



Republic of San Marino

Convention on Biological Diversity (CBD)



**V National Report
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Introduction

Though its limited territorial dimension of 61 sq km, San Marino boasts a great variety of natural environments and micro-habitats and with a rich heritage of biological, geological and landscape diversity. This represents a valuable ecological and environmental resource. However, events such as the reduction of habitats, the use of natural resources, the introduction of alien species, the loss of species richness, pollution and global changes have resulted in the impoverishment of communities and the progressive decay of ecosystems. In addition to the conversion of land use and to a sometimes careless use of natural resources by man, a considerable impact on the biodiversity of the territory of San Marino has also been determined by climate change.

In view of all these considerations and wishing to best preserve the richness and peculiarity of its small territory, San Marino has been adopting an environmental legislation aimed at promoting a sustainable development, that is a development which does not threaten the quality and quantity of natural heritage and reserves. In addition to the update of the regulations protecting the territory, the landscape, human health and the environment in general, in line with European directives and the goals of the Convention on Biological Diversity, protected areas have been established for the safeguard of rare biological species, which are also representative of the territory. Moreover, several studies and monitoring on the state of the environment and biodiversity, on vertebrate and invertebrate fauna, on vegetation, on the quality of water, air and soil have been carried out. As a result, the knowledge of the state of conservation of San Marino natural or semi-natural ecosystems is now pretty comprehensive from a qualitative point of view, while systematic data collection procedures as well as standardized integrated monitoring should be strengthened in order to assess effectively the ecosystem quality through a qualitative and quantitative analysis of biodiversity.

At the same time, regular education, training and awareness-raising actions are carried out by several stakeholders, in order to make the population aware of and appreciate our territory and its specificities. Indeed only by encouraging individual responsibility it is possible to achieve a sustainable development, where environmental policies are an integral part of economic policies. Today we all know that economy and ecology are not in competition but they can and must coexist in order to pass our natural heritage down to future generations.

General characteristics of the territory

The Republic of San Marino is located at circa 15 km from the Adriatic sea, and belongs to the northern ridge of the Romagna Apennines. Its area stretches for 6.119 Ha (61,19 km²) and borders the province of Rimini on the North, East and West side, and the province of Pesaro-Urbino on the southern side.

Elevation ranges between 53 and 739 m a.s.l. and the morphology of this territory is the result of a geodynamic phenomenon called Valmarecchia rock slabs. This geological landscape is characteristic of the Apennine ridge between the valleys of Savio and Conca rivers. Here a series of limestone blocks of the so called “San Marino Formation”, typically with east cliff contrasting with west degrading slopes, are dominated by the mounts Titano (739 m), Monte Carlo (559 m) Seghizzo (550 m s.l.m.), Penniciola (543 m), Poggio Castellano (535), Moganzio (496 m), Montecerreto (458 m), Deodato (453 m), Montecucco (388 m). They are all “exotic”, as coming from other part of the larger area of the paleobasin, limestone enormous boulders included in a series of clay levels characterized by different colors (Argille varicolori della Val Marecchia). These different rocks provide a indented and heterogenic orography, with frequent landslide. Erosion processes in some area modelled the clay levels in badlands. At East, some more blocks at Montegiardino (340 m) and Faetano (260 m) are constituted by gypsum. This outcrop has been exposed to tectonic stress, erosion, and thus displays karstic phenomena such as dolinas, sinkholes and caves. The northeastern slope of these mounts have a softer profile, less steep, but with also badlands and sloping cliffs generated by landslides in the autochthonous Pliocene clay levels.

Lowlands and hilly areas are limited and located nearby river beds. The larger extension is between Dogana and Rovereta, and nearby the river Ausa but smaller are close to San Marino creek and Marano river beds. Rivers and creeks in the Republic have a typical sub-Mediterranean torrential tendency, with high seasonal variation in rainfall levels. In case of strong storms, resulting floods can cause of severe erosion and river bed excavation.

San Marino is in the sub-Mediterranean humid climatic belt with rainfall in autumn and springtime. Mean annual temperature during 1991-2011 years was of 13.7 °C, clearly increased over the 1961-1991 period. Rainfall on the same period was of 767.3 mm with 87.5 days of rain, showing, beside large annual variations, a clear diminishing trend. Over the past few years, it was recorded an increase of extreme meteorological events, with heavy rains in short time and in periods were normally there were statistically few events. The frequency of snowfalls is constant on Titano, and the they often occur at the end of the winter or at the beginning of the spring.

Although over half of the territory is to be considered urban or agricultural, little portions of the State have conserved natural landscape and good ecosystematic functionality. 21% of the whole surface of the State is assessed as urban, while agriculture covers the 41% mainly with arable lands, orchards, vineyards and olive groves.

16% is woodlands, predominantly of oaks and other broadleaves as *Quercus pubescens*, *Fraxinus ornus*, *Ostrya carpinifolia*, *Acer obtusatum*, *Quercus cerris*, *Quercus ilex*, *Populus nigra*, *Salix alba*. Shrublands and similar lands are dominated by *Crataegus monogyna*, *Cornus sanguinea*, *Spartium junceum*, *Rubus ulmifolius*, *Rosa canina*, *Prunus spinosa*, *Quercus pubescens*, *Fraxinus ornus* and *Ulmus minor* cover the 17%. Badlands are the 4% and less than 1% is covered by rivers.

General ecological framework of the Republic of San Marino

On initial observation, the territory of San Marino is heavily anthropized and urbanized; equally important in this context, there are numerous elements of naturalness and of general interest from a naturalistic point of view, constituting a complex landscape. Assessing the various components of the territory, in particular in a situation like this, is important because it highlights the pressure factors from the point of view of their interaction with the distribution of the various elements of the environmental mosaic. In this way it is possible to highlight the primary generating causes of environmental pressure capable of influencing the quality of the environment and functioning of the ecosystems. Based on the maps produced for the State of the Environment in the Republic of San Marino (Santolini 2009), in this chapter some structural and quality indices are presented that offer an initial opinion of the environmental quality of the environmental mosaic and therefore, some of ecosystemic function.

Indices of the shape and diversity of the pieces of the environmental mosaic (types of environment)

Over half the surface area of the territory is occupied by artificial and agricultural soils, whilst the areas that maintain characteristics of naturalness and little disturbance from anthropic activities have been reduced to fairly modest percentages (for example, hygrophilous woods 3.4%, badland areas 4.1%, woods with a prevalence of other broad-leaved trees 5.7%). The Shannon diversity index, applied to the environmental mosaic of the Republic of San Marino, highlights the dominance of environmental types and their equal distribution. The index values range from zero, when the environmental mosaic is formed by a single environmental type, to a maximum determined by the logarithm of the total number of different environmental types that, in our case, are those listed in legend for the vegetation map. Given that the maximum theoretical index value is 2.7 (maximum environmental diversity), based on the effective percentages of cover, the territory of San Marino shows a value of 2.0, effectively indicating a heterogeneous mosaic in which the various types have a relatively uniform distribution, as also confirmed by the index of equipartition, equal to 0.7, which highlights the dominance of some categories of ecosystems with higher percentages.

