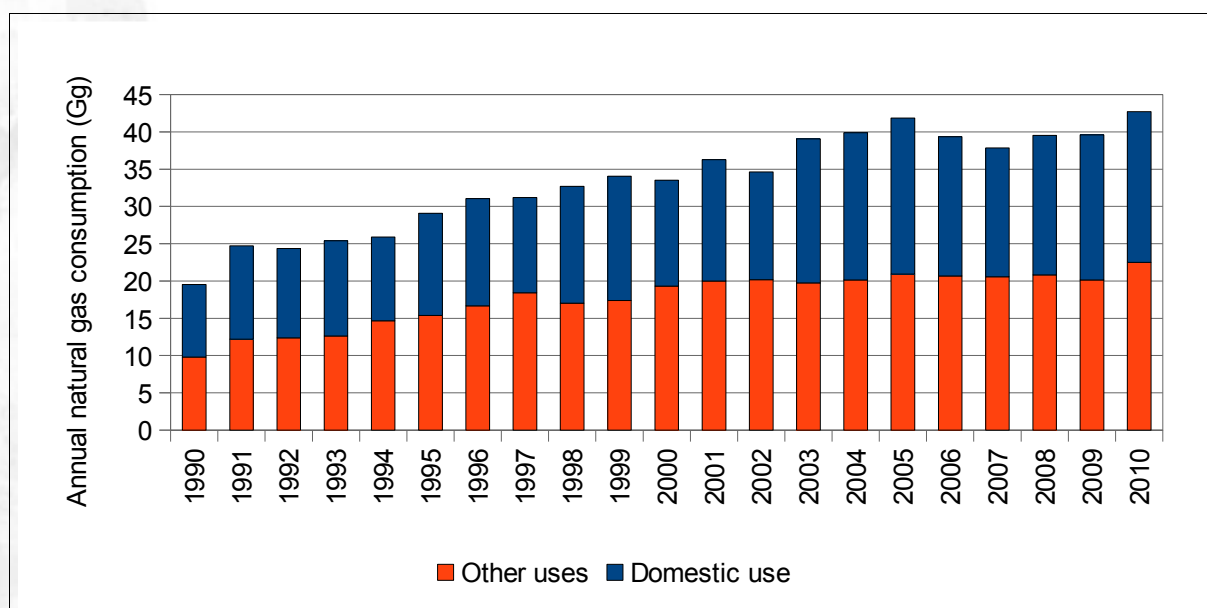


Figure 2.9: Natural gas consumption in San Marino from 1990 to 2010.

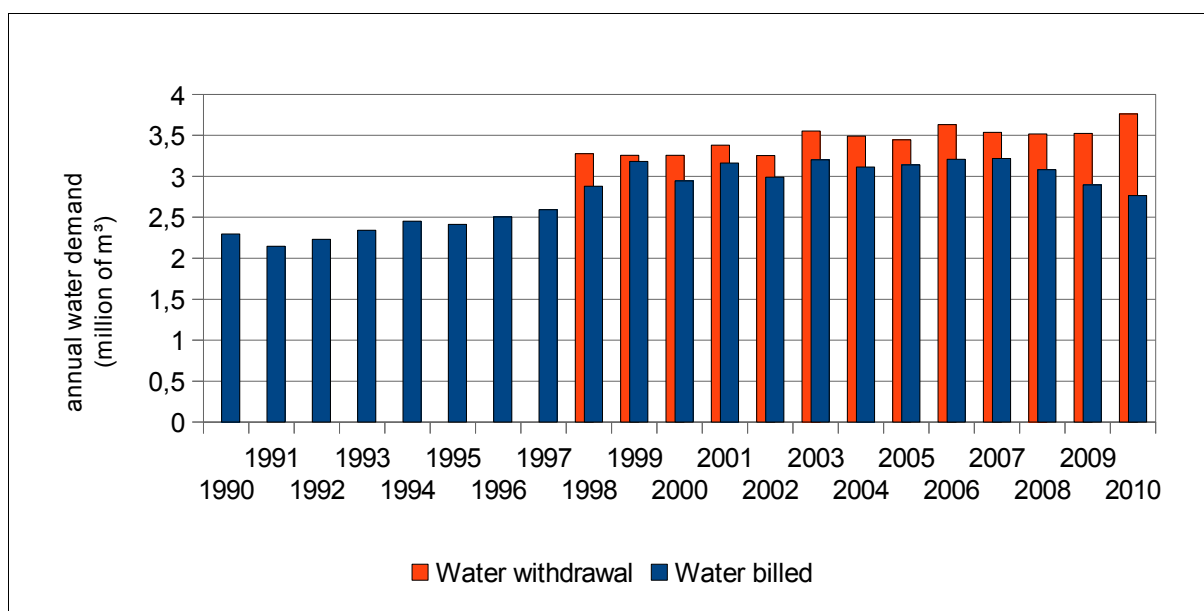


Figure 2.10: Water demand from 1990 to 2010.

2.8 Transports

San Marino has no railway, harbour or airport. Therefore, commercial and civil transport is carried out by road. Presently, the road network covers 4% of the total territory.

Over the years, the number of vehicles registered has constantly increased (Figure 2.11); in 2010, 55 253 vehicles were registered, of which 6 845 were used for working purposes.

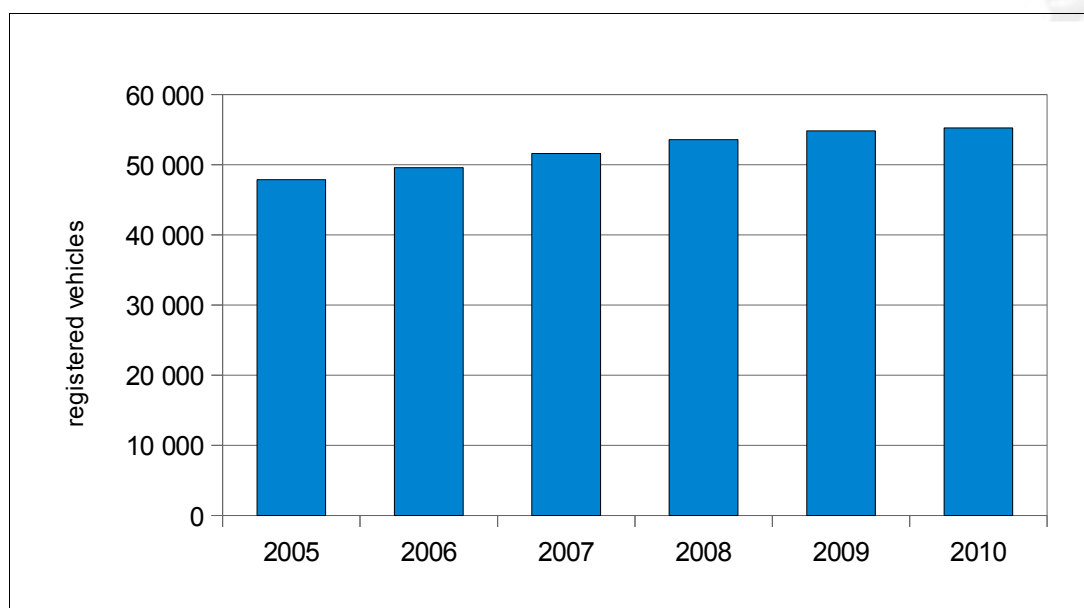


Figure 2.11: Number of vehicles registered from 2005 to 2010 (source UPE).

2.9 Building stock and urban structure

Today's building stock of the Republic of San Marino and the consequent urban structure are the result of historical vicissitudes, economic relations, as well as structural and urban planning decisions throughout the 20th century. The only buildings not included in this context are those located in the historic centres, around which, throughout the centuries, the lives of the Republic's citizens have revolved, as well as some peasants' houses scattered across the territory. In general, these buildings were made of stone masonry with wood or wood and brick floors.

Starting from the 1960s, with the improvement of economic conditions, the buildings have been progressively renewed. In this period, the bearing structures of buildings were mainly made of bricks and concrete, subsequently substituted by bearing structures in reinforced concrete and brick claddings. Already starting from the 1970s, the most widespread wall package was characterised by the inclusion of an air gap, which was often filled up with insulating materials, starting from the 1980s. According to estimates, 80% of San Marino buildings were built between 1970 and 2000.

With regard to industrial areas, created starting from 1980, the most used building typology is represented by structures made of reinforced precast concrete and assembled on the spot, except for the base, which is made on in situ concrete stilts. The materials used were found and imported from the surrounding Italian areas and therefore realised according to the specific regulations.

The development of San Marino buildings is clearly concentrated along the highway San Marino-Rimini, for a strip of about one kilometre broad. Building density increases in the plain area; Serravalle is indeed the most densely built-up municipality. Moreover, other four densely built-up areas are clearly identifiable: the area of Acquaviva - Gualdicciolo; the area of Chiesanuova; the area of Murata - Fiorentino and the area of Faetano.

2.10 Agriculture

Agriculture, which is a traditional sector in the Republic, has constantly lost its importance in the overall economic context. Over the last years, agricultural businesses have mostly become sole proprietorships. However, the San Marino population is still characterised by a strong agricultural tradition, which translates into a considerable percentage of agricultural land cultivated as a hobby by workers and retired people of other economic sectors.

In 2010, the territory of San Marino included 10 square kilometres of woods and forests and 28.6 square kilometres of agricultural land, of which only 26.2 square kilometres were actually cultivated. The main crops are (source UGRAA):

- Cereals (470 ha)
- Forage (910 ha)

- Grapes (118 ha)
- Olives (166 ha)

Moreover, several livestock breeding activities are carried out (cattle, swine, sheep, etc.). In 2010, 1 162 cattle were bred (source UGRAA), destined both to milk and meat production. All animal waste are used for the production of solid manure that it is applied to cultures.

2.11 Waste

Waste generated in households or produced by economic operators on the San Marino territory may be recycled or disposed of. San Marino has no waste disposal plants. Waste to be disposed of is therefore sent to plants based in Italy, in particular in the Emilia Romagna region.

Also waste to be recycled is mainly sent to Italian plants based in the Emilia Romagna, Marche and Lombardy regions, with which specific agreements are in place for the disposal/recycling of waste. However, some plants are being installed on the San Marino territory.

In 2010, the production of urban solid waste was of 20 018 tons (source AASS), equal to 628 kg per inhabitant (these data derive from a product analysis carried out in 2010, which includes also waste produced by some economic activities).

2.11.1 Separate waste collection

Separate collection of urban solid waste, that is to say generated in households or similar waste, mainly covers paper, glass, plastics, metal, wood, batteries and expired drugs. Separate waste collection is carried out both through collection centres and in households and firms.

In 2010, separate waste collection accounted for 20.8% of the total amount of urban solid waste, that is 4 172 tons.

In 2000, the AASS established a multi-collection centre where households may bring various types of separated waste, in return for an economic reward in their electricity bills. In 2010, about 1 400 households brought their waste to the multi-collection centre, for a total amount of about 10.9% of separated waste.

2.11.2 Waste disposal

According to the law, waste shall be classified as urban and special according to the origin of such waste. Both categories may then include various categories of hazardous or non-hazardous waste. The management of urban and special waste follows the procedures provided for at a national level, as well as European procedures with regard to cross-border shipments (Regulation (EC) 1013/2006). Such shipments envisage specific authorisations or simplified procedures.

In compliance with the agreements concluded with the neighbouring regions, in 2010 the Republic of San Marino was able to dispose of 15 846 tons of urban solid waste in the plants of the Emilia Romagna and Marche regions.

