Strategic Health and Environment Plan

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Prologue

The interdependent relationship between the environment and the population's health is becoming increasingly relevant. A healthy environment is a crucial factor for better health. Conversely, pollution and poor environmental quality can influence health in a negative way. The evidence in this respect is unquestionable. In the same way that human activity modifies the characteristics of its environment, environmental factors influence human health, either directly or indirectly. As a result, this can lead to a significant burden of disease in societies. And as we also know, the burden of disease does not affect all people equally, but impacts most strongly on the most vulnerable population groups.

Addressing this issue is of vital importance. I would therefore like to stress the importance of presenting the Strategic Plan for Health and Environment. This Plan is aimed at both citizens and professionals, and its objective is to address the health risks derived from environmental factors and their conditioning factors.

It is an ambitious Plan that establishes lines of action, with specific objectives and indicators, for the most relevant environmental risk factors. The Plan analyses the impact of these factors on health, identifies new threats, establishes response strategies, and proposes the evaluation of the results.

This Plan allows Spain to move forward and work in line with the commitments acquired with the international initiatives of the European Union and the World Health Organisation, thus responding to the need to provide Spanish society with an adequate management tool to face the great environmental challenges of our time, with a One Health approach.

This Plan relies on the participation of the most relevant agents and professionals in the field of public health and the environment, whose participation, knowledge, experience and efforts have contributed significantly to this document. A choral and multidisciplinary document whose aim is none other than to contribute to achieving greater well-being in society, and a healthier environment for all.

Carolina Darias San Sebastián.

Minister of Health.

We know that the environmental conditions in which we live have a direct or indirect, punctual or cumulative effect on human health. A population exposed to environmental degradation is a population that is less protected against disease.

The health crisis caused by COVID-19 has placed public health protection at the centre of public concerns. In this context, there is growing public interest in health problems associated with environmental factors. Engaging citizens in the sense of urgency with which we need to address the problem involves strengthening public awareness and education.

Science has been warning about the risks associated with air pollution, rising temperatures, overexploitation of natural resources, intensive agricultural practices, loss of biodiversity and the deterioration of the protective function of natural habitats for years. In the 21st century, this is evidence that no public official can ignore. We need to anticipate response measures, strengthen prevention and early warning systems.

We must act urgently to address environmental challenges that are already affecting citizens' health: the impacts of climate change, air pollution - including dangerous concentrations of fine particulate matter, nitrogen dioxide and tropospheric ozone - which increases cardiovascular and respiratory diseases, exposure to chemicals that can lead to endocrine disruption or cancer risk, altered water quality threatened by emerging pollutants, the health impacts of noise pollution, and the pressure on habitats that increases the risks of new zoonoses.

There is no time to lose in integrating scientific warnings, health recommendations and environmental variables into public health policy priorities. This is precisely the objective of this Strategic Health and Environment Plan, which jointly addresses the response to the climate and environmental emergency and its implications for citizens' health.

This Plan, to which we committed ourselves in the 2020 Climate Emergency Declaration, is in addition to other environmental measures aimed at achieving a healthy environment for citizens, such as the National Air Pollution Control Programme, which includes the measures necessary to reduce our polluting emissions over this decade, the Air Quality Index, a basic information tool at the service of administrations and citizens, or the Framework Plan for short-term action in the event of episodes of ambient air pollution, which guarantees a homogeneous response throughout the territory in situations of high pollution. We will use this Plan as a basis for further progress in integrating environmental and health variables into public action.

Teresa Ribera Rodríguez.

Third Vice-President of the Government and Minister for Ecological Transition and the Demographic Challenge.

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GLOSSARY OF ABBREVIATIONS

PA	Public Administrations	**EC**	European Commission
CEA	Cost-Effectiveness Analysis	**CEDEX**	Centre for Public Works Studies and Experimentation
DA	Deoxyribonucleic Acid	**EMF**	Electromagnetic Fields
EEA	European Environment Agency	**ECE**	Economic Commission for Europe
AEMET	Spanish Meteorological Agency	**CIBER**	Biomedical Research Networking Centre
AES	Strategic Health Action	**CIEMAT**	Centre for Energy, Environmental and Technological Research
AGE	General State Administration	**CLP**	Regulation on the classification, labelling and packaging of chemical substances and mixtures
RNA	Ribonucleic acid	**CMR**	Contract for the International Carriage of Goods by Road
AUE	Spanish Urban Agenda	**CNPIC**	Critical Infrastructure Protection Centre
AVAC-QALY	Quality Adjusted Life Years	**CO**	Carbon monoxide
AVAD-DALY	Disability Adjusted Life Years	**CO_2**	Carbon dioxide
AVD	Years Lived with Disability	**COP**	Conference of the Parties
AVP	Years of Life Lost	**COVID-19**	Coronavirus disease
BOE	Spanish Official State Gazette	**NMVOC**	Non-Methane Volatile Organic Compounds
IAQ	Indoor Air Quality	**CREAL**	Environmental Epidemiology Research Centre
CBD	Biological Diversity Convention	**CSIC**	Advanced Scientific Research Centre
CCAA	Autonomous Communities and Cities	**CSN**	Spanish Nuclear Safety Council

CTE	Technical Building Code	**WNV**	West Nile Virus
ED	European Directive	**PAH**	Polycyclic Aromatic Hydrocarbons
DMR	Waste Framework Directive	**HBM**	Waste Framework Directive
DSEAR	Purification, Sanitation, Efficiency, Saving and Reuse	**HBM4EU**	Human Biomonitoring Project for Europe
ECHA	European Chemicals Agency	**HEBAR**	Wastewater Based Epidemiological Tool
EEEC	Spanish Circular Economy Strategy	**Hz**	Hertz
EESUL	Spanish Circular Economy Strategy	**IAIA**	International Impact Assessment Association
EFSA	European Food Safety Authority	**AQI**	Air Quality Index
EHAP	EU Environment and Health Action Plan	**ICNIRP**	International Commission on Non-Ionising Radiation Protection
EIA	Environmental Impact Assessment	**INIA**	Spanish Institute for Agricultural and Food Research and Technology
HIA	Health Impact Assessment	**INSST**	Spanish Occupational Health and Safety Institute
EMAU	Urban Environment Strategy	**INTCF**	Spanish National Institute of Toxicology and Forensic Sciences
COPD	Chronic Obstructive Pulmonary Disease	**IPCC**	International Climate Change Panel
VBD	Vector-borne diseases	**ISCIII**	Carlos III Health Institute
EUPHA	European Public Health Association	**ISPA**	Principality of Asturias Health Research
FAO	United Nations Food and Agriculture Organisation	**LARES**	Analysis and Review of the State of Health and Housing in Europe
ELF	Extremely Low Frequency	**LGS**	Spanish General Health Law
FEMP	Spanish Federation of Municipalities	**LSP**	Spanish Public Health Law

MAPA	Spanish Ministry of Agriculture, Fisheries and Food	**SDG**	Sustainable Development Goal
MEFP	Spanish Ministry of Education and Vocational Training	**SO**	Strategic Objective
SNM	Strategic Noise Maps	**OECC**	Spanish Climate Change Office
MINCOTUR	Spanish Ministry of Industry, Trade and Tourism	**WOAH**	World Organisation for Animal Health
MINETAD	Spanish Ministry of Energy, Tourism and Digital Agenda	**WHO**	World Health Organisation
MINISDEF	Spanish Ministry of Defence	**UN**	United Nations
MIR	Spanish Ministry of the Interior	**PAHO**	Pan-American Health Organisation
MITERD	Spanish Ministry for Ecological Transition and the Demographic Challenge	**OSCC**	Health and Climate Change Observatory
MITMA	Spanish Ministry of Transport, Mobility and Urban Agenda	**CAP**	Common Agricultural Policy Strategic Plan
MIU	Spanish Ministry of Universities	**PAN**	Spanish Action Plan
MPR	Spanish Ministry of the Presidency, Relations with Parliament and Democratic Memory	**NAP**	Noise Action Plan
MSAN	Spanish Ministry of Health	**PBT**	Persistent, Bioaccumulative and Toxic
BAT	Best Available Technologies	**PEMAR**	State Waste Management Framework Plan
NAYADE	Spanish Bathing Water Information System	**PESMA**	Strategic Health and Environment Plan
NO_2	Nitrogen Dioxide	**PFAS**	Perfluoroalkylated substances
NTP	Healthy and Safety Note	**GDP**	Gross Domestic Product
O_3	Ozone	**PIMA**	Plan for the Promotion of the Environment for the Adaptation to Climate Change in Spain
OECD	Organisation for Economic Co-operation and Development	**PM**	Particulate Matter

PNACC	Spanish Climate Change Adaptation Plan	**SEE**	Spanish Epidemiology Society
PNIEC	Spanish Integrated National Energy and Climate Plan	**SESA**	Spanish Environmental Health Society
UNEP	United Nations Environment Programme	**SESPAS**	Spanish Public Health and Health Administration Society
PRTR	State Pollutant Emission and Source Register	**SG**	Sub-Directorate General
RADPAR	Radon Prevention and Remediation	**SGALSI**	Sub-Directorate General of Clean Air and Industrial Sustainability
RCMSUE	Council of EU Health Ministers	**SGAR**	Second Generation Anticoagulant Rodenticides
RD	Royal Decree	**SGSASL**	Sub-Directorate General for Environmental and Occupational Health and Safety
REACH	Registration, Evaluation, Authorisation and Restriction of Chemical Substances and Mixtures Regulations	**SGSHAT**	Sub-Directorate General for Animal Health and Hygiene and Traceability
RECS	Spanish Healthy Cities Network	**AIDS**	Acquired Immune Deficiency Syndrome
RENAVE	National Epidemiological Surveillance Network	**GIS**	Geographic Information System
RF	Radiofrequency	**SILOE**	Swimming Pool Information System
RITE	Spanish Regulation on Thermal Installations in Buildings	**SINAC**	Spanish Drinking Water Information System
SM	Social Media	**CNS**	Central Nervous System
ODS	Ozone-Depleting Substances	**SNS**	Spanish National Health System
SAR	Specific Absorption Rate	**SO_2**	Sulphur dioxide
SARS-CoV-2	Coronavirus type 2 causing Severe Acute Respiratory Syndrome	**SQI**	Industrial Chemicals
SCENIHR	Scientific Committee on Emerging Identified Health Risks	**EU**	European Union
SCIP	Substances of Concern in Products	**USA**	United States of America

UV	Ultraviolet	**VLA**	Atmospheric Exposure Limit Values
UVI	Ultraviolet Index	**VSL**	Value of a Statistical Life
VOLY	Value of a Life Year	**SZ**	Supply Zone

EXECUTIVE OVERVIEW

The preparation of the Strategic Health and Environment Plan responds to the need to provide Spanish society with an appropriate management tool to face the major environmental challenges we are facing today. The Strategic Plan for Health and Environment is integrated and forms part of the broader Public Health Strategy, mandated in the Articles of the Spanish Public Health Law and protected by Article 43 of the Spanish Constitution, which provides for the right to health protection, as the alarming loss of biodiversity, the climate crisis and the health emergency resulting from the irruption of COVID-19 are demonstrating, is highly dynamic, and requires the maximum degree of adaptability in the planning instruments used by the bodies that protect health and the environment.

The Strategic Plan sets out general guidelines to be translated into shorter-term (biennial) programming, subject to a continuous level of evaluation and revision. Thus, this Strategic Plan defines the actions aimed at the main determinants of health and identifies synergies with policies of other departments and administrations. The Plan includes an analysis of the state of environmental health and its determinants, defining actions that pursue a more favourable environment for health.

The Ministry of Health in coordination with the Ministry of Ecological Transition and the Demographic Challenge have developed this Strategic Plan for Health and Environment in line with the commitments of the European Union's international initiatives (VII Environment Programme), Directives and Regulations (chemical products, REACH, biocides, phytosanitary products, water, etc.) and other European legislation on health and environment, WHO (Ostrava Conference, WHO 13th General Programme of Work (2019-2023), Europe 2020, 2030 Agenda for Sustainable Development (2015), the European Green Deal (2019), the Paris Agreement on Climate Change (2015) and the EU Sustainability Strategy for Chemicals (2020) and the EU Biodiversity strategy to 2030 (2020).

The main objective of this Strategic Plan is to promote healthy environments that help to achieve the population's health objectives and reduce the risks derived from environmental factors and their conditioning factors, reducing the burden of diseases and identifying new threats. To this end, the development of environmental health policies will be facilitated, promoting a "One Health" approach that includes biodiversity.

The Strategic Plan is divided into two main parts: a technical document that has served as the guiding element and this strategic document that provides the executive framework. The first is an extensive document in which leading national experts in the main thematic areas that have the greatest impact on public health carry out a risk assessment and suggest lines of action within each theme to achieve the priority objectives. From this technical document comes this main document containing the situation of the factors, the key aspects of the Plan, the guidelines and lines of action to be followed. Under its framework, the situation of these strategic lines will be evaluated every two years and, based on this, Action Programmes will be

generated with the priority actions to be developed in this shorter execution period and with the detailed intervention of the executing agents.

The main objective of the Strategic Plan is to contribute to improving the quality of life of human beings and the conservation of the environment by generating healthy environments and acting on the determinants of health. Evidence and experience indicate that approaches focused on the treatment of individual diseases are insufficient to address current health challenges related to the environment. In this sense, special consideration has also been given to social inequalities and economic impact, as well as the initial situation in Spain of the 14 environmental factors considered, with a summary of the impact, sometimes quantified, on population health and of the measures and actions that have been applied by the different public administrations.

Once the objectives and lines of action have been established, the executive document sets forth the criteria for the management, organisation and coordination of the Strategic Plan, as well as the communication, training and participation tools for public consultation and the achievement of the proposed actions. In this sense, the Plan will be monitored and evaluated by means of several indicators and an annual report on them. These indicators are classified into management indicators, which will evaluate the degree of compliance with the Strategy, and indicators by thematic area, which will assess the evolution of exposure to environmental factors and the impact of this on the population's health. Based on this evaluation, it will be possible to better assess the situation at that moment and choose the following priority actions to be developed for the correct fulfilment of the main objective: to reduce the risks to the population's health derived from environmental factors and to build healthier environments that promote health.

1. INTRODUCTION

Public Health is the set of activities organised by Public Administrations, with the participation of society, to prevent disease, as well as to protect, promote and recover people's health, both individually and collectively and through sectoral and transversal health actions.

Spanish Law 33/2011, of 4th October, on Public Health established that the family environment, education, material goods, social and economic inequalities, access to work and its quality, the design and services of cities and neighbourhoods, the quality of the air we breathe, the water we drink and the food we eat, the animals we live with, the physical exercise we do, our social and environmental surroundings all determine our health. The WHO defines Environmental Health as "the discipline that encompasses those aspects of human health, including quality of life and social well-being, that are determined by social and psychosocial, environmental, physical, chemical and biological factors"; a perspective to which the development of this Strategic Plan seeks to respond. Likewise, government actions, at whatever level, and public or private interventions, have an impact on health to a greater or lesser degree. This is why the current public health approach is aimed at shaping actions that go beyond the scope of health services and therefore require new forms of organisation.

The Spanish population's health has not only benefited from quality health services and the excellence of the professionals who work in them. It has also benefited from its environment, its climate, its social and family structure, its diet and many other factors that have contributed to making it one of the countries with the best health indicators in the world. However, there are new realities to deal with which remind us that an advanced society must think about the population of the future, without waiting to solve problems when its social and health services can no longer provide answers. The increasingly ageing population, the increase in single-parent families, the weakening of family and social networks accentuated by dispersed urbanisation, the generalisation of pets, globalisation and its emerging risks, the flow of species, consumerism, the growing use of new technologies, sedentary lifestyles, increasing environmental pollution, the loss of biodiversity, the effects of climate change and mass tourism are some of these new social phenomena. These new realities coexist with others, which are not entirely resolved because they are older, such as physical or intellectual disability, mental health, immigration, poverty, prison incarceration or different situations of social exclusion. Health and social services will only be sustainable if we ensure the best possible levels of health and autonomy for our population at all stages of life and with the guarantee of maximum equality.

Equity is inherent to health and only societies that pursue equity achieve good health outcomes by addressing the causes of social inequalities in health and tailoring interventions to the needs of different population groups and by taking into account biological determinants such as gender. On the other hand, nowadays, international public health threats cannot be stopped or prevented by means of border or containment health. Cooperation and solidarity are the main

preventive actions, which is why public health in any territory cannot be addressed without considering international action as an integral part of Spanish public health policy.

Since the population's health is determined by policies and interventions in other areas, public administrations must ensure a regulatory framework that maximises the level of health without detriment to other social goods that contribute to society's well-being. Today's major health challenges can only be tackled successfully if society as a whole is governed by considering and maximising the health outcomes of the various actions and standards. The inclusion of health and equity in all policies requires an organisation that allows for adequate coordination between the health sector and other sectors, seeking synergies in their policies or the necessary protection of health, when these are not possible.

In Europe and internationally, the situation is similar to that in Spain. There are directives on the different environmental aspects that can affect health, but none that group them together. Similar to what has been done in Spain, work has been carried out linking climate change and health, and preventive and protective measures have been proposed, as in the 2015 Paris Agreement under the United Nations Framework Convention on Climate Change. Furthermore, in 2010 the document "The EU Environment and Health Action Plan" (EHAP) was published, in which the relationship between health and environment was suggested, and measures were proposed to improve the current situation.

In this sense, work has also focused on considering and integrating the links between biodiversity and health in public policies, such as those carried out by the WHO, the Secretariat of the Convention on Biological Diversity (CBD) or the newly created High-Level Expert Council on One Health (OIE, FAO, UNEP) to strengthen collaboration on the One Health approach.

New environmental, climate and health problems are emerging that require rapid identification and response. Recent examples include the management of e-waste, nano-particles, microplastics and endocrine disruptors (bisphenols, dioxins, phthalates, etc.). The global situation is changing at an accelerating pace in terms of technological development, new forms of work organisation, increased migration and tourist movements, climate change, biodiversity loss, ecosystem modification and increasing water scarcity, which creates an urgent need to identify these changes and emerging issues and respond to them in a timely manner.

The sustainability of health systems will be put at risk if the root causes of disease are not seriously addressed. Approximately 10% of the world's gross domestic product (GDP) is spent on health care, but the amount spent on health promotion and prevention is very low. High and recurrent rates of diarrhoeal diseases, respiratory infections and non-communicable diseases, caused by a degraded environment, place a heavy burden on health services and national budgets. Financial and human resources allocated to promotion and primary prevention remain insufficient to reduce the substantial burden of disease due to environmental health risks. As long as pricing structures do not reflect the costs of the full consequences of policies, technologies and products, these costs will continue to be passed on to the health sector and the public.

Approaches that focus on treating individual diseases, rather than intervening in the determinants of health, are not enough to address today's environment-related health challenges. Approaches focusing on individual determinants are unlikely to achieve the expected improvements in equity in health and well-being. Tackling the root causes of disease

therefore requires an integrated approach, often defined by policies in key sectors other than health. Even the failure to address the root causes of disease, as well as the overuse of drugs and pesticides, could contribute to problems such as antimicrobial or insecticide resistance, which could have a substantial impact on public health. It is in this context that the One Health approach stands out, recognising that human health is closely linked to the health of the planet, all living things, ecosystems, our common environment and the relevant systemic drivers.

In this context, there are causes arising from policies or activities directly leading to increased environmental health risks. Examples include decisions relating to energy generation, some agricultural practices, industrial production or business activity, and land-use planning that lead to increased emissions, harmful exposure or increased vulnerability, encourage unhealthy behaviour or accelerate climate change. This is why the United Nations is trying to use these same political tools to try to reverse the trend. This is how the Sustainable Development Goals (SDGs) have been developed with numerous goals in each of them. As will be seen throughout the Plan, the SDG that forms the backbone of this document is SDG 3 on Health and Well-being, from which it is intended to include and promote other SDGs such as SDG 13 on Climate Action.

Among other environmental causes, climate change is a major threat to achieving the SDGs. The health impacts of climate change are wide-ranging and include direct impacts on the environmental factors discussed herein, but also indirect impacts (migration, conflicts over natural resources, changes in the economy, etc.).

On the other hand, it should be noted that in Spain, the obligation to take into consideration the impact on health of both projects and plans and programmes in their respective environmental assessment procedures has been incorporated into Law 21/2013, of 9th December, on environmental assessment. In this sense, it is considered necessary to continue moving in this direction and to incorporate health impact assessment as another tool for the exercise of Health in All Policies in line with the provisions of Article 35 of Law 33/2011, of 4th October, General Law on Public Health.

Both the UN Convention on Biological Diversity and the World Health Organisation have recognised the interrelationship between biodiversity and human health. Biodiversity provides us with essential services for our health, directly as a source of food or medicines and indirectly as a source of clean air and water, for example, and offers options for adapting to change. A healthy environment is therefore the irreplaceable basis for our health and quality of life.

For all the above reasons, the Ministry of Health (MSAN) has promoted and coordinated the drafting of this **Strategic Health and Environment Plan**, with the participation of the Ministry for Ecological Transition and the Demographic Challenge, as well as qualified experts in the main thematic areas that have the greatest impact on public health.

This Strategic Plan is consistent with the commitments of the international initiatives of the European Union (7th Environment Action Programme), Directives and Regulations (chemicals, REACH, biocides, phytosanitary, water, etc.) and other European legislation on health and environment, WHO (Ostrava Conference, 13th WHO General Programme of Work 2019-2023), Europe 2020, 2030 Agenda for Sustainable Development (2015), the European Green Deal (2019), the Paris Agreement on climate change (2015), the European Chemicals Strategy for Sustainability (2020) and the EU Biodiversity Strategy 2030 (2020).

This Plan is part of the Public Health Strategy, which is currently under development. In accordance with Law 33/2011, of 4th October, General Law on Public Health, the Public Health Strategy is the instrument for planning and coordinating public health, understood as the set of activities organised by the Public Administrations to prevent diseases, as well as to protect, promote and recover people's health, both individually and collectively and through health, sectoral and transversal actions.

Before its approval, it has been submitted to public participation of interested parties so that its content reflects the opinions and knowledge of scientific societies, consumers, professional organisations and competent administrations (State Administration, Autonomous Communities and Cities and Local Entities) in environmental health.

2 REGULATORY FRAMEWORK

Article 43 of the Spanish Constitution establishes the right to health protection, entrusting the public authorities with the organisation and protection of public health through preventive measures and the necessary benefits and services.

Spanish Law 14/1986, of 25th April, on General Health (LGS) established (Articles 18, 19, 39 and 40) the obligation to pay special attention to environmental health in the National Health System (SNS) programmes. The right to enjoy a healthy environment is included in Article 45 of the Spanish Constitution. However, the NHS needs to prioritise health protection against environmental risks as established by the LGS and the General Public Health Law 33/2011, of 4th October (LSP), which was published in Spanish Official State Gazette No. 240 on 5th October 2011. The Strategic Health and Environment Plan is mainly included in the framework of this Law, which devotes numerous references to the protection of health and promotion of healthy environments in the face of environmental risks and to the actions of the health authorities in the field of environmental health in its articles.

The Preliminary Title, Chapter II of the LSP, General Public Health Principles, Article 3 b) establishes the "Principle of health in all policies". Public health actions will take into account non-health policies that influence the population's health, promoting those that favour healthy environments and discouraging, where appropriate, those that pose health risks".

- Title I, Rights, Duties and Obligations in Public Health, Chapter III, contains the following Articles:

  Article 10. "*…health administrations will report on the presence of specific risks to the population's health. This information will include an assessment of their impact on health, the measures taken by the health administrations in this respect and recommendations for the population.*"

  Article 11. "*Health administrations will require transparency and impartiality from scientific and professional organisations and experts with whom they collaborate in public health actions, including training and research […]. To this end, the composition of the committees or groups that evaluate actions or make public health recommendations, the selection procedures, the declaration of interests of those involved, as well as the opinions and relevant documents, will be made public, except for the limitations provided for in the regulations in force.*"

- Title II, Public Health Actions, Chapter I (Public Health Surveillance), contains the following articles that mainly require this health and environmental surveillance document:

Article 12. "*Public health surveillance is the set of activities aimed at collecting, analysing, interpreting and disseminating information related to the population's health status and the factors that condition it, with the aim of providing a basis for public health actions. Public health surveillance will take into account at least the following factors: [...] Environmental risks and their effects on health, including the presence of pollutants in the environment and in humans, and the potential health impact of exposure to electromagnetic emissions.*"

- In Chapter III, Prevention of health problems and their determinants, in Article 19.2.

  "*Public administrations, within the scope of their respective competences, will:*

  Lead preventive actions and policies on health determinants, understood as the social, economic, occupational, cultural, dietary, biological and environmental factors that influence people's health."

- Chapter VI (Protecting the population's health) of Title II (Public health actions) sets forth how the Strategy will protect the population's health:

  Article 27. "*Health protection is the set of actions, benefits and services aimed at preventing adverse effects that products, elements and processes of the environment, physical, chemical and biological agents may have on the population's health and well-being. Within the scope of their competences, public administrations will protect the health population's health through activities and services that act on the risks present in the environment and in food, to which end they will develop the services and activities that enable the management of the health risks that may affect the population.*"

  Article 28. "*Health protection will comprise the analysis of health risks, including their assessment, management and communication. To this end, actions will be developed on the risk triggers [...]. Risks arising from the exposure of people to the environment in which they live and to agents in the environment which may affect their physical, mental or social well-being will be analysed.*"

  Article 30. "*Environmental health.*

  1. Environmental health includes the identification, assessment, management and communication of health risks that may arise from environmental conditions; the monitoring of physical, chemical or biological environmental factors and environmental situations that affect or may affect health; and the identification of policies in any sector that reduce environmental health risks.

  2. Public administrations will implement environmental health programmes, coordinated by the health administrations, to raise the level of health protection against the risks derived from environmental conditioning factors."

  Article 31. "*Actions of the Ministry of Health, Social Policy and Equality in the field of environmental health.*

  1. The Ministry of Health, Social Policy and Equality is responsible for the effective coordination of the State with the competent public administrations and bodies, in the

exercise of actions aimed at the prevention and protection against environmental health risks.

2. The Ministry of Health, Social Policy and Equality will promote that the State services that perform functions in the areas of identification, evaluation, management and communication of environmental risks to the population's health, which will include, at least, risks related to chemical products[1] and health and climate change, may act as a national reference centre in these areas.

Subject to prior agreement by the Interterritorial Council of the National Health System, the Ministry of Health, Social Policy and Equality will accredit services that will act as a national reference centre for the identification, evaluation, management and communication of risks to the population's health deriving from environmental hazards.

3. The Public Health Strategy will include analysis of environmental health status and its determinants and will incorporate actions that result in a more favourable environment for health."

- Chapter VII determines the application of health impact assessment in Spain, i.e. the combination of procedures, methods and tools by which a programme or regulation can be evaluated in relation to its effects and the distribution of these effects on the population's health. The need to make progress in health safety makes it advisable for Spain to be one of the leading countries in guaranteeing and promoting health in its government actions, including the actions necessary to evaluate the impact on human health of the various public actions. The inclusion of health impact assessment in our legal system can place us in the group of the most advanced countries, encouraging innovation in the development of reforms related to the sustainable economy that in turn guarantee health security. These ground-breaking provisions are in line with the most modern and progressive public health strategies. The implementation of the LSP would prevent numerous diseases and save considerable health care costs for the National Health System.

- Title III establishes the mission and objectives of the Strategy, as well as its planning and coordination:

  Article 44. *"Public Health Strategy.*

  1. The Public Health Strategy, without prejudice to others that may be approved by the Autonomous Communities, aims to ensure that health and equity in health are considered in all public policies and to facilitate intersectoral action in this area.

  2. The Strategy will define the areas of action on health conditioning factors and will incorporate the public health research actions referred to in Articles 47, 48 and 49 of this law.

[1] "Chemical products" should be understood to mean both substances and chemicals.

3. The Public Health Strategy, which will be approved by the Interterritorial Council of the National Health System, will have a five-year duration and will be evaluated every two years."

Article 47. "*State Public Health Centre.*

3. The State Public Health Centre will monitor and evaluate the Public Health Strategy and coordinate the actions developed by the national public health centres."

With regard to the general relationship between health and the environment there is no other legislation. However, some of the different parts of the environment that affect health have been regulated. The Spanish regulations that include the areas developed in this document are as follows:

- Law 26/2007, of 23rd October, on Environmental Responsibility.
- Law 7/2007, of 9th July, on Integrated Environmental Quality Management.
- Royal Decree 39/2017, of 27th January, amending Royal Decree 102/2011 of 28th January 2011 on the improvement of air quality.
- Royal Decree 678/2014, of 1st August, amending Royal Decree 102/2011, of 28th January, on the improvement of air quality. Specifically, the carbon sulphide value established in the sole transitory provision of Royal Decree 102/2011 is revised, adapting it to the value recommended by the WHO to protect health, which is considerably higher.
- Royal Decree 795/2010, of 16th June, regulating the placing on the market and handling of fluorinated gases and equipment based thereon, as well as the certification of professionals using them.
- Royal Decree 117/2003, of 31st January, on the limitation of emissions of volatile organic compounds due to the use of solvents in certain activities.
- Law 7/2021, of 20th May, on climate change and energy transition.
- Law 34/2007, of 15th November, air quality and atmospheric protection.
- Law 3/2007, of 22nd March, on effective equality between men and women.
- Royal Decree 102/2011, of 28th January, on improving air quality.
- Royal Decree 100/2011, of 28th January, which updates the catalogue of potentially air-polluting activities and establishes the basic provisions for its application.
- Royal Decree 1042/2017, of 22nd December, on the limitation of emissions of certain pollutants into the air from medium combustion plants.
- Royal Decree 818/2018, of 6th July, on national emission reduction measures for certain atmospheric pollutants.
- Royal Legislative Decree 1/2001, of 20th July, which approves the consolidated text of the Water Law.

- Royal Decree 509/1996, of 15th March, implementing Royal Decree-Law 11/1995 of 28th December, on the rules applicable to urban waste-water treatment.

- Royal Decree 261/1996, of 16th February, on the protection of waters against pollution caused by nitrates from agricultural sources.

- Royal Decree 815/2013, of 18th October, approving the Regulation on industrial emissions and implementing Law 16/2002, of 1st July, on integrated pollution prevention and control.

- Royal Decree 817/2015, of 11th September, on criteria for monitoring and assessment of surface water status and environmental quality standards.

- Royal Decree 849/1986, of 11th April, approving the Regulation of the Public Hydraulic Domain, which develops the preliminary titles, I, IV, V, VI, VII and VIII of the consolidated text of the Water Law, approved by Royal Legislative Decree 1/2001, of 20th July.

- Royal Decree 140/2003, of 7th February, on health criteria for the quality of water intended for human consumption.

- Royal Decree 1341/2007, of 11th October, on bathing water quality management.

- Royal Decree 742/2013, of 27th September, on technical and sanitary criteria for swimming pools.

- Royal Decree 1620/2007, of 7th December, which establishes the legal regime for the reuse of treated waters.

- Royal Decree 1514/2009, of 2nd October, which regulates the protection of groundwater against pollution and deterioration.

- Royal Decree 1311/2012, of 14th September, which establishes the framework for action to achieve a sustainable use of plant protection products.

- Royal Decree 971/2014, of 21st November, which regulates the procedure for the evaluation of plant protection products.

- Royal Decree 1054/2002, of 11th October, which regulates the evaluation process for the registration, authorisation and placing on the market of biocidal products.

- Law 8/2010, of 31st March, which establishes the system of penalties provided for in Regulations (EC) concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and on Classification, Labelling and Packaging of Substances and Mixtures (CLP) and amending it.

- Royal Decree 299/2016, of 22nd July, on the protection of the health and safety of workers from the risks related to exposure to electromagnetic fields.

- Law 37/2003, of 17th November, on noise.

- Royal Decree 1513/2005, of 16th December, which implements Law 37/2003, of 17th November, on Noise, with regard to the assessment and management of environmental noise.
- Royal Decree 1367/2007, of 19th October, which implements Law 37/2003, of 17th November, on noise, with regard to noise zoning, noise quality objectives and noise emissions.
- Law 42/2007, of 13th December, on Natural Heritage and Biodiversity.
- Law 22/2011, of 28th July, waste and contaminated soil.
- Royal Legislative Decree 1/2016, of 16th December, approving the consolidated text of the Law on integrated pollution prevention and control.
- Royal Decree 630/2013, of 2nd August, which regulates the Spanish Catalogue of Invasive Alien Species.
- Law 21/2013, of 9th December, on environmental assessment and its subsequent amendments.
- Royal Legislative Decree 7/2015, of 30th October, which approves the consolidated text of the Land and Urban Rehabilitation Law.
- Regulation (CE) No. 1907/2006 on the registration, evaluation, authorisation and restriction of chemical substances and mixtures.
- Regulation (CE) No. 1272/2008 on the classification, labelling and packaging of chemical substances and mixtures.
- Royal Decree 1054/2002, of 11th October, which regulates the evaluation process for the registration, authorisation and marketing of biocidal products.
- Regulation (UE) No. 528/2012 of the European Parliament and Council, of 22nd May 2012, on the placing on the market and use of biocidal products.

As can be seen, environmental health is being approached from different angles. However, the integration and coordination of all these issues is necessary for coherent and sound decision-making. Some examples of regulations that aim to achieve this grouping include: Law 7/2021, of 20th May, on Climate Change and Energy Transition, developed by the Ministry for Ecological Transition and the Demographic Challenge, or the Law on Environmental Assessment. The latter aims to integrate and analyse the health impacts (air quality and atmospheric protection, water quality, exposure to electromagnetic fields, noise analysis, natural heritage and biodiversity, etc.) of projects subject to environmental assessment and plans and programmes subject to strategic environmental assessment.

3. HEALTH AND ENVIRONMENT

3.1. IMPACT OF ENVIRONMENTAL FACTORS ON HUMAN HEALTH

Human health and the environment are closely related, as there are many different factors that surround us and influence the organism. The environment is defined as the set of circumstances external to a living being; thus environmental health includes all the chemical, physical, biological and social factors external to an individual and the interaction between them. Thus, this excludes genetic and intrinsic factors of the individual.

This relationship is of such importance that it is considered one of the main points of study by the World Health Organisation (WHO). This agency only has one Department of Public Health, Environment and Social Determinants of Health that deals with these issues. This relevance becomes even more evident when the weight that environmental factors have had on human health in recent years is estimated. As shown in Figure 1, an estimated **24% of the global burden of disease and 23% of mortality are attributable to environmental factors**. In terms of the world's population, this figure accounts for 12.6 million deaths each year[1].

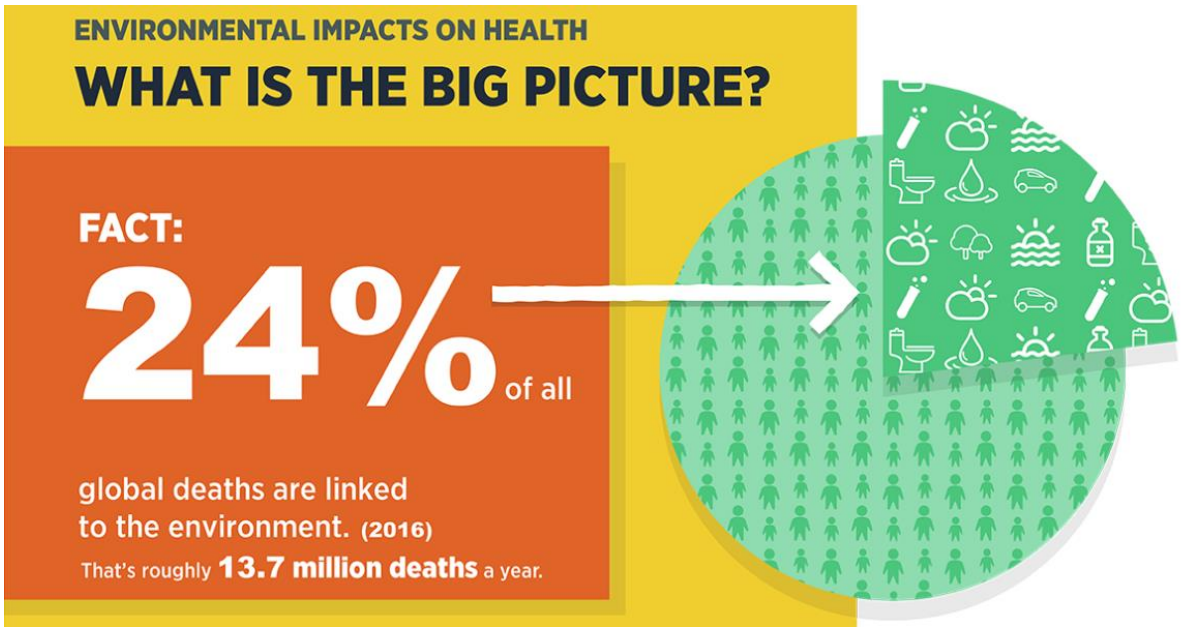

Figure 1. Mortality related to different environmental factors[1].

However, not all of these deaths are equally distributed around the globe. The conditions in each area (health, industrial, economic, social, etc.) and the circumstances in which people live have a great influence on the way the environment affects the population. For example, in the report "Healthy Environments and Disease Prevention" published by WHO in 2006, it is estimated that the high percentage of estimated mortality due to environmental causes[2] , was reduced to 17% in developed regions. The WHO estimates that 50% of the differences in the distribution of major noncommunicable diseases within populations, especially cardiovascular diseases and lung cancer, stem from social inequalities in exposure to risk factors. In addition, the measures that have been taken in the different areas to improve the environment and mitigate its effect on health show a great influence on the global distribution of deaths due to these factors. Thus, the above-mentioned deaths are distributed approximately as shown in Figure 2. It is worth noting that **in Europe, an estimated 1.4 million deaths per year are due to environment-related causes**[1].

Figure 2. Global distribution of deaths caused by the environment[1].

In the case of diseases due to environmental factors, the same pattern is observed as in the case of deaths. As shown in Figure 3, **the least developed countries show the highest rates of morbidity caused by the environment**. Similarly, the so-called first world countries, including Spain, have rates of less than 16%[3].