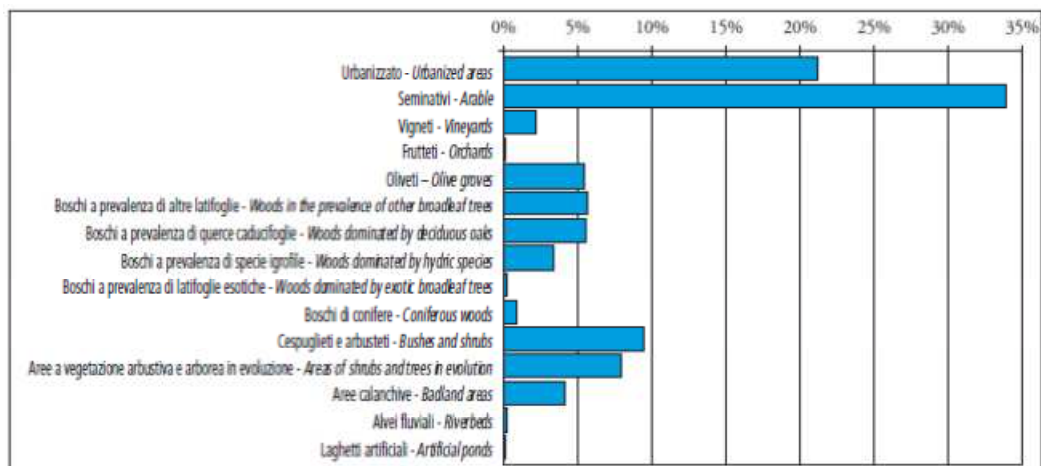


Figure 1 Percentage distribution of the 15 environmental types referring to the vegetation map.

Table 1 shows the mean sizes of the environmental types (“Mean Patch Size”, MPS); the types with larger mean sizes are those attributable to agricultural and artificial surface areas and woods with mainly broadleaved trees, concentrated above all in the south-west in the area between Acquaviva and Pennarossa. Table 1 also indicates the values of the “Mean Shape Index” (MSI), in other words the index of the mean shape of the polygons for each category of soil use. For each polygon, the ratio between the perimeter and the area are calculated; the sum of these values for polygons in the same categories is divided by the total number of polygons in order to obtain a value that describes the central shape trend for each type of soil use. The index is used to estimate how similar the types of environment are to the circular shape, the shape in which the effects of fragmentation are minimal: it has a minimum value of one for a circular-shaped type and grows with the increasing irregularity and lengthening of the polygon. MSI values indicate a certain regularity in shape for “orchards”, “vineyards”, “olive groves”, “conifer woods” and “artificial lakes” that have low mean area values and are therefore heavily influenced by the territorial fragmentation caused by infrastructures. Due to the morphology of the territory of San Marino and its roads, which necessarily follow either contour lines or the “valley floor”, limiting continuity on slopes in particular, types such as “woods with mainly other broad-leaved trees” and “woods with mainly hygrophilous species” largely develop in a longitudinal sense.

Tipologie ambientali/ Environmental types	Superficie Surface area (ha)	MPS (ha)	MSI (ha)	Classi IVN INV classes
Urbanizzato - Urbanized area	1291.3	8.4	3.3	DA
Seminativi - Arable	2065.1	10.0	3.8	DB
Vigneti - Vineyards	133.1	0.9	2.8	DB
Frutteti - Orchards	1.1	0.6	2.5	DB
Oliveti - Olive groves	328.8	1.0	2.9	DB
Boschi a prevalenza di altre latifoglie - Woods in the prevalence of other broadleaf trees	344.6	13.3	4.0	DE
Boschi a prevalenza di querce caducifoglie - Woods dominated by deciduous oaks	340.6	3.7	3.6	DE
Boschi a prevalenza di specie igrofile - Woods dominated by hydric species	207.8	3.3	5.0	DD
Boschi a prevalenza di latifoglie esotiche - Woods dominated by exotic broadleaf trees	15.3	1.0	3.4	DB
Boschi di conifere - Coniferous woods	53.0	2.2	2.9	DB
Cespuglieti e arbusteti - Bushes and shrubs	575.0	2.9	3.2	DC
Aree a vegetazione arbustiva e arborea in evoluzione - Areas of shrubs and trees in evolution	481.7	8.4	3.7	DE
Aree calanchive - Badland areas	252.6	7.7	3.1	DC
Alvei fluviali - Riverbeds	7.1	6.5	6.8	DE
Laghetti artificiali - Artificial ponds	0.4	0.3	2.4	DA

Table 1 Types of land use in the Republic of San Marino. The table shows, for each environmental type, the surface area occupied overall, the Mean Patch Size (MPS) and the Mean Shape Index (MSI). For each type, the Index of Naturalness of the Vegetation is also shown.

Index of vegetation naturalness

To assess the level of man’s disturbance on the vegetation, the Index of Vegetation Naturalness (Fig. 2) or IVN (Ferrari et al. 2008) has been calculated, which associates vegetation and categories of soil use to a scale of values ordered on the basis of the level of anthropic modification they have sustained over time. The classes on the vegetation map are based on five levels of naturalness: DA-urbanized, DB-agricultural, DC-semi-natural, DD-subnatural and DE-natural. In particular, the IVN can be interpreted by taking into consideration three main categories: “high” with vegetation with considerable naturalness ($IVN \geq 0.70$), “average” with sub-natural and semi-natural vegetation ($0.40 \leq IVN < 0.70$) or “low” with vegetation dominated by anthropogenic types ($IVN < 0.40$). For the landscape of San Marino a value of 0.40 has been recorded that therefore indicates the presence of spontaneous vegetation whose structure is however altered and vegetation dominated by anthropogenic types (cultivated land, orchards, etc.).