The total amount of waste exported in 2010 from the Republic of San Marino to plants based on the Italian territory for disposal and recycling operations was equal to 55 973 tons.

3

National greenhouse gas inventory

3.1 Introduction

The national greenhouse gas inventory (GHG) for the Republic of San Marino has been implemented on the basis of the IPCC (Intergovernmental Panel on Climate Change) Guidelines by estimating the emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). The estimates of indirect greenhouse gas emissions, such as nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOC) are also reported.

The sectors considered, for which the functional and relatively precise data referring to the period 2005-2010 have been collected, are the following: energy, industrial processes, agriculture and land-use. With regard to the latter sector, since San Marino has acceded to the Kyoto Protocol, supplementary LULUCF methodologies have been used for the activities under the Kyoto Protocol by making a distinction between removals of CO₂ due to reforestation activities and those due to forest management. To calculate CO₂ absorption related to San Marino land use, the factors used by Italy for the Emilia Romagna region were used, since the type of vegetation is comparable.

The data used to implement the national emission inventory are taken from various public offices competent to manage such inventory. With regard to the use of fuels, since there is no internal production, data are taken from the recording of imports for each single destination carried out by the Tax Office of the Republic of San Marino. Data relative to natural gas consumption are provided by the AASS, which manages the import and distribution of natural gas on the territory, by making a distinction among supply for domestic use, production and services. Data concerning the production sector are collected through the Office for Industry, Handicraft and Trade, while data relative to agriculture, livestock breeding and land use are provided by UGRAA.

3.2 Greenhouse gas emissions by sector

The energy sector is the major contributor to greenhouse gas emissions in the Republic of San Marino. These emissions are caused by fossil fuel consumption in transports, in the heating of buildings, as well as in industry and agriculture. The industrial sector contributes to the emission of non-methane volatile organic

compounds, while the agricultural sector is responsible for the emission of methane and nitrous oxide.

3.2.1 Energy

The emissions of San Marino in the energy sector only concern industry, transports and other sectors, since electricity production plants are not present.

The transport sector is the major contributor to greenhouse gas emissions in San Marino. Between 2005 and 2010, the emissions from this sector, determined by fuel selling, have progressively increased. However, the high incidence of petrol, diesel and other fuels in this sector is not only due to resident population consumption. Indeed, because of the small price differential existing between Italy and San Marino, all those who come to San Marino to work (about 5 000 cross-border workers) or as tourists decide to buy fuel in the Republic.

The emissions from the manufacturing industry and building sector have remained almost unchanged, while the emissions from other sectors have slightly increased. Data on the emissions in the energy sector of CO₂ (Figure 3.1), CH₄ (Figure 3.2), N₂O (Figure 3.3), NO_x (Figure 3.4), CO (Figure 3.5) e and non-methane volatile organic compounds (Figure 3.6) are indicated hereunder.

3.2.2 Industrial production

Emissions concerning the industrial production were estimated considering only emissions of non volatile organic compounds, essentially deriving from the asphaltting of roads and squares and from the production of alcoholic beverage, since other data were not available. Between 2005 and 2010, these emissions have decreased (Figure 3.7).

3.2.3 Agriculture

The agricultural sector is the major contributor to methane emissions. These arise mainly from livestock breeding, due to enteric fermentation during the digestive process of animals and to manure management. As it can be observed from Figure 3.8, methane emissions from the agricultural sector over the period between 2005 and 2010 have decreased.

Nitrous oxide emissions in the agricultural sector derive both from the management of manure and from agricultural land itself. As it can be observed from Figure 3.9, also nitrous oxide emissions over the period 2005-2010 have decreased.

The livestock sector has suffered in recent years a slight decrease in the number of animals bred. This has produced a moderate decrease in emission by the agricultural sector.

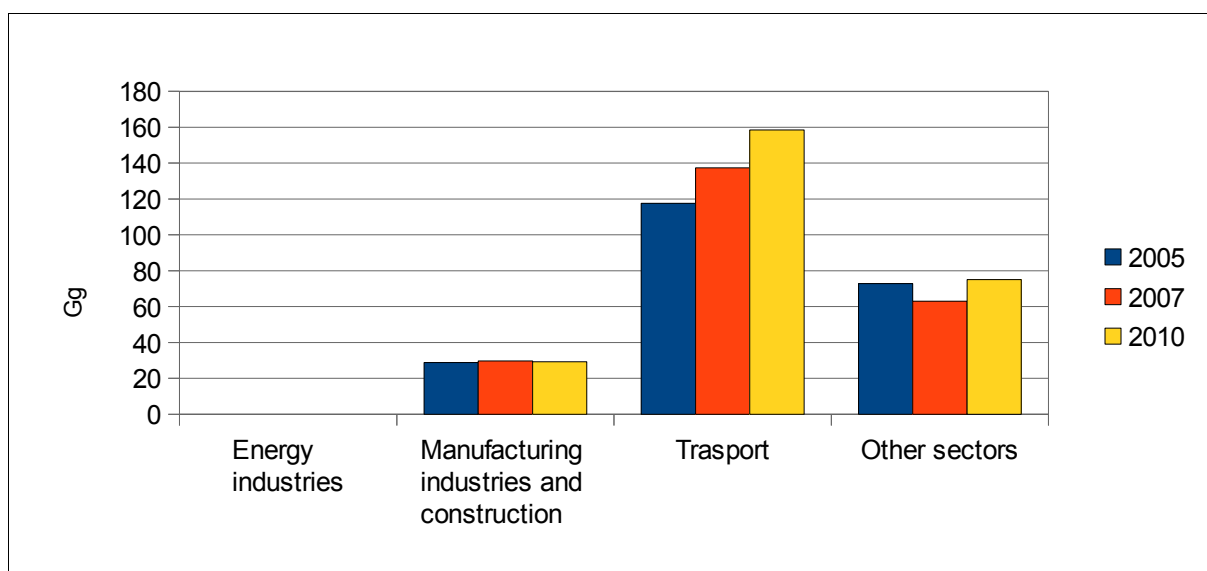


Figure 3.1: CO₂ emissions in the energy sector for 2005-2007-2010.

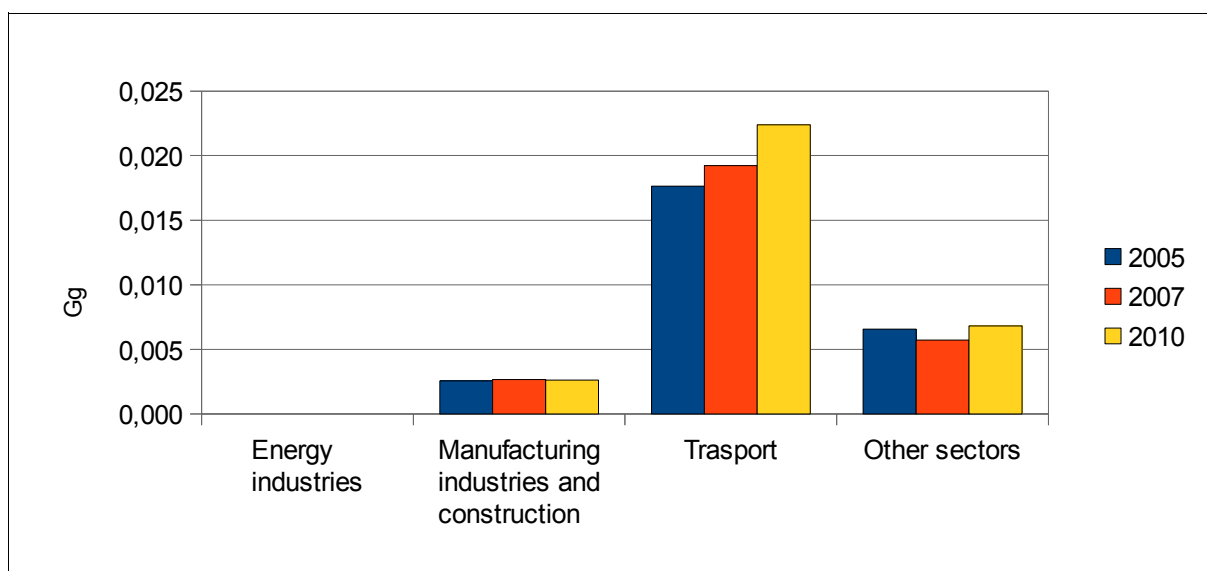


Figure 3.2: CH₄ emissions in the energy sector for 2005-2007-2010.

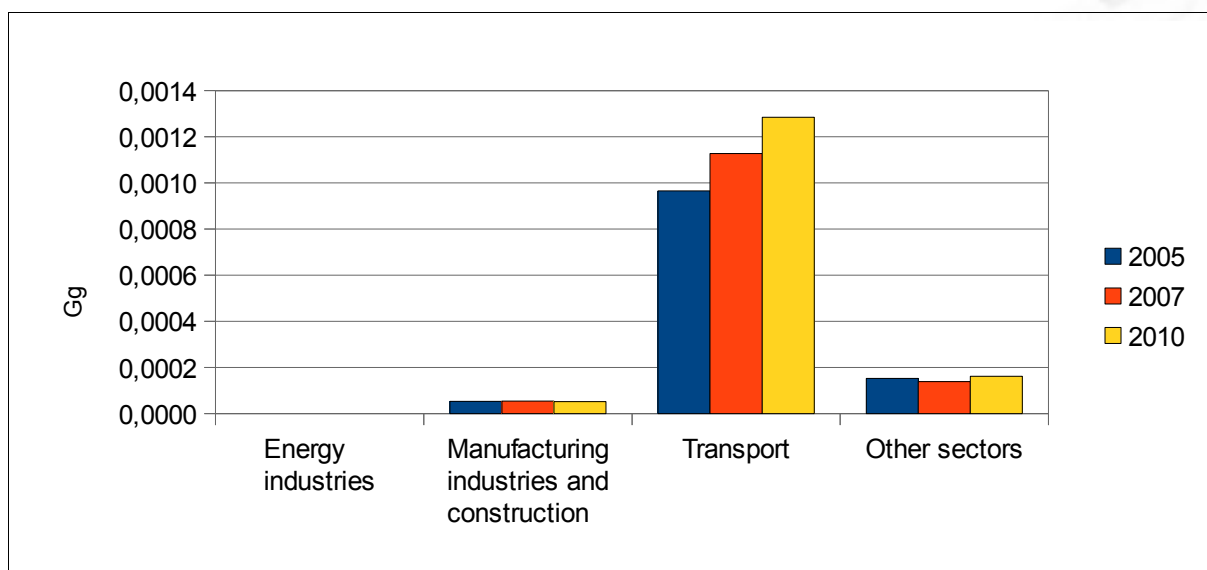


Figure 3.3: N₂O emissions in the energy sector for 2005-2007-2010.