Figure 3 Percentage of the burden of disease caused by the environment in each country[3].

When the environmental causes of these deaths are analysed, the relationship between the environment and human health can be explored in more detail. Of the 12.6 million deaths mentioned above, an estimated 8.2 million are due to non-communicable diseases. These causes mainly develop as follows[1]:

- Strokes – 2.5 million deaths annually.
- Ischaemic heart disease – 2.3 million deaths annually.
- Unintentional trauma – 1.7 million deaths annually.
- Cancer – 1.7 million deaths annually.
- Chronic respiratory diseases – 1.4 million deaths annually.
- Diarrhoeal diseases – 846,000 deaths annually.
- Respiratory infections – 567,000 deaths annually.
- Neonatal conditions – 270,000 deaths annually.
- Malaria – 259,000 deaths annually.
- Intentional trauma – 246,000 deaths annually.

Among all causes of mortality and disease, there are some for which the weight of environmental factors is greater than for others. For example, almost all cases of diarrhoea (94%) are due to environmental factors, while these are less prevalent in AIDS cases. It is important to consider that these weights follow the previously observed trend of global distribution. In developed countries, approximately 20% of respiratory infections are attributable

to environmental causes, and in developing countries this percentage is as high as 42%[2]. Figure 4 shows the weights of importance of environmental factors in the diseases that cause the largest number of deaths in the world's population.

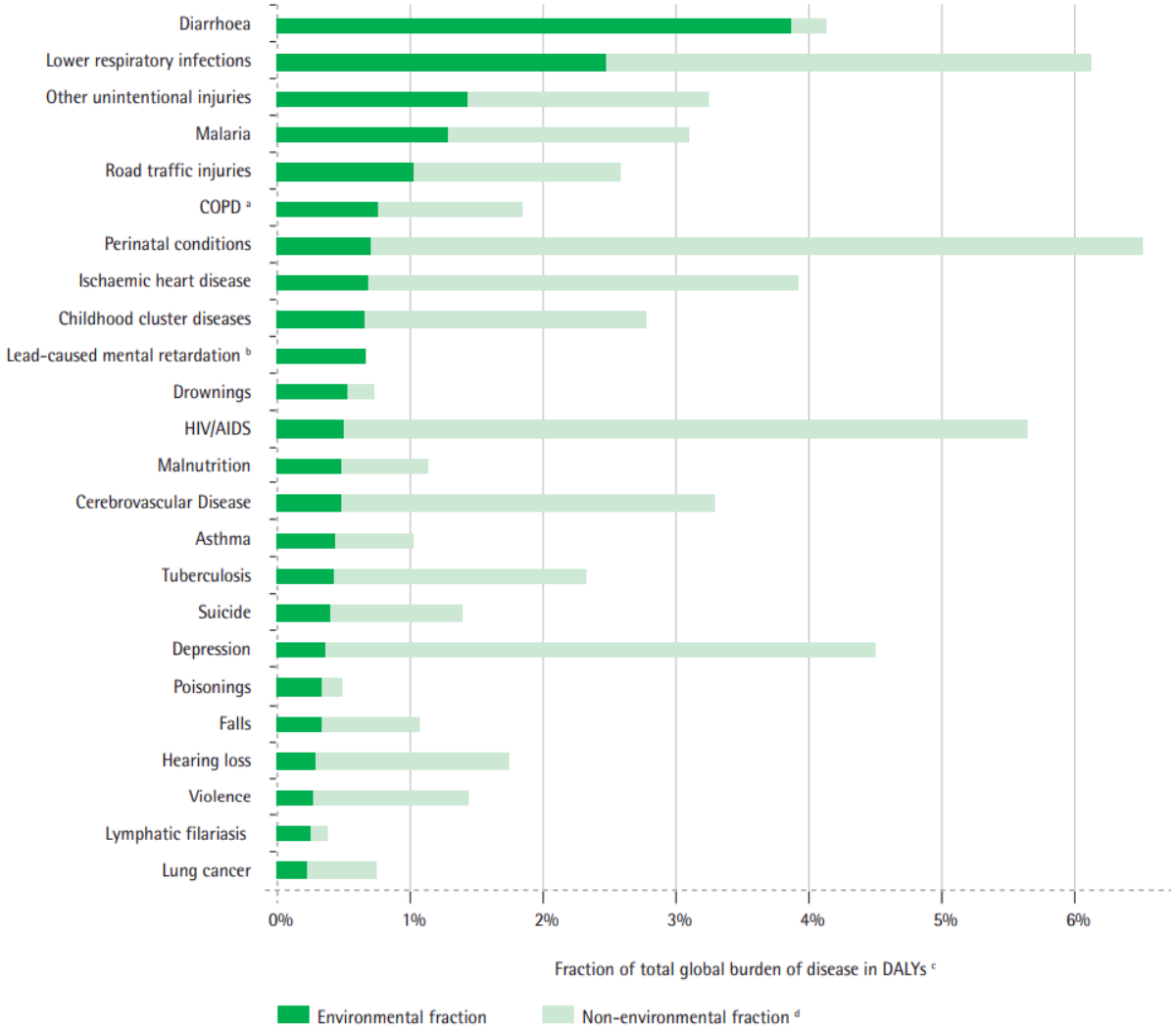

Figure 4. Deadly diseases with the highest environmental contribution[2].

Given the influence of environmental factors on health, there are certain population groups that are particularly vulnerable. These include **children and the elderly, as well as people with fewer socio-economic resources.**

With regard to children, **1.7 million deaths are observed annually in children under 5 years of age**, mainly due to **respiratory infections and diarrhoea** (Figure 5). This contrasts with the main causes of death in adults listed above, which are mainly non-communicable diseases and injuries[1]. In children under five, the mortality rate rises to 26%. With regard to the development of the countries of origin of this vulnerable group, it is estimated that those living in less developed countries lose eight times more years of life than those in the first world due to environmental causes[2].

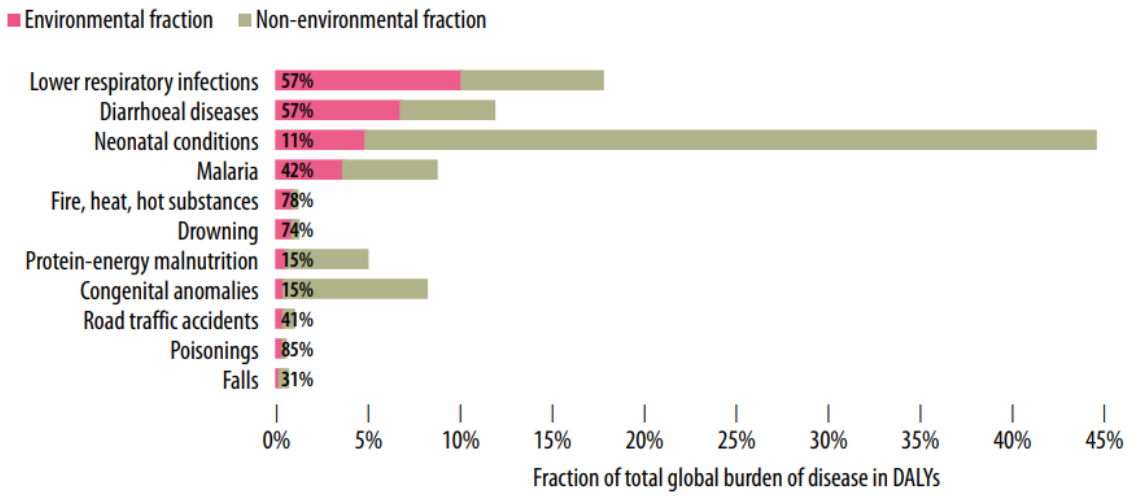

Figure 5. Diseases that most affect children under 5 and the contribution of environmental factors to these disease (in pink)[3].

Once the relevant relationship between the environment and health has been explained and quantified, the main environmental factors that aggravate it can be indicated. This Plan develops the factors with a greater social and anthropic component directly linked to urban areas and activities in the individual's immediate environment.

The WHO focuses on the vision of these causes, which are shown in Figure 6, grouping together all the areas that most influence population health. For example, air pollution takes into account the impact of atmospheric **air quality** and **indoor air quality** on the organism. The main cause of diarrhoea and other contagious diseases is water, so **water quality** in all areas (drinking water, bathing water, reclaimed water, waste water, etc.) is of vital importance if water-related diseases such as legionellosis are to be reduced. Through water, air and food, there are a large number of chemical and biological agents that adversely affect the organism. Adequate protection of water resources through the various management and planning instruments must therefore be able to address current and future challenges related to the risk of water to human health at source. In addition, the **management of chemicals** used in agricultural practices and the monitoring of **emerging chemical and endocrine disrupting hazards** must be robustly studied and controlled to protect the population. However, it should be borne in mind that women are more sensitive to exposure to these endocrine disruptors, especially during their childbearing years. These chemicals may also include all those contaminants derived from **industrial pollution** and from residues of consumed medicines that affect through any of the above-mentioned pathways.

Numerous studies warn of the growing importance and impact of **climate change** and its resulting effects on health. The main effect that has been most emphasised is the increase in global temperature over the last few years due to human action. Thus, mitigation and adaptation can reduce the impact of **extreme temperatures** on individuals and significantly improve their health. The rise in global temperature, along with other related factors, is having an impact on the fact that many diseases that were previously only found in warmer or tropical climates are now reaching latitudes where they could not previously develop.

Although the problem is difficult to quantify, we must not forget the strong impact that invasive alien species can have on health (e.g. the tiger mosquito, **as a vector for disease transmission**, or the zebra mussel in water networks). This impact is expected to continue to increase in the future, with new invasive alien species likely to become established as trade and human population dynamics and trends increase. In addition, as another main factor, climate change may favour the establishment and dispersal in Spain of exotic species typical of warmer climates. The establishment of these species may result in the development of pests that condition and affect crop yields.

It is not only the most intuitively observable environmental factors that affect health. One factor that has a daily impact on the population's health and is responsible not only for discomfort, but also for cardiovascular diseases, ischaemia and insomnia, among others, is **noise,** whether in the workplace or in everyday life as a result of traffic, night-time leisure activities, wind turbines, etc. Another factor is **natural environmental radiation**, which can affect the population through ingestion of water or food, inhalation of radioactive gases such as radon, or simple exposure to radiation. Exposure to low frequency, intermediate frequency and radio frequency **electromagnetic fields** from the widespread use of electricity, security technologies and telecommunication systems (radio, internet, 5G mobile telephony, Wi-Fi, etc.) requires identifying, assessing and monitoring their effects on human health.

The latter factors are particularly prevalent in urbanised environments and are so relevant that they become another environmental factor detrimental to health. To this end, it is important to work on the **quality of the habitat and green cities** in order to develop a favourable and harmonised ecosystem in which human beings can develop their lives with as little damage to their health as possible.

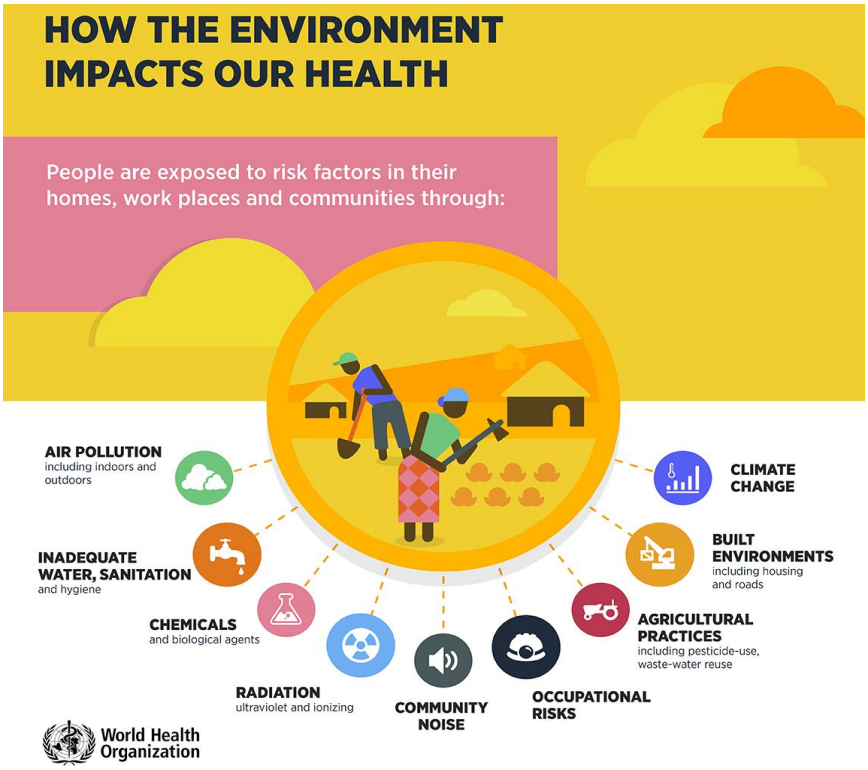

Figure 6. Main factors through which the environment affects human health[1].

3.2. ENVIRONMENTAL EPIDEMIOLOGY

Environmental epidemiology is a branch of epidemiology that uses epidemiological principles, reasoning and methods to study the effects on the population's health derived from exposure to external physical, chemical and biological agents. Environmental epidemiology takes into account the influences of social, economic and cultural and environmental factors (urbanisation, housing, transport, energy, air, water, agriculture, industry, cultural habits, climate change, etc.).

It studies the distribution of physical, chemical and biological agents in the environment that may act as determinants of disease. Exposure to various environmental agents is often unintentional and can affect large groups of the population. For example, exposure to poor air quality, noise or bites from disease-carrying vectors can affect large groups of the population. In this context, environmental epidemiology aims to infer the relationship between exposure and its effects on human health by identifying the environmental causes of disease, such as air and water pollutants, contaminants in food or the characteristics of the built environment in populations, among many others.

In this sense, the approach to environmental issues must consider the joint analysis of three key aspects: health, the environment and the social determinants of health, since the latter are closely related to the health-disease process and should not be considered as isolated elements.

Article 12 of the General Public Health Law 33/2011, of 4th October establishes that public health surveillance will take into account environmental risks and their effects on health. Likewise, in Article 30, dedicated to environmental health, the Law establishes that the functions of this area will include the identification, evaluation, management and communication of health risks that may derive from environmental conditioning factors. Similarly, the monitoring of physical, chemical or biological environmental factors and environmental situations that affect or may affect health is considered.

The development of environmental epidemiology as a discipline is based on several basic characteristics (Figure 7). Firstly, it focuses on the circumstances of exposure to clarify the causal relationships between environmental agents and their effects on exposed populations. This approach generates an integral vision of the environmental problem that allows for the development of more effective interventions in its application. Another of its characteristics is that the practice of environmental epidemiology requires the integration of knowledge from multiple disciplines, from the scientific to the social and economic spheres, generating a set of information that involves both quantitative and qualitative data. To do this, it is essential that environmental epidemiology investigates the origin of problems and their possible consequences, and evaluates not only the efficiency of actions but also their effectiveness.

In addition to the above-mentioned characteristics, environmental epidemiology must incorporate the population's views, in order to adapt to the needs identified. This approach includes the communication of results adapted to the needs of individuals, enabling the integration of communities as agents of change, from a participatory perspective. At the same

time, environmental epidemiology must be able to recognise the close relationship between socio-economic aspects, environment and health, and the correspondence with policies in this sector. In this way, the economic determinants and the use of resources are basic axes of the integral analysis of environmental epidemiology, which makes it possible to visualise and externalise problems of inequalities and inequities, due to existing socio-economic gradients.

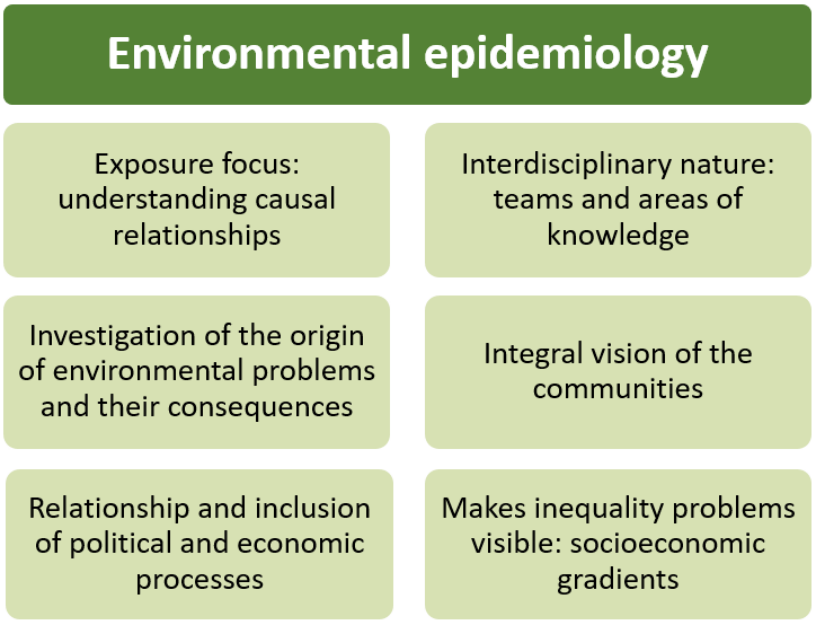

Figure 7. Basic principles of environmental epidemiology.

There are a few aspects that define the complexity of the study of environmental epidemiology. One of these aspects includes the multiple types of environmental risks that exist, resulting from various human activities, and with varied exposure pathways, such as inhalation, ingestion and contact. Exposure may be conditioned by social determinants such as gender or educational level. Moreover, this exposure may occur simultaneously or alternatively. It is also important to note that each type of environmental risk can have more than one effect on health and many of these diseases are characterised as multifactorial, i.e. they can be caused by a combination of different environmental, genetic and lifestyle factors.

As discussed above, environmental epidemiology includes numerous factors that surround public health. It is particularly important to consider animal health aspects, due to the close contact we have with animals at different levels. In this case, the One Health paradigm and the multidisciplinary approach discussed could have a greater impact on environmental epidemiology with a public health focus. This is partly because, by compiling animal health diagnostics, early warnings and predictive models can be created to enable more effective interventions to prevent disease at source, before it affects humans.

Another characteristic aspect of environmental risks is that they can have a spatio-temporal variation, depending on geographical, gender, socio-economic or regulatory conditions. On the other hand, the health effects of certain pollutants (radiation or heavy metals) can occur through acute or chronic exposure by various means, to one or several agents simultaneously (mixtures) at low concentrations, which generates long-term effects that are difficult to causally

relate. In short, all these aspects must be taken into account in order to carry out an adequate and exhaustive study of environmental epidemiology.

The current challenge for environmental epidemiology is to develop a multidisciplinary perspective that fosters the identification of the causal factors of disease and that more effective interventions can be developed to prevent disease, within the framework of equity and the promotion of healthy environments. In this sense, epidemiology is an excellent tool for reducing the impact of environmental factors, supporting cross-sectoral public policy decisions and increasing social awareness and sensitisation on environmental protection and the right to human health.

In Spain, there are several bodies dedicated to the research and evaluation of environmental epidemiology, one of them being the Carlos III Health Institute (ISCIII). Affiliated to the ISCIII are the National Centre for Environmental Health, which specialises in the health aspects of environmental pollution, and the Cancer and Environmental Epidemiology Unit (National Epidemiology Centre), which provides information on the cancer epidemiology in Spain and its determinants, from a public health perspective. Another organisation affiliated to the ISCIII is the Biomedical Research Network Centre - Epidemiology and Public Health (CIBERESP), which focuses its activities on understanding the magnitude and distribution of public health problems and identifying the determinants of these problems. There are several Research Centres (CSIC, CIEMAT, etc.) and Universities that can provide valuable knowledge on the influence of environmental factors on human health. Other institutions recognised for their work in environmental health are the Spanish Society of Environmental Health (SESA), which focuses on the study and identification of environmental risk factors and their effects on health; and the Spanish Society of Epidemiology (SEE) and the Spanish Society of Public Health and Health Administration (SESPAS), which promote multiple working groups dedicated to studies, opinions or assessments of society's health problems, while promoting the study and better knowledge of epidemiology in all its aspects.

Likewise, the Environmental Epidemiology Research Centre (CREAL), which is affiliated with the Barcelona Global Health Institute (ISGlobal), should also be mentioned. The centre's research is based on six programmes: respiratory, cancer, childhood, air pollution, water pollution and radiation. In general, the centre's research is oriented towards the development of health protection policies to reduce diseases and social disabilities due to various environmental exposures. There is also the Health Research Institute of the Principality of Asturias (ISPA), which has a research group dedicated to Environmental and Molecular Cancer Epidemiology; and the Biodonostia Health Research Institute, which has an Epidemiology and Public Health Research group, part of whose research focuses on Environmental Epidemiology and Child Development.

Nowadays, environmental epidemiology has become a fundamental discipline for studying how environmental factors, whether physical, chemical or biological, affect the population's health. In this sense, the knowledge provided by environmental epidemiology will enable the assessment of the consequences of various environmental problems that imply a health risk. For this reason, the approach to environmental epidemiology in the Strategic Health and Environment Plan is a basic instrument that contributes to the achievement of the objectives set forth herein, taking into consideration integral aspects of society and the development of interventions that are effective and efficient in their application.

3.3. SOCIAL INEQUALITIES IN HEALTH

As can be seen, health is determined by the conditions and circumstances in which people live, and by the environment, i.e. socio-economic conditions, the culture and values of the society, the policies in place, the type and conditions of work, education, gender, housing conditions, health services, etc. These circumstances are referred to as **social determinants of health**, and the fact that they are not evenly distributed in the population generates health inequalities. **Social inequalities in health** are the unfair and avoidable differences in health that systematically occur between socio-economic groups in a population and that result from the unequal distribution of the social determinants of health across the social scale[4].

In recent decades, considerable effort has been devoted to demonstrating the relationships between the health conditions of different populations and their economic development. Thus, different models have been developed to explain the social determinants of health. In Spain, the **Conceptual Framework of the Determinants of Social Inequalities in Health** was developed by the Commission to Reduce Health Inequalities in Spain in 2010 (Figure 8), based on the framework developed by the WHO Commission on Social Determinants of Health. More recently, in 2018, the conceptual framework of the Pan American Health Organization (PAHO) Commission on Equity already incorporates as structural factors those related to the natural environment, land and climate[5].

In order to move towards health equity, these social determinants need to be addressed and interventions and policies adapted to the different needs of different population groups. To this end, it must be borne in mind that social inequalities in health are not only present in the most disadvantaged social groups, but show a gradient along the entire social scale, making necessary an approach which addresses both. In turn, work is needed in sectors other than health to address these inequalities, as well as to encourage social participation in policy development.

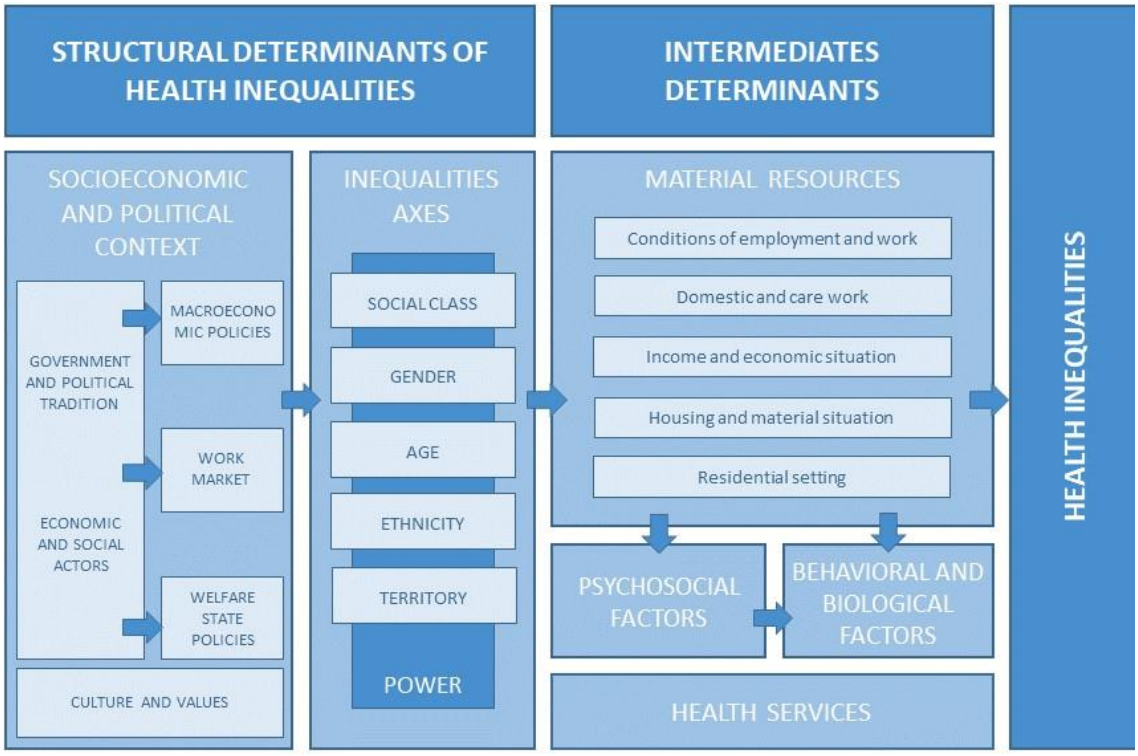

Figure 8. A conceptual framework of the determinants of social inequalities in health[6].

In 2018, the **European Environment Agency** warned that specific measures are needed to protect the poorest people from various environmental risks[7]. Although environmental quality in Europe has gradually improved in recent times, some environmental hazards, such as air and noise pollution, still contribute to serious illnesses and premature deaths. Extreme temperatures are another factor that has had a significant impact on the population's health. However, the consequences have not affected the entire population equally, being a reflection of the socio-economic and demographic differences in modern society.

Similarly, the **World Health Organisation** (WHO) has highlighted the differences between the degree of health equity and inequalities faced by countries in Europe. In particular, the report published in 2019 describes several essential conditions that have an impact on health equity, and where a number of policies are needed to improve the population's health status[8] (Figure 9).

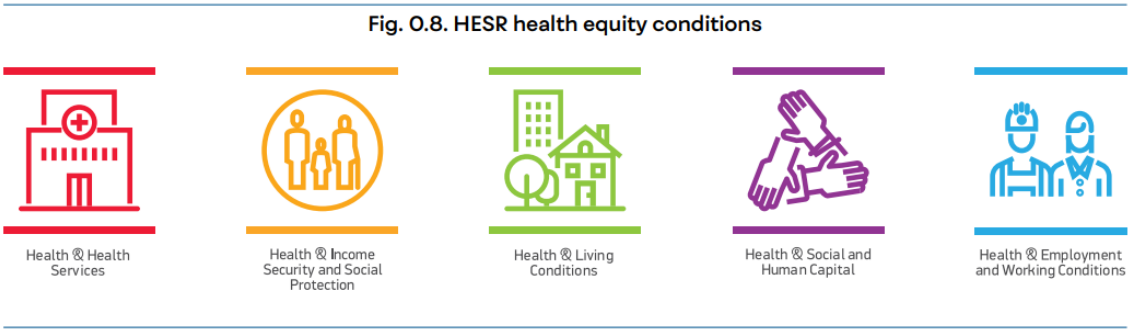

Figure 9. Health equity conditions[8].

In particular, in the so-called "living conditions", the issue of air pollution, which is discussed at length in this Strategic Plan, is set forth. Air pollution generally affects everyone. However, the degree of exposure to air pollution varies depending on the socio-economic conditions of segments of the population. For example, the concentration of air pollutants in densely populated urban areas will be much higher than in other types of areas. Prolonged exposure to these pollutants, as well as to other environmental hazards, results in an increased likelihood of disease and even increased mortality.

The WHO Regional Office for Europe's report on environmental health inequalities in Europe[9], analyses indicators in five domains: housing, basic services, urban environments and transport, work-related, and injury-related. This report highlights not only the unequal distribution of environmental conditions, but that the variability in vulnerability of different population subgroups can in turn result in environment-related health inequalities. It is therefore not only necessary to address environmental conditions and their unequal distribution, but also vulnerability to certain environmental factors also has an unequal distribution in the population.

These aspects addressed by the WHO are in line with some of the commitments presented in the Sustainable Development Goals, such as reducing inequalities, and with the WHO's "*Health 2020*[10] strategic objectives, such as improving health for all and reducing health inequities, as well as improving institutional leadership and participation in health issues.

In Spain, work is being done on health equity by advancing along the lines of the **National Equity Strategy,** which includes the following main lines of work: monitoring equity and social determinants of health, advancing health and equity in all policies, integrating equity in strategies, programmes and activities and actions aimed at improving equity in the early years of life. Furthermore, in 2013 the **Strategy for Health Promotion and Prevention** in the National Health System was approved, with a focus on equity and social determinants of health, and with actions in the health, educational and local environments, favouring environments that promote health.

In turn, in line with European policies and strategies aimed at the commitment to people in situations of poverty or social exclusion, the MSAN, together with the then Ministry of the Presidency, Relations with the Courts and Equality, presented the **National Strategy for the Prevention and Fight against Poverty and Social Exclusion 2019-2023**[11], which examines the health inequalities of the most disadvantaged groups and the health actions to be carried out. In this regard, there is also the **National Energy Poverty Strategy 2019-2024.** In addition, the Just Transition Strategy has been developed as part of the Strategic Energy and Climate Framework, which aims to optimise the outcomes of the ecological transition for employment, to ensure that the opportunities of this transition are maximised and that no one is left behind[12].

There are therefore different axes of inequality to take into account when analysing indicators and planning interventions, from a perspective that includes socio-economic position, income, territory, age, gender, etc. It is also important to pay greater attention to groups with greater vulnerability, such as children, the elderly or those with associated co-morbidities.

Another aspect considered a priority, both in this Strategic Plan and in European initiatives, is the **communication and dissemination of information to the population.** In this respect, socio-economic differences in a population affect the education and information they receive, which in turn affects their health. Therefore, one of the main functions of health systems must

be to **provide information to the whole population** about potential adverse health effects, and to empower and equip them with the skills and tools to deal with them. Legislation, particularly in the field of public health, provides that the public has the right to be informed by the competent authorities about possible factors that may affect their health. For example, knowledge of exposure levels, preventive measures and general actions against the various environmental factors that may have an impact on health will be essential in order to reduce the number of people who may be affected. This is of the utmost importance, considering that all adverse health effects caused by environmental factors generate economic costs. In this regard, all resources employed to raise awareness and sensitise the population, especially in socially and economically disadvantaged sectors, will aim to reduce the morbidity and mortality rates associated with these environmental factors. This investment in education should also be extended to health professionals, and not only to the general public.

This Strategic Plan presents multiple objectives and lines of action related to the mitigation of health effects caused by various environmental risks and are aimed at improving the quality and health care received by the population. Environmental conditions and vulnerability to them are unevenly distributed across the population. Therefore, measures are needed to reduce health inequalities and protect the population's health.

3.4. ECONOMIC ASSESSMENT OF THE IMPACT OF THE ENVIRONMENT ON HEALTH

Environmental factors have various adverse effects on the population's health. Such damage also entails economic costs that have a significant impact on society.

Health economic assessment is an information tool that aims to guide and assist decision-makers in making decisions so that resources for the prevention of environmental health impacts are allocated as efficiently as possible. There are different types of economic analyses that try to quantify the economic cost derived from the impact of environmental factors on health, such as studies that economically quantify the burden of disease, which attribute a monetary value to each effect, direct or indirect, produced by the risk factor; or Cost-Effectiveness Analyses (CEA), which try to estimate the relationship between the costs of a given intervention and the benefits it brings.

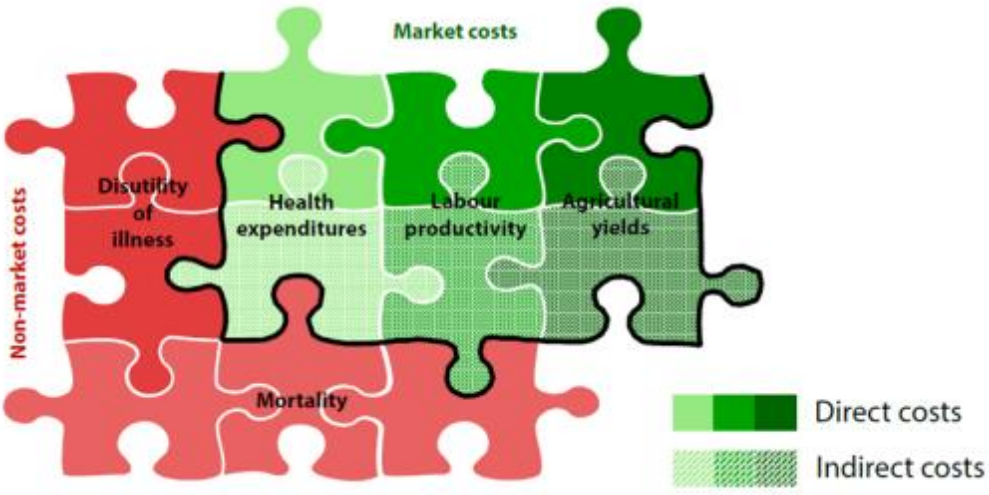

Figure 10. Description of direct and indirect costs caused by air pollution[13].

There are numerous studies that estimate the economic consequences of different environmental factors. One example is the 2016 OECD report on the economic consequences of air pollution and its variation with regard to environmental policies. It shows the current and estimated future status, in the absence of efficient policies, of the direct costs (labour productivity, health expenditure and agricultural output) and indirect costs (production, international and banking trade and price changes) of air pollution. These costs could increase from 0.3% GDP on average in each OECD country today to 1% in 2060, significantly increasing the weight of indirect costs, as opposed to direct costs[13] (Figure 11).

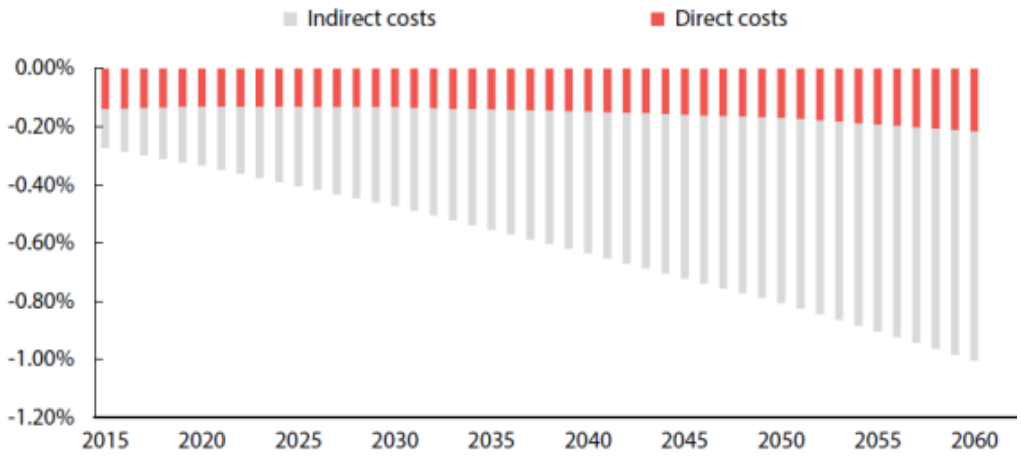

Figure 11. Direct and indirect costs of air pollution on the GDP of an OECD country[13].

Another similar study assesses the economic consequences of climate change, suggesting that the absence of measures to address climate change could have a negative effect on global GDP of between 1 and 3.3% by 2060. The magnitude of these impacts will depend on the magnitude of the climate change scenario in which we find ourselves and, in part, on the capacity to adapt to it by changing production technologies, consumption patterns or international trade patterns. Figure 12 depicts health as one of the main contributors to reduced economic growth due to climate change, estimating that by 2060 the impact on health will be responsible for a loss of 0.9% GDP[14].

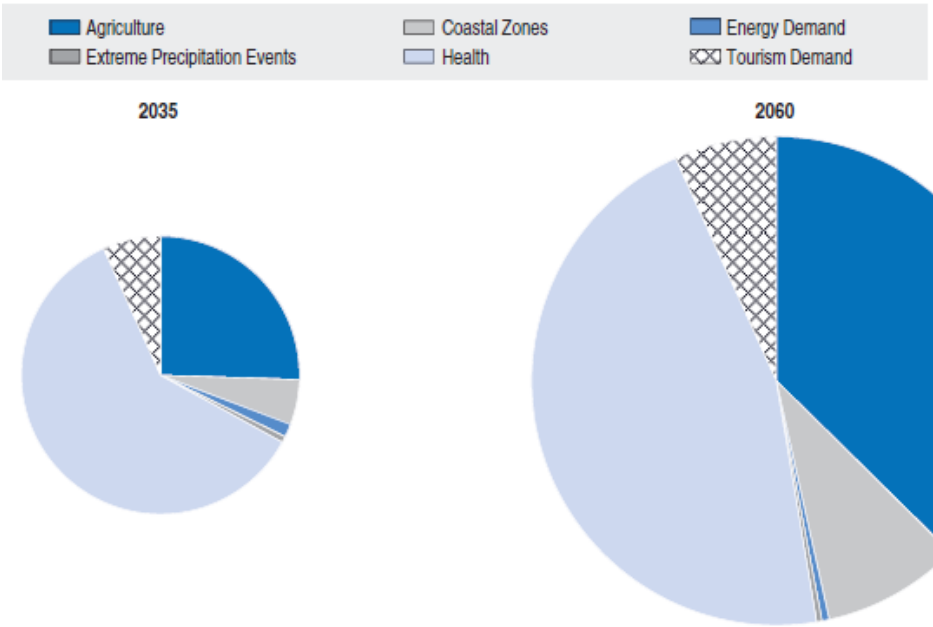

Figure 12. Attribution of selected climate change impacts. Percentage change in GDP[14].

On the other hand, as already mentioned, Cost-Effectiveness Analysis studies take into account both the costs of implementing a given policy and the benefits it brings; this enables

prioritisation between different interventions. Among the most commonly used and recommended measures of effectiveness in economic evaluations are Quality Adjusted Life Years (QALYs) and Disability Adjusted Life Years (DALYs). QALYs are a health measurement that combines information on life expectancy and quality of life of individuals in a generic way, allowing comparison of the costs and benefits of different health interventions. On the other hand, DALYs are an indicator that combines Years of Life Lost (YLL) and Years Lived with Disability (YLD), used to calculate the total burden of disease including mortality and morbidity. The analysis is similar regardless of whether QALYs or DALYs are used, the main difference being the result obtained, obtaining in the first case the cost per QALY gained and in the second case the cost per DALY averted.