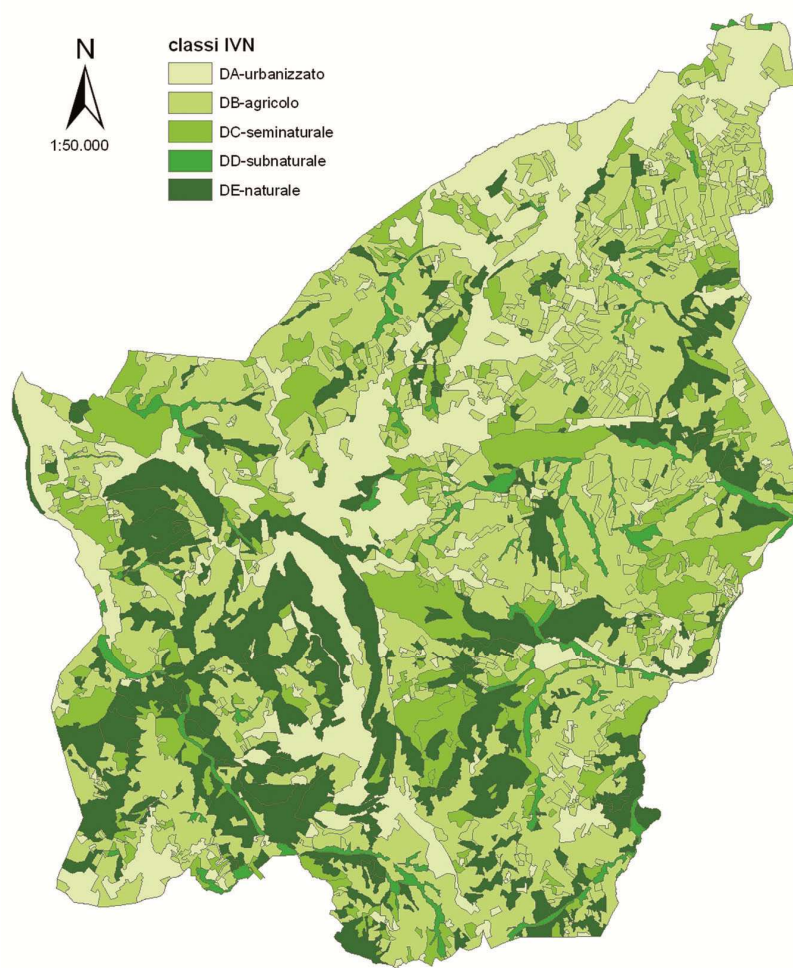


Figure 2 *Index of Naturalness of the Vegetation in the Republic of San Marino (IVN).*

Index of urban sprawl

Calculation of the index of diffused urbanization or urban “sprawl” is useful for highlighting the phenomenon of the diffusion of buildings and subsequent land use. Sprawl indicates the “method of urbanization characterised by low residential densities and abundant land occupation” (Gibelli 2007). The technique used is that of creating a interference space or buffer (Fig. 3) of 50 metres around all buildings and 30 metres around roads (Gibelli and Santolini 2005). Based on the consideration that each anthropic structure interferes in some way with the surrounding territory, through analysis of the buffer zone built around such elements it is possible to estimate the anthropic load and alteration in the structure of the landscape. The ratio between surfaces occupied by urbanized areas, the buffer zone and the benchmark surface area determines the weight of the buildup of urbanization of the territory. Therefore, considering also the parts of the territory that in an indirect way are influenced by transformations, real land use is greater than the areas effectively transformed and therefore, there is a greater difference between the surface effectively built-up surface area and a greater effective land use caused by sprawl.

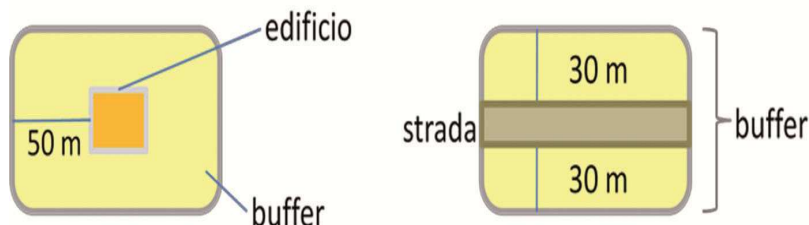


Figure 3 *Dimensions of the buffer zone created around buildings and infrastructures.*

In this case, as can be seen in Table 2, the surface area for roads and buildings occupies almost 9% of the total surface area, but the buffer zones are much larger than the effectively built-up areas; it is a situation in which buildings not only develop along the main communication routes, but are also diffused on the entire territory, with a land use that determines a strong impact on the natural resources. This also determines considerable fragmentation of the territory and a development that makes it difficult to organise multifunctional spaces, as well as limiting collective spaces in favour of residential units and independent transport exigencies. The phenomenon of land use and urban sprawl on the territory of the Republic of San Marino is even more clear if these values are compared with those obtained, for example, for the Municipality of Rimini for 2003 (Morri 2008) shown in Table 2; these indicate a less diffused type of urbanization and one with progressive connection of the urbanized elements.

<i>Superficie effettiva e % di interferenza</i> <i>Effective surface area and % of buffer</i>	<i>RSM/Republic of San Marino</i>		<i>Comune di Rimini/Municipality of Rimini</i>	
	<i>ha</i>	<i>%</i>	<i>ha</i>	<i>%</i>
<i>strade + edifici</i> <i>roads + buildings</i>	546	9	4207	30
<i>strade + edifici con buffer</i> <i>roads + buildings with buffer</i>	2998	49	8051	57
<i>solo buffer</i> <i>buffer alone</i>	2453	40	3844	27
<i>superficie totale</i> <i>total surface area</i>	6120	100	13418	100

Table 2 *Comparison between the effective surface values and the percentage of buffer zones for the Republic of San Marino and the Municipality of Rimini.*

The ecological functionality of the territory

In recent years, numerous initiatives have been implemented to put assessment of the biodiversity and ecological functions at the heart of preservation and management strategies for future planning decisions (TEEB, The Economics of Ecosystems and Biodiversity, www.teebweb.org; COPI, Cost of Policy Inaction, http://ec.europa.eu/environment/nature/biodiversity/economics/teeb_en.htm; IPBES, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, <http://ipbes.net>). If the diversity of the species of an ecosystem correspond to the complexity of the interactions between them - in other words, the number of routes along which energy can travel through a community - alteration of the biodiversity (determined by direct and indirect factors and also caused by transformation of the landscape) causes a reduction in the functionality of habitats and ecosystems, as well as their possible disappearance. The alteration of ecosystems determines a modification in their functionality and often a gradual dystrophy (loss of functions).

Ecosystem services are intended as the ability of ecosystems to provide goods and services (water quality, air quality, absorption of CO₂, protection of the land, raw materials, recreational and cultural services, etc.) that directly or indirectly satisfy human needs (Millennium Ecosystem Assessment 2005, www.millenniumassessment.org/en/index.aspx). Having a good supply of ecosystem services means having more “wealth” per capita in terms of natural capital, but also better health and resilience of the territory with regard to socio-ecological systems. For these reasons, analysis of biodiversity in relation to the assessment of some key ecological functions, on all levels of scale over a vast area, can be an extremely useful instrument. Based on the framework of the species present in the different environmental types, the IFm calculation (Mean Animal

Cenote Index, Santolini and Pasini 2007) is obtained by taking into account the wealth of species and their importance in terms of conservation. The results highlight useful benchmarks for assessment of the geostatic model of ecological functionality.

The ecological functionality model for the territory of the Republic of San Marino in Fig. 5 clearly highlights some aspects linked to territorial dynamics and the ecosystems, with a diversified level of ecological functionality:

1. fragmentation of the landscape is an important phenomenon and one closely linked to high land use (Fig. 4) although there are still areas in which the dynamics of fragmentation are barely noted and therefore, its effects on transforming the efficiency of the ecosystems limited;
2. there are territorial elements that still present fairly high ecosystem functionality, linked in particular to the water network (upper basin of San Marino Torrent) and badland zones with strong ecosystem heterogeneousness (for example, in the valleys of Fosso di Ca' Chiavello and Fosso delle Bruciate or in the Torraccia zone) typical of environmental mosaics;
3. the entire forestry system must be protected and incentivized in its start-up with tall timber trees in order to contribute to and being a reservoir of carbon in compliance with the Kyoto Protocol, as well as for its connectivity with elements on different levels of naturalness in order to increase the functional capacity of the overall system;
4. it would be opportune to identify suitable strategies for preserving calanques that, as well as a restriction on reclamation and construction, provide for the implementation of forms of active management, such as for example, the use of grazing livestock sustainable for maintenance of the original vegetation characteristics;
5. Fig. 2 and the model of ecological functionality (Fig. 5) highlight the elements of naturalness that heavily integrate with areas of diffused agriculture that must increasingly develop the characteristics of quality linked to organic and integrated production in order to maintain those characteristics of heterogeneousness of the landscape that increase the quality of the system.