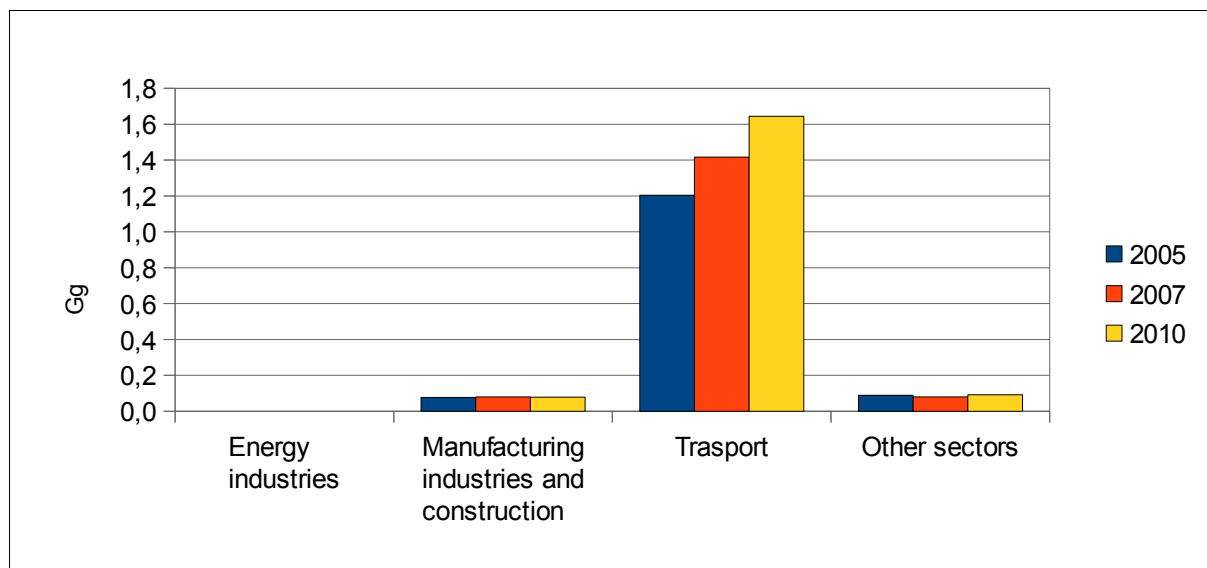


Figure 3.4: NOx emissions in the energy sector for 2005-2007-2010.

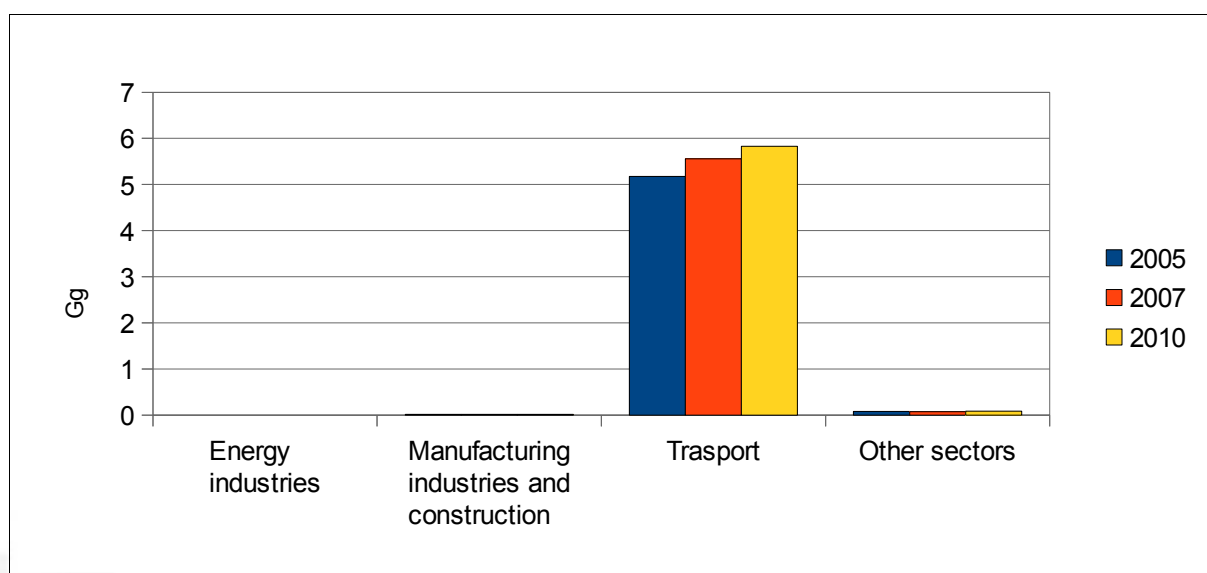


Figure 3.5: CO emissions in the energy sector for 2005-2007-2010.

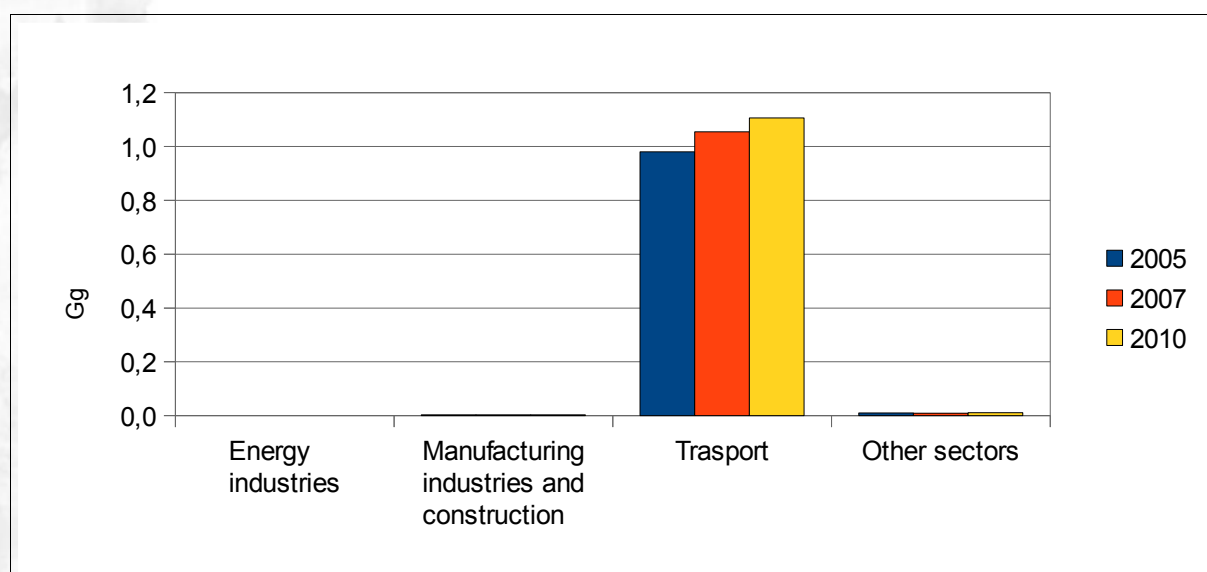


Figure 3.6: NMVOC emissions in the energy sector for 2005-2007-2010.

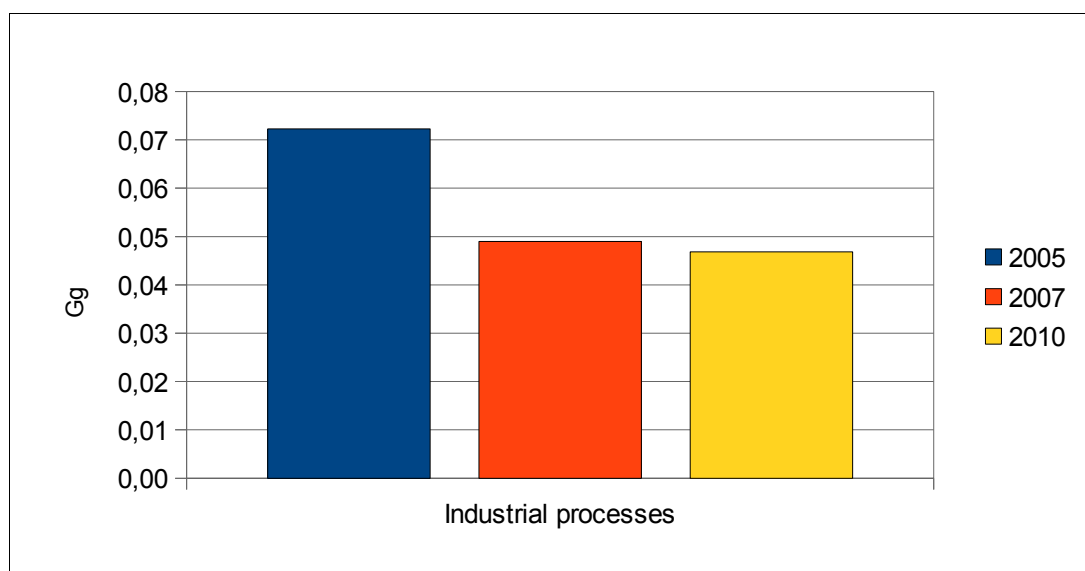


Figure 3.7: NMVOC emissions from the industry sector for 2005-2007-2010.

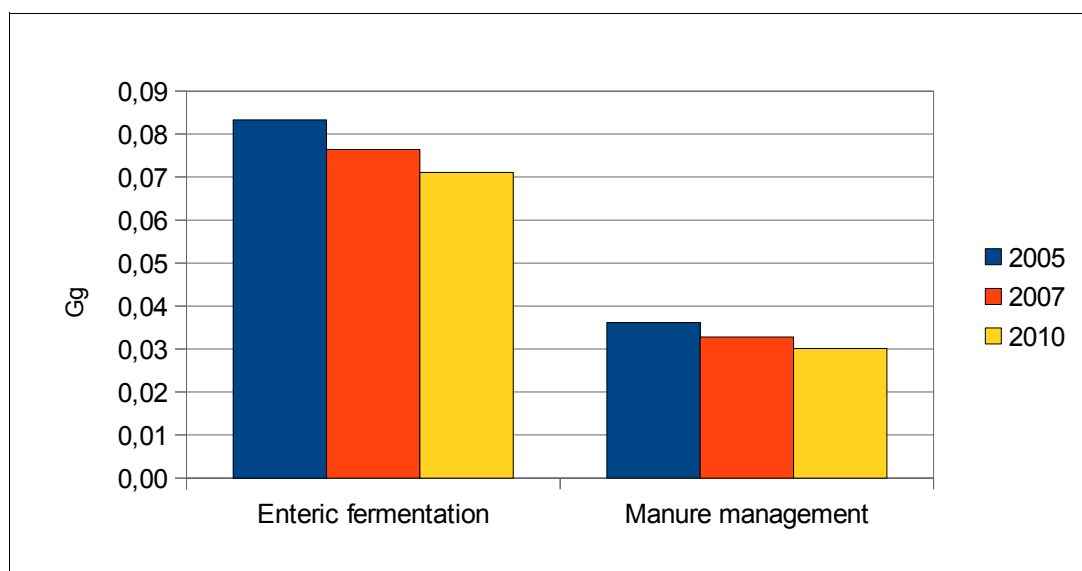


Figure 3.8: CH₄ emissions from the agricultural sector for 2005-2007-2010.