An example of this type of analysis can be found in the RADPAR[15] (Radon Prevention and Remediation), Euro-Project, which aimed to contribute to the reduction of the public health burden of lung cancers caused by residential radon exposure in EU Member States. The results suggest that prevention measures are cost-effective even in areas in which radon levels are not high. For mitigation measures, the results were less clear and the cost-effectiveness was highly dependent on the radon levels in the dwelling.

Another methodology commonly used in health economic evaluation to assess mortality is the Value of Statistical Life (VSL) and the Value of a Life Year (VOLY). Value of Statistical Life refers to the value, in monetary units, that society places on preventing one of its members from dying, while the Value of a Life Year refers to the loss of life expectancy, expressed as years of life lost. Such methodologies are often used in policy settings where the benefit is to prevent deaths from a particular cause.

The European Environment Agency (EEA) has published the first estimate of the costs of air pollution caused by European industrial installations. This report used a simplified estimation model to assess the costs to health and the environment in 2009 caused by the emission of pollutants from industrial facilities based on the Value of Statistical Life and the Value of a Life Year. The results estimated that these emissions accounted for at least 102-169 million euros in 2009 in Europe[16].

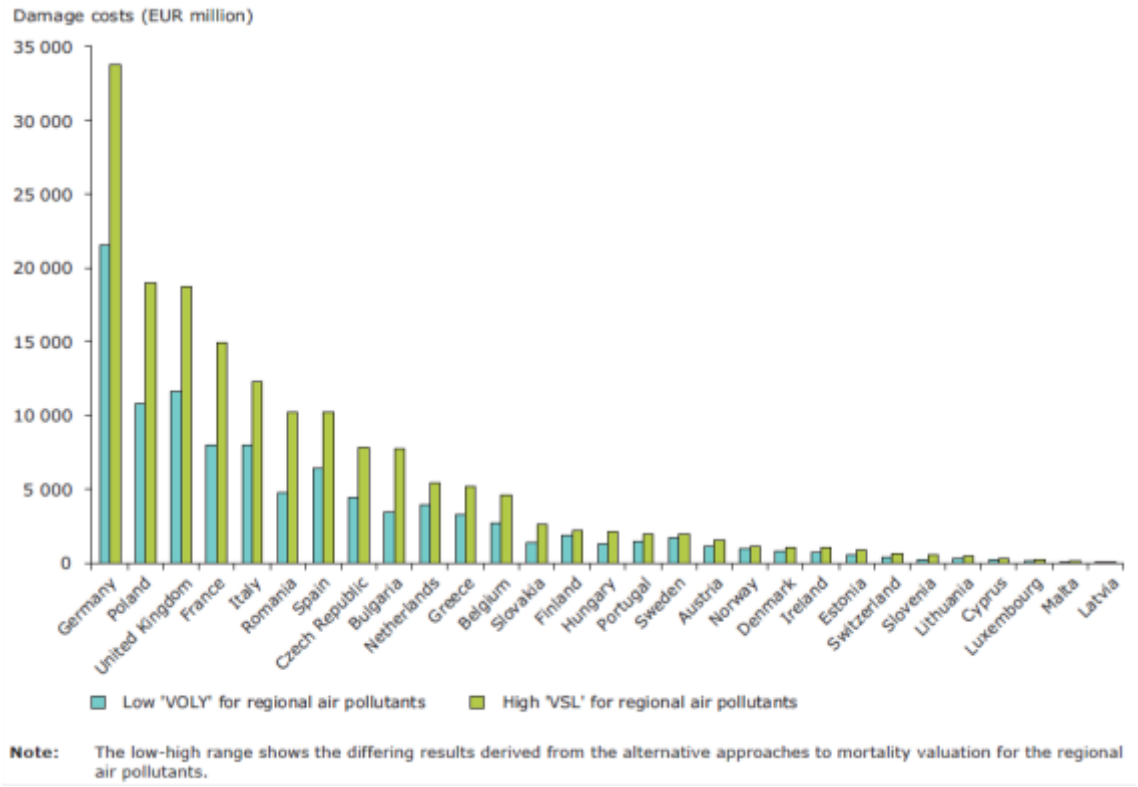

Figure 13. Aggregate cost of damage per country, including CO_2[13].

A subsequent update of this report estimated that the aggregate cost of damage caused by emissions from European industrial installations was at least 329 billion euros in the period 2008-2012.

Pollutant group	Aggregated damage cost (billion EUR_{2005})				
	2008	2009	2010	2011	2012
Main air pollutants (NH_3, NO_x, PM_{10}, SO_2, NMVOCs)	58–168	47–136	44–129	43–124	40–115
CO_2	20–82	18–73	19–76	18–74	18–73
Heavy metals (As, Cd, Cr, Hg, Ni, Pb)	0.53	0.34	0.43	0.34	0.34
Organic pollutants (benzene, dioxins and furans, PAHs)	0.22	0.11	0.17	0.22	0.10
Sum	**79–251**	**65–209**	**64–206**	**62–199**	**59–189**

Figure 14. Estimated aggregate cost of damage by pollutant group, 2008-2012 (2005 prices)[14].

The methodologies described attempt to economically value the adverse effects of environmental factors on the population's health. These analyses are intended to guide decision-makers, but the uncertainties and limitations they present should be borne in mind, and the results obtained should be interpreted and reported with caution, and cannot be the sole basis for decision-making. In any case, beyond the relevant ethical considerations, the economic and social impact of environmental health risk factors is well known and evident.

4. SITUATION IN SPAIN

The environmental factors explained above have been shown to be strongly linked to the population's health. Consequently, surveillance studies are being carried out on some of them in order to determine their situation in Spain. In addition to their study and monitoring, some of them have specific plans that present specific measures to reverse the unfavourable situation and improve the environmental situation. One effect of implementing these plans and projects is to improve the Spanish population's health by minimising the risk and impact of these factors on citizens. However, there is currently no unified document that takes into account all these factors that have been analysed separately and can approach the measures to be developed from a holistic view of the relationship between environment and health.

Partially, there is a tool for the environmental assessment of plans, programmes and projects that analyses a wide range of environmental factors with an impact on human health. In this case, it would be useful to create an instrument to merge these parts into a **Health Impact Assessment** (HIA) instrument that specifically considers health impacts in addition to environmental impacts. In Spain, the HIA is included in Article 35 of Law 33/2011, of 4th October, General Law on Public Health. However, the administrative procedures and the methodological framework to be followed are not specified in the law, so some Autonomous Regions have taken the initiative in developing their own methods. For example, Barcelona's Provincial Council is developing, in collaboration with ISGlobal, a tool for the evaluation of the health impact of actions carried out in public spaces, which can serve as a guide[17].

As mentioned above, this is a procedure similar to that of the Environmental Impact Assessment (EIA). This process, regulated in Spain by Law 21/2013, of 9th December, on environmental assessment, has clear procedures and specific methodologies to quantify and control the effects that certain interventions (plans, programmes and projects) have on the environment. This is why many EU countries have chosen to develop SIA as an integrated part of EIA, respecting equity issues, in what has been defined as an Environmental, Health and Social Impact Assessment. In this regard, some Autonomous Regions, such as Andalusia, already have extensive experience in health impact assessment integrated in Environmental Impact Assessments.

Climate change causes the alteration of numerous factors in the environment, which in turn have a major impact on human health. As the problem is so relevant and wide-ranging, it is being tackled in different ways. Currently, the **various indicators** related to this factor (heat-related mortality, cases of tropical diseases, extreme weather events, etc.) are being **monitored** by MSAN to see how it is developing in Spain[18]. In this regard, the **Health and Climate Change Observatory** (OSCC) was created as an instrument to analyse, diagnose, evaluate and monitor the effects of climate change on public health and the National Health System. From a more general point of view, in 2006 the **Spanish Office for Climate Change** (OECC) developed the **National Plan for Adaptation to Climate Change** (PNACC) which constitutes the basic

planning instrument to promote coordinated and coherent action against the effects of climate change in Spain and incorporates health as one of its areas of work, and in 2020 the new PNACC for the period 2021-2030 was approved. From the perspective of mitigating or reducing greenhouse gas emissions, the ultimate cause of climate change, the Ministry of Transport, Mobility and Urban Agenda is developing the **Strategy for energy rehabilitation in the building sector in Spain**, which pays special attention to the state of thermal comfort of housing and to cases of energy poverty, both aspects linked to the salubrity of dwellings and the living conditions of those who inhabit them; and the MITERD the **National Integrated Energy and Climate Plan** (PNIEC). This plan defines targets for greenhouse gas emission reductions, renewable energy penetration and energy efficiency in order to determine the most appropriate courses of action. The PNIEC details the co-benefits on health, estimating the reduction of premature deaths due to air pollution compared to a scenario without implementation of measures. In the regulatory sphere, the importance of this factor is such that a **Climate Change and Energy Transition Law** has been prepared to legislate on these measures to ensure compliance with the objectives of the Paris Agreement[19], and to facilitate the full decarbonisation of the Spanish economy and adaptation to the inevitable impacts of climate change, so as to guarantee the rational and supportive use of our resources, and the implementation of a sustainable and resilient development model.

One of the main easily observable effects of climate change is the **extreme temperatures** that are being reached in latitudes where they were previously uncommon. This is a particularly significant indicator of the advancing environmental factor that has, in itself, a major impact on the population's health. With regard to heat, an estimated 1,300 deaths are attributable to excessively high temperatures in Spain each year, making it one of the environmental factors with the greatest impact on health. Furthermore, it has been shown to influence the exacerbation of cardiovascular, respiratory and neurological diseases, premature births, etc. Although the previous mitigation measures aimed at combating climate change will consequently be useful to reduce the increase in the frequency and intensity of extreme temperatures that would occur in the worst possible climate change scenarios, in Spain there are already specific preventive actions in place for the unavoidable impacts that are already becoming apparent. Beyond climate change, local changes in climate due to urbanisation, heat islands, lack of vegetation, canalisation of watercourses and bodies of water also affect temperatures. The main measure is the implementation, since 2004 by the MSAN, of the **National Plan for preventive actions against the effects of Excessive Temperatures on Health,** which is activated every summer between June and September. This Plan enables specific alerts to be issued for each area of the territory and the measures associated with each alert to be communicated, as well as the deaths directly related to heat stress reported by the Autonomous Regions. Figure 15 shows that since its implementation there has been a significant reduction in heat stroke deaths and that the current situation has improved considerably[20]. However, there are not as many measures in place to deal with extremely low temperatures, although it is estimated that in Spain this factor is responsible for more than 1,050 deaths per year. It is therefore convenient to consider both extremes as relevant factors, as the impact on the Spanish population's health is practically comparable.

In Spain, atmospheric **air quality** has been shown to have a strong impact on the population. Several studies have been carried out in Spain which estimate that air pollutants are responsible for around 31,000 deaths per year[21-23]. In addition, it has also been shown to be implicated in a wide range of adverse effects on the body, such as serious respiratory and

cardiovascular diseases[21-27]. This effect not only occurs in directly exposed individuals, but foetuses are also affected and it is estimated that 17% of premature births are due to this environmental factor[28]. The latest data published on the Spanish situation in a wide-ranging study in which the Barcelona Institute for Global Health (ISGlobal) is participating show Spain's major problem with atmospheric pollution, especially NO_2, a gas mainly associated with road traffic. In this regard, Madrid is the European city with the highest mortality rate due to this pollutant, accounting for up to 7% of natural deaths, and Barcelona is in sixth position with 6% of such deaths[29].

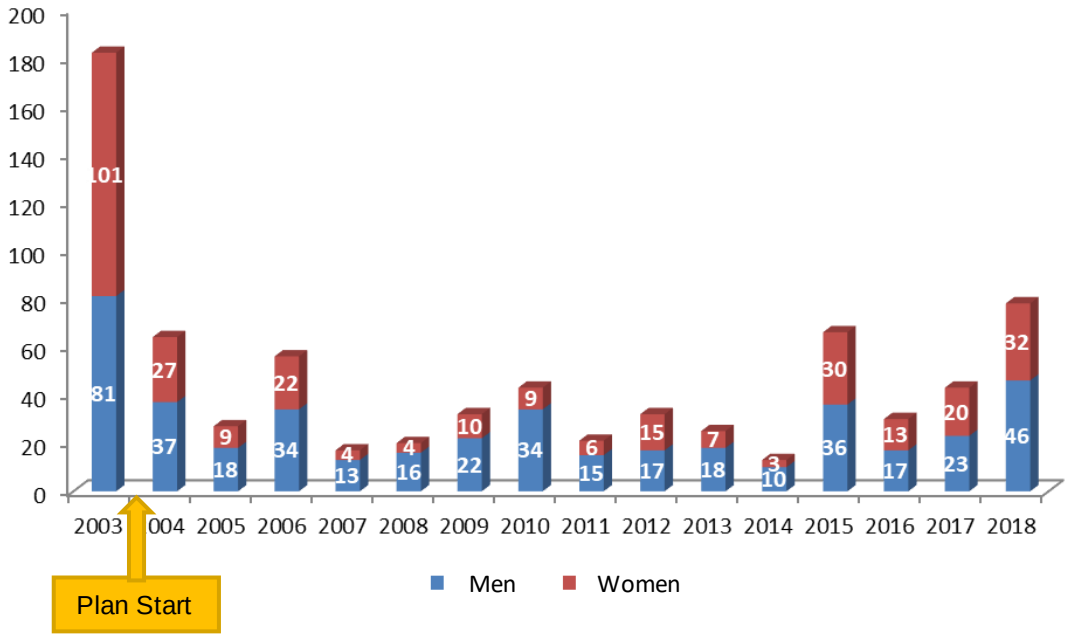

Figure 15. Mortality from exposure to excessive natural heat separated by gender between 2003 and 2018[20].

In this context, the Sub-Directorate General for Clean Air Quality and Industrial Sustainability of the Ministry for Ecological Transition and the Demographic Challenge (MITERD) carries out the assessment of air quality based on the data sent periodically by the autonomous communities and cities and certain local entities. This monitoring is reflected annually in the "Assessment of air quality in Spain" report.[30]. On the other hand, two **National Air Quality Plans** have been approved which, in addition to this assessment, include measures to be carried out by the different related bodies to improve the situation. The first Air Plan started in 2013, while the latest (Air Plan II) covers the period 2017-2019[31]. This Plan includes several health-related measures on which the MSAN is working and which aim to gain a deeper understanding of the impact of air quality on human health in order to reduce risk exposure to high pollution through recommendations on habits and activities.

These and other measures taken in Spain related to air quality have shown the relevance of the factor and the benefit for public health and the country's economy if its situation is improved. Illnesses resulting from exposure to poor air quality induce and aggravate numerous diseases that reduce a person's years of life and days of normal activity. This, together with the treatment of such waste, results in high health costs due to the environmental impact. It is estimated that in 2018 the savings derived from the improvement of air quality in Spain exceeded 5 million

euros, two of which corresponded to health factors[32]. However, the cost of poor air quality continues to be high. For example, in 2014 this cost amounted to approximately 38 billion euros, or 3.5% of Spanish GDP[13-14].

The central government and the various Autonomous Regions and Cities (CCAA) are developing their own additional plans to combat air pollution. The MITERD has approved the **National Air Pollution Control Programme** (PNCCA) for the period 2019-2022, which is derived from Royal Decree 818/2018, of 6th July, on measures for the reduction of national emissions of certain atmospheric pollutants and which aims to comply with the values established for Spain in Directive (EU) 2016/2284 or the Ceilings Directive. In the case of the Autonomous Regions, practically all of them have an air quality plan in which the situation of the territory or part of it is evaluated and, in some cases, specific measures are established to improve it for some specific pollutants.

Water quality is an environmental factor that has been strictly controlled for many years in Spain. Due to this monitoring and the measures taken, episodes of poor water quality affecting the population's health are now infrequent. Many of these measures are based on the application of chemicals, which are key elements to obtain a high level of water quality. In this field, there are several MSAN tools that monitor the quality of drinking water (National Drinking Water Information System, SINAC), bathing water (National Bathing Water Information System, NÁYADE) and swimming pools (Swimming Pool Information System, SILOÉ). They show that, for example, in 2020, only 65,133 (0.5% of the total) drinking water tests showed that the water was unfit for human consumption[33]. In addition, the National Epidemiological Surveillance Network (RENAVE) carries out health surveillance of all outbreaks and cases of diseases caused by poor water quality.

With regard to bathing waters, Table 1 shows the classification made in 2020. Although these poor quality figures continue to be observed, they are relatively low and the important thing is that they are effectively detected and action can be taken. However, this environmental factor continues to have a significant impact on public health. This is evidenced by the number of outbreaks of waterborne diseases that have been observed in Spain. For example, there were 42 cases of cryptosporidiosis in 2019 and 5 cases of cholera in 2017.

Table 1. Figures for final bathing water quality classifications in 2020[34].

Classification	Seawaters	Inland waters
Excellent	1,840 (93.4%)	141 (52.2%)
Good	93 (4.7%)	60 (22.2%)
Sufficient	22 (1.1%)	17 (6.3%)
Insufficient	4 (0.2%)	14 (5.2%)
Unclassified	10 (0.5%)	38 (14.1%)

River basin management plans are the planning instruments that provide an integrated vision of water management, combining the aspects of environmental protection and recovery with those of use and development of water resources, taking into account the risks to human health. They are guided by the criteria of environmental, economic and social sustainability in water use through integrated management and long-term protection of water resources, setting objectives aimed at preventing deterioration of water status, protecting and improving the aquatic

environment and ecosystems, reducing pollution and preventing the effects of floods and droughts. River basin management plans are coordinated with different sectoral planning in order to harmonise the needs of the different sectors that have an impact on water, such as land use, energy policy, irrigation and other agricultural uses.

In addition, the Ministry for Ecological Transition and the Demographic Challenge is preparing a **National Plan for Purification, Sanitation, Efficiency, Saving and Reuse** (DSEAR) with the aim of prioritising and studying the viability of measures and actions in purification and sanitation included in the current water plans (2016-2021), as well as the proposal of other additional measures that allow a greater boost to sanitation, purification and promotion of reuse nationwide within a framework of efficiency and energy saving. According to the figures of the DSEAR Plan, the investment programmed in the basin hydrological plans as a whole for sanitation and purification is nearly 10.4 billion euros until 2033. The development of the DSEAR Plan is being carried out in parallel with the preparation of the next hydrological planning cycle (2022-2027). In this way, environmental improvements in water quality will lead to the maintenance, or even reduction, of the health risk posed by poor water quality.

Another indicator of climate change that has become an environmental health risk factor is **vector-borne diseases**. As previously discussed, both water quality and climate change are involved in this factor and improving both will also benefit the water situation. Globalisation has greatly increased their mobility and climate change has allowed vectors, such as mosquitoes and ticks, which previously could not survive and operate in the conditions found in Spain, to now do so. The most relevant of these is the tiger mosquito (*Aedes albopictus*) of which specimens have been found in numerous municipalities throughout Spain. This has meant that diseases that were endemic in other parts of the world are now found in Spain. This is compounded by the introduction of exotic pets, which can act as reservoirs for diseases and expose them to vectors present in the area. To control their spread throughout the country, MSAN conducts **entomological surveillance** for the detection at the municipal level of the main vectors and the potential diseases they may carry[35]. This was summarised in the **National Vector-Borne Disease Preparedness and Response Plan,** which aims to reduce the risk and minimise the overall impact of emerging vector-borne diseases[36]. In addition, several Autonomous Regions have or are developing their own action plans to ensure proper surveillance and rapid action in the event of cases of these diseases. With regard to disease notification, the Autonomous Regions notify the cases and confirmations that the ISCIII collects through the **National Epidemiological Surveillance Network** (RENAVE)[37].

Many of the water-related health problems in Spain are due to chemicals that enter the water after flowing through areas where they are present. In turn, these products can be ingested through food or incorporated into the body by other means. In Spain, in 2019, there were a total of 1,146 cases of hospitalisation due to poisoning by chemical products, of which 9 individuals died. Most of these cases occur in children between 2 and 6 years of age and in adults between 30 and 44 years of age, with most poisonings occurring in the domestic and work environments[38]. In these cases, the most relevant action taken in the country to ensure the least impact on health is the correct **management of products and chemical substances**. This action focuses on a rigorous registration of these compounds, following an assessment of their potential impact and risk on the population's health that may be exposed to them, as well as the environmental impact that the compounds they contain may have. This registration mainly concerns plant protection products, biocides and industrial chemicals. Likewise, this registration and management has led occupational bodies such as the INSST to develop different **Health**

and Safety Notes to protect workers who are in contact with these chemical products, thus reducing the increased risk caused by these compounds on the population's Health. It is not possible to market chemical products that are outside this regulatory framework, which guarantees extended producer responsibility. In the case of biocidal products, this marketing is subject to an authorisation issued by the Ministry of Health.

One group of products and chemicals that stand out due to their impact on health are **endocrine disruptors**. These disrupt the body's hormonal balance and homeostasis which influences the onset of diseases. Epidemiological evidence of endocrine disruption by endocrine disruptors links them to pathologies including obesity and diabetes, male and female reproduction, hormone-sensitive cancers, prostate cancer, thyroid disruption, and neurodevelopmental and neuroendocrine systems[39]. There are organs and diseases that are more sensitive to this imbalance; as in the case of breast cancer which, in Spain, has increased notably and 59,805 cases have been detected in 2019. This increase is partly due to the fact that these compounds are artificially synthesised and their widespread use began in the second half of the 20th century. Research into the effects of these disruptors is highly complex, knowledge of them has advanced in recent years and more convincing scientific studies are being published. Currently, the measures that regulate the control of these compounds are those that apply to the management of chemical products. However, European legislation and a specific Community strategy are being developed and studies are being carried out to prevent their effects.

In the case of **industrial pollution**, the measures being taken to monitor and control it are currently partially covered by other related environmental risk factors. In this sense, as mentioned above, both chemical agents released into the air, water or soil, as well as noise and vibrations emitted by industrial activities are clear examples of this type of pollution. It is difficult to attribute specific deaths and illnesses to industrial pollution, as its effect is combined with other environmental factors and the effects are often confused. Even so, their impact on public health is undeniable and the link between numerous diseases (cancer, respiratory and allergic problems, congenital malformations and complications in pregnancy, cardiovascular problems, etc.) and the distance of the dwelling from polluting industries has been proven. Their emissions therefore need to be controlled by means of appropriate legislation and an effective inspection system. Although most groups of pollutants have their own regulations, there is **Royal Legislative Decree 1/2016**, of 16th December, which approves the consolidated text of the Integrated Pollution Prevention and Control Law. This law aims to "*prevent or, where this is not possible, reduce and control air, water and soil pollution by establishing a system of integrated pollution prevention and control, in order to achieve a high level of overall environmental protection*." The **State Register of Emissions and Pollutant Sources** was created to monitor this, which collects information on emissions of certain pollutants into the air, water and soil, accidental emissions, diffuse sources and transfers of waste out of industrial complexes.

As highlighted in the previous section, **natural radioactivity** is an invisible environmental factor that can affect the organism in different ways. In this area, the Nuclear Safety Council (CSN) carries out exhaustive monitoring of the levels of radioactivity observed in the different areas of Spain, but the quantification of its impact on the population's health is very complicated. However, it is estimated that the average exposure to natural radioactivity in Spain caused around 5,600 cases of cancer in 2018. With this objective in mind, the MSAN prepared the document "Analysis of the risks derived from the exposure of the population to radioactive substances in drinking water". Radon is the naturally occurring radioactive element with the

greatest impact on human health. For this reason, the **National Radon Plan** is being drawn up. It aims to prevent and control radon exposure in different areas (building materials, exposure of the population, in-depth study, etc.). This area is significantly relevant, as radon contributes half of the radioactivity to which we are naturally exposed. There is scientific evidence that radon is responsible for about 1,500 lung cancer deaths annually in Spain.

The studies conducted in Spain show that the **levels of exposure to Radiofrequency electromagnetic fields (EMF)** of the Spanish population are much lower than those considered unsafe by the ***Recommendation 1999/519/EC*** of the European Union Council of Health Ministers (EU-CMSME), regarding the exposure of the general public to electromagnetic fields (0 Hz to 300 GHz, of 12th July 1999), **Royal Decree 1066/2001, of 28th September**, and the ***International Commission on Non Ionizing Radiation Protection*** (ICNIRP, 1998 y 2010).

The evidence reviewed so far by the WHO, EU, ICNIRP, Agencies, Committees and EMF risk assessment specialists suggests that the average levels of exposure observed in Europe do not cause adverse health effects. The deployment of new 5G telecommunication technologies will not exceed the limits set by current legislation. Specific studies are required to measure exposure levels taking into account the emission characteristics of these technologies.

Environmental **noise** pollution has become a major problem in large cities due to the great impact it has on citizens' health and quality of life. It is estimated that more than 9 million people in Spain endure daily noise levels above 55 dB(A), which is the optimum value accepted by the WHO[40]. More specifically, it is estimated that, in the city of Madrid, between 2003 and 2005, each 1 dB(A) increase in ambient noise caused 468 deaths among people over 65 years of age[41]. In addition to deaths, noise is responsible for the onset and development of cardiovascular, respiratory and metabolic diseases and, above all, discomfort, sleep disturbances and cognitive development[42]. As in the previous case, there are **Health and Safety Notes** that protect the workers who suffer most from this factor and regulations that establish maximum acceptable levels. Even with this legislation, strategic noise maps show that a significant part of the population is exposed to high levels of environmental noise and that it is difficult to reconcile the daily activity of a large city and the noise levels that are recommended for proper health maintenance. Europe has issued recommendations to control noise sources (road traffic, leisure facilities, construction sites, industry, railways, etc.)[43], which must be adapted to the situation in the country and specific measures must be taken along the same lines, as there is ample data to support them in order to solve noise and noise pollution problems.

Poor **indoor air quality (IAQ)** causes numerous diseases: respiratory, infectious, allergic, asthma and even cancer[44]. There are numerous chemical (air quality, tobacco, building materials and furnishings, radon, etc.), physical (noise, lighting, thermal comfort, humidity) and biological (microbes, viruses and allergens)[45] factors that influence the health of building occupants. In addition to the regulations governing some of these factors, the bodies that have focused most on the study of this factor are those related to occupational health, since the workplace is one of the places where an adult individual tends to spend most time, together with the home, with differences due to gender and age. As a result, the then Ministry of Employment and Social Security published an informative document on **Indoor Environmental Quality in Offices**[46] to minimise the impact on employees. The National Institute for Occupational Safety and Hygiene has published numerous **Health and Safety Notes** on various agents aimed at health protection, establishing technical criteria to improve the IAQ. In this respect, it is worth

highlighting a **Health and Safety Notes** for dealing with **Sick Building Syndrome**[47]. However, it should not be forgotten that, due to their widespread distribution, several of these environmental factors can affect the entire population in both outdoor and indoor environments.

On the other hand, mandatory Spanish regulations on indoor air quality in spaces where people are likely to be present on a regular basis also include: the **Technical Building Code,** section HS3 of which applies "in residential buildings, inside dwellings, waste storage rooms, storage rooms, car parks and garages; and in buildings for any other use, to car parks and garages"; the **Spanish Regulation on Thermal Installations in Buildings,** applicable to all other buildings not included in the Technical Building Code; and **Royal Decree 486/1997**, of 14th April, establishing the minimum occupational health and safety provisions, which establishes the effective ventilation that must be provided in workplaces for each employee. On the other hand, ambient noise inside buildings is also worth considering, as the urban population spends around 80-90% of its time inside buildings. The WHO's LARES (**Large Analysis and Review of European Housing and Health Status**) study[40] describes indoor ambient noise due to neighbourhood activity as the second most common source of noise affecting citizens after traffic, behind aircraft and activity noise. The Basic Document on **DB HR Noise Protection**, of the Technical Code, is the state regulation that establishes the acoustic conditions inside buildings. This document was approved in 2009 and represents a major step towards improving the acoustic quality inside buildings, however, most of the building stock has acoustic conditions below the current standards. It is estimated that only 2% of the housing stock was built afterwards, so only those would meet the current acoustic requirements.

The various environmental factors listed above are of great importance in their own right and must be monitored, but their control is a prerequisite for improving the quality of human life and preserving the environment. They can therefore be included in a joint, integrated assessment of the **quality of habitat and green cities** that directly embody these objectives. Urban design and planning have a fundamental role to play in the quality of life in our cities. A compact city, with a mix of uses, proximity, open spaces and connected to nature is a city better positioned to face the demographic (mainly linked to the ageing population) and climatic challenges of the near future. So much so that uncontrolled development of people's homes can lead to the alteration of various environmental factors that end up affecting their health. In this sense, the need to increase and restore the functionality and connectivity of urban and peri-urban natural landscapes is a priority of the **State Strategy for Green Infrastructure and Ecological Connectivity and Restoration**, developed under Law 42/2007, of 13th December, on Natural Heritage and Biodiversity. Coherent planning of green infrastructure and its proper management, promoting green spaces and their connectivity, renaturalising watercourses as they pass through the city or considering the needs for interconnection of habitats in the urban environment, also contributes to a healthier life for its inhabitants.

Green cities are also playing a major role as a solution to promote sustainable development of cities that ensure a high quality of life for their population. In this field, in 2005, the Ministry of the Environment promoted the **Network of Sustainable Local Development Networks** through which 18 provincial and regional networks aimed to promote a concept of a compact, complex, efficient and socially cohesive city, while considering the appropriate balance between urban and rural environments. One year later, the members of this network created the **Urban Environment Strategy (EMAU)** with the aim of adapting the European Thematic Strategy on Urban Environment to the Spanish reality and modifying the current model of competition between territories based on the consumption of resources for another, based on the efficient

use of resources, information and knowledge. In 2009, through these platforms, the Spanish **Strategy for Urban and Local Sustainability** (EESUL) was drafted to broaden the scope of application with a reference document valid for all Spanish municipalities and to facilitate the development of more sustainable local policies. Other similar information documents, published by competent environmental bodies, are the **Green Paper on Urban and Local Sustainability in the Information Age** and the **ECOURBANO Knowledge Portal**.

It was not until 2019, with the approval of the **Spanish Urban Agenda**, when, based on accumulated experience, but with an updated vision and in accordance with the international commitments acquired in the framework of the International Urban Agendas, a new impulse was given to sustainable development from an integrated vision of towns and cities, which takes into account not only environmental factors, but also social and economic factors, as well as, transversally, the effects of all of them on the health of those who live in them. The Spanish Urban Agenda also highlights the essential nature that the environment has on health and recognises the need for decision-making that has an impact on the design, planning and way of life of towns and cities to have, a priori, a global vision that takes into account all the elements that in one way or another may affect the physical, mental and social wellbeing of those who live there: population age, nearby cities, environmentally healthy, sustainable and accessible transport, cities that are well related to their territorial context and integrated with nature, etc.

Human **biomonitoring** is a key element in understanding the health status of the population with regard to the aforementioned environmental factors and taking measures to improve it. With this monitoring system you can determine the degree of exposure of the population to environmental pollutants. Human biomonitoring makes it possible to study temporal and geographical trends in population exposure, identify and eliminate potential sources of exposure, study the cause-effect relationship between pollutants and health, identify the most vulnerable population groups, set priorities in environmental and health research, and test the effectiveness of policies adopted to reduce or eliminate population exposure to environmental pollutants[48]. In this field, the main initiatives have been taken by the competent European bodies, the European Environment Agency and the European Commission. These organisations have developed the **HBM4EU** project (2017-2021) with the collaboration of 28 countries, including Spain, which aims to generate a joint and standardised database that allows a meaningful comparison of the exposure of different areas to environmental pollution. In addition, the most useful indicators for this purpose can be identified and environmental pollutants can be linked to specific adverse effects on the organism. In Spain, several biomonitoring studies have been carried out as part of the DEMOCOPHES (mother-child studies) or BEA (adolescent sampling) projects. However, this work has been carried out by autonomous bodies and is highly targeted at one environmental factor and population group. It is therefore important to create a national biomonitoring strategy that will allow us to determine the current state of the impact of environmental factors on human health and the evolution of this impact after implementing corrective measures.

As can be seen from this Strategic Plan, MITERD and MSAN are working closely together on environmental issues and their impact on health. Therefore, a wide variety of the Plans and works carried out by MITERD are directly related to the environmental factors included in the Plan. All of them can be easily consulted on the Ministry's website:
https://www.miteco.gob.es/es/ministerio/planes-estrategias/planes-y-estrategias-por-area-de-actividad/

5. OBJECTIVES OF THE STRATEGIC PLAN

The mission and overall objective of the Strategic Health and Environment Plan (PESMA) is to reduce the risks to the population's health arising from environmental factors and their determinants; decreasing the burden of diseases caused by them, identifying new threats and facilitating the development of environmental health policies.

In order to achieve this objective, the following strategic objectives have been established:

I. Advance in the compliance and effective application of Law 33/2011 on Public Health in the field of environmental health; especially in the following areas: knowledge of risks, assessment, management and communication of environmental risks, surveillance in environmental health and health in all policies.

II. Identify and assess new and emerging environmental, climate and health risks and issues that may pose a risk to health.

III. To protect the population's health and reduce morbidity and mortality attributable to the effects of environmental determinants and factors.

IV. Implement effective and efficient lines of action based on the best scientific evidence, equity and efficiency to reduce or eliminate the negative impact of environmental factors on public health and carry out a situational diagnosis on health and environment.

V. Review existing assessment procedures and methodologies and develop a Health Impact Assessment protocol to ensure proper assessment and management of factors that may imply a health risk in future interventions.

VI. Plan the exercise of the State Administration's powers in environmental health in order to improve coordination with the Autonomous Regions, local entities, scientific societies and civil society in environmental health.

VII. Develop the most effective measures to prevent, adapt to and control the effects of climate change on human health.

VIII. Organise environmental health information and monitoring systems that provide better scientific knowledge of the impact of environmental factors. The information obtained should facilitate more effective measures to reduce or eliminate exposure to environmental risk factors and promote healthier and more sustainable lifestyles.

IX. Fulfil the commitments, responsibilities and competences of the State Administration to achieve the objectives outlined in EU legislation on health and environment; the Ostrava Declaration; the 2030 Agenda for Sustainable Development Goals; the Paris Agreement

on Climate Change; the WHO Global Strategy on Health, Environment and Climate Change; the "One Health" approach; the Seventh Environmental Action Programme, the EU Zero Pollution Action Plan, the European Green Deal and the post-2020 Global Biodiversity Framework.

X. Promote research, training and risk communication on adverse health effects of environmental factors.

XI. Promote the "Health in all policies" approach in other key sectors that have an impact on health: energy, housing, labour, agriculture, industry, climate change, food, transport and urban planning.

XII. Create healthier, health-promoting environments and enhance the identification, promotion and reinforcement of environmental health assets, such as highlighting the role of biodiversity conservation and restoration as an element of health impact prevention.

5.1. CROSS-CUTTING AND INSPIRATIONAL AXES

The Strategic Health and Environment Plan is a dynamic and flexible strategic planning instrument, designed to be implemented on an ongoing basis and will be subject to regular evaluation. One of the strategic objectives of this Strategic Plan is to be a technical reference for the Autonomous Regions, local authorities, companies and civil society in the promotion and application of health and environmental protection measures. The Plan will be in force until 2026 and has been submitted for approval to the Environmental Health Committee and the Public Health Commission of the Interterritorial Council of the National Health System.

This Strategic Plan also aims to provide a long-term, science-based, globalising approach, using all the knowledge from the wide range of networks of environmental and health experts and including scientific associations. It also aims to protect the most vulnerable population from environmental risks and to raise public awareness of the health problems that can be caused by environmental degradation. By doing so, the aim is to compile and integrate the interdisciplinary knowledge required for such a broad and varied project, taking into account all the areas in which it has an impact.

In order to make this comprehensive approach effective, the Plan encompasses various cross-cutting areas that will allow for an integrated approach, the coordination of intersectoral actions and the development of interventions aimed at benefiting and protecting health. The cross-cutting themes considered in the Plan include those mentioned below:

1. **Equity**

The WHO demands that "Interventions on the social determinants of health and health equity must be supported by an empowered public sector, based on the principles of justice, participation and intersectoral collaboration. Interventions address the following aspects: coherence of government policies; strengthening measures to promote equity and financing; and measurement, evaluation and training."

In this sense, the Plan considers that strengthening measures to promote social equity should be a transversal axis on which all the proposed actions should be based and taken into account when they are developed. The social determinants of health are the circumstances in which people are born, grow up, live, work and age, including the health system. These determinants are the social and economic conditions that influence individual and collective differences in health status. There is abundant scientific evidence indicating the relationship between social determinants and public health.

Public policies, forms of governance and government actions on health can have a major impact on reducing health, socio-economic and gender inequalities, as well as paying special attention to the most vulnerable groups, such as the elderly and children.

2. Gender focus

Gender equality is a fundamental human right, and is one of the United Nations Sustainable Development Goals, which aims to "achieve gender equality and empower all women and girls". Gender mainstreaming is essential in health. Including a gender perspective when studying health implies attention to health in both male and female, taking into account both the different biological characteristics by gender, as well as social gender factors.

Gender mainstreaming in health involves taking into account the different requirements of females and males at all stages of policy and programme development. In this sense, addressing gender perspectives includes ensuring that everyone is guaranteed equal access to resources, that public policies take into account existing inequalities, including gender-related determinants of health, and that outcomes are evaluated taking into account such inequalities, with the aim of correcting them. In addition, progress is being made in studying the effects of environmental toxins on human health, which have different effects at different times of development and with different intensity and duration depending on variables such as gender.

Based on the foregoing, the gender perspective in health is considered to be an essential cross-cutting issue. The Plan incorporates the gender perspective through the implementation of specific actions focused on women, based on those factors in which there is evidence of inequalities, especially in the health sector. Thus, gender mainstreaming in public health improves the efficiency, coverage and equity of the Plan. The annual compliance review and indicators will be disaggregated wherever possible.