Figure 4 *Effective surface area and buffer zones in the built-up areas and road networks.*

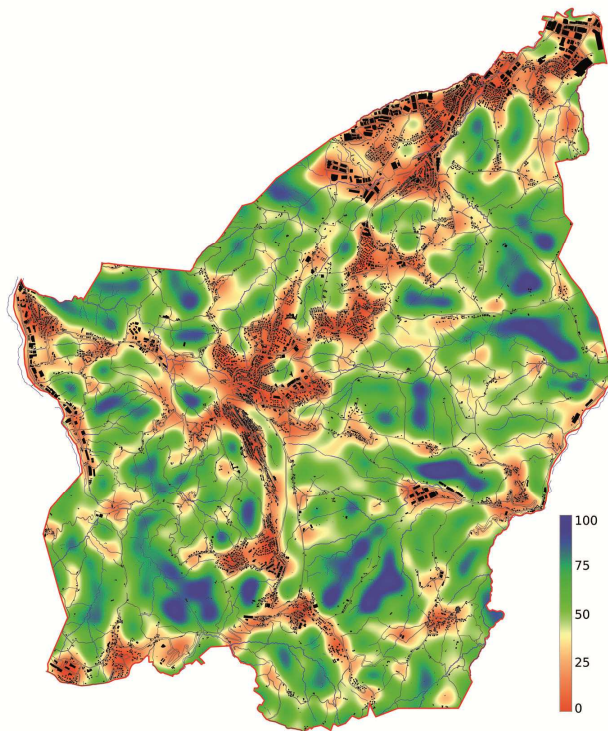


Figure 5 *Ecological functionality model, elaborated by Giovanni Pasini (CREN Rimini).*

*State of conservation, trends and threats to biodiversity
in the Republic of San Marino*

In order to assess the status of biodiversity in the territory of the Republic of San Marino and the trends related to the threats, land management and targeted measures to protect the existing populations, this report refers, as a starting point in the collection and analysis of data, to the detailed report “*Stato dell’ambiente della Repubblica di San Marino – Natura e Biodiversità – Quadro di riferimento dei dati disponibili riguardo le matrici ambientali e le loro interrelazioni*” (General ecological framework of the Republic of San Marino) describing the national situation as of 2009.

In the period 2010-2015, in compliance with the purpose of the strategic plan for biodiversity 2011-2020: “*Taking effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet’s variety of life, and contributing to human well-being, and poverty eradication. To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented, and decision-making is based on sound science and the precautionary approach*”, the Republic of San Marino has deemed it essential to increase knowledge of the size, characteristics and state of conservation of habitats, species and ecosystem services provided by them, as well as of direct and indirect major threats. To this end, San Marino has also promoted and implemented monitoring protocols of the main groups of fauna and flora to be preserved and managed, in collaboration with San Marino Naturalistic Centre, in particular vertebrates. This has also been done to detect and map the current sensitive areas and those resulting from climate change, as well as to implement specific measures to protect them.

The data obtained from the in-depth studies of the past few years allowed to increase significantly the knowledge of the habitats and species of the national territory and led to the publication of documents on the distribution and amount of fish, amphibians, reptiles, nesting birds and mammals living in San Marino. For some of these groups National Red Lists have already been created according to the IUCN criteria. With regard to invertebrates, several studies and entomological monitoring have been carried out (some of them are still ongoing), in particular on aquatic *Coleoptera*, night moths “*Macroheterocera*”, *Trichoptera*, on *Culicidae* and Sandflies, which are important for the agricultural and forestry as well as for the health sector. Other groups of invertebrates subject to monitoring are: Macroinvertebrates of running waters, which are useful bio-indicators of water quality, *Ixodidae*, important for the health sector, and *Potamon fluviatile*, species of conservation interest.

The current situation relating to the best known components of biological diversity and of the threats to its conservation is briefly summarized below. The lists describe the local *status*, as assessed according to the IUCN criteria:

DD (*Data Deficient*);
 LC (*least Concern*);
 NT (*Near Threatened*);
 VU (*Vulnerable*);
 EN (*Endangered*);
 CR (*Critically Endangered*);
 RE (*Regionally Extinct*).

For some anthropophilic species, the term "invasive" has been chosen, as they are not significant in terms of conservation.

With regard to ornithological fauna, trends are represented as follows:

↑ (*Low Increase*)
 ↑↑ (*High Increase*)
 ↓ (*Low Decrease*)
 ↓↓ (*High Decrease*)

Fauna

At present, the group of **Osteichthyes** amounts to 6 species living in natural environment of running waters, including 5 indigenous and one introduced. In artificial environments (small ponds, sport fishing lakes) several alien species introduced by human activity can be found.

All habitats and indigenous species of fish in running water can be considered as endangered (EN) and some of them are critically endangered (CR). Measures to improve habitats and projects to restock populations are currently ongoing. South European Nase (*Chondrostoma genei*), which has not been found since 1990s, can be considered as extinct in the territory.

Checklist e status locale dei Pesci nella Repubblica di San Marino <i>Checklist and local conservation status of Fish in the Republic of San Marino</i>	
Nome scientifico/ <i>Scientific name</i>	STATUS (RSM)
<i>Leuciscus souffia</i>	EN
<i>Barbus plebejus</i>	CR
<i>Rutilus rubilio</i>	EN
<i>Leuciscus cephalus</i>	EN
<i>Cobitis taenia</i>	CR
<i>Anguilla anguilla</i>	EN
<i>Chondrostoma genei</i>	RE

9 species of **Amphibia** live in San Marino: 3 of them are widely distributed in the territory and can be considered at low risk (LC); 5 are distributed in a more fragmented way or are scarcely distributed and can be considered as vulnerable (VU), while one is to be considered as critically endangered (CR) or at risk of regional extinction.

Checklist e status locale degli Anfibi nella Repubblica di San Marino <i>Checklist and local conservation status of Amphibians in the Republic of San Marino</i>	
Nome scientifico/ <i>Scientific name</i>	STATUS (RSM)
<i>Speleomantes italicus</i>	VU
<i>Triturus carnifex</i>	VU
<i>Lissotriton vulgaris</i>	VU
<i>Bombina pachypus</i>	CR
<i>Bufo bufo</i>	LC
<i>Hyla intermedia</i>	LC
<i>Pelophylax lessonae/P. klepton esculentus</i>	LC
<i>Rana dalmatina</i>	VU
<i>Rana italica</i>	VU

12 species of **Reptiles** live in the territory, including 5 widely distributed (LC), 5 locally or scarcely distributed (VU), and for 2 species only one datum is available (DD).