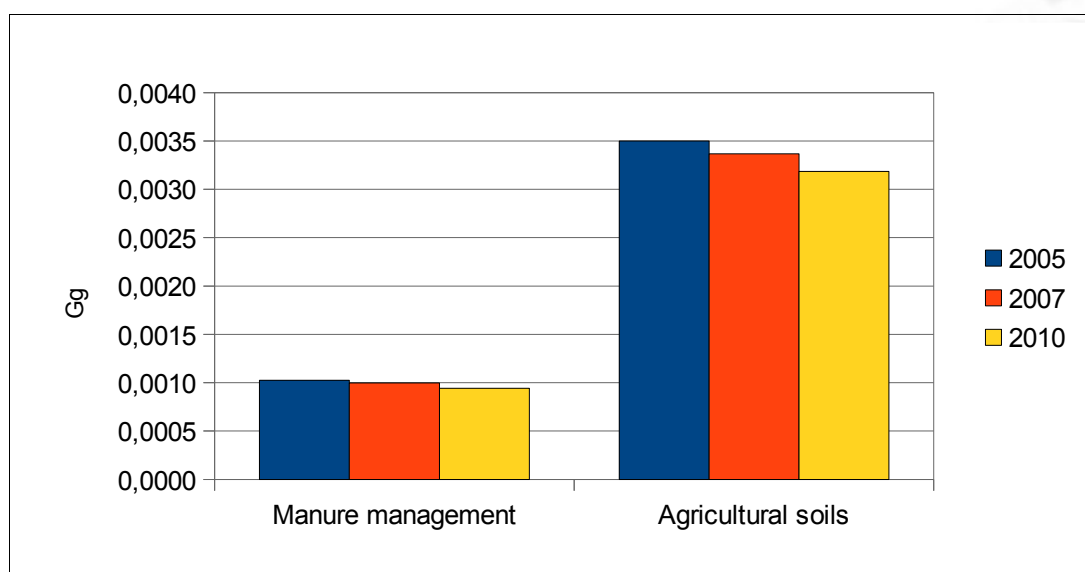


Figure 3.9: N₂O emissions from the agricultural sector for 2005-2007-2010

3.2.4 Land use

This sector takes into account the reduction of atmospheric CO₂ due to absorption and fixation by the vegetation covering the territory.

Between 2005 and 2010, only a few hectares of land have been converted into forest land. This has caused a slight increase in the removal of carbon dioxide (Figure 3.10). In calculating removals of CO₂, supplementary LULUCF methodologies have been used for the activities under the Kyoto Protocol by making a distinction between removals of CO₂ due to reforestation activities and those due to forest management. It follows that almost all removals of CO₂ are due to the management of existing forests.

3.3 Greenhouse gas emissions by type of substance

The warming effect induced by various greenhouse gases can be aggregated using the "Global Warming Potential" (GWP), which is the ratio of the radiative forcing induced in a period of time by a unit mass of a compound to that of a unit mass of carbon dioxide.

In 2010, 98.3% of all San Marino greenhouse gas emissions consisted of CO₂, while the remaining 1.7% of methane and nitrous oxide (Figure 3.11).

3.3.1 Carbon dioxide (CO₂)

Carbon dioxide is the main cause of global warming. CO₂ emissions in the Republic of San Marino are mainly from the use of fossil fuels in the transport sector.



Figure 3.10: CO₂ removal in the land use sector (LULUCF) for 2005-2007-2010.

3.3.2 Methane (CH₄)

Methane is a greenhouse gas with GWP equal to 21. Methane emissions in the Republic of San Marino are essentially due to the degradation and fermentation of organic substances. Indeed, in 2010 nearly 73% of the total methane emissions were from the agricultural sector, in particular livestock breeding. The remaining percentage essentially originates from the use of fuel in transport.

3.3.3 Nitrous oxide (N₂O)

Due to the considerable influence of nitrous oxide on global greenhouse effect (GWP=310), great importance is attached to this substance in order to identify any measure to curb emissions. In 2010, the agricultural sector was the main emitter of nitrous oxide.

3.3.4 Fluorinated greenhouse gases (HFC, PFC, SF₆)

Fluorinated greenhouse gas emissions have not been estimated. The contribution of these gases to total emissions in percentage terms should be very similar to that of Italy, which is approximately 1.3% of total emissions.

3.3.5 Indirect greenhouse gases

Nitrogen oxides (NO_x)

Nitrogen oxides, which include both nitric oxide (NO) and nitrogen dioxide (NO₂), are generated during combustion processes because of oxidation of the nitrogen contained in the air, whatever is the fossil fuel used. Through photochemical cycles,

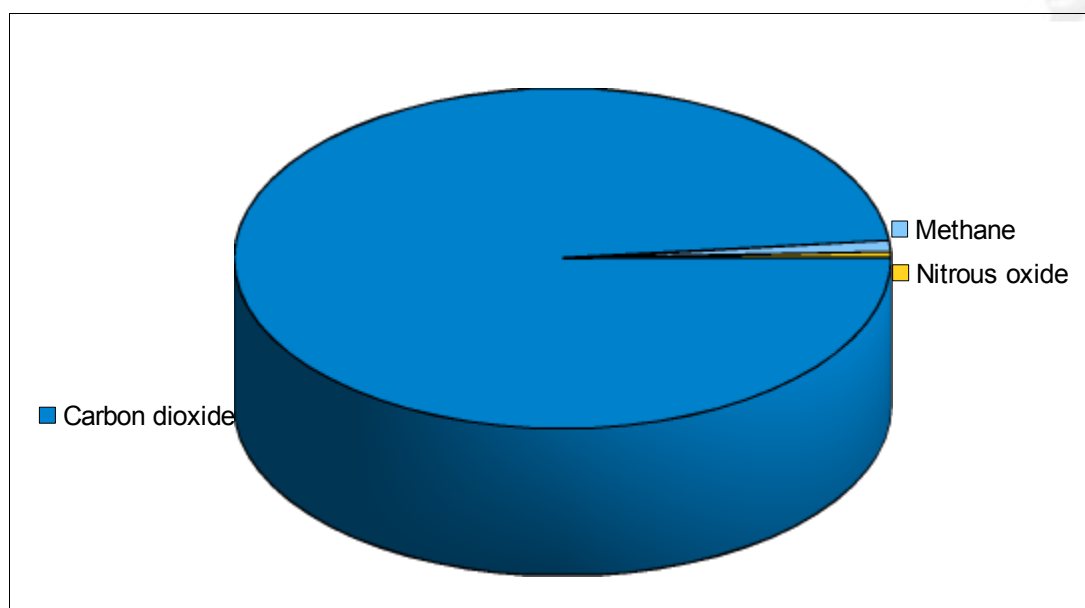


Figure 3.11: 2010 greenhouse gas emissions in CO₂ equivalent.

nitrogen oxides generate nitrates, which constitute a considerable part of fine particles.

In San Marino, NO_x emissions are totally from combustion processes, especially in the transport sector.

Carbon monoxide (CO)

Carbon monoxide emissions (GWP=2), resulting from imperfect combustion, are almost exclusively from the transport sector.

Non-methane volatile organic compounds (NMVOC)

This category conventionally includes thousands of different substances coming from various sources. They may be released unaltered by processes of use (they are volatile at room temperature), or they might have been subject to processes of partial oxidation. Some of these substances are particularly dangerous or toxic or, like for benzene and aromatic polycyclic hydrocarbons (APH), it is demonstrated that they can cause cancer.

Organic compounds, in the presence of nitrogen oxides, act as precursors in complex photochemical cycles that ultimately produce ozone and organic peroxides, as well as nitrate and sulphate ions, which contribute to generating free radicals, strongly oxidised substances and PM₁₀.

Available data show that in 2010 the emission of these substances in San Marino was from the transport sector and from the use of bituminous conglomerate for road surfaces.

3.4 General trend of greenhouse gas emissions

From 2005 to 2010, overall greenhouse gas emissions increased by 19.4% due to an increase in CO₂ emissions. Conversely, CH₄ e N₂O emissions slightly decreased (Table 3.1).

In the Republic of San Marino there are neither electricity production plants nor waste disposal plants. Almost all greenhouse gas emissions originate from the energy sector and are generated by burning fossil fuels for automotive purposes, as well as for the heating of buildings (Table 3.2).

As already observed in section 3.2.1 Energy, more than half the greenhouse gas emissions are due to fuel selling in the transport sector, which necessarily includes the consumptions of non resident people working in San Marino or entering the territory for tourist or other purposes.

In 2010, greenhouse gas emissions of San Marino amount to 267.28 Gg of CO₂ equivalent, corresponding to 8.4 tons of CO₂ equivalent per capita. Taking also into account removals, total emissions decrease to 256.80 Gg of CO₂ equivalent, corresponding to 8.1 tons of CO₂ equivalent per capita (Figure 3.12).

| Greenhouse gases | Formula | GWP factor | CO ₂ equivalent (Gg) | | |
|--|------------------|------------|---------------------------------|---------------|---------------|
| | | | 2005 | 2007 | 2010 |
| Carbon dioxide | CO ₂ | 1 | 219.11 | 230.06 | 262.74 |
| Methane | CH ₄ | 21 | 3.07 | 2.87 | 2.79 |
| Nitrous oxide | N ₂ O | 310 | 1.77 | 1.76 | 1.75 |
| Total (excluding absorption) | | | 223.94 | 234.70 | 267.28 |
| CO ₂ absorption | CO ₂ | 1 | -10.45 | -10.46 | -10.48 |
| Total (including absorption) | | | 213.49 | 224.24 | 256.80 |
| Indirect greenhouse gases | Formula | | (Gg) | | |
| | | | 2005 | 2007 | 2010 |
| Nitric oxide and nitrogen dioxide | NO _x | | 1.37 | 1.58 | 1.81 |
| Carbon monoxide | CO | | 5.27 | 5.64 | 5.93 |
| Non-methane volatile organic compounds | COVNM | | 1.07 | 1.12 | 1.17 |

Table 3.1: San Marino overall emissions in 2005, 2007 and 2010 of greenhouse gases in CO₂ equivalent and of indirect greenhouse gases.

| Sector | 2005 | 2007 | 2010 |
|--|---------------|---------------|---------------|
| Energy | 220.03 | 231.05 | 263.88 |
| Industrial processes | 0.00 | 0.00 | 0.00 |
| Agriculture | 3.91 | 3.65 | 3.40 |
| Total emissions in CO₂ equivalent excluding LULUCF | 223.94 | 234.70 | 267.28 |
| Land-use and forestry change | -10.45 | -10.46 | -10.48 |
| Total emissions in CO₂ equivalent including LULUCF | 213.49 | 224.24 | 256.80 |

Table 3.2: Overall emissions in Gg of CO₂ equivalent by sector.

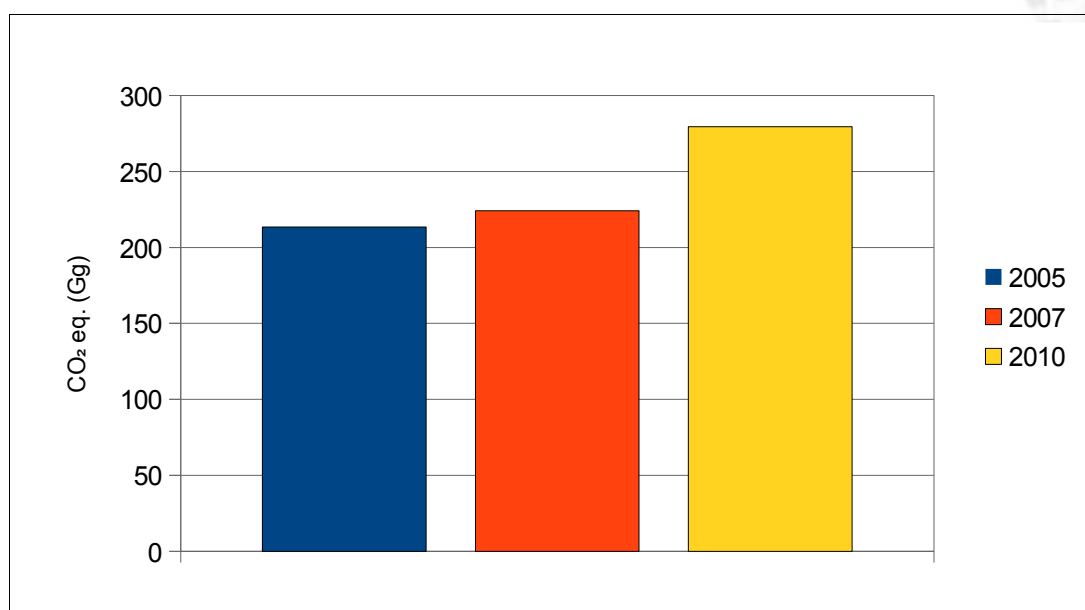


Figure 3.12: Overall emissions, including removals, in Gg of CO₂ equivalent.