3. Transparency and accountability

Nowadays, transparency and accountability are basic components of the systems, as they allow the reporting and justification of the results obtained, based on the principles of efficiency, effectiveness and legality. In order to comply with these principles, the Plan develops a section on monitoring and evaluation, which indicates the review and updating of activities, deadlines, financing, among other aspects.

In addition, the development of this transversal axis is complemented by an annual balance of compliance with the annual report of indicators, which will be used to monitor and evaluate the Plan, as well as to improve it. Thus, in addition to the management indicators inherent to a Plan such as this one and those specific to the thematic area, there are those that consider the progress of each of the points into which the area's actions are divided. In this way, the aim is to structure these evaluation reports in a very comprehensive way so that the Plan is transparent and easily traceable.

4. Sustainability

Plans and projects that include health and environment must be developed within a framework of sustainability, through their actions and decision-making, especially considering the climate context and the current environmental and health crises. These strategies must be characterised by being clean, healthy, green and safe, as well as complying with the rational use of resources, encouraging collaboration and cooperation between the various sectors, with the health system being one of the most important, as established in the Ostrava Declaration, which identifies building the environmental sustainability of health systems and reducing their environmental impact as one of the key areas.

The Plan considers sustainability as a transversal axis in its objectives and actions, which allow for a balanced development, respectful of the environment and based on social welfare. In particular, the Plan focuses on healthy environments and cities, where strategies to favour environmental sustainability, efficiency and improved health are combined, where the population is considered a key actor.

5. Health in All Policies

Spain has invested a lot of resources in healthcare, and has one of the best National Health Systems in the world. However, scientific evidence suggests that the potential contribution of health care to reducing mortality is insufficient and, to a certain extent, overestimated, disproportionate, when compared to other determinants such as biological factors (gender, race, heredity, etc.), the environment or lifestyles, which have a greater potential contribution to reducing morbidity and mortality and improving health.

Studies on the distribution of health expenditure indicate that health care accounts for 80-90%, while expenditure on the promotion of healthy lifestyles and environments accounts for 3%. The increase in health expenditure is based on a restorative approach after the disease has already occurred. An approach based on the social and environmental determinants of health would be more effective and efficient in promoting, preventing and protecting health.

On this premise, the WHO proposed the assessment of factors related to human health when implementing different plans, programmes and interventions, giving birth to the concept of "Health in all policies". It defines this process as "an approach to policy making that systematically considers the health implications of decisions across sectors, seeking synergies and avoiding adverse health effects of policies outside the health sector to improve population health and health equity". In other words, a concept of interdisciplinary collaboration in all sectors and policy areas whose coordination is conditional on not worsening and/or improving the population's health. It can be seen that this is the strategy that runs throughout the Plan, and that it is embedded in all its actions, recognising the interdependent nature of social, economic and environmental development.

Furthermore, this Plan is based on the interdisciplinary analysis of the environmental factors identified in each thematic area by the contributions of all the parties that have participated in the process of drafting the Plan. Closely linked to this analysis is the Health Impact Assessment (HIA). A tool to quantify the magnitude of impacts, positive and negative, resulting from the implementation of any plan, programme and various interventions on human health. Thanks to this tool, it is possible to prioritise actions according to the magnitude of the impacts and the

feasibility of the measures, which facilitates the implementation of different lines of action that can prevent and control the effects of exposure to environmental factors.

For the successful development of the Plan, it is essential that all measures are supported and properly monitored, which is why the Health Impact Assessment (HIA) is considered an inseparable part of the Health in All Policies axis. The Plan's actions in this regard should range from the actual development of high quality HIA protocols to their implementation across all risks, factors and measures covered.

Progress must be made in the development of Article 35 of Law 33/2011, of 4th October, General Law on Public Health, regulating HIA in the regulatory activity of the General State Administration and in the strategies, plans and programmes. To this end, it is necessary to develop Health Impact Assessment procedures, tools and methodologies that guarantee the application of the health and health inequity axis in all implemented policies. This is an ambitious objective that the Strategic Plan for Health and Environment aims to achieve and which underpins future actions and measures in any related field.

The European Public Health Association (EUPHA), in collaboration with the International Association for Impact Assessment (IAIA), has prepared a background paper on ways in which human health can be addressed within the EIA process as set forth in the amended EIA Directive[49]. This document shares with this Strategic Plan the objectives of establishing definitions, setting forth ways in which the health sector can contribute to this process, and providing a document that complements existing national and regional guidance on health in EIA.

As mentioned above, this Strategic Plan is intended to assist the widespread participation of the Autonomous Regions in environmental administrative processes. In particular, they do so through EIAs and, it is expected after the implementation of the Plan, EIAs on plans, projects, programmes and activities subject to the administrative processes of Integrated Environmental Assessment and Integrated Environmental Authorisation.

6. The “One Health” Approach

Related to the previous point, another multi-sectoral and interdisciplinary approach appears with the same idea of abandoning the independent treatment and consideration of certain factors such as those discussed herein. In this case, it is impractical to isolate human health from other areas such as food safety, zoonoses, microbiology and antibiotic resistance, virology, ecology, etc. For example, to prevent, detect and respond to outbreaks of zoonoses, different sectors should safeguard the integrity and health of natural and semi-natural ecosystems, share epidemiological and laboratory data, and governments should respond jointly to these problems, which rarely understand borders.

For this reason, the Plan aims to analyse these factors and propose interrelated measures that seek common responses. The WHO calls this the One Health approach, which has inspired the Plan to collaborate with experts in different sectors (public health, animal health, plant health, environment, ecosystem health, etc.) to promote multisectoral responses. This approach is highly effective when the benefits of the correct state of these factors and biodiversity on human health are assessed.

Not all of the activities proposed in this Strategic Plan can be carried out at the outset. For this reason, specific short-term Action Programmes will be published with the detailed development of those considered to be of highest priority and feasible to improve the population's environmental health; based on the transversal axes considered, the monitoring and evaluation of the current situation and the experts' knowledge.

Other environmental health protection measures are already planned, under implementation or depend on cooperation with other administrations. The approval of the Plan will give a strong impetus to these activities and strengthen the means and resources necessary to ensure their full effectiveness.

The general and specific objectives and planned actions will be adapted to the health, social, environmental, economic and political situations and circumstances at each stage of implementation. As shown in Figure 16, these transversal axes are present throughout the Strategic Plan in order to effectively achieve the main objective.

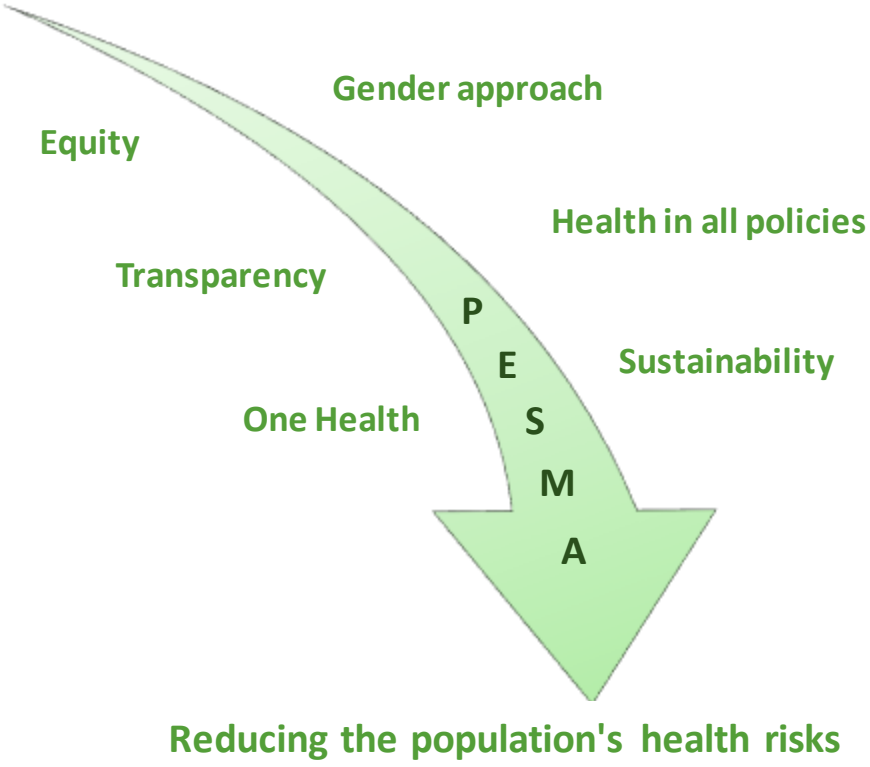

Figure 16. Cross-cutting and inspirational axes of the Strategic Plan for Health and Environment.

6. THEMATIC AREAS

Environmental risk factors are closely interrelated. The proposal made in the Strategic Health and Environment Plan contemplates 14 thematic areas that seek to address the most important environmental risk factors. As can be seen, this proposal, like any other we might make, is not without its advantages and disadvantages.

When considering how to group the various environmental factors that affect health, it can be divided into factors of natural and man-made origin. The first group includes factors that are strongly linked to the environment around us and in which humans have little influence, such as natural radioactivity or high temperatures, and others that are strongly associated with human activities, such as electromagnetic fields or the quality of indoor environments. However, there is usually no clear boundary between the two extremes. Thus, for example, extreme temperatures are clearly an environmental risk factor of natural origin, but one that is significantly influenced by human activity in highly anthropised environments, such as cities and dwellings, and even by long-term modulation mediated by climate change.

A further possible subdivision of environmental risk factors could refer to their physical, chemical or biological nature. Noise, radioactivity or UV radiation are physical risk factors, while the chemicals or waste that surround us are a chemical threat and the vectors that transmit diseases to us are purely biological agents. A closer look may show that sometimes this apparently clear-cut boundary is not so clear-cut: air pollution or the presence of asbestos in an environment are in principle chemical agents that can also damage our lungs through physical mechanisms, and can even be related to a higher incidence of infectious diseases, as COVID-19 has recently shown.

In fact, not all the factors considered in the Plan have the same quantitative importance in terms of their impacts, although, on the contrary, they can generate highly controversial social debates. Environmental noise is, in recent times, acquiring the prominence it deserves from the point of view of social awareness, but in many cases it is still not perceived as a health risk to the extent it deserves. And yet other risks generate a social controversy far greater than the scale of the health problem they have proved capable of generating to date, which is relevant today with the deployment of 5G networks.

In other cases, it can even be difficult to make environmental risks tangible. For example, we are all clearly aware of noise, pollution or radioactivity, but it is sometimes more difficult to realise that living in more or less "healthy" cities, in the vicinity of industrial areas or in modern housing surrounded by man-made chemical compounds makes a potential difference to the risks we are exposed to on a daily basis. Indeed, we are all aware that climate change is, in itself, a factor that has the potential to affect our health, even if we do not know anyone who has fallen ill from "climate change". It could be considered that these places or circumstances have an influence on our health and do not have an entity as such, but rather constitute the meeting place of multiple more tangible and intuitive factors that affect us, subject to numerous conditioning factors that act differently in men and women. Thus, returning to the example of climate change, it is clear that its effecting mechanisms are related to how the global distribution of vectors is changing, or the frequency and intensity of droughts and heat waves, which are in turn environmental risk factors *per se.*

This, in turn, presents a conceptual dilemma: the risk of falling into redundancy. It is clear that industrial areas, in addition to affecting our health through chemical contamination of soils and the environment, also have an influence in relation to the atmospheric pollution produced in them, which is a risk factor (the main one) in itself and which is dealt with in the corresponding chapter. The same can be said of the chapter on healthy cities or climate change, for example. In drafting the Plan we have tried to eliminate redundancies as far as possible, but we believe that redundancies may also be necessary in order to maintain depth of scope in addressing many of these issues. We believe that the Plan would not be complete if we did not address all these issues as areas of their own entity, even at the risk of being redundant in concept, but not in the actions that derive from the Plan.

For this reason, a Plan is offered that structures its thematic areas into four large blocks of analogy or affinity, which are not intended, for the reasons given above, to be watertight containers with no relation between them, but should be considered as groupings that facilitate the approach and understanding of the various problems dealt with. The four main blocks into which the thematic areas are divided are indicated as follows:

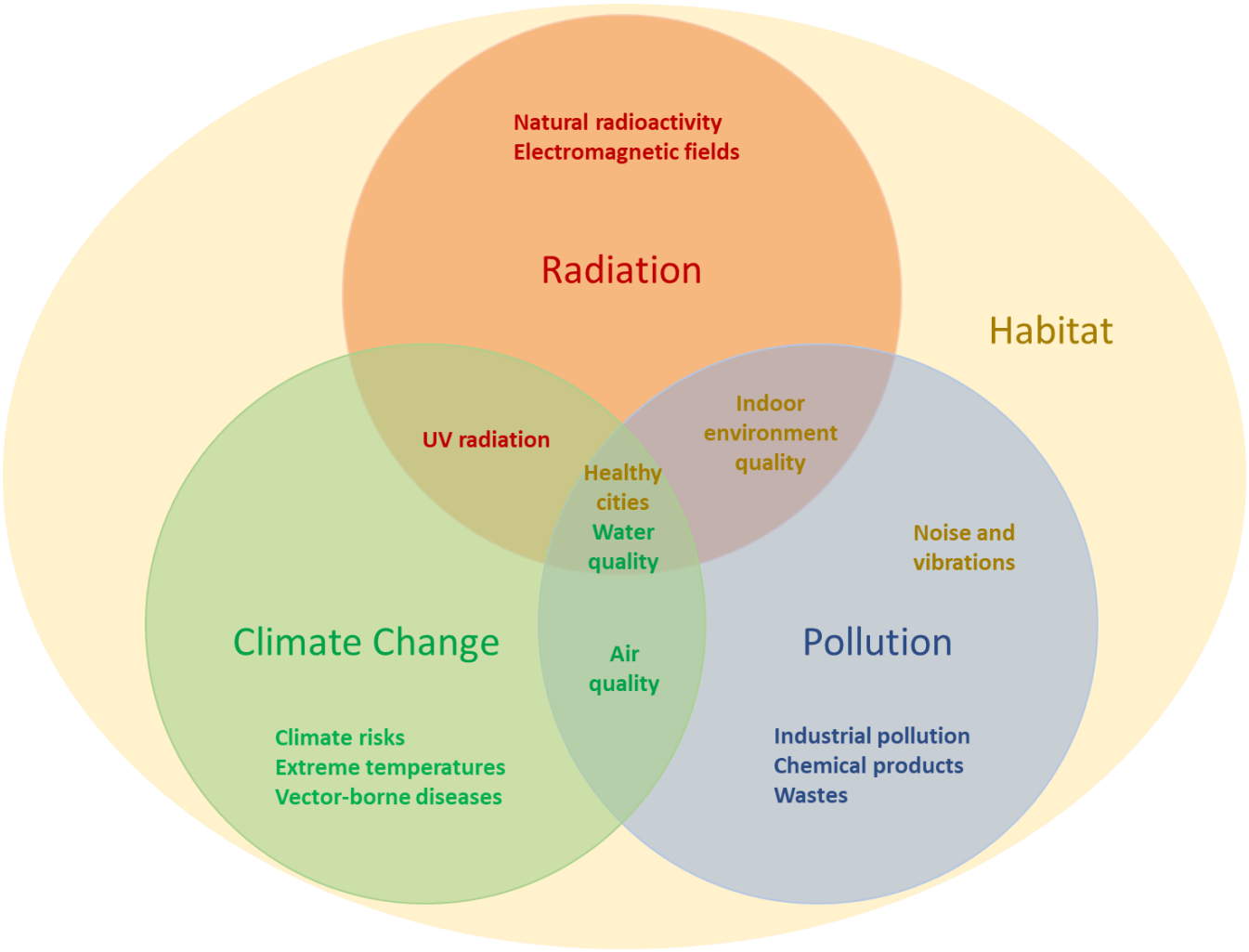

Figure 17. List of the blocks and thematic areas of the Strategic Health and Environment Plan.

Climate change and health:

1. Climate risks.
2. Extreme temperatures.
3. Air quality.
4. Water quality.
5. Vector-borne diseases.

Pollution:

6. Chemical products.
7. Wastes.
8. Industrial pollution.

Radiation:

9. Natural radioactivity.
10. Electromagnetic fields.
11. Ultraviolet radiation.

Habitat and health:

12. Noise.
13. Indoor environmental quality.
14. Healthy cities.

As can be seen in Figure 17, clearly all environmental factors ultimately affect our habitat and environment. This is how they affect human health. If this were not the case, there would be no exposure to them and therefore no impact on the population. Therefore, although there are more habitat-related factors, they can be included in other blocks depending on the approach taken. The clearest example is that of **healthy cities**, which, although they have their own characteristics, are affected by all the other factors that affect them. Another case is the impact of noise, which is a noise and physical pollution. It should be noted that the text of this Plan, in line with the WHO guidelines and European directives, and for conceptual simplicity, includes the terms "noise" and "environmental noise", which, along with vibrations, form part of noise pollution, which in turn influences the acoustic quality of our environment, a much broader concept. The **quality of indoor environments** is affected by a large number of related factors, ranging from all types of indoor pollution (chemical, physical and biological) to radiation that is often concentrated indoors (e.g. radon).

On the other hand, there are factors mainly related to climate change and health. This includes specific factors that must be addressed together due to their links with climate change, such as **climate hazards**, **extreme temperatures** and **vector-borne diseases**. However, other factors are also affected by climate change, but closely related to other blocks. A clear example of this is **air quality**. It has been included in the climate change block, as it is one of the environmental factors most influenced by climate change, although of course its main altering factor is anthropogenic pollution through atmospheric emissions (which is why it could also have been included in the pollution block) and which also has a greater impact in an urban environment (which is why it could have been included in the habitat block). If air quality has been included in the climate change block and not in others, it is due to affinity with the other factors with which it shares grouping and to draw attention to the fact that climate change also has a clear impact on the quality of the air we breathe, it is a mediator of the generation of tropospheric ozone and increases the frequency and intensity of atmospheric blocking situations which sometimes dramatically increase the pollution of our cities. This is air quality, although we could also have talked about chemical or biological air pollution (physical air pollution is dealt with by noise), as it is a broader term that encompasses these, as well as all the natural meteorological or climatic circumstances and factors that make it up.

Water quality is in a similar position, and is also affected by natural radioactivity (radon, radioactive isotopes, etc.). In short, placing an environmental factor in one thematic block or another is always a difficult decision, not without a certain degree of arbitrariness.

As stated above, environmental pollution has a strong influence on a number of environmental factors that may pose a risk to human health. For this reason, in this block we have decided to address the main origins of this problem, such as **industrial pollution** or the use and consumption of **chemical**

products, separately. These issues will be closely related to those specified above, as industrial pollution greatly affects air quality or chemicals affect water quality. This will result in finding complementary concepts and actions in several of these areas that try, without falling into useless redundancies, to reduce risk in an effective way from various approaches. Another of the topics included in this block is **waste** management, which, if not done correctly, can lead to major environmental pollution. After all, some of the anthropogenic pollution discussed herein is the result of poor waste management that is released into the environment.

In the field of **radiation**, it is necessary to distinguish between ionising radiation (natural radioactivity, ultraviolet), which has a known impact on health, and non-ionising radiation (electromagnetic fields) in order to apply differentiated approaches. In the latter case, the priority focus is on monitoring of exposure limits set by the EU and the WHO-ICNIR and risk assessment of new technologies (5G). In the case of natural radioactivity and ultraviolet radiation, their causes are natural and the approach is more focused on reducing exposure to reduce the risk of diseases attributable to these radiations.

Ultraviolet radiation can be of natural origin (solar radiation), as discussed above, but it can also be artificial. In addition to UV radiation, solar radiation includes other frequencies such as high-energy visible (blue light) or infrared radiation that can contribute to skin damage caused by UV radiation.

Figure 17 shows the aforementioned interrelationships between the different areas and blocks into which the Plan is structured. This outline is intended to facilitate a better understanding of the different factors involved, clarifying the impossibility of dealing with them in isolation and explaining the need for joint action with a health and environment approach as proposed in this Strategic Plan.

6.1. CLIMATE RISKS

With regard to this thematic area of climate change, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF CLIMATE CHANGE.***

Climate change is not only one of the most important environmental challenges facing humanity on a global scale, but also influences many sectors, reaching its peak in the area of health. Both direct effects and important indirect effects mean that health must be integrated into energy and climate policies to improve public health.

The WHO estimates that climate change will cause an additional 250,000 deaths per year between 2030 and 2050 as a result of changes in disease patterns. Moreover, the financial cost of direct damage to health from climate change is estimated to be between 2 and 4 billion dollars (US$) by 2030.

Thermal extremes contribute directly to deaths from cardiovascular and respiratory diseases, neurodegenerative diseases and many other health variables. Moreover, in the current context of climate change, cold snaps are not going to disappear, nor will the morbidity and mortality associated with them. On the other hand, atmospheric blocking situations associated with climate change result in increased levels of environmental pollutants. Currently, 95% of Europeans are exposed to levels higher than those recommended by the WHO, and rising temperatures are expected to increase this burden.

Globally, the number of weather-related natural disasters has more than tripled since the 1960s. Every year, these disasters cause more than 60,000 deaths, especially in developing countries. In Spain, the population living in coastal municipalities exceeds 15 million people (about one third of the total). Climate change hazards on coasts include increased frequency and intensity of coastal storms and permanent flooding due to rising sea levels. Furthermore, in some areas, floods are becoming more frequent and intense, contaminating freshwater sources, increasing the risk of water and vector-borne diseases, which are favoured by rising temperatures. This, together with droughts, reduces the availability of water for human consumption and even for other uses, as it implies less quantity and lower quality. These climatic phenomena, such as increased droughts and forest fires, also have an impact on health in the form of air pollution and worsening air quality.

Currently, human food and animal feed crop yields are being significantly affected due to the increased frequency of extreme weather events. Livestock and particularly fisheries are also very sensitive to climate change. Beyond potential feed shortages, a rise in average temperatures could increase the seasonal summer peak in cases of some food-borne diseases.

These changes in climate prolong the transmission seasons of important vector-borne diseases, alter their geographical distribution and modify their incidence and severity. Waterborne diseases (cryptosporidiosis or giardiasis) and vector-borne diseases (visceral leishmaniasis, Lyme borreliosis, tick-borne encephalitis, West Nile virus, Rift Valley fever, dengue fever and chikungunya) are among

the diseases considered to be most influenced by the observed climate change in Europe. In addition, it is affecting wildlife movements and distribution, particularly the migratory routes of wild birds that can act as transmitters of zoonotic diseases such as Avian Influenza or West Nile Fever.

Climate change also poses new risks that were considered unlikely, but with changing conditions may manifest themselves in ways that are not well understood or for which we are not prepared. These are so-called emerging risks and are categorised by the IPCC as low probability but high impact risks. Some of these risks related to the factors discussed above could be the collapse of the thermohaline circulation of large seas or outbreaks of infectious diseases.

The SARS-CoV-2 pandemic is a clear example of a type of emerging risk that requires greater attention: biological risks. These are diseases that change their place of occurrence and spread due to changing ecological conditions on the planet, as the habitat of their biological transmitters changes and they affect different areas that are not prepared for them. Therefore, in addition to taking measures to curb these changes, a thorough monitoring and assessment of emerging risks is necessary in order to be aware of them and to be able to prepare a response if necessary.

Climate change is one of the major international environmental and public health problems, and the information and measures presented in this Plan are therefore in line with the many international projects in force on this issue, such as the **Paris Agreement** and the **WHO Global Strategy on Health, Environment and Climate Change**. **SDG 1**3 deals specifically with climate change, and its targets are also supported by this Plan, such as promoting adaptation to its consequences, reducing the impact on health and integrating climate change measures into national policies and plans. At the **Climate Action Summit**, where this agreement was signed, this issue was and remains a priority in order to keep the temperature increase below 2°C and to adapt to the risks associated with it. In terms of health impact, the **WHO's 13th General Work Programme 2019-2023** presents objectives that are very much in line with those of this Plan, such as reducing climate-related mortality by 10%.

Nationally, this thematic area is in line with the main objective of the **MITERD's National Integrated Energy and Climate Plan** (PNIEC) 2021-2030, which refers to the reduction of emissions, for which measures are proposed such as the development of new electricity generation facilities with renewables, modal shift, more efficient use of means of transport, renewal of the vehicle fleet and promotion of electric vehicles.

This section also relates to the objective of the **MITERD's National Plan for Adaptation to Climate Change** (PNACC) 2021-230, which focuses on the integration of climate change adaptation into the planning of different sectors and/or systems. The PNACC identifies around 20 areas of work, including a specific one on human health. However, other areas of work contain lines of action of great interest to prevent the impacts of climate change on health: the promotion of meteorological observation for early warning and warning services for adverse weather and climate phenomena, the updating of regionalised climate change projections for Spain (climate and climate scenarios), the contingent management of flood risks (water and water resources), the integration of coastal risks in plans and programmes that include the coastal area (coasts and ocean) or the reinforcement of self-protection systems against climate disasters in communities at risk (disaster risk reduction). In the human health sector, the PNACC is aligned with the main areas of work undertaken by the Ministry of Health: prevention of the effects of excess temperatures on health, preparedness and response to vector-borne diseases or preventive actions against episodes of atmospheric pollution. To assess the impact of climate change on health and the effectiveness of the measures taken in relation to it, the MSAN has **health and climate change indicators** which show the evolution of numerous effects on health and the environment over time.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Reducing morbidity and mortality due to climate change-related events.	a) Develop a plan to monitor morbidity and mortality associated with climate change and emerging risks. b) Develop the Action Plan on Energy Poverty. c) Develop a package of measures on climate change and employee health. d) Develop risk maps of factors related to the impact of climate change on health and a proposal for a framework for early and preventive action adapted to the different risk elements. e) Incorporate consideration of aeroallergens, Saharan dust and forest fires and social inequalities by mental illness and gender. f) Improve active monitoring of the impact of extreme temperatures throughout the year. g) Improve prevention of extreme weather events such as storms, thunderstorms, blizzards, etc., especially in flood-prone areas. h) Develop information systems that integrate environmental and animal health data with human health data; with a One Health approach, to better understand the epidemic dynamics of communicable diseases and to be used in surveillance and early warning systems and preparedness and response plans.

Management, organisation and coordination

Objective	Actions
Establish management mechanisms to promote the work and coordination of the planned actions among all the actors involved, reinforcing the One Health approach.	a) Expand and strengthen the Sentinel Surveillance Network for VBDs (vector-borne diseases) state-wide, integrating human and animal epidemiological surveillance and entomological surveillance. b) b) Promote the Health and Climate Change Observatory (S.G. for Environmental Health and Occupational Health, AEMET and Climate Change Office, SGSHAT, SEE and SESA and Universities and reference research centres).

Risk training and communication

Objective	Actions
Improve knowledge of the impact of climate change among health and other professionals, such as communication professionals.	a) Establish training programmes for health professionals to detect risks and vulnerabilities early, prevent impacts, and articulate corresponding prevention plans capable of reducing these impacts. b) Identify the social groups and spaces most vulnerable to different types of climate hazards for better communication. c) Train the occupational risk prevention services of trade unions and companies to protect workers from the effects of climate change that they may suffer in their jobs. d) Associate communication with risk events by linking it to early warning systems, thus making messages more relevant. e) Train media professionals on climate change, its effects and possible preventive health actions. f) Develop messages tailored to different groups and situations in order to improve their effectiveness. g) Develop communication and public awareness campaigns on the benefits of environmental and biodiversity conservation and restoration for the population's health and for the mitigation and reduction of climate change risks.

Research

Objective	Actions
Improve knowledge on the impact of climate change on human and animal health and biodiversity and the effectiveness of adaptation measures.	a) Investigate and record extreme weather events (droughts, torrential rains, heat and cold waves, sea storms, etc.) in order to be able to assess their ultimate impact on the population's health. b) Strengthen food risk monitoring and studies that integrate production (including yield and environmental cost), epidemiological and climatic data. c) Investigate and record changes in the activity cycles and spatial distribution of the main vectors involved in diseases influenced by climate change. d) Collect and analyse environmental and animal health data to assess the impact on the ecosystem, biodiversity and human health and develop effective surveillance, prediction and prevention systems to reduce the impact of risk factors on the population's health and well-being. e) Identify degraded areas likely to favour the establishment and reproduction of vector-borne diseases, in order to restore them. f) Research and characterise the nature and effect of emerging risks in areas where they are having an impact.

Monitoring, evaluation and indicators

Objective	Actions
Have advanced risk management tools in place.	a) Use quantifiable and validated indicators that evaluate the achievement of the proposed objectives, disaggregated, if possible, into factors such as gender, age, etc. b) Monitor risk maps for spatial tracking and correct geographic assessment.

6.2. EXTREME TEMPERATURES

With regard to this thematic area of climate change, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF EXTREME COLD AND HEAT.***

The impact of heat waves on mortality in Europe was clearly demonstrated in the summer of 2003, when Spain alone recorded an excess mortality of 6,600 deaths attributable to high temperatures. As a result of this major public health event, the "National Plan of Preventive Actions on the Effects of Excess Temperatures on Health" has been implemented every summer since 2004 and, in 2015, this plan was updated to include new thresholds that improve the methodology applied.

For Spain as a whole, the average value of the increase in mortality per degree Celsius above the threshold temperature is 9.9%; the impact is greater for respiratory causes (15.3%) than for circulatory causes (9.9%). Heat-related mortality is not only quantified by what is known as "heat stress", but is also related to the aggravation of existing pathologies (cardiovascular and respiratory, renal, gastrointestinal and even neurological causes). In addition, higher temperatures have been linked to an increase in the number of births occurring, as well as an increase in the number of low birth weight and premature births. It should be noted that the effect of extreme temperatures is greater in certain vulnerable groups, especially the elderly. These high temperature effects are particularly relevant in a context of climate change, where projections indicate a progressive increase in high temperatures.

On the other hand, it is worth noting that extremely low temperatures are given less importance than heat waves, since, despite global warming, neither cold waves nor the associated morbidity and mortality are going to disappear. The number of cold waves in Spain is higher than heat waves and the effects of heat waves (3-4 days) occur in the shorter term than the effects of cold, usually mortality and hospital admissions related to cold occur between 7 and 14 days after the drop in temperatures.

In Spain as a whole, for each degree by which the daily minimum temperature is below the cold snap definition threshold, daily mortality increases by 11.5%; the effect is greater for respiratory causes (19.4%) than circulatory causes (15.3%). Every time there is a cold snap, the average mortality in each provincial capital increases by 3.5 deaths per day (higher than the 3.0 deaths that occurred on heatwave days).

LINES OF ACTION

Prevention and health protection

Objective	Actions
Reducing mortality attributable to extreme heat and cold spells.	a) Improve and update the National Plan of Preventive Actions against the Effects of Excessive Temperatures on Health to the context of climate change. b) Develop and initiate the National Low Temperature Preventive Action Plan. c) Trigger the Plans only when a temperature indicator is exceeded. That is, when the daily maximum or minimum temperature exceeds the calculated mortality trigger temperature.

Management, organisation and coordination

Objective	Actions
Improve coordination of the prevention plans of the different administrations.	a) Include the cold weather plans developed by the Autonomous Regions with the same objective in the National Preventive Action Plan for Low Temperatures.

Risk communication and training

Objective	Actions
Improve professional training on the health effects of extreme temperatures and raise awareness of their importance among administrations and the population.	a) Train health agents and professionals in the priority actions suggested by the WHO to detect risks and vulnerabilities early, prevent impacts, and articulate corresponding prevention plans capable of reducing these impacts. b) Improve risk communication to the population and especially to vulnerable groups.

Research

Objective	Actions
Gain the knowledge necessary to optimise the effectiveness of preventive plans.	a) Characterise and assess Isothermal Regions and unified warnings. b) Update mortality trigger temperatures or threshold temperatures. c) Establish a pilot Cold Spell Plan that aims to analyse, characterise and establish threshold temperatures and set up an active monitoring system.

Monitoring, evaluation and indicators

Objective	Actions
Evaluate the impact of preventive plans.	a) Evaluate the functioning and results of the National Preventive Action Plan on the Effects of Excessive Temperatures on Health. b) Assess whether the zoning of threshold temperatures on the basis of isothermal zones defined by AEMET represents an improvement in public health in terms of the system of alerts generated. c) Develop a system of indicators associated with the functioning of the Plans.

6.3 AIR QUALITY

With regard to this thematic area of air quality, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF POOR AIR QUALITY***

Scientific evidence shows that air pollution is responsible for a significant proportion of deaths, hospitalisations, causes and exacerbation of symptoms of numerous diseases. The impact of pollution on health globally or regionally has been assessed mainly in terms of morbidity and premature mortality, taking into account both short-term and long-term effects. Recently, in its latest edition of the 2021 Air Quality Guidance, the WHO revised the negative health impacts of air quality upwards.

Air quality in Spain remains a serious cause for concern and continues to have a serious impact on citizens' quality of life. The problem is particularly acute in large urban areas, where a significant proportion of the population lives. It is important to remember that air pollution remains the number one environmental cause of premature death in the EU and is estimated to cause more than 400,000 premature deaths per year. As a study by the National School of Health revealed, pollution was responsible for the deaths of more than 93,000 people between 2000 and 2009. An ISCIII study has concluded that nitrogen dioxide caused more than 6,000 avoidable deaths each year in Spain, to which almost 500 more should be added due to tropospheric ozone levels. Thus, up to 3% of annual deaths in Spain could be due to air pollution. According to ISGlobal data, this figure would be much higher in major cities such as Madrid and Barcelona, reaching 6 and 7% of natural mortality due to $PM_{2.5}$ and NO_2 pollution, respectively[29]. This problem is so far-reaching that the smaller cities surrounding these capitals are beginning to show similar numbers.

The high costs of this problem to society, particularly in terms of external health-related costs, must also be borne in mind. These costs are difficult to estimate, however, the WHO estimated that, in Spain, air pollution caused the loss of more than 40 billion dollars in 2010[50]. A 2016 study[51] reported that an increase of 10 micrograms per cubic metre of PM_{10} results in a 1.6% increase in absenteeism due to illness in Spain. For the year 2016[52], these figures translate into 31,300 premature deaths per year, 24,100 from $PM_{2.5}$, 1,500 from O_3 and 7,700 from NO_2. Although the main source of air pollution in urban environments is of anthropogenic origin, in Spain the entry of particulate matter from natural sources, such as the advection of dust from the Sahara or volcanic eruptions, is also significant.

Given the vulnerability of the child population to the effects of poor air quality, this impact occurs even at lower concentrations of pollutants than in the adult population. For this reason, air quality regulations provide that air quality plans may also include specific measures to protect vulnerable sections of the population, including children. Exposure to O_3 and PM is associated with an increased likelihood of bronchitis and other respiratory diseases in the postnatal stage, while intrauterine exposure to nitrogen dioxide, sulphur dioxide and particulate matter has significant negative effects on foetal growth and anthropometric birth parameters.

It is also unknown how climate change will affect air quality in Spain, both due to the temperature-pollution interaction and due to situations of blockage and stagnation that prevent the dispersion of pollutants and may result in increased concentrations of various pollutants, especially nitrogen dioxide

and particulate matter. On the other hand, high temperatures and increased sunshine lead to increased levels of ozone, a secondary pollutant whose formation is favoured under these conditions.

In the event of pollution peaks, these could be addressed through a **Short-Term Framework Action Plan for Atmospheric Air Pollution Episodes** for particulate matter below 10 microns (PM_{10}), particulate matter below 2.5 microns ($PM_{2.5}$), nitrogen dioxide (NO_2), ozone (O_3) and sulphur dioxide (SO_2)[53]. The Plan establishes homogeneous values and actions for all the Administrations so that citizens have information on pollution alert levels and on the actions that could be implemented at each of the levels of action, regardless of the geographical area in which they live. A predictive component was also introduced as a new feature. In addition, Royal Decree 102/2011 establishes the obligation to draw up air quality improvement plans in areas in which the limit values and target values established in this Royal Decree are exceeded, with the aim of reducing the levels of pollutants in those areas and substantially improving the quality of the air we breathe in the medium and long term.

Although in the case of NO2 the main source is road traffic, only 26% of $PM_{2.5}$ pollution is generated in the cities it affects (traffic, industrial activities, heating, etc.)[29]. This fact underlines the need to tackle the problem not only from a local point of view, but also through joint regional, national and international action as proposed in the Plan. Another important source of air pollution is biomass burning, which is addressed in Indoor Environmental Quality, highlighting the interdisciplinary approach and joint action proposed in this document.

The European Environment Agency (EEA) has included health recommendations in its air quality index and MITERD approved a **National Air Quality Index** (AQI)[54], in 2019, based on a colour scale like the EEA's and including health recommendations for the general and vulnerable population. With this index, based on air quality information from existing networks, the state of air quality can be determined and can serve as a basis for the implementation of measures, in addition to complying with the obligation of risk communication established by Royal Decree 102/2011, of 28th January, on the improvement of air quality. MITERD is working together with AEMET on the integration of a predictive component in the AQI, so that measures can be anticipated in case of pollution episodes forecast.

The lines of action proposed here are in accordance with the objectives set by science through the Intergovernmental Panel on Climate Change (IPCC), and are aligned with the objectives of the **Paris Agreement** and European climate policy. They are also in line with the **Air Convention** on Long-range Transboundary Air Pollution and the **Clean Air for Europe** Programme, which aim to reduce sulphur dioxide, nitrogen oxides, particulate matter, heavy metals and ground-level ozone, among other pollutants. It also contributes to the achievement of **SDG 3.9** (Reduce air quality-related morbidity and mortality) and **SDG 11.6** (Reduce urban air quality-related environmental impacts). Another shared goal between WHO and this Strategic Plan is contained in the **13th General Work Programme 2019-2023** and is based on reducing air quality mortality by 5%. As discussed below, this Strategic Plan has a particular focus on groups vulnerable to this risk, as indicated in the EU Environment and Health Action Plan (EHAP). In this case, vulnerable groups include children, the elderly and pregnant women, where this Plan also includes women of childbearing age and people who are ill or have pathologies that may be affected by exposure to environmental factors.