Checklist e status locale dei Rettili nella Repubblica di San Marino <i>Checklist and local conservation status of Reptiles in the Republic of San Marino</i>	
Nome scientifico/ <i>Scientific name</i>	STATUS (RSM)
<i>Anguis fragilis</i>	LC
<i>Lacerta bilineata</i>	LC
<i>Podarcis muralis</i>	LC
<i>Podarcis sicula</i>	VU
<i>Chalcides chalcides</i>	VU
<i>Tarentola mauritanica</i>	VU
<i>Hierophis viridiflavus</i>	LC
<i>Coronella austriaca</i>	DD
<i>Zamenis longissimus</i>	VU
<i>Natrix natrix</i>	LC
<i>Natrix tessellata</i>	DD
<i>Vipera aspis</i>	VU

The species of **birds** nesting in the Republic of San Marino, calculated in the period 2007-2015, are 88, including 2 introduced by human activity. For this group of vertebrates a monitoring program is currently ongoing, so as to define the trend of populations nesting in the country. The procedure adopted for the bird census is the one suggested by EBCC, using TRIM software. The monitoring results not only provide information on the trend of each specie, but they also allow to produce aggregate indices representing the overall evolution of a particular bird community or group of birds living in the same environment, thus giving a good representation of their "state of health".

Significant results have been obtained by using the data collected in the previous years and, for some species, an overview of the main trends of the populations living in San Marino is emerging.

Checklist e tendenze degli Uccelli nidificanti nella Repubblica di San Marino			
Checklist and trends of breeding birds in the Republic of San Marino			
<i>Anas platyrhynchos</i>		<i>Phoenicurus ochruros</i>	
<i>Pernis apivorus</i>		<i>Phoenicurus phoenicurus</i>	↑
<i>Circus pygargus</i>		<i>Saxicola torquatus</i>	
<i>Accipiter nisus</i>		<i>Monticola solitarius</i>	
<i>Buteo buteo</i>		<i>Turdus merula</i>	
<i>Falco tinnunculus</i>		<i>Turdus philomelos</i>	
<i>Falco subbuteo</i>		<i>Turdus viscivorus</i>	
<i>Falco peregrinus</i>		<i>Cettia cetti</i>	
<i>Phasianus colchicus</i>		<i>Cisticola juncidis</i>	↓
<i>Coturnix coturnix</i>		<i>Acrocephalus scirpaceus</i>	
<i>Alectoris rufa</i>		<i>Hippolais polyglotta</i>	
<i>Gallinula chloropus</i>		<i>Sylvia cantillans</i>	
<i>Fulica atra</i>		<i>Sylvia subalpina</i>	
<i>Charadrius dubius</i>		<i>Sylvia melanocephala</i>	
<i>Columba livia</i>		<i>Sylvia communis</i>	
<i>Columba palumbus</i>	↑↑	<i>Sylvia atricapilla</i>	↑
<i>Streptopelia decaocto</i>	↓	<i>Phylloscopus bonelli</i>	
<i>Streptopelia turtur</i>	↓	<i>Phylloscopus collybita</i>	
<i>Cuculus canorus</i>		<i>Regulus ignicapilla</i>	
<i>Tyto alba</i>		<i>Muscicapa striata</i>	
<i>Otus scops</i>		<i>Aegithalos caudatus</i>	
<i>Athene noctua</i>		<i>Cyanistes caeruleus</i>	
<i>Strix aluco</i>		<i>Parus major</i>	
<i>Asio otus</i>		<i>Periparus ater</i>	
<i>Caprimulgus europaeus</i>		<i>Sitta europaea</i>	
<i>Apus apus</i>	↑	<i>Certhia brachydactyla</i>	↑
<i>Alcedo atthis</i>		<i>Remiz pendulinus</i>	
<i>Merops apiaster</i>		<i>Oriolus oriolus</i>	
<i>Upupa epops</i>		<i>Lanius collurio</i>	
<i>Jynx torquilla</i>		<i>Garrulus glandarius</i>	↑↑
<i>Picus viridis</i>		<i>Pica pica</i>	
<i>Dendrocopos major</i>		<i>Corvus monedula</i>	
<i>Dendrocopos minor</i>		<i>Corvus cornix</i>	
<i>Lullula arborea</i>		<i>Sturnus vulgaris</i>	
<i>Alauda arvensis</i>		<i>Passer italiae</i>	
<i>Hirundo rustica</i>		<i>Passer montanus</i>	
<i>Delichon urbicum</i>		<i>Fringilla coelebs</i>	
<i>Anthus campestris</i>		<i>Serinus serinus</i>	
<i>Motacilla cinerea</i>		<i>Carduelis chloris</i>	↓
<i>Motacilla alba</i>		<i>Carduelis carduelis</i>	↓↓
<i>Troglodytes troglodytes</i>	↓	<i>Carduelis cannabina</i>	
<i>Cinclus cinclus</i>		<i>Emberiza cirius</i>	
<i>Erithacus rubecula</i>		<i>Emberiza cia</i>	
<i>Luscinia megarhynchos</i>		<i>Emberiza calandra</i>	

46 species of **Mammals** live within the national territory; for 3 of them only very few data are available and their status is not yet known (DD); 3 species are considered endangered (EN), given the small number of specimens; 14 are considered vulnerable (VU) due to the deterioration of their habitat or the low number of specimens. 21 species are not of conservation concern (LC) as they are widely distributed and big in numbers, while 5 species are considered as invasive.

Checklist e status locale dei Mammiferi nella Repubblica di San Marino <i>Checklist and local conservation status of Mammals in the Republic of San Marino</i>			
Nome scientifico <i>Scientific name</i>	STATUS (RSM)	Nome scientifico <i>Scientific name</i>	STATUS (RSM)
<i>Erinaceus europaeus</i>	LC	<i>Tadarida teniotis</i>	VU
<i>Talpa europaea</i>	LC	<i>Lepus europaeus</i>	LC
<i>Sorex samniticus</i>	LC	<i>Sciurus vulgaris</i>	LC
<i>Neomys anomalus</i>	VU	<i>Glis glis</i>	LC
<i>Suncus etruscus</i>	LC	<i>Muscardinus avellanarius</i>	EN
<i>Crocidura leucodon</i>	LC	<i>Eliomys quercinus</i>	EN
<i>Crocidura suaveolens</i>	LC	<i>Microtus savii</i>	LC
<i>Rhinolophus euryale</i>	VU	<i>Myodes glareolus</i>	LC
<i>Rhinolophus ferrumequinum</i>	VU	<i>Apodemus flavicollis</i>	VU
<i>Rhinolophus hipposideros</i>	VU	<i>Apodemus sylvaticus</i>	LC
<i>Myotis nattereri</i>	VU	<i>Rattus norvegicus</i>	invasiva/invasive
<i>Myotis emarginatus</i>	VU	<i>Rattus rattus</i>	invasiva/invasive
<i>Myotis bechsteinii</i>	DD	<i>Mus musculus</i>	invasiva/invasive
<i>Myotis daubentonii</i>	VU	<i>Hystrix cristata</i>	LC
<i>Myotis myotis</i>	VU	<i>Myocastor coypus</i>	invasiva/invasive
<i>Myotis blythii</i>	VU	<i>Canis lupus</i>	DD
<i>Pipistrellus pipistrellus</i>	LC	<i>Vulpes vulpes</i>	LC
<i>Pipistrellus kuhlii</i>	LC	<i>Martes foina</i>	LC
<i>Hypsugo savii</i>	LC	<i>Mustela putorius</i>	EN
<i>Eptesicus serotinus</i>	LC	<i>Mustela nivalis</i>	VU
<i>Plecotus auritus</i>	DD	<i>Meles meles</i>	LC
<i>Plecotus austriacus</i>	VU	<i>Sus scrofa</i>	invasiva/invasive
<i>Miniopterus schreibersii</i>	VU	<i>Capreolus capreolus</i>	LC

The current hunting law, in accordance with the existing wildlife management plan, specifically protects certain animal species; a new law for the protection and preservation of wildlife is in the process of being enacted.