4

Steps taken or envisaged to implement the Convention

4.1 Environmental policy relative to mitigation

The Government of San Marino acted in the direction of completing the regulatory framework, aimed at improving the efficiency of the energy supply chain, developing and disseminating renewable energy sources (RES), as well as protecting the environment.

The Ministry of Territory and the Environment promoted the adoption of several delegated decrees in accordance with Law no. 72 of 7 May 2008 “Promotion and enhancement of energy efficiency in buildings and of renewable energy use in the civil and industrial sectors”, which enabled, among other things, an important dissemination of photovoltaic technology in the territory through the feed in tariff called “Conto Energia”, the promotion of the purchase of plants powered by renewable energy with incentives from the State in the form of interest subsidies and grants, as well as the promotion of energy-saving regeneration of buildings.

The National Energy Plan (NEP) is the reference instrument of energy policies in the Republic of San Marino. Through the analysis of the current energy consumption, the NEP identifies the main objectives and the guidelines for the development and strengthening of the State energy system in terms of production, transport, distribution and savings. In particular:

- planning of the State energy requirements;
- reduction of costs relative to energy import;
- diversification of energy supply sources;
- promotion and development on the territory of energy production from renewable sources;
- promotion and development of energy efficient technologies;
- reduction of polluting emissions and of greenhouse gases;
- replacement, rationalisation and modernisation of infrastructures and plants;
- reduction of final energy consumptions in the transport, production and housing sectors.

The NEP 2008-2011 has marked the effective start of San Marino energy policy towards the reduction of greenhouse gas emissions. The NEP 2012-2015 also intends to carry on the policies of energy saving and rational management of energy, with a view to reducing emissions.

The Ministry of Territory and Environment has also promoted and completed the reorganisation of all legislation relating to the protection, preservation and improvement of the quality of the environment in order to ensure control of potential sources of pollution and environmental impact in surface and groundwater, air, soil and subsoil as well as of acoustic and electromagnetic emissions.

Furthermore, in the waste management sector, the first Multi-annual Waste Management Plan has been approved. The plan establishes separate waste collection targets in line with those of the European Union, supports the launch of door-to-door waste collection, encourages the use of bio-cells for the recovery of the organic fraction of waste by creating compost, promotes the creation of a new multi collection centre.

4.2 Measures to mitigate climate change

The most direct and important consequence of the NEP 2008-2011 was the enactment of Law no. 72/2008, which redefined powers and functions of the Authority regulating Public Services and Energy. This was followed by the enactment of the related Delegate Decrees:

- Delegated Decree no. 88 of 25 June 2009 on the climate characteristics of the territory;
- Delegated Decree no. 89 of 25 June 2009 on the feed-in of electricity from RES;
- Delegated Decree no. 91 of 25 June 2009 on the establishment of the Energy Desk;
- Delegated Decree no. 92 of 25 June 2009 on the Feed-in Tariff then modified by the Delegated Decree no. 20 of 6 March 2012;
- Delegated Decree no. 126 of 17 September 2009 on the definition of energy performance class of buildings;
- Delegated Decree no. 127 of 21 September 2009 on the establishment of the Energy Certifiers' Register and the organisation of the Service for the Management of Energy Procedures (GPE);
- Delegated Decree no. 128 of 21 September 2009 on the encouragement of energy interventions;
- Delegated Decree no. 129 of 21 September 2009 on the energy audit requirement for large users;
- Delegated Decree no. 84 of 17 July 2012 on the implementing rules and revision of the Law no. 72 of 7 May 2008.

Other law provisions, once again identified by the NEP for the period 2008-2011, concerned incentives to buy low environmental impact vehicles (Delegated Decree no. 4 of 23 January 2009), waste management (Delegated Decree n. 23 of 4 March

2009), exploitation of biomass and production of energy from RES in the agricultural sector (Delegated Decree no. 158 of 21 September 2010).

The Budget Laws of 2010 (no. 194) and of 2011 (no. 200) confirmed the allocation of considerable sums of money to cover financial commitments concerning policies and incentives to promote the use of renewable energy, resulting from the PEN 2008-2011.

4.2.1 Renewable energy sources

Photovoltaic plants

Following the establishment of the Feed-in Tariff and the relevant facilitations, the first photovoltaic plants were installed in 2010, but only in 2011 was there a considerable increase both in their number and in terms of installed powers. For this reason, RES data also include 2011.

Between December 2010 and December 2011, the Energy Desk authorised the installation of 135 low-power photovoltaic plants (on average 3-4.5 kWp each), to which the incentive rates envisaged by the Feed-in Tariff were granted (Delegated Decree no. 92/2009). Moreover, between October 2010 and December 2011 the Authority regulating Public Services and Energy received 8 requests for preliminary authorisation of plants with nominal power higher than 20 kWp, for a total installed power of 1 319.61 kWp.

As of 31 December 2011, the photovoltaic plants connected to the electricity network had a nominal power of 1 521.89 kWp (Table 4.1). In 2011, the electricity produced by photovoltaic plants was equal to 589 MWh.

| <i>Year</i> | <i>Plants with nominal power ≤ 20 kWp</i> | <i>Quantity</i> | <i>kWp</i> |
|--|--|-----------------|------------|
| 2010 | Plants connected and entitled to incentives | 8 | 24,73 |
| 2011 | Plants connected and entitled to incentives | 127 | 600,91 |
| <i>Year</i> | <i>Plants with nominal power > 20 kWp</i> | <i>Quantity</i> | <i>kWp</i> |
| 2010 | Plants authorised by the Authority | 4 | 795,23 |
| | of which connected and entitled to incentives <u>in 2011</u> | 2 | 571,87 |
| 2011 | Plants authorised by the Authority | 4 | 524,38 |
| | of which connected <u>and entitled to incentives in 2011</u> | 2 | 324,38 |
| <i>Summary</i> | | <i>Quantity</i> | <i>kWp</i> |
| Total of plants authorised by the Authority | | 139 | 1 521,89 |
| Total of plants connected and entitled to incentives | | 4 | 423,36 |

Table 4.1: Situation as of 31/12/2011 concerning the number of photovoltaic systems entitled to incentives, and installed powers.

Solar thermal plants

Among others, Law no. 72/2008 introduced incentives for solar thermal plants. As of 2011, 17 plants were installed in private buildings, for a total of 62 m² of absorbent surface. In addition to these, some solar thermal plants have also been installed in some school buildings.

Biomass

Delegated Decree no. 158 of 21 September 2010 provides for incentives for the use of biomass arising from agricultural and forest dedicated crops, forest management and agricultural residues, and also for the production of energy from RES in the agricultural sector. In particular, the electricity produced by cogeneration plants fuelled by biomass is remunerated with a feed-in tariff for 15 years. In addition, cogeneration plants fuelled by biomass are entitled to the deductibility of costs and a grant aid.

To date, no system has either been installed or planned. However, the issuing of the decree may have paved the way for initiatives and experiments in the field of biomass.

4.2.2 Energy consumption reduction

Energy efficiency in buildings

Law no. 72/2008 has introduced several energy requirements and quality standards for both new and renovated buildings, in order to:

- a) optimise energy performance of buildings, following the logic of a correct and balanced improvement of their overall quality, also in terms of hygiene and environmental well-being;
- b) promote the development, enhancement and integration of RES;
- c) favour energy diversification both in the civil and industrial sectors;
- d) regulate electricity market;
- e) stimulate the adoption of efficient technologies to reduce industrial consumptions;
- f) stimulate the production of electricity from RES or similar sources and the adoption of efficient technologies to reduce industrial consumptions;
- g) curb emissions of polluting gases and, in particular, of greenhouse gases.

Delegated Decree no. 126/2010 introduced energy classification of buildings, based on the winter energy performance index, establishing nine classes: from class G, with the lowest energy performance, to class A++, with the highest energy performance.

Any new building built after 2010 shall meet class C minimum energy requirements and shall comply with Law no. 72/2008 in terms of water consumption reduction measures for sanitation uses and the use of rainwater.

The introduction of energy efficiency standards for buildings, provided by Law 72/2008, has not had any significant impact yet. The crisis of the building sector is slowing down both the construction of new buildings and the revision of the existing building stock. Therefore, there have not been significant reductions in energy requirements in the building sector yet.

Industrial sector

Delegated Decree no. 129/2009 introduced the requirement, for companies with overall energy consumption (natural gas and electricity) greater than 200 toe/year, to adopt the energy audit procedure. The energy audit is a procedure to analyse the energy demand and is aimed at reducing consumptions, enhancing the production efficiency, decreasing greenhouse gas emissions and encouraging the use of renewable energy and similar sources.

Also in this case, the application of the legislation has not yet led to a significant reduction in energy consumption.

Public sector

In public buildings, the indications provided by the PEN 2008-2011, concerning the replacement of old fuel oil heating systems with natural gas heating systems, have been fully implemented. The same applies to the indications relative to the improvement of public lighting efficiency, with the introduction of modern LED lighting systems.

Moreover, a 20 kWp photovoltaic plant and a solar thermal plant have been installed in the elementary school of Dogana, while a 5 kWp photovoltaic plant and a solar thermal plant have been installed in the kindergarten of Serravalle.

4.3 Measures envisaged

4.3.1 Interventions envisaged in the NEP 2012-2015 concerning energy supply.

Energy production plants from fossil fuels

The NEP 2012-2015 envisage interventions supporting the spreading of methane co-generation systems, such as:

- the conclusion by the AASS of supply contracts for electricity originated by co-generation systems;
- targeted initiatives of training and promotion of technology;
- establishment of a specific feed-in tariff for electricity produced by cogeneration plants.

Photovoltaic energy

Thanks to the carrying on of incentive-based policies, the NEP provides for the installation of further photovoltaic plants in the four-year period 2012-2015. By 2015, total installed power is expected to reach 6 MWp, which will meet approximately 2.6% of the total electricity needs.

The objective envisaged also takes into account the installation by 2015 of some plants in the public sector, with around 1 Mwp of total power.

Solar thermal energy

The NEP 2012-2015 envisages a substantial increase in the dissemination of solar thermal plants in residential buildings, as a result of the carrying on and strengthening of incentive-based policies, such as the inclusion of domestic hot water consumption among the energy performance parameters of building units. These changes may lead to the installation of approximately 2 500 m² of flat plate solar collectors by 2015, corresponding to a reduction in the consumption of natural gas of about 220 toe/year, with a relative reduction in emissions of 0.5 Gg of CO₂/year.

The use of thermal solar energy in public buildings and in the industry sector will contribute to a further reduction in fuel consumption, since solar thermal energy is particularly efficient where considerable quantities of hot water are used, such as swimming pools and sports facilities in general, hospitals and schools.

Wind power

General studies on wind characteristics, aiming at exploiting wind energy, indicate that in most of the territory the average speed of winds is less than 5 m/s, thus insufficient to ensure the operation of a wind turbine system. In areas where the wind speed is higher, i.e. the top of Mount Titano, the installation of wind rotors of medium power might be convenient, although their environmental impact (acoustic and visual) would be high.

Nevertheless, in order not to limit the spreading of small wind turbines in the area, simplified verification of sites suitability (such as data collections restricted to periods of six months to integrate the general data already available) and the establishment of an ad hoc feed-in tariff are under consideration.