Likewise, this area is in line with the **MITERD's I National Air Pollution Control Programme (PNCCA),** which defines objectives and actions for the fulfilment of emission reduction commitments. The measures in this Programme are in accordance with both the air quality and energy and climate policies of the **National Integrated Energy and Climate Plan (PNIEC),** which estimates that, with the quantified reductions in air pollutant emissions, premature deaths from air pollution in 2030 would be

reduced by around 2,400 people (8,913 in the Baseline Scenario to 6,521 in the Target Scenario), a 27% reduction. The projections of the Zero Pollution Action Plan, which puts this reduction at 55%, are somewhat more ambitious and require extensive work on the following actions.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Reduce mortality and morbidity attributable to exposure to air pollution in accordance with the objectives of the PNCCA. *Ensure the prevention of diseases resulting from air pollution and poor air quality, through monitoring, analysis and evaluation of instantaneous and accumulated data from pollution meters, and actions arising therefrom.*	a) Draw up a Prevention Plan for episodic contamination situations that clearly establishes a protocol for action by the health authorities in the event of this type of situation. b) Strengthen structural measures aimed at reducing average concentrations of pollutants and improving air quality, especially in metropolitan and urban areas, such as modal shift. National Air Pollution Control Plan. c) Monitor air quality in areas of high vehicle concentration and susceptible environments, especially school, children's and health care environments. d) Encourage and promote green infrastructure in areas identified as having a high concentration of air pollution as an air pollution mitigation and abatement measure. e) Promote monitoring systems for pollen and other atmospheric aeroallergens.

Management, organisation and coordination

Objective	Actions
Improve the effectiveness of coordination between MITERD and MSAN in their respective areas of competence.	a) Establish a Technical Committee between the Ministry of Health (MSAN) and the Ministry for Ecological Transition and the Demographic Challenge (MITERD). b) Incorporate coordination mechanisms with the Air Quality Monitoring Network within sentinel networks under the health authorities. c) Transfer data from air quality meters to health authorities' analysis sites, and involve public health professionals in the management of air quality data. d) Establish a national technical committee capable of advising the various administrations on the measures to be taken to combat air pollution and its impact on health. e) Coordinate and unify the elaboration of protocols for action in the event of pollution episodes by the different administrations with homogeneous values and actions. f) Establish coordination mechanisms with the Autonomous Communities and Cities and City Councils for the development of actions that require their intervention (pedestrian and low-emission zones, reduction of road traffic, public transport, etc.). g) Involve companies and other social actors in the aspects of dissemination, training and commitments on sustainable mobility, air quality, etc.

Training and risk communication

Objective	Actions
Improve public and professional awareness of the effects of poor air quality.	a) Train health professionals on the health risks of exposure to air pollution and the strategies related to its management and prevention. b) Develop easily understandable information on how air pollution can affect the population's health, especially for at-risk groups, and involve environmental and health education groups. c) Develop a Health Protection Information Programme that provides information and recommendations on a daily basis for capital and metropolitan areas. d) Conduct awareness and sensitisation campaigns for the promotion of healthy and environmentally sustainable habits and practices to improve air quality. e) Develop educational information on the importance of biodiversity for the reduction and mitigation of air pollution and the prevention of health effects. f) Establish a procedure to ensure communication to the sensitive population, i.e. ensure that health centres, educational establishments, nursing homes, etc. are informed of pollution episodes. g) Provide the public with access to simple and clear information on air quality to enable them to protect their health.

Research

Objective	Actions
Improve scientific knowledge on the health, economic, social and environmental impacts of air pollution on health.	a) Establish an Epidemiological Surveillance Plan on the effects of air pollution and studies on the impact on health, characterising the exposure of the population and analysing and quantifying the short and long-term effects of air pollution on health in Spain. b) Make an economic and social estimate of the impact of air pollution in Spain. c) Analyse the influence that climate change has and will have on air pollution. d) Develop new lines of R&D&I aimed at promoting knowledge about atmospheric pollution, its causes and dynamics. e) Promote research studies on the possible effects on health and well-being of other environmental factors such as odours or biodiversity.

Monitoring, evaluation and indicators

Objective	Actions
Monitor the impact of prevention measures.	a) Assess air pollution-related morbidity and mortality, with disaggregated data. b) Make progress in identifying respiratory diseases resulting from pollution in the population.

6.4. WATER QUALITY

With regard to this thematic area of water quality, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF ANY KIND OF WATER POLLUTION, WHATEVER ITS USE.***

Water is necessary for human life and development, in sufficient quantity and quality and easily accessible to the population. Humans use water for drinking, food preparation, personal hygiene, industrial, agricultural, domestic and recreational purposes. This water is affected by the quality of natural water and therefore by the quality of treated wastewater discharges and reclaimed water.

Therefore, since 2010, the United Nations General Assembly has recognised the human right to water supply and sanitation to ensure the protection of the population. This is defined as the right of everyone to sufficient, safe, acceptable, accessible and affordable water for personal and domestic uses.

Some of these conditions to be met by the water supply are conditioned by certain environmental aspects. The first of these is water availability. Water availability is closely related to the phenomenon of climate change as it alters the water cycle. This means that a marked change in climate conditions the availability of sufficient water for water catchment and domestic or personal use. In Spain, there are some areas that frequently suffer from droughts and therefore lack sufficient water for the development of the population.

In addition, climate change affects water both in quantity and quality. For example, changes in thermal conditions may favour the proliferation of cyanobacteria, particularly in reservoirs and lakes, which can synthesise toxins that act on the liver, skin and nervous system; in marine waters, they may also contribute to an increase in the presence of jellyfish and cyanobacteria. Beyond droughts, there are other phenomena intrinsically related to climate change that can affect water quality. Examples include storms and floods that contaminate catchment areas or water purification and sanitation sites. Some of the main repercussions of this include the inability to collect drinking water in lakes or reservoirs and exposure to the body through inhalation of wave-generated aerosols.

It should be noted that poor or absent sanitation and wastewater treatment will lead to microbiological and chemical contamination of water, resulting in increased exposure of the population to this contamination and thus increasing the risk to human health; increasing the costs of treatment necessary for the purification of water for human consumption. The importance of the reuse of reclaimed water in Spain is based on the need to have resources that either replace or complement the availability of water, preferably in arid and semi-arid areas, or in times of shortage due to excess demand.

As mentioned above, drinking water supply is vital for public health. However, the mass use of water, not always for basic purposes, is greatly undermining the ecological stability of the territory, including coastal areas, especially in a water-poor Mediterranean climate. The reservoirs retain sediments that do not reach the sea, especially in a normal regime (linked to rainfall and snowmelt), so the coasts

suffer more erosion and impoverishment of essential nutrients, impacting human health with coastal flooding and reduction of seafood. A holistic approach to the reduction of these causes under the One Health paradigm such as the one proposed is required in order to re-establish and maintain the balance between environmental health, animal health and human health.

Water quality is threatened by emerging contaminants, whether pathogenic or chemical, from the increasing use of multiple chemicals that end up in the water cycle. For example, medicines and personal care products, ingredients in consumer products, materials in distribution pipes, nanoparticles and microplastics, disinfection by-products and other processing products and which may act as endocrine disruptors. Another example is microplastics, whose impact on health has not been defined in the absence of future studies. This creates new challenges for proper water treatment, where appropriate chemicals have an important role to play, as well as the new REACH regulations.

The new European regulation on drinking water, Directive (EU) 2020/2184 of the European Parliament and of the Council, of 16th December 2020, on the quality of water intended for human consumption, presents a new perspective to face the assessment and management of new water risks and aspects related to water supply, thus controlling parameters such as Legionella, uranium, haloacetic acids or PFAS and bisphenol A; greater transparency for citizens on water quality data and access to water for vulnerable groups.

Current regulations on the protection of water resources make it possible to control the quality of surface water and groundwater so that they are compatible with the environmental objectives set, minimising the risks to human health in accordance with all available information and establishing the appropriate protection measures in accordance with their intended uses. The river basin management plans carry out, in six-year cycles, the diagnosis of the pressures and impacts that cause deterioration in water quality, as well as programming the measures to be adopted to achieve the environmental objectives, which include, among others, measures relating to the improvement of sanitation and purification, as well as those relating to the control and prevention of diffuse pollution from economic activities, particularly agricultural and livestock activities.

The UN's **2030 Agenda** outlines Sustainable Development Goals for the next 15 years. One of them, **SDG 6,** specifically corresponds to water quality and its targets run parallel to the goals in this section of the Plan. Furthermore, there are other specific targets, such as **SDG 3.9** (Reduce water quality-related morbidity and mortality) and **SDG 11.6** (Reduce water quality-related environmental impacts in cities), which are also addressed by the measures proposed herein. These measures also respond to the **Ostrava Declaration**, which aims at sustainable agriculture in the use of water, and the **WHO Global Strategy on Health, Environment and Climate Change.**

Nationally, this subject area is in line with the process of drawing up the 2022-2027 River Basin Hydrological Plans and with the **MITERD's National Plan for Purification, Sanitation, Efficiency, Saving and Reuse** (*PLAN DSEAR* in Spanish), which aims to review the intervention strategies defined in the current second cycle hydrological plans, and the preparation of the third cycle plans.

Also within the framework of the PNACC is the **MITERD's Plan to Promote the Environment for Adaptation to Climate Change in Spain** (*PIMA Adapta* in Spanish), which includes actions in the area of water management and the public water domain, among others.

LINES OF ACTION

Prevention and health protection

Objective	Actions
	a) Improve the required drinking water treatment according to the quality of the source water by using at least filtration and disinfection in small supply areas.
	b) Improve the quality of drinking water supplied to consumers, taking into account the possibility of emerging contaminants.
	c) Include in the risk assessment pesticides which, although their use is prohibited, are slow and/or difficult to eliminate, such as lindane.
	d) Improve wastewater and stormwater management to protect the quality of water for drinking water production and bathing water.
	e) Improve installations, avoiding or replacing materials such as lead in distribution networks and interior installations with other innocuous materials, as well as assessing structural leaks in both supply and sanitation systems and implementing corrective measures to remedy them.
Protect human health from the adverse effects of any type of water pollution; guaranteeing access, healthiness, quality and cleanliness in each and every one of its uses.	f) Develop a common methodology for the assessment and management of water risk (Water Health Plan) and its impact on health. Both for supply areas and for bathing water, swimming pools/spas, wastewater and reclaimed water, encouraging its application.
	g) Improve analytical tools, with real-time results in both microbiological and physico-chemical parameters, by promoting method intercomparison exercises.
	h) Monitor mass use of water to protect the ecological stability of the territory.
	i) Implement the most appropriate purification and reclamation systems to improve water quality and make it suitable for further use.
	j) Include pool-related morbidity and mortality as notifiable and included in the relevant surveillance network.
	k) Improve sanitation, purification, reclamation and reuse systems, promoting the installation of separate rainwater networks.
	l) Promote the use of nature-based solutions for the improvement of the quality of water available to the population.
	m) Evaluate the effectiveness and safety of physical, chemical and biological systems for the prevention and control of Legionella.

Management, organisation and coordination

Objective	Actions
Improve co-ordination between water management authorities.	a) Implement the new European Drinking Water Directive and the European Water and Health Protocol in relation to human health. b) Improve real-time information on the status of water bodies and water uses. c) Improve data reporting to health information systems: SINAC, NAYADE or SILOE. d) Improve coordination in the management of wastewater, reclaimed water and water reuse. e) Develop a new epidemiological surveillance system based on wastewater monitoring, called HEBAR. f) Include public health criteria in integrated river basin management and promote the use of nature-based solutions where feasible. g) Improve coordination with companies and user associations to involve them in the aspects of dissemination, training and commitments on drinking water quality that contribute to accelerating the objectives of the Plan.

Training and risk communication

Objective	Actions
Improve professional training and the population's information and knowledge on the health effects of poor water quality.	a) Establish specific training schemes on water risk assessment and management strategies for health and water administration staff. b) Encourage all own or subcontracted staff involved in water management, supply, purification, installation or analysis activities to have the necessary training for the activity they carry out within the company, by means of professional qualifications, university credits, etc. c) Information campaigns aimed at professionals on the correct use of chemical products used in water treatment and on the hygienic-sanitary maintenance operations of the facilities. d) Carry out information and education campaigns for citizens on saving and consuming water without health risks and the correct use of reclaimed water. e) Develop effective social action mechanisms to ensure the right to drinking water for vulnerable groups and to promote environmental awareness for the protection of water resources. f) Introduce early warning systems for sudden or unexpected changes in bathing water quality. g) Establish information and education campaigns for bathers on the risks associated with bathing (especially prevention of drowning, accidents and microbiological risks).

Research

Objective	Actions
Increase knowledge on the potential health impacts of water quality in specific geographic or use areas.	a) Conduct risk assessment and risk management of catchment areas of water abstraction points for the production of drinking water; in supply areas and in indoor facilities of priority public buildings. b) Develop monitoring systems for cyanobacteria and cyanotoxins in the protected zones of catchment areas or bathing waters. c) Develop mathematical models to help accurately predict the quality of bathing sites. d) Develop digital services to report and predict the status of resources in (near) real time. e) Conduct epidemiological studies on morbidity and mortality, surveillance systems and exposure risks. f) Develop appropriate purification and reclamation technologies, mainly with systems that have a lower environmental and health impact. g) Promote risk assessment on the reuse of reclaimed wastewater and on the effectiveness of physical and physico-chemical systems for its treatment. h) Promote research studies on the risks of new installations that may cause legionellosis, on the factors determining the growth and dispersion of Legionella and the infective dose of this micro-organism.

Monitoring, evaluation and indicators

Objective	Actions
Ensure compliance with measures to improve water quality.	a) Develop indicators for drinking water, bathing water, reclaimed water and wastewater.

6.5. VECTOR-BORNE DISEASES

With regard to this thematic area of vector-borne diseases, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE TRANSMISSION OF DISEASES TRANSMITTED BY MOSQUITOES, TICKS AND OTHER VECTORS***

Major vector-borne diseases (VBDs) account for 17% of the global burden of transmissible diseases, causing more than 700,000 deaths per year. In Spain, surveillance of *Aedes albopictus* mosquitoes is of particular relevance. This mosquito species is included in the Spanish Catalogue of Invasive Alien Species, related to the transmission of diseases such as dengue, Zika and Chikungunya. In addition to these diseases, West Nile Fever (WNF) also poses a high risk in Spain, due to the fact that the mosquitoes related to its transmission (*Culex pipiens, Culex perexiguus*), are well established in the territory.

The *Anopheles artoparvus* mosquito also spreads vector-borne diseases and is associated with the transmission of malaria, although its presence is not as widespread as that of *C. pipiens*. Other arthropods involved in the transmission of such diseases include ticks such as *Ixodes ricinus, Hyalomma marginatum* and *Hyalomma lusitanicum*, which are associated with Lyme disease and Crimean-Congo haemorrhagic fever; phlebotomine sandflies (*Phlebotomus perniciosus* and *Phlebotomus arisi*), related to Leishmaniasis and diseases caused by phleboviruses such as Toscana or Granada; lice, transmitters of Typhus (caused by the bacteria *Rickettsia prowazekii and Bartonella quintana*) and fleas (*Xenopsilla cheopis* and *Ctenocephalides felis*), related to Murine Typhus. To date, no disease transmission due to bedbugs or blackfly bites has been reported in Spain.

The nature of these diseases means that in some cases co-infections can develop, which can affect the recovery of those affected. This is especially relevant in Lyme disease, where pathogens such as *Babesia, Bartonella, Ehrilichia* or *Rickettsia* worsen the symptom picture, make diagnosis and treatment difficult, as the disease cannot be resolved without addressing these co-infections.

Most of these vector-borne diseases are zoonotic, and therefore different animal species, both wild and domestic, are involved in their transmission cycle. For this reason, the World Health Organisation (WHO), the United Nations (FAO) and the World Organisation for Animal Health (OIE) are promoting coordination and cooperation between the Public Health, Animal Health and Environment authorities in the different countries, within the One Health concept.

Although there have been some autochthonous cases of the above diseases, the overall risk is medium-low. However, certain factors can increase the prevalence of this type of disease, as well as the proliferation of its main vectors, such as changes associated with land use, urban planning, migratory movements, light pollution at night, population movements and climate change. One aspect that may be key to controlling new vector-borne diseases is the thorough control of the entry and exit of invasive species that may introduce new diseases.

As a result of these factors, it has become a global problem. For this reason, WHO has an **Action Plan on Entomology and Vector Control 2018-2023** and a **Global Response Strategy for Vector Control 2017-2030**.

These documents are in line with the work carried out in Spain on vector-borne diseases. Currently, the MSAN has a **National Vector-Borne Disease Preparedness and Response Plan**, thanks to which it has been possible to observe, for example, that the tiger mosquito (*Aedes albopictus*) is well established in the eastern part of the peninsula and in the Balearic Islands, and it has been possible to give adequate indications for its control. The following lines of action are intended to follow on from previous work and increase VBD control and intervention in Spain.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Implement effective systems for prevention and early control of vector-borne disease outbreaks.	a) Strengthen human, animal and environmental epidemiological surveillance especially in high-risk areas and establish special vector surveillance zones to avoid outbreaks or resurgences in areas with a traditionally positive vector presence. b) Expand comprehensive and multisectoral action plans involving public and private institutions that play a role in disease preparedness and response (National Vector-Borne Disease Preparedness and Response Plan), including, in addition to diseases transmitted by *Aedes*, those transmitted by the rest of the vectors mentioned above. c) Identify environmental factors linked to the development of zoonotic diseases with potential impact on human health. d) Identify degraded areas where the development and reproduction of disease vectors is favoured. e) Establish, especially in risk areas, measures to control vector-borne disease reservoirs. f) Promote integrated pest management, biological control, environmental management and the rational use of biocides. g) Establish Entomological Surveillance Programmes: Systematically monitor the vector population potentially transmitting the pathogen and the entry of new species during growing seasons. h) Strengthen vector control measures around ports and airports and wetlands. i) Assess the relevance of the inclusion of some vector-borne diseases as notifiable diseases.

Management, organisation and coordination

Objective	Actions
Improve the coordination of the different administrations involved.	a) Develop working protocols to address the problem of vectors or reservoirs in a transversal manner in the different territories in order to homogenise actions in the event of outbreaks or cases. b) Apply in a coordinated manner, between the different administrations and environmental health service companies, the necessary measures for vector control, timely risk communication and outbreak management. c) Create an advisory committee involving entities, institutions and professionals engaged in the development of actions based on the One Health axis, e.g. CCAES, MAPA, MITERD, ISCIII, universities, etc. d) Assess environmental and social risks locally in order to propose appropriate preventive measures in each context.

Training and risk communication

Objective	Actions
Improve professional training and citizens' awareness.	a) Carry out interventions where health professionals are informed of the protocols for action and early detection. b) Inform the population travelling to endemic countries about traveller's consultations. c) Increase population-based interventions that explain preventative measures against the main vectors. d) Promote the use of technologies applied to vector control management and citizen participation to achieve this objective, as well as support Citizen Science projects. e) Inform and communicate the risk to groups that may be involved in the private sector in the development of the proposed actions (farm managers, farmers, stockbreeders, hunters, etc.). f) Make agreements with the University, especially with the Veterinary Faculties, for training in the identification and control of vectors of communicable diseases and their recording and reporting to surveillance systems.

Research

Objective	Actions
Improve knowledge about risk management of vector-borne diseases.	a) Promote the study of reservoir dynamics. b) Analyse the ecology and entomology of endemic or historically endemic areas to assess the factors conditioning the transmissibility of the disease. c) Establish a system for coordination of data collection and data sharing to facilitate risk assessment and knowledge of vector status and to enhance the systematic collection of entomological and animal health data. d) Assess the relevance of using vector control techniques. e) Assess and monitor the potential risk of introduction of alien species into the country that may pose an increased risk of vector-borne disease transmission. f) Analyse the possible effects of climate change and biodiversity loss on the distribution of vectors with increased transmissibility capacity. g) Conduct studies on the vectorial capacity of the main vectors in Spain. h) Estimate the population of asymptomatic people in the period of viral transmission who do not attend hospital (are outside the RENAVE network) but may result in an underestimation of risk. i) Conduct studies on the gender-differentiated effects of the main vectors and their consequences. j) Collaborate with research centres on diseases in developing countries. k) Conduct short-, medium- and long-term studies of vectors and their pathogens, taking into account different habitats. This is especially important for tick-borne diseases, as their phenology changes depending on the habitat.

Monitoring, evaluation and indicators

Objective	Actions
Evaluate the health impact of plans and the effectiveness of vector and outbreak management measures.	a) Develop indicators related to vector-borne disease control. b) Report on the results of the implementation of the Plan on vector populations capable of transmitting diseases. c) Assess the surveillance network by the number of institutions participating in entomological surveillance exercises for disease transmission vectors. d) Report on surveillance, entomological control and vector-associated epidemiology.

6.6. CHEMICAL PRODUCTS

With regard to this thematic area of chemical products, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM ADVERSE EFFECTS RESULTING FROM EXPOSURE TO CHEMICAL SUBSTANCES AND MIXTURES.***

Contact with chemicals is an everyday part of our lives. 98% of economic activities require chemicals in their production chain, which makes the chemical industry a key sector for ensuring our well-being, protecting our health and safety, and addressing new social and environmental challenges through innovation. Despite the progress they have made, there may be negative consequences for health or the environment due to exposure to certain chemicals.

We routinely use a countless number of chemicals in general for a wide variety of industrial, agricultural, domestic and other uses, as well as a number of active substances used to formulate biocidal and phytosanitary products. Since exposure to such substances can have effects on the health of those exposed, for many years the EU has been developing policies aimed at managing chemicals with the essential objective of protecting health and the environment. The aim is to ensure that chemical substances and mixtures are produced and used in a way that minimises adverse effects.

With this objective in mind, two horizontal Regulations were created: the Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and the Regulation on Classification, Packaging and Labelling of Chemicals (CLP), the purpose of which is to determine whether a substance or mixture has properties that determine its classification as hazardous, in a way that is understandable and can be communicated to the public so that they are able to act upon it. Sharing objectives, specific legislation such as the Regulations on the placing on the market and use of biocidal products and on the placing on the market of plant protection products also emerged.

Some of these chemicals may act as endocrine disruptors. These are chemical compounds capable of coming into contact with the body through water, air or food and disrupting hormone balance and embryonic development and causing adverse effects on the health of an organism or its offspring. The term encompasses a group of chemicals of different origin and structure that were synthesised to perform various functions, which can be persistent and accumulate in living organisms. The available scientific evidence suggests that the increasing trends in certain adverse effects observed in wildlife and human health could be attributed to exposure to these substances.

The World Health Organisation is actively involved in the work of multilateral environmental conventions and agreements related to the protection of human health and the environment from the effects of chemical pollution. In addition to those discussed below, one example is the **Rotterdam Convention** on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. **The 7th Environment Action Programme** sets the long-term goal of a non-toxic environment and, to this end, provides that action is needed to ensure that significant adverse effects of chemicals on human health and the environment are minimised.

Among the hazardous chemicals it is worth mentioning the persistent organic pollutants (POPs) regulated by international conventions such as the Protocol on Persistent Organic Pollutants to the **Air Convention** on Long-Range Transboundary Air Pollution, the latest revision of which, although Spain and the European Union have ratified it, has not yet entered into force, as well as the **Stockholm Convention** on POPs, a legally binding international agreement negotiated within the United Nations Environment Programme (UNEP), which entered into force in Spain on 26th August 2004 and aims to protect human health and the environment from POPs by eliminating and, where this is not possible, minimising emissions of these dangerous pollutants. In line with these conventions and sharing their objective is Regulation (EU) 2019/1021 of the European Parliament and of the Council on POPs.

Similarly, mercury has given rise to the **Minamata Convention**, a legally binding international agreement negotiated under UNEP, which entered into force on 16th August 2017 and aims to protect human health and the environment from anthropogenic releases of mercury and mercury compounds. In line with this convention and sharing its objective, Article 10 of Regulation (EU) 2017/852 of the European Parliament and of the Council on mercury "Dental Amalgam" in its paragraphs 1 to 3, establishes restrictions on the use of dental amalgam containing mercury and also includes the obligation for each Member State to establish, no later than 1st July 2019, a national plan concerning the measures it intends to implement for the gradual reduction of the use of dental amalgam.

With regard to plant protection products, incorporating the postulates established in the **6th Community Environmental Action Programme**, there is European legislation (Regulation 1107/2009 on the placing of plant protection products on the market) and Directive 2009/128/EC establishing a framework for Community action to achieve a sustainable use of pesticides; which aims to reduce the risks and impacts of pesticide use on human health and the environment and to promote integrated pest management and alternative approaches or techniques in order to reduce dependence on the use of pesticides. This directive, developed in Royal Decree 1311/2012, of 14th September, contains the basic provisions relating to the rationalisation of the use of pesticides in order to reduce the risks and effects of their use on human health and the environment, and establishes a **National Action Plan** (NAP) required for its achievement. The first NAP (2013 - 2017) to achieve a sustainable use of plant protection products, in accordance with the EU mandate, was approved in Order AAA/2809/2012 of 13th December. This NAP ended on 31st December 2017 and as a consequence of its review and update, a new NAP was approved in December 2017, with a period of validity from 1st January 2018 to 31st December 2022. Subsequently, by Royal Decree 555/2019 of 27th September, Royal Decree 1311/2012 was amended to establish the harmonised hazard-based risk indicators. These risk indicators will serve to estimate trends in risks arising from the use of pesticides and are based on statistics, prepared in accordance with Regulation (EC) No 1185/2009, on the quantities of active substances placed on the market of plant protection products. By combining the statistics and information on active substances referred to in Regulation (EC) No 1107/2009, including low-risk substances, candidates for substitution or other active substances, a calculation method is established to produce a harmonised hazard-based risk indicator, which calculates the potential risks from the use of pesticides.

In order to reduce the risks and impacts of the use of pesticides (biocides and plant protection products) on human health and the environment, integrated pest management and alternative approaches or techniques should be promoted with the aim of reducing dependency on the use of pesticides (biocides and plant protection products).

It is essential to monitor both initial and further training systems for distributors, advisors and professional users of pesticides (biocides and plant protection products), as well as certification systems recording such training, so that those who use or will use pesticides are fully aware of the

potential risks to human health and the environment, and of the appropriate measures to reduce them as far as possible.

On the other hand, among the biocidal substances and products regulated by Regulation (EU) No 528/2012 of the European Parliament and of the Council, of 22nd May 2012, concerning the placing on the market and use of biocidal products, the anticoagulant rodenticide substances, on the basis of which the vast majority of chemical products for rodent control are made, deserve special attention due to their effects on health and the environment. In environmental terms, these substances present a high risk of poisoning for non-target species. In fact, there are numerous studies describing cases of wild species poisoned by rodenticides, many of them of high ecological value, both in Spain and in other EU countries. Another environmental hazard resulting from these substances is their high persistence in the environment. All of the so-called SGARs (Second Generation Anticoagulant Rodenticides) have been identified as PBT (Persistent, Bioaccumulative and Toxic) and/or vPvB (very Persistent and very Bioaccumulative) substances. Resistance has also been identified in rodent species to several of these anticoagulant substances, with the dangers that this entails.

While SGARs are of particular concern because there are currently no acceptable alternatives to their use, other biocidal active substances are subject to restrictions or bans, based on the outcome of the evaluation carried out by the European Chemicals Agency (ECHA) in collaboration with the EU Member States through a Review Programme.

As for the REACH Regulation, the authorisation process is a risk management tool to control the use of certain highly hazardous substances, including carcinogenic, mutagenic and toxic to reproduction (CMR), PBT, vPvB and other substances of equivalent hazard such as endocrine disruptors. As a safety net, the restriction procedure involves limiting certain uses or prohibiting the placing on the market of substances whose risks to health or the environment are considered unacceptable. Both processes are covered by the **Chemicals Sustainability Strategy**[5] in order to increase and improve their effectiveness.

Exposure to these and other substances is currently assessed externally through their sources and, although it allows estimating the levels of pollutants to which the population might be exposed, it is associated with large uncertainties, which is why the use of human biomonitoring (HBM) is becoming increasingly relevant. HBM, defined as the measurement of internal exposure to contaminants in humans, by analysing their concentration or that of their metabolites in any of their biological matrices, can be used as a cross-sectional tool for an integrated assessment of exposure to any chemical, taking into account all routes and sources of exposure, thus reducing the uncertainty derived from the external estimation of environmental exposure.

Chemicals have long been of international concern and this section of the Plan seeks to address the concerns raised. For example, research on this topic is in line with the proposals of the EU Environment and Health Action Plan (EHAP) to study the combined effect of chemicals on health and the development of human biomonitoring programmes in Europe. In this last point, the measures proposed in the Plan are aligned with Spain's participation in the Human Biomonitoring for Europe (**HBM4EU**) project to harmonise the methodology and share data on human biomonitoring. With regard to chemical safety, the registration and treatment of the different chemicals detailed in the Plan responds to the concerns of the **World Health Organisation (WHO) Strategy on Health, Environment and Climate Change** and **Sustainable Development Goal (SDG) 3.9** (Reduce chemical-related morbidity and mortality).

In Europe, the Commission presented its **Sustainability Strategy for Chemical**[55] in October 2020. In line with the European Green Deal, the aim of the Strategy is to achieve a toxic-free environment, where chemicals are produced and used in a way that maximises their contribution to society, but avoids causing harm to the planet and to current and future generations. This strategy is aligned with the new **Circular Economy Action Plan**. Until now, chemicals policy and regulation has largely addressed the hazards and risks of chemicals from a linear, non-circular economy point of view. But if reuse of resources is to be encouraged, it must be ensured that this does not lead to the reintroduction of hazardous chemicals into the market through the recycling of manufactured objects and materials. In this regard, the Commission has identified four problems that could lead to a toxic circular economy. These include the fact that waste managers do not have information on the content of hazardous substances in the materials they recycle. To address this problem, a database of substances of concern in items has been set up to ensure that when these items become waste, waste managers are aware of the presence of these substances and thus improve waste management. This database will also be opened up to consumers to help them make a more informed choice and thus contribute to promoting the reduction of the hazardous substance content of items.

The Strategy encourages innovation, seeking to make it the route to safer and more sustainable alternatives. From this innovative perspective, initiatives such as Safe and Sustainable by Design, which promotes that designers, researchers, industries and companies take into account the aspect of safety and sustainability from the initial stages of product development, are encouraged. This strategy is the first step towards a zero pollution ambition for a toxics-free environment announced in the **European Green Deal.** The strategy will drive innovation for safe and sustainable chemicals, and enhance the protection of human health and the environment from hazardous chemicals.

The Sustainability Strategy for Chemicals also notes that per- and polyfluoroalkyl substances (PFAS) require special attention, considering the increasing number of cases detected at global and EU level reflecting serious soil and water contamination events, including drinking water, and the number of people affected by a full spectrum of diseases. PFASs still have uses in many sectors, including the textile industry, and should therefore be strongly considered for phasing out in order to reduce consumer exposure and increase consumer protection.

Along the same lines of supporting innovation, since 2018 ECHA has been promoting a strategy to encourage the substitution of chemicals of concern with safer chemicals. This strategy complements the chemicals regulations already discussed, while contributing to the EU's overall objectives of promoting innovation and boosting the circular economy. ECHA's ongoing activities have stimulated substitution of substances of concern, while helping to shift the debate from a compliance-oriented approach (which can lead to unwanted substitutions) to one focused on innovation for safer and more effective alternatives.

Already in 2012, the European Commission, in its Communication on the combined effects of chemicals[56], stated that exposure to chemical mixtures posed a greater risk to health and the environment than the risks accepted for individual substances. The European Union is discussing, from a pragmatic approach, the best mechanism to assess the risks, both health and environmental, of the combined effects of mixtures of chemical substances. In this regard, the Sustainability Strategy for Chemicals includes among its proposals the need to take into account the effect of these chemical mixtures and to integrate it more generally into chemical risk assessments.

The **Farm to Fork Strategy** is at the heart of the European Green Deal, which aims to make food systems fair, healthy and environmentally friendly. This strategy aims to significantly reduce dependence, risk and use of chemical pesticides, fertilisers and antibiotics and to develop innovative

farming and fishing techniques that protect crops from pests and diseases. The strategy also aims to contribute to achieving a circular economy, from production to consumption.

Furthermore, the European Commission's Common Agricultural Policy (CAP) 2020 Strategic Plan must be consistent with the European Green Deal and contribute to achieving the European Union's climate and environmental objectives. Once the post-2020 CAP is in place, it introduces profound change and the final beneficiaries of support must contribute to the promotion of a smart, resilient and diversified agricultural sector that ensures food security and intensifies environmental care and climate action.

LINES OF ACTION

Sub-topic: Industrial chemicals, plant protection products and biocidal products

Prevention and health protection

Objective	Actions
To protect public health from risks arising from exposure to chemicals on the market and to which various human populations are exposed directly (workers or consumers) or indirectly (through the environment).	a) Evaluate the danger, exposure and risk of chemical substances. b) Contribute to the finalisation of ECHA's Biocidal Active Substances Review Programme. c) Streamline the management of registration systems and Classification and Labelling Reports for chemical substances and mixtures. d) Promote the use of non-hazardous or less hazardous products for health and the environment and of techniques that minimise the risk of exposure to biocidal and phytosanitary products, in particular to promote integrated pest management and scientifically endorsed tools to improve productivity. e) Improve systems for recording, reporting and surveillance and epidemiological assessment of diseases caused by exposure to chemicals. f) Implement human biomonitoring strategies as a tool to monitor the relationship between exposure and potential health effects. g) Identify high hazard substances that may require specific risk management measures (CMR, DE, respiratory sensitisers) and promote their substitution. h) Develop a Code of Good Practice for the use of rodenticide products in collaboration with the different actors involved. i) Implement and monitor the National Plan for the reduction of the use of dental amalgams. j) Follow-up and participation in discussions on combined effects of chemical mixtures in Europe. k) Promote the use of low-risk substances and products and reduce the use of substances that are candidates for substitution. l) Promote environmentally sound agricultural practices that minimise the use of hazardous chemicals in food production. m) Promote initiatives such as "good neighbourliness" to pass on knowledge and precautionary measures among farmers, passers-by and residents.

Objective	Actions
	n) Promote the reduction of the use of plant protection products and biocides, both qualitatively and quantitatively, and in particular as regards plant protection products consistent with the 50% reduction target of the EU Farm to Fork and Biodiversity 2030 Strategies. o) Review the resources available to speed up the evaluation of active substances in European programmes. p) Promote and collaborate in the establishment of measures to eliminate those chemicals most dangerous to human health and the environment, such as persistent organic pollutants. q) Promote the substitution and elimination of "new" hazardous chemicals or group of chemicals that pose a high level of exposure to the population, such as PFASs.

Management, organisation and coordination

Objective	Actions
Promote coordination and cooperation with other institutions with interests in this area within the scope of their respective competences: MITERD, MAPA, INTCF, Autonomous Regions, INIA and INSST.	a) Prioritise review of authorised plant protection products or biocidal products containing chemicals newly classified as CMRs. b) Ensure effective implementation of the National Action Plan (2018-2022) to achieve a sustainable use of plant protection products. c) Collect statistical data to identify trends in the use of plant protection products and biocidal products containing active substances of particular concern and those of low risk. d) Improve enforcement and participation in European inspection projects. e) Improve coordination with competent authorities in order to collect quantitative data on the presence of rodenticidal substances and their environmental relevance for non-target species. f) Strengthen the toxicological information service of the National Institute of Toxicology and its participation in the European Network. g) Reinforce the inspection by the Autonomous Regions of products imported into the EU and their compliance with EU regulations, REACH, etc. h) Make a greater effort to collaborate with third countries to implement European standards in their processes. i) Monitor chemicals that can be purchased through online commerce or other unauthorised access to chemicals. j) Improve coordination and specify the functions and participation of the regional health authorities in the application of Royal Decree 1311/2012, of 14th September, which establishes the framework for action to achieve a sustainable use of plant protection products. k) Ensure the development of the EU Farm to Fork Strategy and its national implementation through the post-2020 CAP.

Training and risk communication

Objective	Actions
Improve professional training on the health risk that can arise from exposure to chemicals, as well as raise awareness of these risks for the whole population.	a) Increase the training/qualification of the technical staff involved in the control of chemical products in the Autonomous Regions responsible for the control of compliance with relevant aspects of the legislation. b) Increase training/education of professionals in risk assessment due to exposure to chemicals, as well as in classification and labelling of chemicals and identification of endocrine-disrupting properties. c) Improve transparency and communication to the public of information on chemical use through awareness campaigns, in collaboration with professional associations. d) Improve the dissemination of relevant information on chemical exposure to facilitate public access to this information. e) Continue to provide advice to the sector on implementing the legislation. f) Adapt training for distributors, integrated pest management advisors, technical staff of environmental health companies and professional users of pesticides (biocides and phytosanitary products). g) Implement training in toxicology and endocrine disrupters in undergraduate courses related to health sciences. h) Promote and improve public information and awareness of the serious damage that mercury can cause to human health and disseminate information on the consumption of products containing high levels of mercury, especially to the most vulnerable groups (women of childbearing age or pregnant women and children under 16 years of age).

Research

Objective	Actions
Promote the necessary measures to foster research and innovation.	a) Participate in activities and working groups to establish new or improve existing assessment procedures. b) Enhance quantitative human biomonitoring studies (HBM) as a tool for monitoring the relationship between exposure and potential health effects. c) Participate in EU and OECD test method validation projects. d) Contribute scientific and technical input to the objectives of the Commission's European Green Deal, in particular the Chemicals for Sustainability Strategy, to promote a toxic-free environment and the goal of "zero pollution". e) Support the implementation and development of the European Plastics Strategy and also, more generally, the promotion of the Circular Economy, through the database of substances of concern in articles (SCIP), as well as with scientific contributions and proposals, especially on microplastics. f) Improve the understanding of the universe of chemicals registered under REACH to contribute to an integrated regulatory approach.

Monitoring, evaluation and indicators

Objective	Actions
Determine the degree of compliance with measures, identify trends by analysing results.	a) Regularly report on the results of the implementation of the Strategic Health and Environment Plan on Chemicals Management, including biocides, plant protection products and industrial chemicals. b) Strengthen waste management methodologies to minimise releases of hazardous substances, in particular to promote and certify the effluent management system for plant protection products.