Flora

According to historical data and more recent information, the vascular flora of the Republic of San Marino is composed of at least 744 different species, quite a large number considering the small size of its territory.

A biological spectrum has been obtained by analysing the different biological forms. The spectrum provides information on the prevailing ecological conditions in the study area and allows to compare different floras, thus highlighting the existing differences and providing useful ecological and bioclimatic information.

The biological spectrum of San Marino flora indicates that 38% of species belong to the Hemicryptophytes group (H). Following this predominance, the territory of San Marino can be included in the temperate climate zone.

34% of plant species are Therophytes (T); this represents a considerable value, since many of them are linked to arid environments and continuously exposed to human presence. The Geophytes group (G) consists of 13% of the species and it is important to note that it is made up of typical deciduous forest plants.

The smallest groups are Chamaephytes (C), representing 6% of the species, and Phanerophytes (F), representing 9% of woody tree species.

The chorological spectrum, i.e. the general distribution of San Marino flora, is as follows:

END 1.7% (endemic and sub endemic Italian);

STM 7.9% (stenomediterranean);

EUM 22.1% (eumediterranean);

MEM 1.6% (mediterranean mountain);

ORO 1.2% (orofite);

ATL 2.7% (atlantic);

BOR 7.6 % (boreal);

EAS 35.2% (eurasian and european);

AMP 19.7% (wide distribution);

INC 0.3% (not known general distribution).

Among the most recent in-depth studies, worth mentioning are the phytosociological study on the plant landscape of the territory of the Republic of San Marino and the "Herbarium of San Marino flora".

Under Law no. 126 of 16 November 1995, the following plant species considered rare and/or typical of the spontaneous flora, grouped into three different lists, shall be protected:

Lista A	
specie rare e significative ed esemplari arborei meritevoli di maggiore protezione (Lista B Ø ≥ 50 cm) <i>rare and important species and tree specimens deserving more protection (List B Ø ≥ 50 cm)</i>	
<i>Arbutus unedo</i>	
<i>Ephedra major</i>	
<i>Ilex aquifolium</i>	
<i>Lilium croceum</i>	
<i>Lilium martagon</i>	
<i>Staphylea pinnata</i>	

Lista B	
specie arboree o specie arbustive ed erbacee poco comuni <i>species of trees or shrubs and herbaceous uncommon</i>	
<i>Acer campestre</i>	<i>Ostrya carpinifolia</i>
<i>Acer monspessulanum</i>	<i>Paliurus spina-Christi</i>
<i>Acer obtusatum</i>	<i>Phyllirea media</i>
<i>Acer opalus</i>	<i>Populus alba</i>
<i>Alnus glutinosa</i>	<i>Populus nigra</i>
<i>Carpinus betulus</i>	<i>Prunus avium</i>
<i>Carpinus orientalis</i>	<i>Pyrus pyraster</i>
<i>Castanea sativa</i>	<i>Quercus cerris</i>
<i>Celtis australis</i>	<i>Quercus ilex</i>
<i>Cupressus sempervirens</i>	<i>Quercus pubescens</i>
<i>Daphne laureola</i>	<i>Salix alba</i>
<i>Dianthus (tutto il genere)</i>	<i>Salix purpurea</i>
<i>Fraxinus excelsior</i>	<i>Sorbus aria</i>
<i>Fraxinus ornus</i>	<i>Sorbus aucuparia</i>
<i>Juniperus oxycedrus</i>	<i>Sorbus domestica</i>
<i>Laburnum anagyroides</i>	<i>Sorbus torminalis</i>
<i>Laurus nobilis</i>	<i>Tilia platyphyllos</i>
<i>Malus sylvestris</i>	<i>Tilia x-vulgaris</i>
<i>Mespilus germanica</i>	<i>Ulmus campestris o minor</i>
<i>Orchidaceae (tutto il genere)</i>	<i>Ulmus montana o glabra</i>

Lista C	
specie arbustive ed erbacee ed esemplari arborei appartenenti alla lista B Ø < 10 cm <i>shrubs and herbaceous and tree specimens belonging to the list B Ø < 10 cm</i>	
<i>Adiantum capillus - veneris</i>	<i>Juncus inflexus</i>
<i>Allium pendulinum</i>	<i>Juncus articulatus</i>
<i>Asparagus acutifolius</i>	<i>Ligustrum vulgare</i>
<i>Centranthus ruber</i>	<i>Lonicera (tutto il genere)</i>
<i>Cistus incanus</i>	<i>Morus nigra</i>
<i>Colutea arborescens</i>	<i>Narcissus (tutto il genere)</i>
<i>Cornus sanguinea</i>	<i>Prunus spinosa</i>
<i>Coronilla emerus</i>	<i>Rhamnus alaternus</i>
<i>Corylus avellana</i>	<i>Rosa canina</i>
<i>Crataegus monogyna</i>	<i>Ruscus aculeatus</i>
<i>Crataegus laevigata</i>	<i>Sambucus nigra</i>
<i>Cyclamen neapolitanum</i>	<i>Scilla bifolia</i>
<i>Cyclamen repandum</i>	<i>Scolopendrium vulgare</i>
<i>Cymbalaria muralis</i>	<i>Sempervivum tectorum</i>
<i>Erica arborea</i>	<i>Tamarix africana</i>
<i>Euonimus europaeus</i>	<i>Typha angustifolia</i>
<i>Galanthus nivalis</i>	<i>Vinca minor</i>
<i>Gladiolus segetum</i>	

Threats

Since the national territory has a very limited extension (6,119 ha) and is totally located within the Italian peninsula, it is inevitably subject to environmental changes, pressures and the threats that, on a large scale, affect biodiversity in Italy.

The generalised process of land use and environmental degradation threatens biodiversity and has a considerable impact on the preservation of habitats and species. Among the direct consequences of the current rate of urbanisation are the loss, fragmentation and erosion of habitats and the impairment of their ecological and functional role, with several negative effects on the survival of populations and species, soil permeability, rise in temperature and on hydrogeological balance. These processes, which are considered also at a European level the main cause for biodiversity loss, generally cause a loss of ecological resilience. This situation was generated, at least in part, by a lack of or incomplete and unsatisfactory integration of the need to protect biodiversity into territorial planning instruments, both at large scale and locally.