Geothermal energy

San Marino subsoil has no significant thermal anomalies. Therefore, the only possible way of using geothermal energy is the installation of low enthalpy geothermal systems, in which the subsoil is used as a heat accumulator.

The NEP 2012-2015 recommends the implementation of some low-enthalpy geothermal plants in new public buildings, also with a view to clearly showing the potentialities of this system to the community and to the technical experts of this sector.

4.3.2 Interventions envisaged in the NEP 2012-2015 concerning energy demand

Residential sector

The residential sector accounts for a total of 16% of electricity consumption and 42% of natural gas consumption.

The impact of Law 72/2008 in terms of energy savings, regarding the energy certification, retrofit and classification of buildings, has been very limited since the number of new buildings built according to energy efficiency criteria is still limited.

In order to speed up energy interventions on the building stock, with particular reference to the existing one, the NEP 2012-2015 suggests some more incisive policies in terms of tax incentives and of tariff incentives/disincentives. Among these, it identifies some amendments to Law no. 72/2008, such as:

- the inclusion of the energy required for summer air conditioning among the energy parameters of buildings;
- stricter limitations for new buildings;
- more effective regulatory interventions for existing buildings, most of which are estimated to be included in class G (consumption for winter heating of $240 \text{ kWh}\cdot\text{m}^{-2}\cdot\text{year}^{-1}$).

Industrial and service sectors

Industrial and service sectors account for 76% of electricity consumption and 53% of natural gas consumption. Moreover, among the top 20 electricity users, 16 are industrial activities that account 30% of San Marino consumption.

The NEP 2008-2011 already identified electric motors and lighting systems as the most energy intensive and considered the possibility of intervening on these, where feasible on account of the working cycles, through the introduction of power regulators, inverters and automatic control systems.

The NEP 2012-2015 reiterates that substantial reductions in the national energy demand can be achieved in a relatively short time by intervening on the production cycles of the most energy intensive manufacturing companies. In addition, through the examination of the results achieved in the first years of application, the NEP identifies some amendments to the law on the energy audit for companies.

Public sector

The public sector accounts for 8% of electricity and 5% of natural gas consumptions. Interventions involving State-owned buildings play a significant role in terms of communication and total amount of energy effectively saved.

The NEP 2012-2015 provides for the carrying on of the renovation programme of heating systems in public buildings, replacing old fuel oil heating systems with natural gas heating systems, for a total capacity of 5.84 MW. Furthermore, the new

NEP provides for Energy Audit procedures also for State-owned buildings, starting from the most energy-intensive ones. The envisaged interventions can ensure a reduction in the consumption of electricity and gas, by 2015, of about 2 000 toe per year.

Public lighting accounts for 1.9% of the overall electricity consumption, corresponding to 5.15 GWh per year (2010 data). The AASS has planned, by 2015, to extend the use of light flow regulators, for a total of about 800 lights, and to continue the installation of LED lighting systems in new plants, as well as the renovation of obsolete plants (Historic Centre of Borgo Maggiore, etc.).

In the transport sector, the NEP 2008-2011 reiterates the directions concerning the analysis of the use of State vehicles and journeys made. In addition, it urges the gradual renewal of the fleet with low environmental impact vehicles.

Law no. 188 of 5 December 2011, "Reform of the structure and organisational model of the Public Administration", established the Transport Office, with the task of taking care of and optimising public transport services, according to best efficiency criteria, also in terms of energy performance.

4.4 Other interventions

4.4.1 Waste management

With the introduction of Delegated Decree no. 44 of 27 April 2012 (Environmental Code), San Marino has recently rearranged and updated the entire legislation on waste.

The key elements introduced by legislation are the following:

- a) the "Waste Management Plan", which reports on the current state of affairs and includes a 5-year programme for the reduction of waste production and the recovery of materials from urban waste. The Environmental Management Unit is responsible for monitoring waste production and dispatch to disposal and recycling plants offers a flexible and thorough instrument on waste management over a period of 5 years;
- b) the "Register of waste loading and discharge and list of wastes", which includes the instruments to control that waste is properly managed by companies producing it.

The legislation establishes that waste management is a public interest activity and specifies that such management is aimed at ensuring a high degree of environmental protection, at guaranteeing efficient controls that take into account specific hazardous waste and at preserving natural resources.

Waste must be recycled or disposed of without any risks for human health and without using any procedures or methods that could present a risk to the environment, in particular:

- a) without presenting any risks to water, air, land, animals and plants;
- b) without causing any inconvenience from noise or odours;
- c) without damaging the landscape and particularly interesting areas.

Waste management is therefore carried out according to principles of precaution, prevention, proportionality, responsibility and cooperation among all those involved in the production, distribution, use and consumption of the goods from which waste is produced.

4.4.2 Water management

Legislation on water protection and management of water resources, also reorganized and updated by the Environmental Code, has the following objectives:

- a) preventing and reducing pollution and implementing the restoration of healthy waters;
- b) improving water conditions and adequately protecting water destined to specific uses;
- c) using water resources in a sustainable manner, with particular reference to drinking water;
- d) preserving the natural self-cleansing capacity of water sources, as well as the capacity to sustain large and well diversified animal and plant communities;
- e) mitigating the effects of extreme atmospheric events, thus contributing to:
 - guaranteeing sufficient supply of high-quality surface water and ground-water for a sustainable, balanced and fair use of water;
 - significantly reducing water pollution;
- f) protecting and enhancing the status of aquatic ecosystems, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems with regard to their water needs, and preventing deterioration thereof.

Law 72 of 2008 already provides for the following measures to reduce water consumption for sanitary use:

- obligation to fit flow reducers in taps and showers;
- obligation to install toilet cisterns with devices to adjust water flow;
- incentives for the adoption of systems that allow the supply of flushing cisterns by grey water;
- obligation to install, in new buildings, tanks for the recovery of rainwater.

Concerning the protection of the natural environment and the establishment of essential levels of water service supply, the Environmental Code provides for the elaboration of the “Water management and protection plan”, which plans and programmes actions and rules for water conservation, defence and use, and the “Management regulation of the integrated water service”. Such documentation will include various measures to reduce water consumption, as:

- waste water recovery in production cycles;
- re-use of waste water from swimming pools for irrigation purposes;

- disincentive rates to discourage consumption higher than is strictly necessary for personal use; summer/winter tariff treatment with remote reading of meters;
- ongoing awareness raising campaigns for citizens, particularly in schools.

and interventions to ensure that the demand is met, such as:

- feasibility study for the construction of a reservoir of about 1 000 000 m³ along the Torrent San Marino, for which, data collection on flow-rate, quality analyses, geological surveys in the area are being carried out;
- reconstruction of some water mains to reduce losses of raw water.



5

Vulnerability and adaptation

5.1 Climate change scenarios in San Marino

5.1.1 Methodology

In order to measure and possibly estimate statistically significant climate variations in the Republic, the data of the San Marino meteorological station have been analysed for the period covered by available time series (precipitations from 1924 to 2011, temperatures from 1932 to 2011). The analysis has been carried out with the collaboration of the Climate and Applied Meteorology of ISPRA, Rome.

On the basis of available data, the anomalies, compared with the period 1961-1990, of annual average temperatures, seasonal average temperatures, cumulative annual precipitation and cumulative seasonal precipitation have been calculated.

Trends have been estimated with a Mann-Kendall linear model, where the null hypothesis is that there is no monotonic trend over the entire period and the alternative hypothesis is that a monotonic trend exists over the entire period. The significance level used is 5%.

Since the time series is not complete, the annual/seasonal data of one year have been considered only if all monthly values were present for that year (12 for annual data and 3 for seasonal data).

The seasonal subdivision adopted is the meteorological one, that is:

- spring: March, April, May;
- summer: June, July, August;
- autumn: September, October, November;
- winter: December (of the previous year), January, February.

5.1.2 Temperature and precipitations

Over the last 20 years, average temperatures have substantially increased, in particular summer temperatures. The average maximum temperature has increased from 14.1 °C (1931-1960), to 14.3 °C (1961-1990), to 16.3 °C (1991-2010), while the average minimum temperature has increased from 7.9 °C (1931-1960), to 8.8 °C (1961-1990), to 10.4 °C (1991-2010).

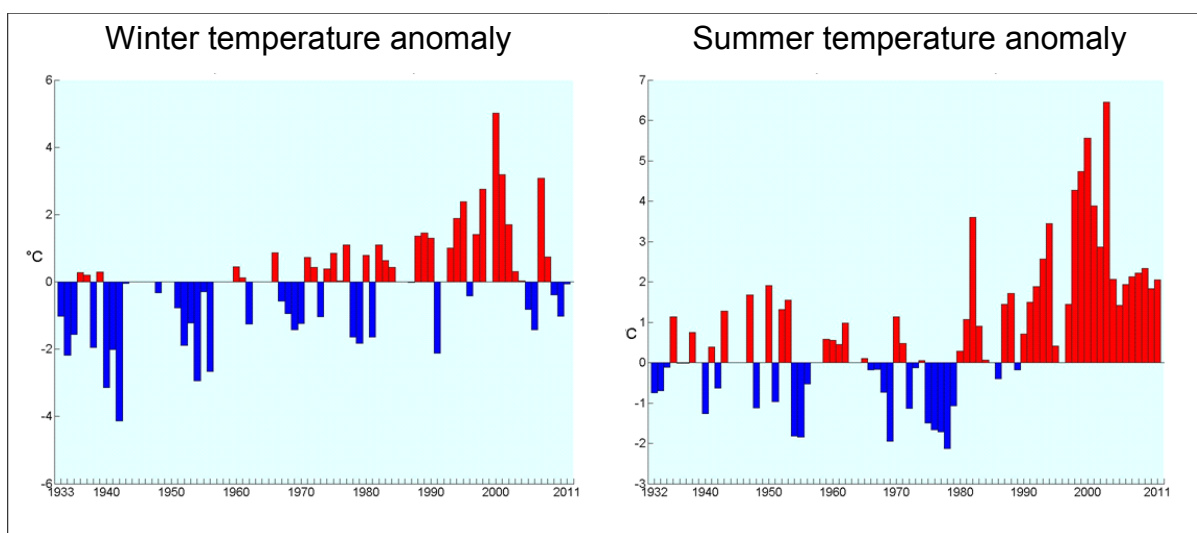


Figure 5.1: Winter and summer temperature anomalies observed, compared with the period 1961-1990.

Trend analysis over the period 1932-2011 has shown an increase in the average annual temperature by 2,9 °C. This increase is more considerable in spring and summer months (+3.3 and +3.2 °C) compared to winter and autumn months (+2,3 and +2,8 °C) (Figure 5.1 e Table 5.1).

Over the same period, the average annual precipitation shows a clear downward trend. The average annual precipitation has decreased from 933 mm in 91.7 days of rain (1931-1960), to 807 mm in 90.4 days (1961-1990), to 769 mm in 87.8 days (1991-2010), although 2005 and 2010 were two exceptionally wet years, with precipitations higher than 1 200 mm/year. Also the annual amount of snowfall has decreased substantially, going from 13.1% of precipitations (1931-1960) to 9.6% (1991- 2010).

| INDICATOR | average variation per decade | variation over the entire period (starting and ending year). |
|---------------------------------|------------------------------|--|
| Average annual temperature | +0.33 °C | +2.9 °C (1932-2011) |
| Average spring temperature | +0.37 °C | +3.3 °C (1932-2011) |
| Average summer temperature | +0.37 °C | +3.2 °C (1932-2011) |
| Average autumn temperature | +0.26 °C | +2.3 °C (1932-2011) |
| Average winter temperature | +0.33 °C | +2.8 °C (1933-2011) |
| Cumulative annual precipitation | -2.51 % | -24.3 % (1924-2011) |
| Cumulative spring precipitation | -4.18 % | -40.4 % (1924-2011) |
| Cumulative summer precipitation | no trend | no trend |
| Cumulative autumn precipitation | -2.68 % | -25.87 % (1924-2011) |
| Cumulative winter precipitation | no trend | no trend |

Table 5.1: Temperature and precipitation trend between 1924 and 2011.