Sub-topic: Endocrine disruptors

Prevention and health protection

Objective	Actions
Improve the population's health and well-being by reducing human and environmental exposure to endocrine disrupting chemicals.	a) Promote activities aimed at the assessment and identification of substances as endocrine disruptors. b) Increase knowledge on the exposure of vulnerable groups to endocrine disruptors. c) Assess human exposure through the public health surveillance system (Human Biomonitoring) of endocrine disruptors in the population. d) Promote activities on endocrine disruptors within the sustainability strategy for chemicals and in particular those related to classification and labelling.

Management, organisation and coordination

Objective	Actions
Promote coordination and cooperation with other institutions with interests in this area: MITERD, MAPA, INDUSTRY, LABOUR, Autonomous Regions.	a) Promote measures to reduce the presence of endocrine disruptors in consumer products and in the environment and the exposure of the population through appropriate legislative instruments for their regulation. b) Develop specific national regulation on endocrine disruptors (possibility of a National Strategy). c) Improve coordination with Universities and research organisations to carry out the assessment of the effects of endocrine disruptors. d) Implement an EU-wide strategy for a non-toxic environment, in line with the 7th Environment Action Programme, which fully addresses endocrine disrupters and the combined effects of chemicals, among other issues.

Training and risk communication

Objective	Actions
Train health professionals and promote proper communication to the public.	a) Develop a programme that encourages the training of health professionals and other agents of local and municipal administration to serve as a reference for citizens and to guide local policy decisions. b) Improve professional training on chemical risk (connection with chemicals management). c) Strengthen the role of health professionals in informing and raising awareness among the population. d) Enhance transparency and communication to the public on the safety of chemicals in everyday use by providing information on best practices for limiting exposure with priority given to populations most at risk. e) Improve communication on strategies to prevent or control risks due to endocrine disruptors. f) Provide legible and understandable labelling for the public.

Research

Objective	Actions
Promote the necessary measures to encourage research and innovation to understand and adapt regulation and management in the most effective way.	a) Coordinate disruptor research programmes with chemical hazard research programmes. b) Promote clinical epidemiological studies that include exposure to endocrine disruptors. c) Introduce a mechanism for early monitoring of poorly studied emerging disruptors.

Monitoring, evaluation and indicators

Objective	Actions
Be familiar with the monitoring and evaluation of endocrine disrupting chemicals.	a) Number of endocrine disruptors in the progress report of the active substance review programme. b) Substances included in the lists of endocrine disrupters updated on the website www.edlists.org or any other compilation of endocrine disrupting substances developed in the future by the European Commission and its Agencies ECHA, EFSA, etc. c) Number of substances identified as endocrine disrupting substances and therefore included in the candidate list as set forth in Article 59(1) of the REACH Regulation.

Sub-topic: Human Biomonitoring

Prevention and health protection

Objective	Actions
Contribute to the improvement of public health by assessing the exposure of the population to chemicals.	a) Prioritise both the substances with the greatest impact and the most vulnerable population groups. b) Establish exposure reference values for the study population for the prioritised substances. c) Identify geographical differences, vulnerable population groups or those at higher risk of exposure. d) Identify the determinants of exposure. e) Establish health guideline values for the prioritised substances. f) Establish recommendations for action to the population based on the results.

Management, organisation and coordination

Objective	Actions
Promote the consolidation of infrastructures and harmonised tools at national level, aligned with European structures, for the implementation of campaigns. Promote coordination and cooperation with other institutions with interests in the field: MITERD, MAPA, INDUSTRY, LABOUR, Autonomous Regions.	a) Establish a strong and stable national human biomonitoring structure through the creation of the National Human Biomonitoring Node. b) Establish an Advisory Commission on Human Biomonitoring. c) Establish a network of human biomonitoring laboratories nationally, coordinating with existing laboratory networks. The network will be collected in a dynamic database that will be regularly updated. d) Linking biomonitoring campaigns with other environmental monitoring programmes. e) Establish legislative or preventive measures based on evidence from human biomonitoring studies.

Training and risk communication

Objective	Actions
Train health professionals in the use of human biomonitoring as a tool to enable them to act as reference elements in their fields of action, thus facilitating informed citizen participation.	a) Develop a programme that encourages the training of health professionals and other agents of the autonomous, local and municipal administrations to serve as a reference for citizens and guide local policy decisions. b) Raise awareness among the population by transmitting basic general knowledge about health and environmental exposure, encouraging them to adopt behaviours that improve their habits and promote responsible consumption. c) Conduct regular information campaigns in the media, schools, etc. aimed at the public on the safety of chemicals in daily use, providing information on best practices for limiting exposure. d) Carrying out campaigns targeting associations and NGOs for their role in communicating with the public. e) Create a national information platform.

Research

Objective	Actions
Promote research on Human Biomonitoring and include it in the thematic priorities and priority lines of research of national and regional calls for proposals.	a) Include Human Biomonitoring in the Strategic Action on Health (AES of the ISCIII), the State Plan for Scientific and Technical Research and Innovation and in the research plans on health and the environment of the Autonomous Regions. b) Implement regular human biomonitoring campaigns.

Monitoring, evaluation and indicators

Objective	Actions
Verify the functioning of the actions proposed in this line of action. *Evaluate the functioning and effectiveness of the National Human Biomonitoring Node.*	a) Number of advisory reports, guideline values recommended by the Advisory Commission on Human Biomonitoring and No. of reviewed studies. b) Number of HBM campaigns carried out and scope of coverage (national, regional, local). c) Laboratory network: number of member laboratories, participation in intercomparison exercises, validated methods for the different biomarkers. d) Link to control programmes: collaboration agreements between administrations, official reports issued. e) Evaluation of the participatory system.

6.7. WASTE

With regard to this thematic area of waste, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF WASTE MISMANAGEMENT.***

Since its inception in the 1970s, EU and national environmental policy has been geared towards maximum protection of human health and the environment, including in its objectives all aspects of waste generation and management. In addition to the basic waste legislation, different legislative initiatives have been developed on certain waste streams, as well as on different waste treatments (incineration and landfill), which continue to have the same objectives.

However, the high variability in the composition of the different types of waste, as well as the low characterisation of which population may be exposed, and the extent of such exposure, has made it difficult to assess potential health effects from contact with the waste or with the means of collection, transport and treatment of the waste. To overcome these difficulties, prevention has been proposed as a cross-cutting **preventive** measure, understood as measures taken during the conception and design, production, distribution and consumption phases of a substance, material or product to reduce the amount of waste and the adverse impacts on the environment and human health of the waste generated or the content of harmful substances in materials and products.

However, in many cases, when waste generation cannot be avoided, waste should be managed according to the first management options of the waste hierarchy (preparation for re-use, recycling and other forms of recovery) trying to avoid the worst scenario: disposal. This principle of hierarchy is one of the key tools of the **circular economy**, a model that aims to reduce the use of natural resources for production, reduce any type of impact that waste may generate and maximise its use by avoiding its disposal.

In order for these activities to be carried out correctly, it is necessary to have an in-depth knowledge of the nature of each of the types of waste generated in order to ensure the most appropriate treatment. In this respect, waste has been separated by "fractions" or waste streams for which, in some cases, specific regulations or targets have been developed, e.g. bio-waste, paper and cardboard, electrical and electronic equipment, batteries, textiles and footwear, medicines, cooking oils, packaging, tyres, vehicles, ships, industrial oils, sewage sludge, mining waste, health care waste. The impacts associated with some of the treatments that waste undergoes are also known: landfilling, incineration/co-incineration, etc. These activities are therefore subject to specific regulation.

Asbestos is a group of fibrous materials that have the ability to withstand high stresses. It has low thermal conductivity and high resistance to chemical attack and, to date, there are 6 types of asbestos of natural origin. Therefore, this product was widely used as insulation for buildings, fireproofing blankets, medicine packaging, in the automotive industry and as an additive to plastics[57]. However, the IARC classified it as a group 1 carcinogen and in 2002 its use was banned in Spain, due to its association with health problems such as lung cancer, asbestosis and pleural effusions.

The specific case of asbestos has required separate consideration, due to its direct impact on the population's health and, above all, on workplaces. Therefore, there is an extensive regulatory framework on this material through the **Ministerial Order, of 7th December 2001**, amending Annex I of Royal Decree 1406/1989, of 10th November 1989, on restrictions on the marketing and use of certain hazardous substances and preparations. In addition, due to its involvement in occupational diseases, **Royal Decree 396/2006**, of 31st March 2006, was drawn up, establishing the minimum health and safety provisions applicable to work with risk of exposure to asbestos, which led to the development of a specific health surveillance protocol for workers exposed to asbestos in Spain. Finally, an additional provision has been included in the Draft Law on Waste and Contaminated Soil, which makes it compulsory to census facilities and sites with asbestos and to plan their removal. However, the coordination of different administrative, jurisdictional and territorial areas is important to continue working on health surveillance for asbestos exposure, in accordance with the framework of the European Parliament Resolution, of 14th March 2013, on asbestos-related health risks in the workplace and prospects for the removal of all existing asbestos.

However, even though its manufacture and use has been banned, it is still present today and its management as waste remains a challenge[58]. Above all, there are certain remnants of asbestos in old buildings and spontaneous asbestos cemeteries have been found in different parts of the peninsula.[58]. Globally, the WHO estimates that 125 million people are exposed in the workplace, with 10-15% of lung cancers attributed to this exposure. In addition, millions of deaths from domestic asbestos exposure are also attributed to asbestos[59].

This thematic area provides evidence of the adverse impacts on human health and the environment of the waste generated and its main treatment pathways. In this sense, its content is in line with the main objective of the MITERD's **State Waste Prevention Programme 2014-2020**, which consists of developing measures to help reduce the waste generated in 2020 compared to 2010.

In December 2015, the European Commission presented a circular economy package with several policy proposals including amendments to the **Waste Framework Directive** (WFD) and other related directives (packaging, landfills, etc.). Law 22/2011, of 28th July, on waste and contaminated soils, transposes the WFD into Spanish law and, in coherence with it, establishes the framework for the regulation of waste management, promoting measures that prevent waste generation and allow for more efficient waste treatment that does not compromise the environment and human health, in line with the provisions of the circular economy strategy. The Law will soon be amended to incorporate the revision of the WFD adopted in 2018. The new draft has been submitted by the government to Parliament and includes strategies for the prevention of waste generation and separation of waste streams and new commitments to Extended Producer Responsibility systems. In addition, together with the new draft Royal Decree on packaging and packaging waste, it proposes restrictions on single-use plastics.

Furthermore, these new legislative proposals are in line with the objectives of the MITERD's **State Waste Management Framework Plan** (PEMAR) 2016-2022, which focus on guiding waste policy to ensure the achievement of legal objectives and guarantee the protection of human health and the environment. Furthermore, the **Spanish Circular Economy Strategy** (EEEC) has recently been presented, which is aligned both with the European Green Deal and the 2030 Agenda for Sustainable Development and with the objectives of the two EU Circular Economy Action Plans: “Closing the loop: An EU Action Plan for the Circular Economy", 2015, and “A new Circular Economy Action Plan for a cleaner and more competitive Europe", 2020.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Minimise the impacts of waste on global health.	a) Characterise and map areas of highest exposure and design and disseminate protective measures to minimise such exposure. b) Strengthen waste management methods to minimise releases of hazardous substances, in particular encourage and certify plant protection effluent management systems. c) Strengthen the proper management of asbestos waste. d) Improve risk assessment of contaminated soils, generating guidelines for their standardisation. e) Improve epidemiological surveillance and characterisation of human health effects of waste. f) Propose joint public-private actions to prioritise the restoration of sites contaminated by poor waste management with a higher risk of human exposure. g) Identify bioremediation measures for contaminated soils.

Management, organisation and coordination

Objective	Actions
Improve coordination to further develop the work and management of the planned actions.	a) Continue the work carried out by the Coordination Committee on waste and, in particular, those relating to the annual reports of waste managers. b) Normalisation and standardisation of waste managers' reports and the method of their reporting. c) Homogenise the autonomous region's regulations on the management of health care waste. d) Ensure the existence of a publicly accessible map of higher risk facilities related to waste management. e) Create action plans for the safe and comprehensive removal of asbestos, by 2028.

Training and risk communication

Objective	Actions
Show interest in and importance of the main effects that exposure to certain wastes can have. *Provide information, raise awareness and make the population responsible for the correct management of waste, especially household waste.*	a) Write a monograph describing the main impacts of waste streams on health in detail. b) Design and implement public-private communication and health education strategies that inform not only about the basics of the circular economy but also about the short- and long-term effects of improper waste management, especially of household waste. c) Elaborate informative materials on health risks related to domestic or common use waste, aimed at the general population, as well as training and awareness-raising actions channelled through health structures (Health Centres, Health Councils) and community structures (associations).

Research

Objective	Actions
Incentivise research for future waste reduction, as well as for the proper management and remediation of the impacts already generated.	a) Define a national research plan on waste and its effects on health. b) Improve environmental quality records, with identification and geolocation of the different points of maximum waste exposure for each of the waste streams. Improved waste traceability. c) Improve characterisation of human exposure in higher priority areas related to waste management and treatment facilities. d) Improve the diagnosis of asbestos exposure and generate a registry of related diseases. e) Design tools (questionnaire, health diagnostics, etc.) to improve the collection of human exposure history in population areas close to waste management facilities, identifying information on potential confounding factors that can be taken into account in subsequent epidemiological studies. f) Identify pre-clinical health effects related to contaminants in waste, and establish a register of morbidity and mortality cases more specifically related, according to scientific evidence, to toxic compounds present in different types of waste. g) Conduct epidemiological or other individual-based population and occupational health studies, including where appropriate biomonitoring, to analyse the potential health impacts of different waste fractions, not only locally but also regionally and nationally in cases or areas where this is deemed necessary.

Monitoring, evaluation and indicators

Objective	Actions
Ensure a health approach to waste management.	a) Evaluate population awareness interventions and active training of health professionals. b) Identify a list of priority diseases related to exposure to waste and waste management facilities.

6.8. INDUSTRIAL POLLUTION

With regard to this thematic area of industrial pollution, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF INDUSTRIAL POLLUTION.***

Harmful substances constantly emitted into the environment by many types of industrial facilities can affect both the workers employed at the factories and the populations living near the facilities, as well as the environment, which has an impact on human health. Many of the substances that have recently been quantified in Spain have proven carcinogenic or potentially carcinogenic effects[60].

In Spain, the prevalence of cancer is such that the number of new cases of cancer in 2020 will reach 277,394 (160,198 in men and 117,196 in women), with the most frequent being colon/rectal, prostate and breast cancer. In 2019, tumours were the second leading cause of death in Spain (26.4% of all deaths), although they were the leading cause of death in men (297.8 per 100,000 deaths)[61]. Although not all cases are specifically caused by industrial pollution, this is a factor that, in addition to the above, can play a role in the development of cancers and tumours.

Numerous international studies show evidence of the health risks of living in the vicinity of industrial areas emitting pollutants, such as the development or exacerbation of respiratory and allergic problems, congenital malformations and pregnancy complications, cardiovascular problems, neurological problems and premature mortality.

In recent years, numerous technical improvements have been made in the production processes of most major industries in Spain and the release of pollutants into the environment has been greatly reduced. The increasing industrialisation of many areas of Spain in recent decades makes it appropriate to study the health consequences that could be associated with exposure to emissions from these new industries.

In relation to the possible development of industrial pollution monitoring and information systems, there are proposals on the use of more individual data from health records combined with environmental data records and exposure assessment to improve industrial pollution monitoring and surveillance systems.

Finally, in relation to the cost-benefit analysis of clean-up interventions at sites contaminated with industrial toxins, in other countries, the benefits of the interventions have been quantified and are much higher than the costs of the interventions.

It should be noted that industry in Spain is making a great effort to adapt to all current regulations and contribute to achieving a less polluted and healthier environment. The EU is the most highly regulated and safest area in this field and industrial companies invest large amounts of money in the continuous adaptation of their processes and products to regulations and work closely together through numerous voluntary initiatives to improve the environment and sustainability.

In Spain, as a member state and party to the UNECE Protocol on Pollutant Release and Transfer Registers, there is a **State Pollutant Release and Transfer Register (PRTR-Spain).** The Spanish register has a wider scope than that regulated in European and international regulations, as it includes reporting obligations for more than 70 industrial activities and for 115 polluting substances. It also includes information on transfers of waste (according to the European Waste List codes) for final treatment off-site and on other point and diffuse sources.

Industrial PRTRs are very useful information tools for analysing the environmental performance of the technologies used in different industrial sectors in terms of the emission of pollutants. When these analyses are used to establish conditions in the environmental permits for the operation of these industries (Integrated Environmental Authorisations), based on Best Available Technologies (BAT), they can be used to reduce industrial emissions in each sector of activity. This approach is followed across Europe, through the Industrial Emissions Directive, and there are studies, such as the one recently published by the OECD on BAT-based policies, which analyse the efficiency of these policies in reducing the emission of pollutants by industry.

Globally, this area is highly relevant to the **Sustainable Development Goals**. Not only does it contribute to the SDGs mentioned above on health and environment (SDG 3 on health and well-being, SDG 6 on clean water and sanitation or SDG 13 on climate action), but it also plays an important role in the SDGs more closely related to sustainable economic and industrial development (SDG 7 on affordable and clean energy, SDG 9 on industry, innovation and infrastructure or SDG 12 on responsible production and consumption).

LINES OF ACTION

Prevention and health protection

Objective	Actions
Reduce morbidity and mortality associated with industrial pollution by monitoring human and animal exposures and their health effects.	a) Elaborate a Methodological Guide with tools to facilitate the assessment of risks associated with industrial activities, in line with the SESA document. b) Biomonitor populations in the vicinity of selected industrial areas emitting pollutants to assess possible risks from some of the emitted compounds. c) Monitor environmental immissions or concentrations of pollutants. d) Monitor population health in the vicinity of industrial areas emitting pollutants in terms of morbidity, mortality and reproductive health, based on health and civil records. e) Reduce industrial pollution at source by strengthening controls in the different industrial sectors to prevent the use and generation of Persistent Organic Pollutants. f) Develop ecological restoration initiatives (nature-based solutions) to reduce or eliminate pollution from industrial sources. g) Identify and recover contaminated soil. h) Map industrial diseases and pollutants nationally. i) Establish environmental exposure limit values (ELVs) for industrial pollutants, in particular for substances that constitute new and emerging risks, such as hormone disruptors.

Management, organisation and coordination

Objective	Actions
Minimise risks associated with contaminated soil.	a) Manage land uses taking into account the interactions between residential areas and certain industrial activities and include them in the HIA. b) Coordinate, with the MITERD, the effective implementation of remediation actions or change of use of soils contaminated with industrial toxins when they pose a health risk. c) Involve companies in the aspects of dissemination, training and commitments in industrial pollution control.

Training and risk communication

Objective	Actions
Improve professional training and public awareness.	a) Promote transparency in the information provided to the public on emissions of pollutants from industries. b) Enable a rapid and effective communication channel on any risk that may be detected to communicate the risks to the authorities and health professionals; and to the general public, avoiding scaremongering and accompanied by the actions to be carried out. c) Develop information materials and videos on industrial pollution and develop communication systems (website, social networks). d) Conduct environmental health training for health and administration professionals, with a special focus on paediatric and veterinary professionals, on the health effects of industrial pollution exposures. e) Conduct specific training on health risk assessment strategies and tools for health risk assessment of exposure to polluting products for professionals involved in the assessment of such risks.

Research

Objective	Actions
Improve on-the-ground knowledge of the risks to certain populations.	a) Conduct epidemiological cohort studies in populations in the vicinity of industrial sites that make it possible to estimate the concentrations of compounds that accumulate in the human body and their effects on health and to estimate the environmental (immission) concentration. b) Improve and refine the measurement of population exposure to industrial pollution (biomonitoring) through the use of exposure biomarkers (measurements in blood, urine or hair). c) Study and establish health reference values (immission levels) for the different industrial pollutants (VOCs, PAHs, etc.) currently not regulated. d) Identify and characterise nature-based solutions that have the potential to reduce industrial pollution. e) Evaluate the use of urban wildlife biomonitoring as a tool for collecting data on the impact of environmental conditions on disease occurrence.

Monitoring, evaluation and indicators

Objective	Actions
Determine the effectiveness of the measures.	a) Monitor the effectiveness of the proposed measures to be carried out in this area by means of process and result indicators that allow such assessment.

6.9. NATURAL RADIOACTIVITY

With regard to this thematic area of natural radioactivity, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF NATURAL RADIOACTIVITY.***

Natural radioactivity originates from radionuclides present in water, soil, air, as well as cosmic rays (per se and by generation of radionuclides in the upper atmosphere). In contrast to radioactivity of artificial origin, it never has deterministic effects (cause-effect) due to its low intensity, but its effect consists of linearly increasing the probability of developing alterations in DNA that result in the development of tumour processes, with no lower threshold that can be considered safe.

Humans have been exposed to an average background natural radioactivity of 2.4 mSv/year since their origins. Half of this radioactivity is due to the inhalation of radon and its progeny (1.2 mSv) and the other half is caused in a similar proportion, although in varying degrees, by radionuclides in soil and buildings (0.5 mSv), cosmic rays (0.4 mSv) and water and food (0.3 mSv).

There is nothing we can do about most of this dose - food, travel, etc. - but it should not be a cause for social alarm, as it is inherent to our life as a species on Earth. However, there are areas where measures can be taken to reduce this exposure. The main area of intervention would be radon, which has its own section in this Strategic Plan, but measures can also be taken to reduce exposure from building materials and from drinking water.

Medical exposures (radiodiagnostics or nuclear medicine), which account on average for a further 0.4 mSv/year and whose risk minimisation is sufficiently taken into account by health professionals, are excluded from this section. Similarly, exposure to radiation from the nuclear industry, whose contribution under normal operating conditions is negligible, is also excluded.

An interesting feature of natural radioactivity is the significantly distorted perception of risk due to its association with nuclear, radioactive or military disasters, leading the general public to overestimate its importance in some cases.

Radon deserves special mention. Radon is a heavier-than-air noble gas from the decay of uranium or thorium. Of all the radons resulting from such decay, the one that is important from the point of view of the present study is ^{222}Rn. Its importance lies in two factors: (1) it contributes 50% in magnitude of the average natural radioactivity dose received and (2) it is possible to take measures to reduce exposure.

Their presence is associated with certain geological characteristics, so there are areas where the magnitude of exposure can potentially be greater. Radon released into the atmosphere is diluted in the atmosphere and is of no great interest, but the problem lies in its possible accumulation in closed environments, mainly from subsoil emanations, but also from drinking water or building materials, which can lead to potentially very high exposures, especially in areas of high geological risk.

The problem is not so much the radon itself but rather its short-lived progeny, which are solid and are captured and retained in bronchopulmonary tissue. This mechanism is magnified in environments with aerosols or particles (dust, smoke, etc.), because they tend to aggregate with them, so they remain airborne for a long time and the magnitude of their deposition in the lungs or bronchial tubes is greater. Radon is the second leading cause of lung cancer and the leading cause in non-smokers. It is responsible for between 2 and 14% of such cancers, depending on other environmental factors. It is therefore necessary to establish monitoring and preventive and, where appropriate, corrective measures.

These measures include actions such as more radon measurements especially in risk areas, detailed mapping of risk areas, preventing radon from entering buildings through pre-construction or remediation measures in existing buildings, promoting the reduction of smoking as a radon-enhancing factor, as well as proper risk communication to the population. This risk communication should be accompanied by recommendations for proper ventilation, which, in addition to being one of the main measures against radon, will favour the reduction of other pollutants.

Radiation safety, as has already been mentioned, is a priority point of the **WHO Global Strategy on Health, Environment and Climate Change**, which is addressed by the actions proposed in this section.

Internationally, the objectives of this thematic area are in line with **Council Directive 2013/51/EURATOM**, which aims to establish requirements for the protection of the population's health with regard to radioactive substances in water intended for human consumption. This area is also in line with **Directive 2013/59/EURATOM**, which establishes basic safety standards for the protection of human health against the risks arising from ionising radiation.

Likewise, nationally, the objectives of the area coincide with those set out in **Royal Decree 314/2016** (which amends Royal Decree 140/2003, 1798/2010 and 1799/2010), which aims to adopt new basic criteria for the protection of the population's health against the dangers derived from ionising radiation for drinking water.

Similarly, the objectives of this area are consistent, for example, with the MSAN **Radon Plan**, which aims to establish the basis for reducing health effects due to indoor radon exposures, and the amendments in Royal Decree 732/2019, of 20th December, amending the **Technical Building Code**, of the Ministry of Transport, Mobility and Urban Agenda, which introduces a new section HS6 in the "Basic Health Document" specifically dedicated to the protection of buildings from exposure to radon gas. This section sets forth the requirements to be met by buildings for the protection of people from exposure to radon and lists municipalities where, based on measurements, it is considered that there is a significant likelihood that buildings constructed without specific radon protection solutions have radon concentrations above the reference level of 300 Bq/m^3. The new section HS6 applies to all new buildings to be constructed in these municipalities and also to existing buildings in these areas in which a renovation intervention is to be carried out that affects any building element that influences radon concentration, as well as extensions and areas of the building affected by a change of use.

Furthermore, this area is in line with the Nuclear Safety Council (CSN) in the document **Protection Against Radon Gas Emissions in Buildings**, which addresses the problem of living in spaces with excessive radon gas concentrations and defines a set of regulations to address protection against the penetration of radon gas in new buildings. Furthermore, the CSN has published a **Map of Radon Potential in Spain**, which accompanies and favours the actions proposed below. The CTE incorporates a new section "HS6: Protection Against Radon Exposure" in the basic health document.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Reduce exposure to naturally occurring radioactivity from avoidable sources.	a) Implement the Radon Action Plan. b) Assess environmental exposure in the population and its impact on human health. c) Implement actions to manage the radiological risk in drinking water.

Management, organisation and coordination

Objective	Actions
Improve co-ordination of environmental radioactivity monitoring programmes.	a) Designate a reference group made up of all the competent administrations and research bodies (CSN, MITERD, Industry, CIEMAT, etc.) to advise the Ministry of Health's Environmental Health Commission. b) Establish coordination mechanisms with the Autonomous Regions and Cities and Municipalities, especially in the geographical areas most affected by radon.

Training and risk communication

Objective	Actions
Improve professional training and public awareness of radioactivity and its effects.	a) Improve health inspectors' training on risks associated with radioactivity. b) Inform and raise awareness in this area among the local administration and interest groups, and design a general risk communication strategy establishing the messages, channels and recipients so that it is clear and credible. c) Improve information available to citizens regarding radioactive substances in drinking water collected in SINAC (Spanish Drinking Water Information System). d) Conduct campaigns to promote radon gas measures in priority areas. e) Provide information and raise public awareness on natural radon radioactivity and establish radon-related outreach campaigns, educational and health centres, community networks, etc. f) Link radon risk communication and smoking prevention strategies.

Research

Objective	Actions
Expand the knowledge on exposure to natural radioactivity by geographical areas.	a) Assess the health risk geographically and its impact on the population. b) Identify the types of radioactive parameters present in water bodies and water supplies intended for human consumption and characterise them with regard to radon as a contributory factor to indoor exposure. c) Obtain screening and indicative dose values in parallel allowing for modification of the screening limit values without loss of efficacy. d) Develop specific studies of the potential correlation of the presence of radon gas with other risk factors, such as smoking, and diseases other than lung cancer. e) Promote research on nature-based solutions to radioactivity control.

Monitoring, evaluation and indicators

Objective	Actions
Assess the degree of compliance with the proposed measures.	a) Assess the efficiency of drinking water supply management. b) Monitor exposure to natural radioactivity in the general population.

6.10. ELECTROMAGNETIC FIELDS

With regard to this thematic area of electromagnetic fields, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM EXPOSURE TO ELECTROMAGNETIC FIELDS.***

Exposure to electromagnetic fields (EMF), especially those in the Extremely Low Frequency (ELF) spectrum and, in the last two decades, Radio Frequency (RF) fields, has raised concerns about their hypothetical relationship with various acute and chronic effects on human health.

The widespread use of mobile phones, wireless telecommunication systems (especially conventional Wi-Fi), the deployment of phone masts and in the coming years 5G technology, have caused some concern regarding the potential long-term health consequences of exposure to these EMFs.

In order to protect the population from the possible health effects of EMF exposure, in 1999 the EU Council, based on the ICNIRP guidelines, issued Recommendation (1999/519/EC) on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz). Assuming the criteria of this Recommendation, in 2001 Royal Decree 1066/2001, of 28th September 2001, was approved, approving the Regulation establishing conditions for the protection of the public radioelectric domain, restrictions on radioelectric emissions and health protection measures against radioelectric emissions, which establishes the limits of exposure to radioelectric emissions.

However, Royal Decree 1066/2001, of 28th September, approving the Regulation that establishes conditions for the protection of the public radioelectric domain, restrictions on radioelectric emissions and health protection measures against radioelectric emissions only affects electromagnetic waves (radio frequencies) used in telecommunications, therefore, the emission limits of the other frequencies of the electromagnetic spectrum, such as ELF EMF (e.g. high-voltage lines) have not been regulated, which lack a specific regulation for the general public, although in practice the electricity companies tend to apply the limits of Recommendation 1999/519 and the levels of Royal Decree 299/2016 on the protection of the public radioelectric domain. However, in practice, electricity companies tend to apply the limits of Recommendation 1999/519 and the levels of Royal Decree 299/2016 on the protection of the health and safety of workers against risks related to exposure to electromagnetic fields. The legislation should be updated and exposure limits for short and long term effects should be set to ensure the population is protected in line with the framework outlined above.

Most standards for exposure to electromagnetic fields are based on the recommendations of the International Commission on Non-Ionising Radiation Protection (ICNIRP). This non-governmental organisation, formally recognised by the World Health Organisation (WHO), evaluates the results of scientific studies carried out worldwide, based on which it establishes recommended exposure limits. In 2020, it published a Guide to Reducing Exposure to Electromagnetic Fields (100 kHz-300 GHz)[62] which included the most recent experimental, clinical and epidemiological studies on the subject.

The main conclusion of the WHO assessments is that exposures to EMF levels below the limits recommended in the ICNIRP international guidelines do not result in any known health consequences.

Regarding telephony, 5G technology needs a spectrum in three frequency bands, which have been agreed at the World Radiocommunication Conferences of the International Telecommunication Union These frequency bands are defined in the National 5G Plan of the Ministry of Energy, Tourism and Digital Agenda (MINETAD).

In Spain, according to the annual report (2018) on the exposure of the general public to radio emissions from radio communication stations (General Directorate of Telecommunications and Information Technologies), the average value was **0.66 μW/cm^2**. All measured levels are well below the exposure limits established (**10 W/m^2**) in Royal Decree 1066/2001, of 28th September. In compliance with this Royal Decree, 5G technology will use the 700 MHz, 3.5 GHz and 26 GHz frequency bands with reference levels for the general public of between 3.5 W/m^2, 10 W/m^2 and 10 W/m^2, respectively. These levels are similar to current levels for other frequencies and new technologies are not expected to increase emission levels, although studies will be needed to ensure compliance.

Over the last few years, many studies, both experimental, clinical and epidemiological, have been conducted to assess the health effects of EMF. To date, no adverse health effects of mobile phone use have been confirmed.

Several systematic reviews of the health effects of RF have been published, with a particular focus on the relationship between mobile phone use and brain tumours and other diseases, such as electromagnetic hypersensitivity. In general, it can be stated that there is an absence of adverse health effects from RF exposure, according to the conclusions of the relevant agencies and committees on EMF risk assessment (ANSES, 2016, 2018; ARPANSA, 2014; CCARS, 2016; Health Council of Nederlands, 2016; Demers et al., 2014; Ministry of Health 2018, NZ, 2015; PHE, 2013; SCENIHR, 2015; SSM's Scientific Council on Electromagnetic Fields, 2014, 2016, 2018 y 2019).

The SCENIHR (Scientific Committee on Emerging and Newly Identified Health Risks) is the independent scientific body that advises the European Commission and produces its opinions on new emerging risks and a wide range of complex, multidisciplinary issues that require comprehensive assessment as they affect public health, consumer safety and the environment. In 2015, upon request by the European Parliament due to social demand, the report Potential Health Effects of Exposure to Electromagnetic Fields (EMF)[63], was published, in which the health effects of exposure to electromagnetic fields were analysed. This report concludes that the results of scientific studies to date show that, at exposure levels below those set by current regulations, there are no obvious adverse health effects.

The current evidence from clinical and epidemiological findings does not establish a strong causal relationship between exposure to mobile phone radio frequencies and adverse health effects. Therefore, the application of Royal Decree 1066/2001, of 28th September 2001, makes it possible to guarantee the health of the public with regard to exposure to radioelectric radiation and, in the light of current scientific knowledge, there are currently no health reasons to justify a change in the exposure limits established in Annex II to Royal Decree 1066/2001, of 28th September 2001.

On the other hand, in relation to electromagnetic hypersensitivity, published studies do not provide convincing evidence of a causal relationship between exposure to radiofrequency fields and symptoms reported by people claiming to be hypersensitive to them, and there is currently no scientific basis for linking exposure to electromagnetic fields (ELF and RF) and such symptoms.

The controversies surrounding EMF and RF can only be clarified by using the evidence provided by the most reliable studies, analysing their results and methodological validity without prejudice and without biases that confirm our illusions or subjective beliefs.

LINES OF ACTIONS

Prevention and health protection

Objective	Actions
Educate and inform the population to make responsible and safe use of new technologies and telecommunications used by EMFs. *Improve information on risk perception of RF and ELF EMF exposure.*	a) Develop and disseminate recommendations for use and precautions for children and the adult population. b) Develop a risk assessment guide on EMF from BF (power transmission lines) to be used as a reference for environmental health reporting on the measurement of population exposure levels. c) Develop a preventive programme of information and education about the impact on health of excessive and dependent use of screens (computers, tablets, video game consoles, mobile phones, etc.) that prevent other educational, social or cultural activities. d) Facilitate access to information on the SAR (Specific Absorption Rate) of mobile phones, electronic devices and provide information on the levels of exposure (ELF and RF EMF) to which we are regularly exposed at home, school or at work.

Management, organisation and coordination

Objective	Actions
Improve the management and coordination of the competent administrations in EMF prevention and health protection.	a) In coordination with other relevant ministries, evaluate the prohibition of the use of mobile phones in secondary education, analysing all aspects that this measure may entail. b) Create the Interministerial Committee foreseen in the General Tax Law in coordination with the Ministry of Industry. c) Promote the creation of a Centre for Biomedical Research in EMF Research Network (CIBER). d) Update RD1066/2001 to include the new ICNIRP guidelines (2020). Develop specific legislation on the level of exposure of the population to ELF EMF that complies with EU, WHO and ICNIRP recommendations.

Training and risk communication

Objective	Actions
Educate and improve the responsible use of new technologies related to EMF.	a) Develop information and education materials on EMFs for health professionals, teachers and the general public. b) Conduct information campaigns on the safe use of telecommunication devices and technologies and other equipment generating RF EMF and ELF. c) Inform and educate for health on the appropriate and safe use of communication technologies, mobile phones, internet, social networks, fake news, etc. d) Include the recommendations proposed by the experts on this topic (see EMF and non-ionising radiation thematic area) for appropriate use of mobile phones during childhood and adolescence and for public risk communication.

Research

Objective	Actions
Promote research and dissemination of the effects of public exposure to RF EMF and ELF to maintain reasonable exposure levels.	a) Identify and promote the coordination of existing research centres to use their results for the implementation of effective prevention and information measures on the appropriate use of telecommunications products and technologies. b) Make an inventory of the research projects underway in Spain and the results obtained. c) Develop a comprehensive database of related articles published in indexed journals in the field. d) Disseminate research results to health professionals, researchers and the general public. e) Promote research on the problems that information technologies can generate on school learning, mental disorders (depression, anxiety, addiction, social networks, etc.), bullying at work or school, false news, hoaxes, family relationships, friendships, excessive use of mobile phones, etc., with data disaggregated by gender. f) Conduct specific studies on the levels of exposure to 5G-based networks and their health impacts, with data disaggregated by gender. Conduct studies of exposure to ELF EMFs. g) To study and analyse the updated prevalence and incidence rates of CNS tumours and leukaemias. Monitor the evolution of trends in these rates in the Spanish population with data disaggregated by age and sex.

Monitoring, evaluation and indicators

Objective	Actions
Ensure compliance with the objectives and actions foreseen in the Plan.	a) Evaluate the exposure levels of the Spanish population published by the Ministry of Industry and the results of research studies on dosimetry. b) Monitor morbidity and mortality rates of CNS tumours and leukaemias, with data disaggregated by gender. c) Establish a technical committee to assess the evaluation of the objectives and the degree of compliance with the measures foreseen in the lines of action.

6.11. ULTRAVIOLET RADIATION

With regard to this thematic area of ultraviolet radiation, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF HIGH EXPOSURE TO ULTRAVIOLET RADIATION.***

Ultraviolet (UV) radiation is part of the electromagnetic spectrum emitted by the sun. When solar radiation penetrates the earth's atmosphere, it is attenuated by scattering and absorption processes due to the components of the atmosphere. Even so, when it reaches the Earth's surface, the effects of UV radiation on the health of living beings and the environment are very diverse, such as mutagenic action on DNA and RNA or the disappearance of and changes in numerous marine and terrestrial ecosystems. These effects are mainly caused by UV variation resulting from the depletion of the ozone layer.

The harmful effects of UV radiation on humans are mainly manifested on the skin, eyes and immune system. The immediate effects of intense exposure are actinic erythema (sunburn), immunosuppression and photoaging of the skin. Of all the adverse effects of excessive exposure to UV radiation, skin cancer of all types is the most worrying.

The WHO concludes that globally, excessive exposure to solar UV radiation caused the loss of approximately 1.5 million disability adjusted life years (DALYs/DALYs) in 2000 (0.1% of the total global burden of disease) and 60,000 premature deaths. Worldwide, an estimated 2-3 million epithelial skin carcinomas and 132,000 malignant melanomas are diagnosed each year, and the overall trend is an increase of 3-7% per year. Specifically in Spain, while the crude incidence rate of melanoma is 8.76 cases per 100,000 inhabitants, the incidence rate of squamous cell carcinoma rises to 38.16 and basal cell carcinoma is much higher, with 113 cases per 100,000 inhabitants.