The abandonment of the countryside, especially in mountainous and sub-mountainous areas, with the gradual closure of open areas in favour of shrub and tree formations, the general simplification of agro-ecosystems (mostly in hilly and plain areas) with the elimination of the traditional elements of agricultural landscape (hedges, rows, wells, springs), as well as the widespread use of pesticides, considerably impair biodiversity associated with these environments, which instead is strongly favoured by extensive agriculture based on a multifunctional approach.

Worth considering is also the impact on all levels of biodiversity caused by all forms of pollution of soil, water and air: these ecosystem alterations impair, in an often irreversible way, the ecological functions of environments, with repercussions both locally and at large scale. Besides directly damaging biodiversity and ecological processes, pollution has a heavy impact on ecosystem services and can be largely considered to be the consequence of a lack of quantification of direct and indirect costs resulting from unsustainable development. A particular form of pollution derives from release into the environment of lead pellets contained in the cartridges used for hunting.

The impacts of climate change on biodiversity are characterised by complex interactions, whose full extent is difficult to assess. These interactions are able to change both the structure of habitats and their ecological functions by changing the composition of communities and consequently food webs, causing species to move within biological communities, thus influencing the physical elements of the ecosystem, the relations among species and their ability to survive, with particular reference to migratory species and mountain environment. The most direct and immediate effects of climate change are indeed expected on mountain environments (Alps and Apennines); their orographic characteristics, isolation and access difficulty have contributed to maintain a certain integrity of natural and cultural heritage with the preservation of a consequent and extraordinary diversity, not only biological but also cultural.

Invasions of alien species in natural, agricultural and man-made environments currently constitute a further environmental emergency, considering the adverse effects on biodiversity and ecological processes, economic damage to many human activities and significant health problems caused by

this phenomenon. The costs attributable to the effects of the presence of invasive alien species (IAS) are often particularly high and derive both from the need to carry out activities for the eradication and control of these species and from direct damage caused to agriculture, fisheries, infrastructure and human health, as well as to preservation of the biodiversity of indigenous species and natural habitats.

Among the causes for impact that, given the small territory, can be considered more "controllable" and manageable, worth recalling are those related to hunting pressure and poaching, although the latter is very limited in the territory. With regard to hunting, worth noting is that, despite it is practised in 60% of the national territory by approximately 1,200 hunters, with a decreasing hunting pressure equal to 0.32 unit/hectare, it mainly involves introduced species (pheasant and red grouse) or subject to restocking plans (hare), as well as migratory species, and only marginally sedentary species. In this regard, worth recalling is that the taking of huntable species must be carried out in a manner compatible with the satisfactory preservation of populations, meaning that the extent of hunting must be compatible with the extent and status of huntable populations, as well as, in principle, in line with the provisions and objectives of European Directives. To this end, it is necessary to identify and regularly monitor, both in terms of quality and quantity, geographic populations of huntable species present in the national territory and constantly verify compliance of national rules in this sector with EU Directives.

Also the building of specific infrastructure (for example, MT/AT power lines, wind turbines, light fixtures) in places that are "sensitive" for certain biodiversity components and without any technical measures necessary to mitigate their effects, constitutes a threat to the preservation of certain species that, at the time being, are of secondary importance to the country.

In the light of the above, and given that all the aforesaid factors have in any case a negative impact on biodiversity, in the small Republic of San Marino the major threats currently constituting an immediate danger to the preservation of habitats and species - thus requiring priority interventions - are substantially as follows:

- Loss of soil and change of its intended use, with consequent modification and fragmentation of habitats, caused mainly by a high rate of widespread urbanisation;
- Alteration of ecosystems of running waters due to the dispersion of mostly organic waste and modification of the natural physical structure of beds.

Actions taken to implement the Convention on Biological Diversity

Although a dedicated working group was not established, and in the absence of a National Biodiversity Strategy, over the last decade the Public Administration has started to operate in the various fields of competence in view of environmental protection, landscape preservation and sustainable use of resources, roughly in line with what is required at European level. Thanks to this awareness of the intrinsic value and importance, also economic, of the complex structure of ecosystems, guaranteeing ecosystem services essential to us and constituting our landscape, new or updated legislative instruments have been timely introduced and effective action has been taken to preserve and sometimes restore the natural conditions of ecosystems.

The **Environmental Code** (DELEGATED DECREE no. 44 of 27 April 2012), is a fundamental and effective tool for the improvement of environmental conditions and the wise and rational use of natural resources. The Code is updated to the latest European standards and its implementation entails the following: a thorough prior assessment of environmental impact of certain works or activities; a careful monitoring of air quality and a reduction in emissions related to road traffic and industrial production plants; a reduction in noise and electromagnetic pollution; a careful monitoring and prevention of water and soil pollution by decreasing toxic substances in the environment; a more sustainable waste management, aimed at reducing the related environmental impact by minimising pollution and emissions.

The legislation on energy saving promotes and encourages energy efficiency of buildings, also thanks to the introduction of energy auditing, including for industrial plants, according to a multi-year **National Energy Plan**. The promotion of renewable energy sources (RES) and energy efficiency mainly concerns photovoltaic and solar thermal sectors, micro wind and mini hydroelectric power, as well as cogeneration plants.

The great attention paid by Institutions to issues related to environmental impact is demonstrated by the fact that, in 2014, the Government adopted the reform of the **Law on the promotion and enhancement of energy efficiency in buildings and of renewable energy use in the civil and industrial sectors** (Law no. 72 of 7 May 2008).

The new legislation has the following objectives:

- a) to optimise energy performance of buildings, following the logic of a correct and balanced improvement of the overall quality of buildings, also in terms of hygiene and environmental well-being;
- b) to promote the development, enhancement and integration of renewable sources; c) to promote energy diversification both in the civil and industrial sector; d) to regulate the electricity market; e) to encourage the adoption of efficient technologies to reduce industrial consumption; f) to stimulate the production of electricity from renewable sources and the adoption of efficient technologies to reduce industrial consumption; g) to reduce water consumption in the civil sector; h) to limit the emissions of polluting gases and, in particular, of greenhouse gases.

This legislation paves the way for future initiatives and business activities related to **Green Economy**, which has always been supported by the Institutions of the Republic of San Marino.

Another important step is the adoption of **Implementing Technical Rules relating to the Detailed Plan of Protected Natural Areas**, provided for in the General Town Planning Scheme (Law no. 7 of 29 January 1992) and in the Framework Law on the protection of the environment and the safeguard of landscape, flora and fauna (Law no. 126 of 16 November 1995). Such rules govern the management of Protected Natural Areas, which account for 39% of the national territory, and through such rules the Administration intends to achieve the objectives set out below:

1. protection and safeguard of the areas through an integrated management plan that preserves their agricultural, ecological-environmental, landscape, nature and hydrogeological suitability;
2. rational use of the territory where primary and secondary urbanisation interventions are envisaged, taking account of settlement and structural typologies that integrate with the characteristics of said areas covered by the reference implementing rules;
3. starting of processes to manage such areas related to hydrogeological preservation.