Trend analysis over the period 1924-2011 shows that the cumulative annual precipitation has decreased by 24.3%, particularly during spring months (-40.4%). In autumn, the decrease in the amount of precipitation (-25.9%) is close to the average annual value, while no statistically significant variations are registered in summer and winter (Table 5.1).

Therefore, San Marino climate follows the global trends, namely increasing average temperatures and higher frequency of extreme events. On average, snowfall is less frequent and less abundant and the number of days with below-zero temperatures has considerably decreased (annual average of 55 days from 1931 to 1960, 45 days from 1961 to 1990, 33 days from 1991 to 2010).

The frequency of extreme meteorological events, such as intense or absent precipitations and thermal anomalies, has considerably increased over the last years. In particular, periods characterised by little or no precipitation and hot temperatures, leading to heat waves and droughts, are becoming more and more frequent.

5.2 Assessment of vulnerability and adaptation measures

So far, the Republic of San Marino has not carried out any assessment of the vulnerability to global warming of its territory. Notwithstanding this, it is possible to assess the general implications of temperature increase and of precipitation decrease in various fields.

San Marino has already implemented some measures to adapt to climate change in the field of human health and is working towards the application of further measures in the field of water supply and agriculture. A national strategy for adaptation to climate change is also being studied.

5.2.1 Human health

Climate changes, in particular the increase in global average temperatures and variations in meteorological precipitation, have considerable implications on human health.

The impacts of climate on human health are already evident in countries hit by drought and floods, in particular in the South of the world, and in countries affected by the so-called “heat waves”, as recently occurred also in some European regions. Along with direct consequences, there are also indirect effects related to environmental changes, which can be caused by climate change.

This is the case of the potential northward and southward migration from tropical areas of infective diseases transmitted by vectors (malaria, yellow fever, dengue fever, chikungunya, West Nile fever, Lyme disease, Chagas disease, leptospirosis, leishmaniasis, schistosomiasis), the increase in diseases caused by malnutrition and consumption of unsafe food and non-potable water, as well as a higher concentration of pathogens in the air.

In order to prevent these risks in the context of a local community such as San Marino, some of the effects of climate change on human health have been analysed, while envisaging specific adaptation measures in those areas with a real risk for San Marino.

Heat waves

Deaths related to heat waves are becoming an increasing problem in many regions, in particular during summer. An increase in the frequency and intensity of heat waves will further worsen the situation.

For the EU populations, estimates indicate a 1-3% increase in mortality rate for each 1°C increase in the summer average temperature. Elderly people are more at risk since they have a reduced physiological ability to regulate their temperature (thermal regulation).

At present, no increase in the number of deaths during summer months has been recorded in San Marino. However, potential risks for health derive from the fact that, in the last few years, a progressive increase in temperatures has been recorded also in San Marino. Furthermore, because of the progressive ageing of the population, an increasing number of elderly people will be exposed to heat waves.

Through the national health information system, which is being implemented, it will be possible to identify and quantify population groups at risk and in need of preventive measures.

San Marino intends to establish a warning system monitoring the number of heat waves-related hospitalised patients, by differentiating flat areas (more vulnerable to heat waves) from hilly areas. Moreover, San Marino intends to launch awareness-raising campaigns to reduce the risks related to heat waves by informing the population on the adoption of healthy lifestyles and behaviours during summer months.

In view of the increasing problems connected with heat waves, health personnel will need to be trained on issues related to the impact of heat waves on health.

Vector-borne infectious diseases

Climate change is likely to cause changes in the ecological systems, thus affecting seasonal activities of local vectors and migration of tropical vectors. This may result in the indirect spreading of infectious diseases transmitted by these vectors. For instance, some climate change models estimate an increase in the risk of malaria also in Europe. Moreover, in the last few years, some cases of chikungunya and West Nile fever have been reported in Italy for the first time, in particular in the nearby Emilia Romagna region.

Although no cases of vector-borne infectious diseases have been reported so far, the proximity of San Marino to Emilia Romagna entails a possible risk of transmission also in the Republic. For this reason, San Marino is strengthening its collaboration

with Italian institutions, both at a national and regional level, to jointly face these public health problems.

San Marino is committed to strengthening its vector monitoring system and developing measures aimed at preventing processes, which could provide a breeding ground for vectors.

Food infections

Several studies have confirmed and quantified the effects of high temperatures as expressed in common forms of food intoxication, e.g. salmonella.

Pathologies related to food infections might spread in San Marino as well, especially during summer months.

San Marino has developed food self assessment systems (SSOP – HACCP) and inspection systems to guarantee food and beverage safety.

Additional measures

As evidenced in the 2011-2013 General Guidelines for the Social and Health Plan, approved by the Great and General Council, San Marino intends to develop environmental policies that are able not only to effectively reduce or eliminate from the environment pollutants dangerous to human health, but also to counter the negative effects of climate change through specific actions relative to environmental protection and human adaptation strategies in relation to climate change (heat waves, droughts, etc.).

Therefore, San Marino intends to strengthen the health and social system in order to systematically face future effects of climate changes. To this end, increased integration of this system with other strategic sectors, such as territory, economy and education, will be necessary.

In particular, the following shall be implemented:

- an information system connecting health and climate aspects, as well as warning systems for pathologies related to climate changes;
- a health emergency plan allowing for a rapid response also to climate-related emergencies;
- health facilities equipped with adequate instruments for the treatment of climate-related diseases;
- training and information programs for health professionals on issues regarding climate and health.

5.2.2 Water supply

San Marino is extremely vulnerable in terms of water supply. Since it is part of the Mediterranean area, San Marino has been suffering from a reduction in available water for several years already. Moreover, its internal resources are only enough to

meet a small part of the requirements and therefore it strongly depends on external sources.

The progressive drop in spring precipitations and the alternation of dry summers have decreased the amount of available water during summer months. For this reason, the body that manages water distribution has often been forced to request legislative provisions to limit water consumption in dry periods to essential uses only.

5.2.3 Agriculture

Climate change may have various kinds of effects on agriculture. In the Mediterranean area, where San Marino is situated, these are mainly negative effects.

Temperature increase may cause a decrease in productivity and may shorten the growth period. Moreover, the decrease in available water could considerably limit irrigation possibilities.

Probable impacts on the main crops in the territory are the following:

- in arable crops, temperature increase may lead to premature ripening, variable production and exposure of crops to extreme meteorological events;
- temperature increase may favour the cultivation of vines and olives at higher altitudes, but summer droughts may cause a decrease in their harvests and the cultivation of varieties suited to warmer climates may be required.

In 2009, San Marino adopted the agricultural and environmental plan, with the aim of carrying on and developing projects for the protection and safeguard of biodiversity, the recovery of natural areas, the spreading of low-impact cultivation systems, the protection of soil as a resource, environmental and landscape conservation. The plan provides for 7 commitments:

- **crop rotation**, which guarantees maintenance of agricultural fertility and a balance among the components of the agro-ecosystem; our soils, mainly clayey, heavy and non-irrigated, entail some limitations and constraints in the choice of crops to be rotated;
- **fertilisation/soil conditioning plan**, which aims at reducing losses of nitrates by runoff and, more in general, at limiting the use of chemical fertilisers, also through cover crops, in order to increase soil organic matter levels;
- **surface water retention**, which provides for the re-naturalisation of primary ditch beds by using spontaneous vegetation; these plants reduce soil surface erosion and have a beneficial effect on climate;
- mandatory adoption of **low-tillage techniques**, conservative and inexpensive in terms of energy, up to no-tillage practices, mandatory with slopes of more than 30% gradient; the aim is to protect the most fertile layer of the soil, by limiting erosion phenomena and organic matter oxidation, as well as to reduce the loss of nutrients by run-off;

- **limiting the dispersion of phytosanitary products** by envisaging a proper functioning of sprayers, the use of water soluble containers and that phytosanitary products are kept and handled with the maximum caution;
- **restoration of agricultural landscape**, with the aim of countering simplification deriving from the cutting down of hedges and from cultural uniformity to favour the preservation of environmental biodiversity;
- **protection of spontaneous vegetation and wild animals**, which envisages the preservation of small water puddles and natural micro habitats for herbaceous species of humid environments; the maintenance of hedges, a buffer strip of at least 1.5 metres all along the margins of land parcels, as well as hay-making and threshing operations from the centre to the margins of the land parcel, to enable wild animals to escape, are made mandatory; moreover, the use of herbicides and of flame weeding to clean embankments, ditches and headland strips are forbidden.

Sustainability of agriculture requires that natural diversity of agricultural systems be preserved and sometimes recreated, through restoration of the agricultural landscape and the correct management of non-cultivated areas. The presence of wooded, shrubby or herbaceous strips at the margins of ditches, channels and watercourses enables the consolidation of banks, the reduction of surface erosion, as well as the limitation of nutrient loss and of the dispersion of phytosanitary products from cultivated land. This also regulates the micro-climate, thanks to the reduction in wind intensity and temperature excursions, as well as to a higher level of humidity in neighbouring surfaces. Moreover, it helps fixing higher quantities of carbon in the soil avoiding its transformation into CO₂.

5.2.4 Forestry

Wooded areas on the San Marino territory are not very extensive and predominantly consist of oaks, elms and maples.

Temperature increase is causing all over Italy a shifting of environments towards higher altitudes. However, this shifting is too fast to have a parallel natural shifting of tree species and therefore climate change is likely to cause a progressive degradation of woodland.

Worth considering is also the increasing danger of forest fires in the dry season.

6

Other information useful to achieve the objectives of the Convention

6.1 Research and monitoring

The meteorological station of San Marino is included in the network of meteorological data collection of the Emilia Romagna region, which collects and systematically observes numerous meteorological parameters, such as air temperature, rainfall, snowfall, winds, humidity, etc.

San Marino Naturalistic Centre carries out research activities on the Republic's environment and on the influence of climate change on local fauna and flora.

6.2 Education and training

According to the San Marino school system, education on climate change is part of the more comprehensive subject "Environmental and Sustainable Development Education". This subject includes a wide range of activities aimed at promoting among the young the knowledge of the natural environment, raising their awareness of major environmental issues and encouraging them to behave in such a way as to avoid waste of natural resources.

In San Marino schools, environmental education involves the understanding of relations with or within the ecosystem, education to active citizenship through participation in social processes, as well as the perspective of sustainability. A society is sustainable when it integrates economic policies with environmental and education policies. Therefore, the primary objective of training is to stimulate the knowledge of global problems and to understand the connections existing among phenomena (natural, social, political, etc.).

The purpose of Environmental and Sustainable Development Education is to substantially change individual and collective behaviours and attitudes. Concepts and knowledge are not fixed in themselves and therefore specific methods and instruments are chosen to promote voluntary processes of change through action.

All disciplines contribute to Environmental and Sustainable Development Education since this subject involves the entire curriculum. Many issues can be easily connected with the Republic's territory and this is the reason why they have been included in the "Curriculum guidelines for a new form of knowledge in San Marino schools", adopted with Decree no. 57 of 15 March 2006. These guidelines are a fundamental

reference tool for the “local curriculum” and include a series of interdisciplinary programs closely linked to the territory and adopted by all school grades.