Although in Spain, due to the latitude, the dose of natural UV radiation is among the highest in Europe, the incidence of skin cancer is significantly lower than in other countries at higher latitudes. However, it remains a major public health problem and is beginning to be considered an epidemic. However, UV radiation is not one of the most studied environmental factors and therefore no institutional measures have been taken accordingly.

Globally, the WHO has published numerous guides with recommendations on the care of different groups in the event of radiation; of particular note is the **INTERSUN Project** which includes advice, activities and measures to be developed in this field. All these actions are based on the establishment of a **Global Solar UV Index** by the WHO that easily measures the intensity of UV radiation on the earth's surface and its ability to cause skin damage.

One element closely related to exposure to high doses of ultraviolet radiation is the ozone layer, which filters a large quantity of this radiation reaching the Earth and reduces its incidence on the population. Therefore, in 1987, the **Montreal Protocol** was signed and universally ratified to protect the Earth's ozone layer, with the goal of eliminating the use of ozone-depleting substances (ODS). From that time until 2014, more than 98% of controlled ODS have been successfully phased out, helping to reverse damage to the ozone layer and reduce the risk of this environmental factor.

In the EU, ODS legislation is among the strictest and most advanced in the world, going even beyond what is required for the implementation of the Montreal Protocol. The current **Ozone Regulation** (Regulation (EC) 1005/2009) not only regulates the production of ODS and their trade in bulk, but also prohibits their use, limiting it to certain permitted uses. It also regulates and monitors not only the substances covered by the Montreal Protocol, but also some others. However, despite the Montreal Protocol's success in phasing out ODS, ODS have a long half-life in the atmosphere, which means that it takes several decades without emissions for concentrations to return to adequate levels.

In Spain, **Royal Decree 1002/2002**, of 27th September 2002, regulating the sale and use of ultraviolet tanning devices is in force. On the other hand, the AEMET includes UV radiation as a meteorological parameter in the daily forecast. For this reason, the lines of action proposed in this area follow the path of standardising the UV Index to raise public awareness and to bring Spanish legislation on UV radiation into line with that of neighbouring countries that have tackled the risk of this environmental factor. By doing so, it aims to contribute to **SDG 3** on health and well-being and its target of reducing premature mortality from non-communicable diseases by one third.

LINES OF ACTION

Prevention and Health protection

Objective	Actions
Prevention and control of health risks associated with UV exposure.	a) Develop and adopt sun-healthy entity accreditation labels, such as dermo-healthy product labels or healthy school labels that provide sun-health education. b) Institutionally develop a decalogue of reference photoprotection. c) Promote that people have good photoprotection habits and protect themselves from solar radiation adequately, especially population subgroups with specific needs for protection against solar radiation (e.g. cancer patients). d) Encourage shading in places such as school playgrounds or public places with large numbers of people and encourage the naturalisation of highly transformed spaces, especially urban and industrial ones, to reduce exposure to UV rays. e) Update the regulations on work breaks and the obligation to provide the necessary equipment and ensure the use of sun cream in uncovered areas, if sun exposure is necessary.

Management, organisation and coordination

Objective	Actions
Improve the UV exposure regulation.	a) Evaluate the feasibility of a state regulation of tanning booths. b) Encourage public-private partnerships in achieving the objectives described in this Plan. c) Evaluate the feasibility of a state regulation making it compulsory for companies to provide the necessary equipment, including sun cream, to workers who must work in uncovered areas exposed to the sun. d) Establish a cross-sectoral dialogue with the aim of promoting a more precise regulation adapted to technological advances in the field of photoprotection and assess the development of a label for sun protection products (creams) that informs the consumer about the protection offered by the product against UV-A radiation in a more detailed manner.

Training and risk communication

Objective	Actions
Encourage people to have good photoprotection habits and protect themselves adequately from solar radiation.	a) Promote the use of the UV index in the media and other high circulation information channels throughout the year when disseminating daily weather information. b) Promote training strategies in different areas related to sun exposure: teachers, health workers and companies with workers whose jobs require them to spend a lot of time outdoors. c) Publicity campaigns to educate about the risks of exposure to UV radiation, photoprotection measures, and UV index, and including visible information in places of interest such as beaches and swimming pools, etc. d) Raise awareness of the devices and substances that contribute to the destruction of the ozone layer and thus to increased exposure to UV radiation. e) Inform the social, municipal and school community about the risks of exposure to UV radiation as well as photoprotection measures. f) Establish recreational and incentive activities to promote sun protection measures and strategies to promote a culture of photoprotection. g) Carry out awareness-raising campaigns on the benefits and risks of sun exposure and on the importance of photoprotection in everyday life. Likewise, carry out activities and dissemination campaigns both in forums with intense exposure to the sun and at large sporting events.
Train professionals on the everyday sources of ozone-depleting gases.	h) Ensure that staff handling ozone-depleting substances have the required qualifications. i) Properly communicate requirements for the placing on the market and handling of such substances, and monitor compliance with them.

Research

Objective	Actions
Improve knowledge and scientific evidence on UV radiation and its impact on health.	a) Study the erythematic doses received at levels other than horizontal in the most vulnerable population, such as children, or in the most exposed population, such as outdoor workers or athletes. b) Conduct further studies on incidences of pathologies related to overexposure to the sun. c) Research the habits and attitudes of different sectors of the population in order to determine the actual potential exposure in different life situations and the photoprotection strategies currently adopted. d) Research the results of training and strategic actions to determine changes in attitudes and habits that lead to a decrease in the incidence of pathologies. e) Research new sun protection strategies and promote research on the beneficial effects on people's health following the inclusion of different protection methods.

Monitoring, evaluation and indicators

Objective	Actions
Assess the impact of prevention measures adopted.	a) Assess the evolution of incidence rates of ultraviolet radiation-related diseases. b) Conduct epidemiological studies of prevalence, morbidity and mortality of the different risk groups and disaggregated by gender.

6.12. NOISE

With regard to this thematic area of noise, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM THE ADVERSE EFFECTS OF NOISE***

The WHO estimates that 1.6 million healthy life years have been lost as a result of traffic noise, making environmental noise the second most damaging environmental factor to health in the EU, behind only air pollution. More specifically, in Western European countries, 61,000 life years have been lost due to ischaemic heart disease, 45,000 due to cognitive problems in children, 900,000 due to sleep disorders, 22,000 years due to tinnitus and about 650,000 due to other problems.

The health effects for which most scientific evidence has been found, beyond the obvious auditory effects, are those non-auditory effects related to cardiovascular problems, such as ischaemic heart disease or hypertension. In Spain, studies have linked traffic noise to increased blood pressure, mortality from myocardial infarction and mortality from hypertension. In addition to long-term effects, a short-term association between traffic noise and hospital admissions for cardiovascular causes has been observed.

In its document **Environmental Noise Guidance for Europe**, the WHO demonstrated that exposure to environmental noise affects ischaemic heart disease, creates discomfort, sleep disturbance and affects cognitive development by influencing learning and reading comprehension in children. For these associations, and mainly in relation to traffic and aircraft noise (the most studied), it was concluded that the quality of evidence was generally moderate. In addition to noise from transport, the Guide highlights the inclusion of noise from nightlife and wind turbines, which have a significant impact on both rural and metropolitan areas. Studies subsequent to the WHO guidelines have increased the evidence on the association between noise and metabolic diseases and, specifically in Spain, the short-term effect of traffic noise on adverse birth outcomes, including foetal mortality, has been observed in the city of Madrid. Exposure to traffic noise has also been found to be associated with respiratory diseases.

It should be noted that some associations are based on low quality studies, insufficient number of studies or are outdated, and further research is needed. For example, associations between specific noise sources with mortality, hypertension or other cardiovascular, metabolic, respiratory or mental diseases, with cognitive development or with adverse birth or sleep variables. In summary, the evidence so far shows that environmental noise has a significant impact on public health, on diseases such as cardiovascular diseases, which are the leading cause of morbidity and mortality worldwide. Although some of the evidence is of low quality, if some associations are confirmed, the effect of noise could be even greater.

Environmental noise is a health problem in large cities all over the world, therefore the **EHAP** (Environment and Health Action Plan) proposes, like this Strategic Plan, to further study the effect of noise on human health and the establishment of measures to limit exposure to noise. The way in which the environment is constructed in turn conditions noise levels and its exposure by the population, which is why actions are required in the environment to reduce its levels and its impact on

health. To this end, the WHO published the aforementioned Guide, in which it develops in depth the issues and objectives set forth in the Plan. The EHAP also identifies noise from neighbourhood activities as a health problem and the 2018 WHO Environmental Noise Guidelines for the European Region rank noise from neighbourhood activities as the second source of noise nuisance after traffic noise. Noise from neighbourhood activities as defined in WHO documents includes noise from neighbours, pets, facilities and commercial activities. With regard to acoustic conditions inside buildings, the **Basic Document DB HR Protection** against noise of the Technical Building Code establishes the basic requirements for acoustic insulation (airborne noise, impact and noise from outside), reverberation time and sound absorption and the conditions relating to noise and vibrations in installations.

In Spain, **Law 37/2003**, of 17th November, on Noise constitutes the basic applicable legislation for protection against environmental noise. This law has been implemented by **Royal Decree 1513/2005**, of 16th December, which transposes **Directive 2002/49/EC** on the assessment and management of environmental noise, and **Royal Decree 1367/2007,** of 19th October, which develops all matters relating to acoustic zoning, quality objectives and noise emissions.

In December 2018, Annex II of Royal Decree 1513/2005 was amended, replacing the provisional calculation methods used for the assessment of noise indices and population exposed, by a new common European assessment methodology, established in Directive 2015/996/EC.

Commission Directive (EU) 2020/367, of 4th March 2020, amending Annex III to Directive 2002/49/EC as regards the establishment of methods for the assessment of harmful effects of environmental noise was published in March 2020.

This new directive has been transposed by Order PCM/542/2021, of 31st May, which amends Annex III of Royal Decree 1513/2005, replacing the methods for assessing the harmful effects of noise with new methods that take into account the guidelines on environmental noise for the European region of the World Health Organisation (WHO), in which the dose-effect relationships of the harmful effects caused by exposure to environmental noise are presented. An important factor related to environmental noise in terms of physiological response is vibration. Typical vibration disturbances are known as startle responses (e.g. increased heart rate), which can quickly normalise with continued exposure, continue or develop gradually. Moreover, physiological disturbances are often less sensitive than psychological reactions. It is therefore difficult to study their impact on human health, adding that they are often accompanied by other factors such as noise.

However, this difficulty does not hide its adverse impact on people's health, and more research on this factor is needed. For the time being, measures can be taken in those areas that are best known and related, as the INSST does in the workplace with **NTP 963 Vibrations: health surveillance in exposed workers**. Moreover, this factor is already considered in the EIAs and should be included in the SIAs, as well as its consideration as a health risk factor and in the measures accompanying this distinction.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Reduce the population exposed to environmental noise and identify and preserve quiet areas in cities with more than 50,000 inhabitants. *Analyse and quantify the impact of noise pollution on morbidity and mortality in Spain and its economic valuation.* Protect human health from vibration effects.	a) Properly integrate consideration of the health effects of environmental noise into environmental noise assessment and management tools, especially Strategic Noise Maps (SNM) and Noise Action Plans (NAP), by developing guidelines and technical documents. b) Adapt and unify the strategic noise maps prepared by the Competent Authorities to achieve consistency and comparability that allow the integration of the different results in global noise exposure indicators. c) Transform the Noise Action Plans into useful instruments to improve the noise environment, with properly prioritised actions and indicators for monitoring and evaluation. d) Establish a simplified methodological framework for the assessment of noise pollution and the identification of quiet areas in cities of 50,000 to 100,000 inhabitants. e) Develop procedures, guidelines and best practices to detect, protect and create new quiet zones, based on traffic calming. f) Evaluate the inclusion of noise from nightlife, entertainment and neighbourhood behaviour in the actions deriving from the Noise Directive, which currently only affect industry and transport. g) Adapt the methodologies for calculating the health effects of environmental noise to the reality of Spain, based on detailed studies in the territory of the State. h) Make progress in the consideration of vibrations as an environmental risk factor with an impact on health, associated with noise. i) Promote proper sound insulation, both in building renovation works and in new construction.

Management, organisation and coordination

Objective	Actions
Establish links between MSAN and MITERD in relation to noise pollution.	a) Create a Working Group on Noise Pollution and Health, between the technical staff of the MSAN and MITERD and the research bodies dependent on the General State Administration, to advise and cooperate in the development of all the tasks and work carried out by the municipal and autonomous authorities related to the impact of noise pollution on health. b) Achieve the maximum degree of compliance with the obligations of public administrations to assess environmental noise and take action to improve noise quality, through the development of SNMs and NAPs. c) Enforce and ensure compliance with noise pollution legislation. d) Improve coordination with companies to involve them in the aspects of dissemination, training and commitments that contribute to reducing the impact of noise pollution and achieving the proposed objectives.

Training and risk communication

Objective	Actions
Improve professional training on noise pollution and raise awareness of its importance among administrations and the population.	a) Develop and disseminate good practice guides to train technical professions in the consideration of noise pollution in the design of healthy environments and health professionals on the impacts of environmental factors, in particular noise. b) Disseminate the health impact and health co-benefits of reducing exposure to noise pollution from a health promotion and community health point of view. c) Establish common minimum criteria for regulating and accrediting the training of technical staff in environmental acoustics. d) Support the dissemination and diffusion of the importance of environmental noise for health and quality of life, and people's responsibility in relation to environmental noise. e) Develop a Guide for teachers and schools with best practices for raising awareness of the impact of noise on health at an early age.

Research

Objective	Actions
Improve the existing knowledge on noise and its health effects.	a) Analyse and quantify the effect of noise on morbidity and mortality in Spain according to different age groups, gender and risk groups, depending on the sources of noise.
	b) Analyse the health impacts of nightlife and wind turbine noise on the health of residents in areas in which these activities are widespread.
	c) Analyse the effect of nocturnal noise pollution on sleep.
	d) Research the effect of noise pollution in Spanish schools.
	e) Estimate the short- and long-term health and economic impact of noise pollution in Spain.
	f) Investigate the health benefits of the presence of so-called quiet areas under Directive 2004/49/EC of the European Parliament and of the Council, of 29th April 2004, on noise.
	g) Research and develop a methodological framework for nightlife noise mapping.
	h) Develop a metrological framework adapted to new noise measurement instruments in smart cities, to avoid that such instruments continue to be deployed outside legal metrology.
	i) Design longitudinal time-series ecological studies to assess the impact of noise on population health in locations where real-time noise data are available to determine short-term impacts on different specific causes of mortality and morbidity.
	j) Design cohort studies to assess the impact of noise on the health of the population for municipalities with more than 100,000 inhabitants that have noise maps to detect the long-term impacts of noise and vibration.
	k) Carry out an economic assessment of the cost associated with noise pollution through its impacts on health.
	l) Analyse the health impact of noise from neighbourhood activities or from building installations.
	m) Study the importance of cultural factors in the annoyance and adverse health effects of environmental noise.
	n) Research citizens' perception of noise and vibration in their homes, depending on the characteristics of these risks.

Monitoring, evaluation and indicators

Objective	Actions
Identify and promote actions that have the greatest benefits from the point of view of noise pollution.	a) Develop a simple and transparent set of indicators, based on the results of the environmental noise assessment and management work (SNM and NAP), to allow long-term assessment of the evolution and possible improvement of noise pollution problems in Spain. b) Evaluate the implementation of the Action Plans that should address the solution of noise pollution problems and the effectiveness and efficiency of those that have already been implemented. c) Develop mechanisms for the identification, recognition and dissemination of good practices in relation to environmental noise management.

6.13. INDOOR ENVIRONMENTAL QUALITY

With regard to this thematic area of indoor Environment quality, the Strategic Health and Environment Plan's mission is to ***PROTECT HUMAN HEALTH FROM ADVERSE HEALTH EFFECTS RESULTING FROM POOR INDOOR ENVIRONMENTAL QUALITY***

The health risks for occupants of indoor spaces associated with poor indoor environments in developed countries have increased in recent years. This is associated with changes in building typology, changes in the horizontal and vertical distribution of indoor space, reduction and/or mechanical control of ventilation, temperature, humidity, artificial light, etc. Cognitive aspects, such as the promotion of emotional well-being and mental health, which influence human health from the point of view of indoor environments, also play a role.

Atmospheric pollution, both outdoor and indoor air pollution, has become one of the main risk factors for the population's health. And, although in developing countries it is much higher due to biomass burning, in developed countries other causes of impact are emerging that make it necessary to consider the quality of indoor environments as a highly important factor in health.

One of the main factors influencing the health of indoor occupants is the air quality, which is directly related to the outdoor environment. This indoor air is differentiated by two relevant facts. The time people spend indoors, which is usually much longer than in outdoor air, and higher concentrations for most pollutants, due to the combination of both outdoor and indoor pollutants and inadequate ventilation. The combination of these two facts implies a higher level of exposure and therefore health risk to occupants, as demonstrated by the occurrence of long-term respiratory and carcinogenic effects.

From the point of view of air pollution and indoor air quality, emissions of PM2.5 and Non-Methane Volatile Organic Compounds (NMVOCs) need to be addressed. In the case of PM2.5, it should be noted that inefficient biomass combustion generates high emissions of pollutants and that particulate matter resulting from residential wood combustion incorporates several toxic constituents, including carcinogenic and/or mutagenic compounds, such as polycyclic aromatic carbides (PAHs), and can constitute a serious public health problem. It is therefore necessary to reduce fine particulate emissions from wood burning in fireplaces and cookers in the residential sector, to establish regulatory certification requirements for biomass used in heating and domestic hot water systems in the residential sector and to encourage the use of more efficient systems. In the case of NMVOCs, their emissions in Spain are mainly linked to domestic consumption factors (with a foreseeable growing trend) such as the use of solvents, paints, household hygiene products, household pesticides or aerosols. It is therefore necessary to promote the use of low environmental impact products with reduced NMVOC content and the sustainable consumption of products from domestic solvent use in paints, construction products, household products and cosmetics and other toiletries.

Another important fact is that, in indoor environments, in addition to the presence of physical (PM10 and PM2.5 particles), chemical (benzene, nitrogen dioxide, formaldehyde, carbon dioxide, carbon monoxide, naphthalene, etc.) or biological (bacteria, fungi and viruses) pollutants, comfort aspects

such as temperature, lighting, noise, relative humidity or ventilation air speed must be taken into account.

The priorities lie in 3 different types of indoor environments: buildings for private use; public and non-health public buildings used by high-risk occupants, such as children (nurseries, primary and secondary schools, etc.) and the elderly (nursing homes); and public buildings for health use (health centres, hospitals, etc.).

The relationship of indoor air quality with adverse health effects and its monitoring and communication are objectives that are raised both in this Strategic Plan and in the EU Environment and Health Action Plan (EHAP). Beyond this specific international document, the **WHO Global Strategy on Health, Environment and Climate Change** also refers to the radiation safety needed to reduce the impact of radon indoors, which is discussed at length in this section. In addition, the *French Agence Nationale de Sécurité Sanitaire de l'alimentation, de l'environnement et du Travail* (ANSES) has developed indoor air quality guidelines (***Qualité de l'air intérieur - Valeurs Guides de qualité d'Air Intérieur***) with the aim of addressing the health impact and providing information to manage this risk, as shown in this section.

In Spain, there is the **Regulation on Thermal Installations in Buildings** (RITE) of the Ministry of Industry, Tourism and Trade and the then Ministry of Housing, which aims to establish the conditions to be met by installations designed to meet the demand for thermal comfort and hygiene through heating, air-conditioning and domestic hot water installations. This regulation includes different categories of air quality depending on the use of the building or premises, and 5 methodologies are established for the calculation of the outdoor air flow rate.

On the other hand, there is Royal Decree 732/2019, of 20th December, which amends the Technical Building Code, approved by Royal Decree 314/2006, of 17th March, which approves the Technical Building Code (CTE) and its Basic Health and Safety Document "HS3 Indoor air quality" with the aim of eliminating pollutants that occur regularly during normal use in residential buildings. To this end, it establishes several methodologies based on CO_2 concentration and minimum ventilation flow rates.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Protect human health from the adverse effects of all forms of indoor environmental pollution. *Reduce the risks from public exposure to radon.*	a) Develop specific national legislation for indoor environments for the IAQ obligation for buildings. b) Implement the Radon Action Plan. c) Promote and support the development and rehabilitation of healthy building stock based on CTE and European health criteria. d) Establish reference methods or use those methods that have been demonstrated to be equivalent for the analysis of contaminants. e) Establish certification requirements for biomass used in heating and domestic hot water systems in the residential sector. f) Strengthen actions to expand smoke-free areas in areas such as hospitality establishments, private vehicles and certain outdoor public spaces (transport stops, access to different public facilities, etc.). g) Establish reference values for the health of the general population for major chemical compounds. h) Establish criteria for the ventilation of indoor public spaces, both for buildings with natural and mechanical ventilation. i) Develop plans to reduce the quantity and to reduce the adverse impact on human health and the environment of pesticides used by local administrations.

Management, organisation and coordination

Objective	Actions
Establish a general regulatory and organisational framework for indoor environmental quality management.	a) Develop an Indoor Environmental Quality surveillance system with the MSAN, MITERD, MITMA, Autonomous Regions and other stakeholders to monitor progress and needs in IAQ. b) Establish coordination mechanisms with the Autonomous Regions and Cities and Municipalities, especially in the geographical areas most affected by radon. c) Establish coordination with companies to involve them in the aspects of dissemination, training and indoor environmental quality commitments.

Training and risk communication

Objective	Actions
Improve professional training and public information and awareness of the effects of poor indoor environmental quality, including radon.	a) Undertake specialised training by official institutions and ensure that the training already provided is recognised by meeting a series of minimum requirements demanded by the competent public administrations. b) Conduct information campaigns to inform the population about the environmental risks arising from their exposure in indoor environments and about preventive measures to reduce such exposure. c) Conduct awareness-raising campaigns on the health risks of exposure to tobacco smoke in the home. d) Link radon risk communication and smoking prevention strategies. e) Inform and raise awareness of the NMVOC content of household products and solvents (pesticides, cosmetics, cleaning and disinfection products, etc.). f) Promote the EU Ecolabel for household paints, multi-purpose household cleaners and certain cosmetic products, and promote an EU-wide environmental label for products that emit NMVOCs and encourage the use of lower impact products. g) Raise awareness, through information and awareness campaigns, of measures aimed at reducing emissions of fine particulate matter from the burning of wood in domestic fireplaces and cookers. h) Conduct information and communication campaigns to promote energy efficiency in the residential sector and in the tertiary and public sector. i) Disseminate information on the suitability for indoor environmental quality of using EU Ecolabel products. j) Inform and raise public awareness of the importance of correct hygienic handling of animals and of the application of zooprophylactic treatments for pet animals in order to preserve human health.

Research

Objective	Actions
Improve knowledge about the risk and health impacts of poor indoor environmental quality.	a) Evaluate priority pollutants and methods of analysis for inclusion in the regulations. b) Facilitate health research to determine exposure levels of most-at-risk populations, multi-pollutant exposure studies, assessment of health impacts of multiple pollutants, etc. c) Conduct pre-normative or methodological research to determine other pollutants in indoor air that also have health effects. d) Risk and efficacy assessment of physical and physico-chemical air disinfection systems. e) Explore the correlation between levels of exposure to multiple pollutants and the age of the building and the presence or absence of controlled mechanical ventilation systems, differentiating this between double flow, single flow or non-existent (natural ventilation only).

Monitoring, evaluation and indicators

Objective	Actions
Ensure compliance with measures to improve the IAQ.	a) Establish a reduced set of IAQ indicators for priority pollutants in specific sites occupied by vulnerable populations.

6.14. HEALTHY CITIES

With regard to this thematic area of healthy cities, the Strategic Health and Environment Plan's mission is to ***IMPROVE THE QUALITY OF LIVING ENVIRONMENTS AND REDUCE THE ENVIRONMENTAL RISKS OF CITIES ON HUMAN HEALTH.***

Urban and territorial planning is key to the quality of life of populations. With regard to urban planning, different aspects determine the environment and the well-being of its inhabitants, such as mobility, green spaces, air quality, food security, landscape or housing-related aspects. The form and design of the urban environment and its surrounding territory have a great impact on the health of its inhabitants, both physically and mentally.

The health of the rural and urban environment depends on the characteristics of the population, the natural and built environment, economic and social development, lifestyles and environmental risks. However, in the territory there is a complex interaction of all these factors that generates a final impact that is very important and difficult to estimate. In this sense, urban governance is key to address issues such as active living, healthy ageing, physical activity, healthy eating and obesity, social cohesion, loneliness and isolation, stress, depression, food safety, road traffic collision and road traffic injury control, etc.

Urban planning and design is therefore of great relevance to health, both in terms of the environment's ability to influence people's choices about healthier lifestyles, and in terms of policies to reduce pollution and mitigate the impact of climate change and its consequences. Health and sustainability therefore share common objectives in the urban environment.

The traditional Mediterranean model in Spain favoured reasonably dense, medium-sized cities with safe, healthy and quality urban spaces, balanced in terms of services compared to rural areas, thus guaranteeing coexistence and social diversity. However, from the mid-1980s onwards, a model of dispersed urban development prevailed, with low density, greater social segregation, strong environmental impact and drastic alteration of the natural and rural values of the surrounding territories. These different models of growth have negative repercussions on the health of the population, on the natural and rural environment, due to the alteration of the physical environment.

Currently in Spain, 80% of the population (19% over 65 years of age) is concentrated in urbanised areas which account for only 20% of the territory. Of these, 25% live in urban agglomerations with more than one million inhabitants and 17% in the largest cities. Meanwhile, the villages, which occupy more than 2/3 of the territory, show a notable demographic gap and regression. This situation poses significant territorial imbalances, which have a differential impact on the population's health.

Although there is a general tendency to associate biodiversity with rural and isolated environments, the importance of urban biodiversity should not be underestimated. Many Spanish cities and towns are home to an unexpectedly rich biodiversity in their municipalities and even within their urban centres. A garden, a forest, a lake, a river, old buildings, any space can be important to protect, care for and

promote nature, contributing to the promotion of green spaces that are beneficial to citizens' physical and mental well-being.

In addition to the foregoing, the demographic change that the most developed countries are undergoing poses a challenge for society as a whole. It is estimated that by 2050, the elderly will represent more than 30% of the European population, with Spain being one of the countries with the highest ageing rate. It is therefore necessary to advance in urban planning that responds to the growth of an increasingly ageing population, promoting active ageing, independent living and social participation, and that also meets the criteria of age-friendly cities as defined by the WHO.

For all these reasons, a holistic and integrated vision and intersectoral commitment are required when making decisions that have an impact on the population's health. The policies and measures adopted based on the above should lead to more environmentally sustainable, socially more inclusive, economically more competitive and, consequently, healthier environments.

The Council of Ministers' approval of the **Spanish Urban Agenda** (AUE)[64], responds to the achievement of these objectives. It offers a strategic framework in which a ten-point list of objectives is identified which, along with the specific objectives and lines of action, aim to guide and inspire the adoption of more coherent and coordinated public policies that promote environmentally more sustainable, socially more inclusive, economically more competitive and, consequently, healthier environments, based on the full connection and respect for their territorial, historical and cultural context.

The AUE also responds to the fulfilment of the commitments made by Spain in relation to the 2030 Agenda and contributes to the achievement of more than 90 of the 169 targets identified in the 17 SDGs. Among them, those related to **SDG 11** on sustainable cities, which presents specific targets similar to those proposed in this Strategic Plan, such as SDG 11.2 (Promote access to safe, accessible and sustainable transport) or SDG 11.7A (Promote the link between urban and rural areas), among others. SDG 3 on health and wellbeing is also related to these goals. These SDGs are the central themes of the **European Healthy Cities Network**, currently in Phase VII (2019-2024) of implementation coordinated by the WHO Regional Office for Europe, which emphasises designing urban environments that improve health and well-being, promoting greater population participation, investing in people and sustainability. The same applies to the **Ostrava Declaration** and the **Sendai Framework for Disaster Risk Reduction.** Finally, related priority objectives, such as low-emission buildings, sustainable mass transport, implementation of naturalisation plans for cities with more than 20,000 inhabitants, EU organic farming and poverty reduction, are addressed in key international programmes such as the **Climate Action Summit**, the **EU Biodiversity Strategy** and the **EU's 7th Environmental Action Programme,** and are presented in the Plan.

This thematic area is also consistent with the objectives proposed in the **Spanish Sustainable Mobility Strategy** (Ministry of Transport, Mobility and Urban Agenda and MITERD), currently being drafted, whose objectives include improving citizens' health, promoting actions against sedentary lifestyles, improving air quality and reducing noise levels, by means of sustainable strategies such as those proposed in the Plan. The **State Strategy for Green Infrastructure and Ecological Connectivity and Restoration** also contributes to the achievement of these objectives.

The Ministry of Health is also adopting measures in this respect, in coordination with the Spanish Federation of Municipalities and Provinces (FEMP), both through the **Spanish Network of Healthy Cities** (RECS) and through the **Strategy for Health Promotion and Prevention of the National Health System**[65]. It includes different priority environments for action, including the local environment,

in which a local implementation of the Strategy[66-67], has been established, specifically addressing different actions such as political commitment, intersectoral work to improve health and the identification, visibility and strengthening of existing community resources in the municipality that can help citizens to improve their health.

LINES OF ACTION

Prevention and health protection

Objective	Actions
Encourage, in the field of urban and rural planning, that the necessary elements are taken into account to improve citizens' health and wellbeing while combating climate change; favouring active life, coexistence, equal opportunities and equity. *Enable more environmentally sustainable, socially inclusive, economically competitive and healthier environments.*	a) Develop and implement the objectives of the Spanish Urban Agenda (AUE) and fulfil the commitments made by Spain in relation to the 2030 Agenda that contributes to the achievement of the SDG 3 targets on health and well-being and SDG 11 on sustainable cities and communities. b) Apply the principle of "Health in All Policies" by strengthening intersectoral work and develop health impact assessments (HIAs) of projects, plans and programmes on urban planning, mobility, housing, etc. with an equity approach. c) Promote multimodal sustainable mobility as an alternative to the private car and active mobility (walking and cycling). d) Promote proximity accessibility to basic community services and ensure accessibility on foot, by bicycle or public transport to them. e) Develop specific plans to enhance active mobility for commuting to work, schools and other essential services. f) Promote public space allocation measures to allow more space for safe cycling and pedestrian traffic. g) Promote the development of plans for urban biodiversity and renaturalisation, in accordance with the Strategic Plan for Natural Heritage and Biodiversity, strengthening the health and biodiversity component in cities.

Management, organisation and coordination

Objective	Actions
Enhance the sustainability of rural and urban environments, reducing the effects of climate change and the ecological footprint caused by human activities, while respecting the conditions of the territorial context, the landscape and traditional livelihoods. *Promote social and functional diversity in the city's construction. Promote housing rehabilitation and neighbourhood regeneration policies, including the gender perspective, that guarantee minimum conditions of habitability, safety, universal accessibility and energy efficiency.*	a) Establish specific coordination programmes between MITERD, the Ministry of Agriculture, the Ministry of Transport, Mobility and the Urban Agenda, the Ministry of Labour, MSAN, the Autonomous Regions and City Councils within the scope of their respective competences and agree on effective measures to improve the quality of the habitat and more sustainable, efficient, ecological and healthy cities. b) Establish Integrated Plans for various environmental risks in the urban environment (pollution, heat islands, etc.). c) Incorporate public health professionals into traffic and transport decision-making processes. d) Promote public-private collaborations and partnerships to achieve urban sustainability goals and their impact on health. e) Establish coordination mechanisms with the Autonomous Regions and local councils for the development of actions such as the creation of pedestrian and low-emission zones, traffic reduction, public transport, etc.

Training and risk communication

Objective	Actions
Increase professional training and public awareness.	a) Develop training programmes on the relationship between health, urban planning, housing, climate change, transport and mobility, for professionals from multiple specialties and fields, and promote the dissemination of information through the use of new technologies. b) Develop guides and recommendations that provide a sound basis and scientific consensus on public health knowledge applicable to land use and urban planning. c) Raise awareness of civic attitudes and health risks to the population, especially children's health from contact with urban wildlife or their excrement.

Research

Objective	Actions
Increase existing knowledge about the health impact of the urban environment and its determinants. *Extend the knowledge gained locally to other contexts.*	a) Assess the validity and reliability of the proposed indicators and investigate their links using epidemiological, human and animal tools. b) Analyse the usefulness of indicators for the design of interventions, as well as the most effective combinations of measures to improve the health of populations. c) Review local experiences and best practices in the development of towns and cities, both success stories and failures. Study possible applications in other contexts, fostering citizen science. d) Assess the risk of children's contact with various environmental risk factors in public parks (e.g. airborne particles, urban fauna and their excrements, etc.). e) Study the inclusion of Mobility to Work Plans for workplaces with more than 200 people. f) Analyse the health impacts associated with the quality and biodiversity of urban and peri-urban green areas. g) Assess the use of urban wildlife biomonitoring as a tool to collect data on the impact of environmental conditions on disease occurrence. h) For urban planning measures, estimate the social impact, economic costs and burden on the health system through health impact assessment studies. i) Make progress in the design of measures to prevent unwanted species from remaining in urban habitats.

Monitoring, evaluation and indicators

Objective	Actions
Evaluating the effectiveness of actions.	a) Select an appropriate indicator system that connects environment and health from the set of descriptive indicators of the Spanish Urban Agenda. b) Monitor morbidity and mortality rates due to environmentally attributable diseases.

7. MANAGEMENT, ORGANISATION AND COORDINATION OF THE STRATEGIC PLAN

The coordination of the Strategic Health and Environment Plan lies primarily with the Ministry of Health and the Ministry for Ecological Transition and the Demographic Challenge The main objective and focus of the Plan was to create lines of action on environmental factors affecting health that are dynamic and adaptable to this ever-changing field. Therefore, the coordination of the Plan must take into account both the technical and scientific data emerging in the areas covered, as well as the possibility of management for the correct execution of the relevant actions. In order for all these processes to be carried out correctly and to involve all the agents, the development of the following Commissions is foreseen, which, if necessary, will be carried out by means of a regulatory provision with the corresponding rank:

- Interdepartmental Monitoring Committee of the Strategic Plan.
- Technical Committee of the Strategic Plan: The Environmental Health Committee of the Public Health Commission of the Interterritorial Council of the National Health System will carry out the functions of the Technical Committee.

Executive Committee of the Strategic Plan: The Public Health Committee of the Interterritorial Council of the National Health System will carry out the functions of the Executive Committee.

Interdepartmental Monitoring Committee of the Strategic Plan

The **Monitoring Committee of the Strategic Plan** will be composed as follows:

- **Chairperson:** Head of the State Secretariat for Health.
- **Vice-Chairperson:** Head of the State Secretariat for the Environment.
- **Secretary:** Head of the Sub-Directorate General for Environmental and Occupational Health.
- **Spokespeople:**
  - Directorate General for Public Health (MSAN): 4 spokespeople.
  - Directorate General for Digital Health: 1 spokesperson.
  - Directorate General for Environmental Quality and Assessment (MITERD): 1 spokesperson.
  - Directorate General for Water (MITERD): 1 spokesperson.
  - Spanish Climate Change Office (MITERD): 1 spokesperson.
  - Directorate General for the Coast and Sea (MITERD): 1 spokesperson.
  - Directorate General for Biodiversity, Forests and Desertification (MITERD): 1 spokesperson.
  - Directorate General for Agricultural Production Health (MAPA): 1 spokesperson.
  - Directorate General for Urban Agenda and Architecture (MITMA): 1 spokesperson.
  - Directorate General Consumer Affairs (MIC): 1 spokesperson.

- Dirección Ejecutiva de la Agencia Española de Seguridad Alimentaria y Nutrición (MIC): 1 spokesperson.
- Directorate General for Evaluation and Territorial Cooperation (MEFP): 1 spokesperson.
- Carlos III Health Institute (ISCIII): 1 spokesperson.
- State Meteorological Agency (AEMET): 1 spokesperson.
- Centre for Scientific Research (CSIC): 1 spokesperson.
- Centre for Energy, Environmental and Technological Research (CIEMAT): 1 spokesperson.
- Centre for Public Works Studies and Experimentation (CEDEX): 1 spokesperson.
- Nuclear Safety Council (CSN): 1 spokesperson.
- Regional Administration: Five people from the Departments of Health of the autonomous regions and cities, proposed by the Interterritorial Council of the National Health System, appointed on a rotational basis by the Head of the General Secretariat of Health, for a period of two years.
- Local Administration (FEMP): 2 spokespeople.
- Scientific societies: 2 spokespeople.
- Non-governmental organisations: 2 spokespeople.
- Sectoral organisations: 2 spokespeople.

The main functions of the Monitoring Committee will be, among others, to:

- Ensure transparency in the implementation of the Strategic Health and Environment Plan.
- Contribute to the achievement of the actions from a health and environmental point of view.
- Coordinate the actions of the Plan and the information and measures nationally with those established internationally, in accordance with the decisions and commitments adopted in Europe and globally on health and environment issues.

It shall be summoned to an ordinary meeting during the month of June and an extraordinary meeting (if necessary) in the month of November. This Committee may be advised, on a consultative basis, by experts in various fields in the fight against environmental risks and their impact on health.

Technical Committee of the Strategic Plan

The **Environmental Health Committee of the Public Health Commission of the Interterritorial Council of the National Health System** will carry out the functions of the Technical Committee.

The functions of the Technical Committee of the Strategic Plan for Health and Environment will be, among others, to:

- Manage and implement the Strategic Health and Environment Plan.
- Draft and propose the biennial Action Programme.
- Prepare the evaluation reports of the Plan and the biennial Action Programme.

The Technical Committee may propose the designation of technical experts or support groups made up of experts depending on the subjects to be dealt with or on specific issues which, due to their complexity, subject matter or scope, require their creation and shall define, where appropriate, the scope of work and the timeframe for action.