Substantially important in terms of management decisions on biodiversity is the **Observatory of Wildlife and its Habitat**, established at San Marino Naturalistic Centre, i.e. a joint committee of technical experts, administrative executives, representatives of environmental associations and of the hunting world, chaired by the Minister of Environment and entrusted with the following tasks:

1. draw up the draft hunting seasons, annually submitted to the Congress of State for its approval by decree;
2. propose any changes to the hunting and fauna plan and studies on fauna and the environment to the Congress of State, which may implement them also by decree;
3. propose any changes of restocking areas and wildlife sanctuaries to the Congress of State, which may implement them by decree;
4. adopt the most appropriate guidelines and directives for the management and protection of wildlife and its habitats throughout the country in accordance with the wildlife plan for huntable species;
5. establish the modalities of intervention and compensation for farmers who implement agricultural practices designed to harmonize their activities with the preservation of and increase in wildlife and its habitats;
6. identify the areas supporting hunting activities;
7. report annually to the Great and General Council (Parliament), through the Minister of Environment and upon ratification of the decree regulating hunting activities, on the state of wildlife and its habitats.

The Institute which, at national level, mainly deals with issues related to biodiversity is **San Marino Naturalistic Centre (C.N.S.)**, Documentation and Research Institute and Museum of Natural History, established in 1997 as part of the Department of Education and Culture with the aim of creating a cultural centre in the field of Natural Sciences and contributing to the diffusion of a naturalistic-environmental culture by promoting awareness of and optimizing the natural and landscape heritage of San Marino.

Since 2012 the C.N.S. has been an organizational unit of the Department of the Territory and the Environment and the seat of the Observatory of Wild Fauna and Relevant Habitats a body that, based on the law, deals with fauna and environmental management. The C.N.S. has also been designated Scientific Authority for the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES). The C.N.S. is responsible for monitoring the natural aspects of the territory through study and field research activities, both independently and in collaboration with other organizational units of the public administration and/or other authorities or private subjects. In particular, its activities concern:

- promoting and carrying out studies, research and monitoring of the fauna, flora, vegetation and other natural aspects of the territory;
- producing, collecting, using and diffusing publications, studies, reports, IT-multimedia and video-photographic material and other tools designed to document and diffuse a naturalistic environmental culture;
- collecting, studying and disseminating, in special sections dedicated to ornithology, fauna, earth sciences and the most representative natural environments of the territory, material and naturalistic finds of considerable scientific and documentary interest, with particular reference to the local environment;
- organising, in collaboration with scientific institutes, universities, schools, associations, authorities and private subjects, educational and training activities, as well as the implementation of specific study and research projects;
- promoting a system of tourism offers that are increasingly respectful of natural ecosystems by diffusing naturalistic, environmental and ecological awareness;
- providing technical-scientific services and consultancy to the State and other organizational units of the public administration.

With the ratification in 2009 of the *Bat Agreement* or EUROBATS, **Agreement on the Conservation of Populations of European Bats** aiming at the protection of bats, the Republic of San Marino intends to improve the conservation status of the 17 species of bats that are currently known to live on the national territory, by countering the degradation and disturbance of their habitat and places of refuge. In this regard, in addition to strengthening the study and monitoring of the species, some measures were taken to protect known breeding and wintering sites and a public information and awareness-raising campaign was started also through educational workshops in the schools.

The Republic of San Marino is also a State party to the following International Conventions on the environment:

International Convention for the Regulation of Whaling;

Protocol Amending the International Convention for the Regulation of Whaling;

Convention on the Prevention of Marine Pollution by Dumping of Wastes;

Vienna Convention for the Protection of the Ozone Layer;

Montreal Protocol on Substances that Deplete the Ozone Layer;

London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer;

Framework Convention on Climate Change;

Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer;

United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa;

Montreal Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer;

Kyoto Protocol to the United Nations Framework Convention on Climate Change;

Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);

Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer;

European Landscape Convention;

Doha Amendment to the Kyoto Protocol.

In recent years, the State has greatly invested in an important aspect, i.e. **education and training** on the general themes concerning the environment, climate change and the importance of biodiversity.

According to the San Marino school system, these concepts are 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 recognizes 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.

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.

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 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.

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.

Strategic Goals and Aichi Targets

Strategic Goal A:

Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

As mentioned above with regard to the relevant specific objectives, the actions taken by the Republic of San Marino, especially in relation to education, training and awareness raising, are contributing to the good progress towards achieving Target 1 *“By 2020 at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably”*.

Further progress, especially in terms of legislation, has been made towards the achievement of the other specific objectives:

Target 2 *“By 2020 at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems”*.

Target 3 *“By 2020 at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions”*.

Target 4 *“By 2020 at the latest, Governments, business and stakeholders at all levels have taken steps to Achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits”*.

Strategic Goal B

Reduce the direct pressures on biodiversity and promote sustainable use

The new policies for land management, aimed at the protection and conservation of the areas through an integrated management plan that preserves agricultural, ecological, environmental, landscape, natural and hydrogeological suitability, are an excellent instrument to achieve Target 5 *“By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced”*.

The good level of knowledge of the status of fish fauna and aquatic biological communities of water courses in the national territory, acquired from studies and periodic monitoring, as well as the projects started to restock and improve the habitats of endangered fish communities, together with the progressive removal of threats, aim at the achievement of Target 6 *“By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened*

species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits”.

In relation to Target 7 “*By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity*”, in 2010 the new Agro-Environmental Plan entered into force in order to support eco-friendly and eco-sustainable agriculture protecting and preserving the territory, habitats and species of fauna and flora.

Concerning Target 8 “*By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity*”, soil and air quality is constantly monitored and is not, at present, a threat to biodiversity. On the contrary, the quality of surface water has suffered from dispersion of organic waste, having an impact on biological communities. In this regard, some projects to improve the drainage system are on-going.

In relation to Target 9 “*By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment*”, the Public Administration carries out surveillance activities on invasive species which, at the time being, are not a priority problem.

Strategic Goal C

Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

As mentioned above with regard to internal water in the national territory, i.e. three main torrents and other small water courses, the country's contribution to the achievement of Target 11 “*By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes*”, can be considered satisfactory.

In relation to Target 12 “*By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained*”, some specific projects to protect and restock the populations of species at risk of local extinction, for reasons related to human factors, are being implemented with respect to fish species.

With regard to Target 13 “*By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity*”, the State implemented in past decades a project of clonal selection of indigenous grapes with *screen-house* preservation of the mother plants.

Strategic Goal D

Enhance the benefits to all from biodiversity and ecosystem services

Raising awareness among citizens of the value of biodiversity, together with the development by the State of policies promoting knowledge, preservation, improvement and sustainable use of resources that constitute our natural heritage, are key goals to maintain functionality and increase the resilience of ecosystems, albeit limited in space, in the territory of the Republic of San Marino.

Strategic Goal E

Enhance implementation through participatory planning, knowledge management and capacity building

Thanks to the small size of the country and its "streamlined" administrative and political procedures, as well as of those concerning territorial management, scientific knowledge and technologies related to biodiversity, its value and its functioning have been widely improved, shared and integrated within the Society. Moreover, some effective and participatory action plans have started to be implemented, despite the current economic constraints that the country is facing.

Ministry of Territory and Environment

Naturalistic Centre

Office in charge of the Management of Agricultural and Environmental Resources (UGRAA)

Public Health Department - Protection of Natural and Built Environment

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