Today, environmental knowledge is a new scientific paradigm, which fully recognises concepts such as “complexity”, “system” and “uncertainty” as an intrinsic feature of technical and scientific knowledge. The educational programs provided for in the guidelines are based on research and action and use the local territory, from a geographical and scientific point of view and therefore not strictly bound to political borders, as a real laboratory for the testing of various methods, with a view to best making a necessary epistemological and ethic reflection. Therefore, schools are the elected place to promote environmental, social and cultural sustainability as experience of democracy and intercultural exchange, as well as a critic analysis of the various environmental problems, that is to say a laboratory for the shaping of different territorial development models.

6.2.1 School activities

Although the topics may vary from year to year, all activities are based on two common elements:

- to live the environment in order to be able to appreciate it;
- to recognise the impact of everyday behaviour on the environment.

If the behaviour of the young is to be affected, they must get a first-hand feeling of the problem. This is why environmental issues are often dealt with through direct experience.

In kindergartens (3-6 years) the program is mainly focused on experience and game, as well as on space and time dimensions as key parameters to understand the interdependence of environmental components. The acquisition of environmental knowledge through territory exploration and landscape analysis aims at stimulating children's desire to be actively involved in the protection of the environment. Environmental education on climate change is provided in particular through specific teaching projects stressing the importance of preventing waste of resources, as well as reuse and recycling materials.

In elementary schools (6-11 years) children learn how to protect ecosystems and recognise the effects of human activities on the environment. They also learn the fundamental concepts of “Agenda 21” and are stimulated to identify possible initiatives for a “Local Agenda 21” promoting sustainable development throughout the territory. Besides specific teaching programs, also regular classes contribute to increasing children's knowledge about climate change and related issues.

In junior high schools (11-14 years) children become acquainted with specific terms and cause-effect relations. The main purpose is to develop their decision-making skills concerning environmental protection under complex and uncertain conditions and, in particular, to help them identify and analyse the interdependence among development, environment and economy on the San Marino territory. With regard to

climate changes, students learn, from a scientific and geographic point of view, to assess the global impact of technologies and products on the environment and to reduce the negative effects thereof. They also learn to recognise global and local effects of the planet's warming and the importance of adopting a fairer and therefore more sustainable development model. With regard to civic and citizenship education, students are invited to take an active part in real situations, including responsibility-taking, conflict management and dispute-solving, while assessing actions and possible related consequences for the environment and future generations.

In high schools (14-19 years) students are invited to adopt a complex and comprehensive point of view in the analysis of the San Marino landscape in order to develop their skills to correlate local and global aspects. Teaching programs promote their capability to analyse and assess interdependence among development, environment and economy throughout the territory, as well as among culture, environment and technology. Students are then invited to develop intervention projects to protect the environment, including under extremely uncertain and complex conditions. High school students often take part in specific conferences on climate change and energy.

Some of the materials produced by students are available online at the address http://www.educazione.sm/scuola/servizi/CD_virtuali/ed_ambientale.htm.

6.3 Awareness raising

In the Republic of San Marino several institutional and non-governmental bodies promote information and public awareness campaigns.

The **Ministries of Environment and of Relations with the AASS** promote annual campaigns to encourage separate waste collection and the reduction of drinking water and electricity consumption. Local press and television play a crucial role in these campaigns.

The **Ministry of Territory and Environment**, in collaboration with various offices, bodies and associations, promotes each year the "**Ecology Day**". This event aims at disseminating and increasing awareness of environmental issues and environmentally friendly culture, by encouraging green behaviours and careful management of available territorial resources. During the Ecology Day, didactic laboratories, competitions for schools and a waste collection programme in woods and natural areas are organised.

The **Prevention Department of the Social Security Institute** (<http://www.iss.sm/online/Home/DipartimentoPrevenzione.html>) manages a network for the monitoring of environmental data on the territory and provides for the collection of data and dissemination of collected data. Moreover, it carries out training and information activities directed to schools and citizens.

The **San Marino Naturalistic Centre** (<http://www.centronaturalistico.sm/>) includes a museum and a study centre. It was established in 1997 with a view to collecting, studying and publicly exhibiting naturalistic materials and findings related to the San

Marino environment. Ever since its establishment, it has always conducted awareness-raising campaigns through:

- a series of conferences on San Marino natural environment;
- teachers' training;
- teaching activities destined to students.

Among the Naturalistic Centre's research activities are the monitoring and analysis of the presence of exotic species facilitated by the current climate change in the ecosystems of the San Marino territory.

The **San Marino Agenda 21 Coordination** was established in 2007 and includes 23 bodies and associations (<http://www.associazioni.sm/agenda21.html>). It has organised, and still organises, several training and awareness-raising initiatives for general public and schools, including conferences and exhibitions focused on the promotion of sustainable development, an in-depth knowledge of climate changes, the spreading of new technologies for alternative energies and energy saving.

Agenda 21 coordinates with San Marino RTV the participation of the Republic in the awareness campaign for energy saving entitled "M'illumino di meno", organised by the RAI radio programme "Caterpillar".

The **Chamber of Commerce of San Marino** (<http://www.cc.sm>), in collaboration with the Agenda 21 Coordination and the Township Council of Borgo Maggiore, organises "Ecomercatale", the annual fair of environmentally friendly technologies and production - separate waste collection, technologies for the building sector providing for low energy consumption, reduced heat dispersion and recovery of rainwater, as well as electric vehicles and environmentally friendly cars.

The aim of Ecomercatale is to promote among adults and young people everyday behaviours and technological solutions that contribute to energy saving and the protection of resources. Besides the exhibition fair, some conferences, didactic laboratories and performances are organised in the context of this event.

The **San Marino Mycological Association** (<http://www.micologica.org/>) was established in 1990 as a non-governmental organisation. The association is active in promoting respect for the environment and public health protection. The association's monthly magazine "Il sottobosco", addresses issues of local and global environmental issues, is very popular.

Annexes

| Greenhouse gas source and sink categories | CO ₂ emissions | CO ₂ removals | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | NO _x | CO | NM VOCs | SO _x |
|---|----------------------------------|--------------------------|-----------------|------------------|----------------------------------|------|-----------------|-----------------|------|---------|-----------------|
| | CO ₂ equivalents (Gg) | | | N ₂ O | CO ₂ equivalents (Gg) | | | (Gg) | | | |
| | CO ₂ emissions | CO ₂ removals | CH ₄ | | HFCs | PFCs | SF ₆ | NO _x | CO | NM VOCs | SO _x |
| Total national emissions and removals | 262.74 | -10.48 | 2.79 | 1.75 | | | | 1.81 | 5.93 | 1.17 | 0.00 |
| 1. Energy | 262.74 | 0.00 | 0.67 | 0.46 | | | | 1.81 | 5.93 | 1.12 | 0.00 |
| A. Fuel combustion (sectoral approach) | 262.74 | | 0.67 | 0.46 | | | | 1.81 | 5.93 | 1.12 | 0.00 |
| 1. Energy Industries | NO | | NO | NO | | | | NO | NO | NO | NO |
| 2. Manufacturing industries and construction | 29.23 | | 0.05 | 0.02 | | | | 0.08 | 0.02 | 0.00 | 0.00 |
| 3. Transport | 158.42 | | 0.47 | 0.40 | | | | 1.64 | 5.83 | 1.11 | 0.00 |
| 4. Other sectors | 75.09 | | 0.14 | 0.05 | | | | 0.09 | 0.08 | 0.01 | 0.00 |
| 5. Other (please specify) | 0.00 | | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| B. Fugitive emissions from fuels | 0.00 | | 0.00 | | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| 1. Solid fuels | | | NO | | | | | NO | NO | NO | NO |
| 2. Oil and natural gas | | | NE | | | | | NE | NE | NE | NE |
| 2. Industrial processes | 0.00 | 0.00 | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.05 | 0.00 |
| A. Mineral products | 0.00 | | | | | | | 0.00 | 0.00 | 0.05 | 0.00 |
| B. Chemical industry | NO | | NO | NO | | | | NO | NO | NO | NO |
| C. Metal production | NO | | NO | NO | | | | NO | NO | NO | NO |
| D. Other production | 0.00 | | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| E. Production of halocarbons and SF ₆ | | | | | NO | NO | NO | | | | |
| F. Consumption of halocarbons and SF ₆ | | | | | NE | NE | NE | | | | |
| G. Other (please specify) | NA | | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 3. Solvent and other product use | NE | | | NE | | | | | | NE | |

Table A.1: Summary data of the greenhouse gas inventory of the Republic of San Marino in 2010, sheet 1 of 2 (NE=not estimated; NO=not occurring; NA=not applicable).

| Greenhouse gas source and sink categories | CO ₂ emissions | CO ₂ removals | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | NO _x | CO | NM VOCs | SO _x |
|---|----------------------------------|--------------------------|-----------------|----------------------------------|------|------|-----------------|-----------------|------|---------|-----------------|
| | CO ₂ equivalents (Gg) | | | CO ₂ equivalents (Gg) | | | (Gg) | | | | |
| 4. Agriculture | | | 2.13 | 1.28 | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| A. Enteric fermentation | | | 1.49 | | | | | | | | |
| B. Manure management | | | 0.63 | 0.29 | | | | | | 0.00 | |
| C. Rice cultivation | | | 0.00 | | | | | | | 0.00 | |
| D. Agricultural soils | | | 0.00 | 0.99 | | | | | | 0.00 | |
| E. Prescribed burning of savannahs | | | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.00 | |
| F. Field burning of agricultural residues | | | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.00 | |
| G. Other (please specify) | | | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.00 | |
| 5. Land-use change and forestry | 0.00 | -10.48 | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| A. Changes in forest and other woody biomass stocks | 0.00 | 0.00 | | | | | | | | | |
| B. Forest and grassland conversion | 0.00 | 0.00 | 0.00 | 0.00 | | | | 0.00 | 0.00 | | |
| C. Abandonment of managed lands | | 0.00 | | | | | | | | | |
| D. CO ₂ emissions and removals from soil | 0.00 | 0.00 | | | | | | | | | |
| E. Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | | | | 0.00 | 0.00 | | |
| 6. Waste | | | NO | NO | | | | NO | NO | NO | NO |
| A. Solid waste disposal on land | | | NO | | | | | NO | | NO | |
| B. Waste-water handling | | | NO | NO | | | | NO | NO | NO | |
| C. Waste incineration | | | | | | | | NO | NO | NO | NO |
| D. Other (please specify) | | | NO | NO | | | | NO | NO | NO | NO |
| 7. Other (please specify) | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table A.2: Summary data of the greenhouse gas inventory of the Republic of San Marino in 2010, sheet 2 of 2 (NE=not estimated; NO=not occurring; NA=not applicable).

Glossary of acronyms and abbreviations

AASS: Public Utilities Autonomous State Corporation

CH₄: Methane

CO: Carbon monoxide

CO₂: Carbon dioxide

CO₂ eq emissions in carbon dioxide equivalent

GDP: Gross Domestic Product

GWP: Global Warming Potential

LULUCF: Land Use and Land Use Change and Forestry

N₂O: Nitrous oxide

NEP: National Energy Plan

NMVOC: Non-methane volatile organic compounds

NO_x: Nitrogen oxides

RES: Renewable Energy Sources

SSOP-HACCP: Sanitation Standard Operating Procedures - Hazard analysis and critical control points

UGRAA: Environmental and Agricultural Resources Management Office

UPE: Office of Economic Planning