Health and Environment Strategic Plan Executive Committee

The **Public Health Committee of the Interterritorial Council of the National Health System** will perform the functions of the Executive Committee.

The functions of the Executive Committee will be, among others, to:

- Approve the biennial Action Programme
- Report and approve the evaluations and, where appropriate, transfer them to the CISNS for approval.
- The Executive Committee may designate experts or support groups made up of experts depending on the subjects to be dealt with or on specific issues which, due to their complexity, subject matter or scope, require their participation in the Technical Committee and shall define, where appropriate, the scope of work and timeframe for action.

8. COMMUNICATION, TRAINING AND PARTICIPATION IN THE STRATEGIC PLAN

In order to achieve the objectives of the Strategic Health and Environment Plan **2022-2026**, society as a whole must **participate** and **be involved** in it at different levels: from the Administrations in the application of measures, to the different professionals involved, to the citizens in their day-to-day lives.

This requires a **comprehensive strategy of education, communication and participation** that accompanies it throughout its development and implementation. This Strategic Plan should include different **tools** which, although they overlap, can be differentiated as follows:

- **Information and communication tools**

  The Strategic Health and Environment Plan can be found on the Ministry of Health's **website**. As there is a wide range of environmental health risks, other **specific portals for each treated environmental factor** can be accessed from the **web portal** where this Strategic Plan is located. These will specify the prevention and health protection **objectives** and the **actions** proposed by the Plan in relation to that particular **risk** in an accessible way and in clear and simple language. The necessary **communication and outreach materials** will be generated and disseminated for this purpose. The aim is for the Plan to be communicated in such a way that the key features of each **environmental risk** and the individual and collective **actions** that can be taken to prevent it or reduce its impact can be easily found in the Plan.

  The Plan's communication will at all times incorporate a positive approach, emphasising the improvement of the **environmental determinants** of health, **Health Promotion** and prevention, highlighting the importance of the creation and promotion of **healthy environments** and the drive to identify and improve health resources, in coordination with the actions of the **Health Promotion and Prevention Strategy in the National Health System**, and with the health promotion strategies of the autonomous regions and cities in order to integrate these aspects into them. Attention should also be paid to **inequalities** in health and the environment, also trying to reduce them through communication actions. To this end, special attention will be paid to the choice of messages, formats and channels so that they are as inclusive as possible while taking into account the special needs of the most affected populations.

  Communication will be tailored to each **identified audience**, both in its **content** and in the **channels** used to disseminate it. This will provide both **technical content**, aimed at professionals, and informative **communication and awareness-raising materials**, aimed at the general public. It will also be gender-sensitive and use inclusive and non-sexist language.

  The **technical contents** are extensively developed in the text of the Plan itself and are easily accessible so that interested persons, in the professional field, can understand and use this information. However, an **extraordinary effort** must be made to ensure that the Plan is known, disseminated and communicated to the greatest number of professionals throughout the country,

for which purpose **specific actions** will be carried out to publicise it and effective channels will be used to communicate with professionals.

The design and creation of specific **informative, educational and awareness-raising materials** will be carried out by professionals in **communication, health education** and **environmental education,** in collaboration with experts in each thematic area who have participated in the preparation of the Plan or other experts in the field. For its dissemination, the Plan will identify the most appropriate **communication channels** for each audience (training of healthcare professionals, social networks, web content, mobile applications, television and radio, etc.); as well as the format of the messages and a schedule that establishes the most appropriate time for their dissemination.

A practical application of the Plan's communication is the use of the most effective tools that can be easily used, such as those that the different regulations make mandatory for the marketing of products, such as European labelling or waste management campaigns.

It should not be forgotten that certain environmental risks addressed in the Plan affect some **population groups more than others**, and their specific communication needs should be taken into account and communication actions should be directed primarily to them. An example of this would be to consider the digital divide of the population to ensure the efficient dissemination of information, especially to vulnerable groups. Health professionals can be key elements in the **detection** of these groups and serve as a channel to **spread the message**, so they should be adequately trained in the communication of these risks and have the collaboration and work together with professionals in communication and environmental and health education.

Another of the elements to be incorporated into school and professional education systems in a transversal manner is the "One Health" perspective in order to raise awareness of the synergies between lifestyle habits, respect for the environment and health in the population.

In this line, it must be considered that the **socio-economic differences** that exist in a population are closely related to the **education and information they receive**, which in turn will be a determining factor in the population's health. One of the main functions of health systems should be to **provide information** on potential adverse health effects **to the whole population**, and the Plan should therefore specifically consider which channels and content are appropriate to reach all socio-economic levels. The Risk Communication Plan needs to take these inequities into account in order to reduce them.

On the other hand, when the risk affects a certain **geographical territory**, the authorities must have a **warning and geographical information system** for **better communication of the risk** and **recommendations to reduce exposure to it** (as is already the case, for example, with the risk of extreme temperatures). Such warning systems need to be accompanied by appropriate communication tools for the population.

Furthermore, these systems allow for a very simple and intuitive visualisation of the possible risks and their magnitude in the different geographical areas. In this way, it is possible to observe the areas that suffer most from these risks, and to take priority measures in these areas for better **risk assessment and management**. As mentioned above, these measures include **risk communication** to the population, where these images are a very useful resource for their transmission**.** In addition, the temporal monitoring of these images makes it possible to visually observe the **evolution of the risk** in the affected areas.

Finally, it should be mentioned that an information and management tool for the correct implementation of the Plan and the achievement of its objectives is the **geographic information systems** (GIS). Given that a Plan like this requires joint and coordinated action by the General State Administrations and the Autonomous Regions and Cities, the use of this information and management tool is essential for the correct assessment and management of the risks involved.

- **Training and capacity-building tools**

A fundamental part of the Plan's communication is the **continuous training and capacity building** in the contents and proposals included in it for the different professional profiles (social and healthcare professionals, educators, business people, politicians, etc.) in different areas (autonomous communities and cities, town councils, the education system, social and professional organisations of all kinds, etc.) and at different times of life (initial undergraduate and postgraduate training, in training cycles, job training, etc.) who are going to be in contact in the present or in the future either with the general public or with more specialised audiences in relation to these aspects of health and the environment.

The aim is that all these people can act as valid **mediators** of information that is truthful, based on the best available scientific evidence, and can respond correctly to the concerns of the population when they are asked questions of this type; in addition to collaborating with the education and dissemination of the information contained in the Plan.

For this reason, proposals will be made for **continuing education and on-site and online training** so that all those who wish can learn about the Plan through **on-site and**, fundamentally, **online training actions** (for example, with online courses on health and the environment and on the Strategic Health and Environment Plan). These training activities should be provided by state bodies, in line with scientific, technical and regulatory developments in all thematic areas.

This training will be mainly aimed at **professionals** of all kinds, especially in health and environmental issues, who can collaborate in the training and communication of the issues covered in the Plan through their work. In addition to social and environmental health professionals, special importance, and motivation, will also be given to **those with decision-making capacity** in this area in autonomous communities and cities, town councils, organisations, etc.

Another specific target group for this training is **educational staff**. As it is particularly important that the new generations grow up educated and aware of the issues discussed here in order to achieve real change, all agents involved in their education must be properly trained. This involves not only teachers specialising in these issues, but the **whole community**. From teachers at all levels to leisure time educators (trainers of trainers, leisure activity instructors, activity and leisure managers, etc.).

It would also be of great interest to hold a **National Congress on Health and the Environment**, in collaboration with other competent Ministries, coordinated with the most relevant scientific, academic and professional societies in this field and with the participation of the people involved in drawing up the Plan, as well as representatives of civil society and local authorities. It will also serve to disseminate and highlight the Plan to society and give it the greatest possible impact.

- **Awareness-raising and educational tools**

Information is important for behavioural and lifestyle change, but it is also necessary to influence attitudes and values to motivate these changes, and the environments in which people live, study, work and socialise need to make it possible and easier to make healthy choices. This approach to promoting healthy environments should be applied to the urban environment, schools, homes, workplaces, leisure spaces, etc.

The transmission of information alone is not effective in changing **attitudes, values, behaviours, habits and lifestyles.** These processes of change are much more complex. In this sense, the creation and promotion of **healthy contexts and environments** (at school, at home, at work, in cities, neighbourhoods and villages, etc.) is an essential tool for change to accompany any communication campaign.

Transformative education and communication strategies need to be put in place. Information and education campaigns must always be considered in this broader context if they are to be effective and make real change possible. For its implementation, collaboration with other ministries and between state, regional and local levels is essential and synergies should be exploited through existing structures and new spaces for intersectoral collaboration should be created.

To this end, the Plan envisages the implementation of educational and communicative tools, such as:

- Informative and educational materials on the Plan for professionals and the general public.
- Educational materials for the pedagogical field at different levels of education, supported by teacher training, in coordination with and under the supervision of the Ministry of Education.
- Nationwide compilation of environmental education initiatives and materials and identification of good practices for other schools, organisations, administrations, community health networks, etc. for dissemination.

- **Social participation tools**

Participation is key to ensuring ownership of policies and their development by stakeholders, and should be planned to be effective and contribute to reducing the impact of environmental determinants on health inequalities, taking into account the gender perspective.

Tools will be designed to promote and facilitate the participation in the framework of the Strategic Plan of the social and professional sectors involved and of citizens as a whole, for its design, evaluation and improvement.

In this sense, it is proposed to carry out an **initial participatory process** (2021) to enrich the initial document, based on different techniques (online participation, working groups, questionnaires to experts, etc.), another **participatory process of intermediate evaluation** (2024) and a **participatory process of final evaluation of the Plan** (2026). It will also present and communicate the evaluation of the Plan, both its general aspects and those of education, awareness-raising, communication and training/capacity building.

9. MONITORING, EVALUATION AND INDICATORS OF THE STRATEGIC PLAN

The Strategic Health and Environment Plan **will be reviewed at least every five years** and updated as necessary with regard to activities, timelines, funding, etc. It will be reviewed based on the evolution of the indicators included in the Plan's monitoring and evaluation reports and on the Committee's assessment.

In addition, a **report will be published annually with the indicators** used to monitor and evaluate the Plan; these are divided into management indicators (global) and results indicators (by thematic areas). This document will show the base line of each indicator upon implementation of the Plan and its evolution over time and the development of the Plan's measures and actions. This will enable both the capacity to carry out the proposed actions and their effectiveness to be assessed.

To this end, two sets of indicators will be formulated:

A. Plan management and implementation indicators.
B. Indicators by thematic area.

The management and implementation indicators are intended to assess the degree of progress of the measures, and the indicators by thematic area, the effectiveness of the measures. Each thematic area will have a set of indicators that will be calculated with the indicated periodicity to monitor the evolution of pollutant levels and rates of morbidity, mortality and other environment-related health effects.

This series of indicators based on the objectives and points of each thematic area is shown in Table 2. As discussed below, these indicators are a reference guide for the Committee's evaluation and are those that will be further developed in a separate document and updated in the evaluation reports of the Action Programmes.

In order to monitor and evaluate the Plan from an equity perspective, indicators are sought that allow for territorial disaggregation, as well as disaggregation by variables such as age, sex and other socio-economic disaggregators, whenever possible.

9.1. STRATEGIC PLAN MANAGEMENT AND IMPLEMENTATION INDICATORS

The monitoring of the development and management of the Strategic Health and Environment Plan will be carried out by the Monitoring Committee. This body will publish an annual report assessing the degree of compliance with the actions proposed in each thematic area through the management and implementation indicators selected by the Committee. This will enable a proper evaluation of the Plan's progress and the continuation or implementation of the actions deemed appropriate by the Committee.

As a strategic reference document, general indicators are set out here to facilitate the Committee's task of assessing the implementation of the Action Programmes and the actions proposed to achieve the overall objectives. This entire battery of indicators is shown in Table 2 in relation to the objectives they seek to evaluate in each thematic area.

With regard to the points into which these actions are divided, the indicators by thematic area presented in the following section serve to evaluate the development and effectiveness of **Prevention and Health Protection**. This section also provides some examples of general management and performance indicators that can be used by the Committee to assess the other points developed in each thematic area. These indicators may include:

- **Management, organisation and coordination**: Meetings held on the subject between the administrations and the bodies involved and/or the sector.
- **Training and risk communication**: Courses, lectures, talks and awareness-raising campaigns carried out.
- **Research**: Reinforced research and analysis projects, scientific publications, studies, etc.
- **Monitoring, evaluation and indicators**: Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.

It should be noted that these indicators are proposals that it is considered more appropriate to detail and develop in depth together with the Action Programmes that are published biannually. This allows the flexible and adaptive nature of the Strategic Plan to be maintained according to the Committee's assessment and the priority actions to be included in these Programmes.

In the Plan's Control Panel, shown in Table 2, the function of each of these indicators can be observed, as mentioned above. This organisation makes it possible to obtain a complete view of the overall progress of the Strategic Plan and of all its points separately, taking into account the nature of each one of them.

9.2. INDICATORS BY THEMATIC AREA

This section provides a simplified set of indicators to be considered as an effective way of assessing progress in each of the thematic areas. Wherever possible, at least one **exposure** and one **outcome** indicator have been included. These indicators are intended to allow a clear observation of trends in a simple and manageable way following the comprehensive analysis and measures taken through the actions of each area.

As mentioned above, the Plan is intended to serve as a reference for further action by the Autonomous Regions. This document therefore establishes a general framework within which the Autonomous Regions can -additionally- develop other indicators according to their specific situation..

Finally, any indicators considered appropriate for this objective will be extensively developed in the Plan's Monitoring and Evaluation document published by the Committee.

1. Climate risks

Indicator name	1.1. Extreme weather warnings
Indicator description	Quantification of the alerts caused in Spain by extreme weather events related to temperature, precipitation, wind and Saharan dust intrusion collected by AEMET's MeteoAlerta Plan.
Objective	Assess the evolution of the number of extreme weather events as an effect of the impact of climate change on the Spanish population and their health and safety. Observe which populations are most exposed or vulnerable to the impact of climate change through these events.

Indicator name	1.2. Mortality due to exposure to forces of nature
Indicator description	Number of deaths due to extreme temperatures and natural disasters resulting from extreme weather events such as storms, floods and other forces of nature (SDG 13.1.1).
Objective	Relate and quantify the impact of climate change on the population's health through its influence on the meteorological conditions that generate natural disasters. Analyse which populations are most exposed or vulnerable to the impact of climate change through these natural disasters.

2. Extreme temperatures

Indicator name	2.1. Extreme heat warnings issued for health protection
Indicator description	Number and distribution of alerts issued due to extreme heat by the National Plan of Preventive Actions on the Effects of Excessive Temperatures on Health.
Objective	Monitor extreme heat episodes by geographical area and evaluate the issuing of warnings and recommendations by the National Plan of Preventive Actions on the Effects of Excessive Temperatures on Health.

Indicator name	2.2. Mortality from excessive exposure to natural heat and cold
Indicator description	Expresses the mortality rate caused by exposure to excessive natural heat and cold in the Spanish population.
Objective	To quantify the impact of exposure to excessive natural heat and cold on the Spanish population and its trend. Identify the most vulnerable population groups and territories and compare between regions.

Indicator name	2.3. Mortality attributable to extreme temperatures
Indicator description	Expresses the difference between the expected mortality with excess temperature and the base mortality based on the information provided by MoMo and MoMo heat.
Objective	Detect changes in the overall mortality trend (excess mortality) very immediately. Adjust the assessment of observed mortality due to population exposure to excess temperature and identify high-risk groups and plan interventions.

3. Air quality

Indicator name	3.1. Exceedances of air quality limits
Indicator description	Proportion of occasions when the established limit value and the WHO recommended value of concentrations of major air pollutants were exceeded (PM_{10} y $PM_{2.5}$, NO_2, O_3 and SO_2).
Objective	Assess compliance with air quality regulations in terms of exceedances of maximum levels of air pollutants.

Indicator name	3.2. Average levels of suspended particles
Indicator description	Measurement of concentrations and average levels of airborne molecular particles (PM_{10} and $PM_{2.5}$).
Objective	Monitor the evolution of these pollutants that are so closely linked to health problems and assess the exposure of different populations in detail.

Indicator name	3.3. Emergency hospital admissions for Chronic Obstructive Pulmonary Disease
Indicator description	Emergency admissions to national hospitals with a diagnosis of Chronic Obstructive Pulmonary Disease (COPD). As COPD is closely related to air quality, monitoring its development in the Spanish population provides a reliable measure of the impact of air quality on health.
Objective	Assess the impact of air quality on the Spanish population's health through the development and exacerbation of the main diseases related to air quality.

4. Water quality

Indicator name	4.1. Suitable water supply zones
Indicator description	Number of Supply Zones (SZ) with more than 95% of the analysis bulletins fit for human consumption per population supplied in the SZ.
Objective	Determine the level of compliance established in the current legislation on the sanitary quality of the supply zones and by population intervals.

Indicator name	4.2. Population served by safe drinking water supply services
Indicator description	Proportion of the Spanish population safely supplied with drinking water coverage (SDG 6.1.1).
Objective	Know the population that has easy access to drinking water and recognise at-risk areas in order to ensure universal and equitable access to drinking water.

Indicator name	4.3. Bathing areas with excellent or good quality water
Indicator description	Proportion of bathing sites in the whole territory with an annual classification of excellent or good.
Objective	Know the quality of marine and inland bathing areas and the evolution of their management in order to ensure a good sanitary status of the waters so that they are suitable for bathing.

Indicator name	4.4. Legionella infections
Indicator description	Number of cases and outbreaks of diseases related to Legionella infections, such as legionellosis and Pontiac fever (non-pneumonic legionellosis).
Objective	Know the impact on the population of infections by bacteria of the genus Legionella and the resulting outbreaks in order to assess the state of installations susceptible to emit Legionella and the emission of contaminating aerosols.

5. Vector-borne diseases

Indicator name	5.1. Distribution of the presence of disease-transmitting vectors
Indicator description	Compare the presence and absence of the main disease vectors in the different areas of Spain.
Objective	Know the actual distribution and potential risk areas (where the presence of the vector and cases of disease coincide) of the main vector-borne diseases found in Spain and their impact on the population.

Indicator name	5.2. Indigenous cases of vector-borne diseases
Indicator description	Number and distribution of indigenous cases of the main vector-borne diseases (Zika, dengue, Chikungunya, malaria, West Nile fever, Lyme disease, etc.) in the different areas of Spain.
Objective	Know the actual distribution and potential risk areas of the main vector-borne diseases found in Spain.

6. Chemical products

Indicator name	6.1. Management of chemicals, plant protection products and biocides
Indicator description	- Number of reports issued for industrial chemicals (SQI), plant protection products (PPP) and biocidal products (B). - Number of campaigns implemented, samples collected and biomarkers tested.
Objective	- Monitor the activity of the SGSASL (Ministry of Health) and the SGALSI (Ministry for Ecological Transition and the Demographic Challenge) in relation to the implementation of the legislation in this area, which aims, among others, to provide a high level of protection of human health against these risks. - Evaluate the functioning of the National Human Biomonitoring Node.

Indicator name	6.2. Incidents due to exposure to chemicals
Indicator description	- Number of cases of human and animal poisoning related to the use of chemicals, biocides and plant protection products, excluding cases of self-injury. - Number of incidents reported to the Rapid Chemicals Information Exchange System (SIRIPQ in Spanish) related to chemical products.
Objective	- Identify substances that give rise to chemical poisoning in workers or the general population. - Improve knowledge of the potential effects of chemicals on human health, biodiversity and ecosystems. - Identify the risks associated with poisoning to the population, biodiversity and ecosystems and the circumstances of the affected groups.

7. Waste

Indicator name	7.1. Proportion of waste recycled
Indicator description	Ratio of municipal waste collected regularly and sent for recycling to total municipal waste generated (SDG 11.6.1.).
Objective	This indicator is a first approach to early identification of poor waste management and the integration of the waste management system into a sustainable economy.

Indicator name	7.2. Hazardous waste generated and treated
Indicator description	Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment (SDG 12.4.2).
Objective	Quantify the amount of hazardous waste generated per capita and what proportion of it is treated in recovery or disposal operations.

8. Industrial pollution

Indicator name	8.1. Concentration of metals in the population
Indicator description	Concentrations of trace metals such as As, Cd, Cr, Ni, Pb, Zn and Hg in the body.
Objective	Trace metals are used as biomarkers because they reflect both known and unknown exposures, are not affected by recall bias and integrate all sources of exposure. Therefore, quantifying the concentration of these metals in human tissue (whole blood, serum and urine) serves as a biomarker of population exposure to industrial pollution.

Indicator name	8.2. Morbidity and mortality from diseases related to industrial pollutants
Indicator description	Number of cases and morbidity and mortality rates for prevalent diseases that can serve as indicators in specific industrial areas as appropriate (toxic anaemias, pulmonary oedema, toxic effects of metals, etc.).
Objective	Analyse and detect changes in the morbidity and mortality trend of diseases related to industrial pollutants. Study the distribution of this morbidity and mortality in different geographical areas in order to observe its potential impact in relation to industrial areas.

9. Natural radioactivity

Indicator name	**9.1. Drinking water abstractions exceeding the reference values for radionuclides**
Indicator description	Number and proportion of drinking water abstractions with negative characterisation; including screening, indicative dose, radon, etc.
Objective	Assess the trend of the impact of natural radioactivity in water catchments intended for human consumption and the development of characterisations of these catchments.

Indicator name	**9.2. Population exposed to radon levels above 300 Bq/m^3 at home**
Indicator description	Proportion of the Spanish population estimated by the CSN to be exposed at home to radon levels above the recommended reference level in Spain (300 Bq/m^3).
Objective	Check the proportion of the Spanish population that is exposed in their own homes to radon levels above the value recommended by the Nuclear Safety Council (300 Bq/m^3) established in the Technical Building Code.

10. Electromagnetic fields

Indicator name	**10.1. Incidence, morbidity and mortality of CNS tumours and leukaemia.**
Indicator description	Standardised morbidity, mortality and incidence rates per 100,000 person-years of new annual cases of central nervous system tumours and leukaemia.
Objective	Understand and monitor trends in the rates of these diseases to see if there is a causal relationship between EMF exposure and these diseases.

11. Ultraviolet radiation

Indicator name	11.1. Ultraviolet radiation exposure: UV index (UVI)
Indicator description	Measurement of the daily UV radiation level using the UV index (UVI).
Objective	Quantify the ultraviolet radiation dose received by the population through a simple indicator (UVI) to alert the population to use preventive and/or protective factors.

Indicator name	11.2. Skin diseases related to UV radiation
Indicator description	Study of the rate of skin diseases in the population related to UV radiation.
Objective	Follow the trend in time, place and activity in order to assess the impact and reduce these UV-related skin diseases and problems.

12. Environmental noise and vibrations

Indicator name	12.1. Population exposed
Indicator description	Proportion of the population exposed to excessive noise pollution levels. This indicator is subdivided into population exposed at night and in the 24-hour period. The indicator gives an overall description of the noise situation in an agglomeration, and of the population exposed to noise.
Objective	Calculate the proportion of people exposed to noise and how they are distributed in order to meaningfully assess their health risks and the extent to which they are affected at the territorial level.

Indicator name	12.2. Harmful health effects of exposure to excessive noise levels
Indicator description	Calculation of the harmful effects of excessive noise on the exposed population. Dose-effect relations of daily and night-time values are used, as a result of the calculation through the transposition of Annex III of Directive (EU) 2020/367.
Objective	Verify the health effects of daytime and night-time noise exposure on the Spanish population, as well as its magnitude and vulnerable groups.

13. Indoor environmental qualitys

Indicator name	13.1. Hospital admissions due to hypersensitivity pneumonitis
Indicator description	Admissions to national hospitals with a diagnosis of hypersensitivity pneumonitis, also known as extrinsic allergic alveolitis.
Objective	Hypersensitivity pneumonitis is related to the quality of indoor environments, as it is caused by fungi or bacteria present in humidifiers, heating and air conditioning systems and to certain chemicals found in homes and offices. Therefore, this parameter can be used to assess a trend about the different health impacts of indoor environments.

Indicator name	13.2. Indoor pollutant levels
Indicator description	Measurement of the levels of the most relevant biological (bacteria, fungi or their by-products), chemical (benzene, CO_2, CO, formaldehyde, ozone, PM, etc.) and physical (radon, asbestos, noise, etc.) pollutants in the safety and quality of indoor environments.
Objective	Measure the concentrations of these pollutants to ensure good indoor air quality and monitor their evolution, in order to assess indoor human exposure and their impact on health. Analyse the correlation with the age of the building, construction characteristics or ventilation system.

14. Habitat quality and green cities

Indicator name	14.1. City Model (Spanish Urban Agenda Indicator Battery)
Indicator description	There are many aspects of the city that must be assessed in order to determine whether or not a city meets the criteria for a healthy city. For this purpose, in order to avoid duplicating indicators, it is proposed to take into account those included in the Spanish Urban Agenda which are also aligned with those of the 2030 Agenda. In particular, descriptive, evaluation and monitoring indicators are proposed for the following objectives: SO. 2.3; 2.4; 2.5; 2 SO: 3.2 SO: 5.1; 5.2 SO: 6.1
Objective	Evaluate the urban model of a city in relation to aspects such as compactness, sprawl, re-naturalisation of green areas, accessible and safe public space, air quality, mobility, etc.

Indicator name	14.2. Population's physical activity level
Indicator description	Measurement of physical activity performed by the population according to its frequency, duration and intensity, including all types of physical activity, leisure, work, travel, etc.
Objective	Assess the physical activity behaviour of the population and its relationship to the city model. It can serve as an indication of the type of city that is most conducive to active transport and leisure.

9.3. STRATEGIC PLAN CONTROL PANEL

Table 2. PESMA Objectives and Indicators Control Panel.

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
1. Climate risks	Reduce morbidity and mortality due to climate change-related events.	Establish management mechanisms that promote the work and coordination of the planned actions among all the actors involved, reinforcing the One Health approach.	Improve knowledge of the impact of climate change among health professionals and other professionals, such as communication professionals.	Improve knowledge about the impact of climate change on human and animal health and biodiversity and the effectiveness of adaptation measures.	Have advanced risk management tools in place.
Indicators	*1.1. Extreme weather warnings.* *1.2. Mortality due to exposure to forces of nature.*	*No. of reports of the Observatory on Health and Climate Change.*	*No. of health and climate change outreach campaigns conducted.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
2. Extreme temperatures	Reduce mortality attributable to extreme heat and cold.	Improve coordination of the prevention plans of the different administrations.	Improve professional training on the health effects of extreme temperatures and raise awareness of their importance among administrations and the population.	Gain the knowledge necessary to optimise the effectiveness of prevention plans.	Assess the impact of prevention plans.

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
Indicators	*2.1. Extreme heat warnings issued for health protection.* *2.2. Mortality from excessive natural heat and cold exposure.* *2.3. Mortality attributable to excess temperature.*	*No. of meetings held with the Work Group.* *Meetings held with the Inter-Ministerial Committee.*	*Reach of the "Summer and Health" campaign.* *Number of interactions on social media (Twitter and Facebook).* *No. of users subscribed to the Excess Temperature Warning Subscription Service*	*No. of enhanced research and analysis projects, scientific publications and studies on the health impact of extreme temperatures.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
3. Air quality	Reduce mortality and morbidity attributable to exposure to air pollution in line with the objectives of the PNCCA. Ensure the prevention of diseases resulting from air pollution and poor air quality through the monitoring, analysis and evaluation of instantaneous and accumulated data from pollution meters, and the actions arising therefrom.	Improve the effectiveness of coordination between MITERD and MSAN in their respective areas of competence.	Improve public and professional awareness of the effects of poor air quality.	Improve scientific knowledge on the health, economic, social and environmental impacts of air pollution on health.	Monitor the impact of prevention measures.

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
Indicators	*3.1. Exceedances of air quality limits. 3.2. Average levels of suspended particulate matter. 3.3. Emergency hospital admissions for Chronic Obstructive Pulmonary Disease.*	*No. of coordination meetings between the administrations involved. Air quality monitoring network activity.*	*No. of training and dissemination activities and awareness-raising campaigns conducted.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
4. Water quality	Protect human health from the adverse effects of any type of water pollution; guaranteeing access, healthiness, quality and cleanliness in each and every one of its uses.	Improve co-ordination between water management authorities.	Improve professional training and public information and awareness of the health effects of poor water quality.	Increase knowledge on the potential health impacts of water quality in specific geographic or use areas.	Ensure compliance with measures to improve water quality.
Indicators	*4.1. Suitable water supply areas. 4.2. Population served by safe drinking water supply services. 4.3. Excellent or good quality bathing areas. 4.4. Legionella infections.*	*No. of meetings of the Environmental Health Committee on water issues. Completion of SINAC, NAYADE and SILOE.*	*No. of citizen access to SINAC, NAYADE and SILOE.*	*No. of research projects on water and health.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
5. Vector-borne diseases	Implement effective systems for prevention and early control of vector-borne disease outbreaks.	Improve the coordination of the different administrations involved.	Improve professional training and public awareness.	Improve knowledge on vector-borne disease risk management.	Assess the health impact of plans and the effectiveness of vector and outbreak management measures.
Indicators	*5.1. Distribution of the presence of vector-borne diseases.* *5.2. Indigenous cases of vector-borne diseases.*	*No. of entomological surveys answered annually. Percentage response rate of the Autonomous Regions to the entomological survey.*	*No. of training and dissemination activities and awareness-raising campaigns conducted*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
6. Chemical products **Sub-topic: Industrial chemicals, plant protection products and biocidal products**	Protect human health from risks arising from exposure to chemicals on the market and to which various human populations are exposed directly (workers or consumers) or indirectly (through the environment).	Promote coordination and cooperation with other institutions with interests in this area within the scope of their respective competences: MITERD, MAPA, INTCF, CCAA, INIA and INSST.	Improve professional training on the health risk that can arise from exposure to chemicals, as well as raise awareness of these risks in the whole population.	Promote the necessary measures to foster research and innovation.	Identify the degree of compliance with the measures, identify trends through the analysis of results

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
Indicators	*6.1. Management of chemicals, plant protection products and biocides.* *6.2. Incidents arising from exposure to chemicals.*	*No. of meetings held in this respect between the administrations and the bodies involved and/or the sector.*	*No. of training and dissemination activities and awareness-raising campaigns conducted.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
Sub-topic: Endocrine disruptors	Improve the population's health and well-being by reducing human exposure and environmental exposure to endocrine disrupting chemicals.	Promote coordination and cooperation with other institutions with interests in this area: MITERD, MAPA, INDUSTRY, LABOUR, Autonomous Regions.	Train health professionals and promote proper communication to the public.	Promote the necessary measures to encourage research and innovation to understand and adapt regulation and management in the most effective way.	Be aware of the monitoring and evaluation of active substances.
Indicators	*6.1. Management of chemicals, plant protection products and biocides .* *6.2. Incidents caused by exposure to chemical products.*	*No. of meetings held in this respect between the administrations and the bodies involved and/or the sector.*	*No. of training and dissemination activities and awareness-raising campaigns conducted*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
Sub-topic: human biomonitoring	Contribute to the improvement of public health by assessing the exposure of the population to chemicals.	Promote the consolidation of infrastructures and harmonised tools nationally, aligned with European structures, for the implementation of the campaigns. Promote coordination and cooperation with other institutions with interests in the field: MITERD, MAPA, INDUSTRY, LABOUR, Autonomous Regions.	Train health professionals in the use of human biomonitoring as a tool to enable them to act as reference elements in their fields of action, thus facilitating informed citizen participation.	Promote research on Human Biomonitoring and include it in the thematic priorities and priority lines of research of national and regional calls for proposals.	Verify the functioning of the actions proposed in this line of intervention. Evaluate the functioning and effectiveness of the National Human Biomonitoring Node.
Indicators	*6.1. Management of chemicals, plant protection products and biocides.* *6.2. Incidents arising from exposure to chemicals.*	*No. of meetings held in this respect between the administrations and the bodies involved and/or the sector.*	*No. of training and dissemination activities and awareness-raising campaigns conducted.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
7. Waste	Minimise the impacts of waste on global health.	Improve coordination to promote progress in the work and management of the planned actions.	Show interest in and importance of the main effects that exposure to certain wastes can have. Provide information, raise awareness and make the population responsible for the correct management of waste, especially household waste.	Incentivise research for future waste reduction, as well as for the proper management and remediation of the impacts already generated.	Ensure a health approach to waste management.
Indicators	7.1. Proportion of waste recycled. 7.2. Hazardous waste generated and treated.	*No. of meetings of the MITERD Waste Coordination Committee and its working groups.*	*No. of training and dissemination activities and awareness-raising campaigns conducted.*	*No. of enhanced research and analysis projects, scientific publications, studies, etc. on waste and/or circular economy and health.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
8. Industrial pollution	Reduce morbidity and mortality associated with industrial pollution by monitoring human and animal exposures and their health effects.	Minimise risks associated with contaminated soil.	Improve professional training and public awareness.	Improve on-the-ground knowledge of the risks to certain stocks.	Be aware of the effectiveness of measures.

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
Indicators	*8.1. Concentration of metals in the population.* *8.2. Morbidity and mortality from diseases related to industrial pollutants.*	*No. of meetings held in this respect between the administrations and the bodies involved and/or the sector.*	*No. of training and dissemination activities and awareness-raising campaigns conducted.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
9. Natural radioactivity	Reduce exposure to naturally occurring radioactivity from avoidable sources.	Improve co-ordination of environmental radioactivity monitoring programmes.	Improve professional training and public awareness of radioactivity and its effects.	Expand knowledge of exposure to natural radioactivity by geographical area.	Be aware of the degree of compliance with the proposed measures.
Indicators	*9.1. Drinking water abstractions exceeding the reference values for radionuclides.* *9.2. Population exposed to radon levels above 300 Bq/m3 at home.*	*No. of meetings of the Working Group of the National Radon Plan.*	*No. of radon dissemination campaigns carried out.* *Dissemination actions on radon and smoking.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the National Radon Plan.* *Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
10. Electromagnetic fields	Educate and inform the population to make responsible and safe use of new technologies and telecommunications used by EMFs. Improve information on risk perception of RF and ELF EMF exposure.	Improve the management and coordination of the competent administrations in EMF prevention and health protection.	Educate and improve the responsible use of new technologies related to EMF.	Promote research and dissemination of the effects of public exposure to RF EMF and ELF to maintain reasonable exposure levels.	Ensure compliance with the objectives and actions foreseen in the Plan.
Indicators	*10.1. Incidence, morbidity and mortality of CNS tumours and leukaemia.*	*No. of meetings of the Interministerial Committee on Radio Frequencies and Health.*	*No. of information campaigns on the safe use of technologies.*	*No. of research projects on the health effects of the use of digital devices.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
11. UV radiation	Prevention and control of health risks associated with UV exposure.	Improve regulation in relation to UV exposure.	Encourage people to have good photoprotection habits and protect themselves adequately from solar radiation.	Improve knowledge and scientific evidence on UV radiation and its impact on health.	Assess the impact of prevention measures taken.

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
Indicators	*11.1. Ultraviolet radiation exposure: UV index (UVI).* *11.2. Skin diseases related to UV radiation.*	*No. of national and international meetings on UV radiation.*	*Scope of the "Summer and Health" campaign.* *No. of interactions on social media (Twitter and Facebook).* *No. of users subscribed to the Excess Temperature Alert Subscription Service.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
12. Noise	Reduce the population exposed to environmental noise and identify and preserve quiet areas in cities with more than 50,000 inhabitants. Analyse and quantify the impact of noise pollution on morbidity and mortality in Spain and its economic valuation. Protect people's health from the effects of vibrations.	Establish links between MSAN and MITERD in relation to noise pollution.	Improve professional training on noise pollution and raise awareness of its importance among administrations and the population.	Improve the existing knowledge on noise and its health effects.	Identify and promote those actions that have the greatest benefits in terms of noise pollution.

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
Indicators	*12.1. Exposed population.* *12.2. Harmful health effects of exposure to excessive noise levels.*	*No. of coordination meetings between MITERD, MSAN, CCAA and FEMP on noise and health issues.*	*No. of training and dissemination activities and awareness-raising campaigns conducted.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*
13. Indoor environmental quality	Protect human health from the adverse effects of any kind of indoor air pollution. Reduce the risks arising from the exposure of the population to radon.	Establish a general regulatory and organisational framework for indoor environmental quality management.	Improve professional training and public information and awareness of the effects of poor indoor environmental quality, including radon.	Improve knowledge about the risk and health impacts of poor indoor environmental quality.	Ensuring compliance with measures to improve IAQ.
Indicators	*13.1. Hospital admissions for hypersensitivity pneumonitis*	*No. of reports within the scope of the Indoor Environmental quality monitoring system.*	*No. of training and dissemination activities and awareness-raising campaigns conducted.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*

Area and Objectives	Prevention and Protection	Management, Coordination and Organisation	Training and Communication	Research	Monitoring, Evaluation and Indicators
14. Healthy cities	Promote, in the field of urban and rural planning, consideration of the necessary elements to improve the health and welfare conditions of citizens while combating climate change; favouring active life, coexistence, equal opportunities and equity. Enable environmentally more sustainable, socially more inclusive, economically more competitive and healthier environments.	Enhance the sustainability of rural and urban environments, reducing the effects of climate change and the ecological footprint caused by human activities, while respecting the conditions of the territorial context, the landscape and traditional livelihoods. Promote social and functional diversity in the construction of the city. Promote housing rehabilitation and neighbourhood regeneration policies, including the gender perspective, that guarantee minimum conditions of habitability, safety, universal accessibility and energy efficiency.	Boost professional training and public awareness.	Increase existing knowledge about the health impact of the urban environment and its determinants. Expand the knowledge obtained locally to other contexts.	Assess the effectiveness of actions.
Indicators	*14.1. City model (Spanish Urban Agenda Indicator Battery).* *14.2. Population's level of physical activity.*	*No. of meetings of the Spanish Network of Healthy Cities.*	*No. of training and dissemination activities and awareness-raising campaigns carried out by the FEMP.*	*No. of research and analysis projects promoted, scientific publications, studies, etc.*	*Degree of implementation and progress of the Strategic Plan and of the actions included in the Action Programmes.*

10. HEALTH AND ENVIRONMENT ACTION PROGRAMMES

The premise that has always marked the Plan's approach has been to create a framework of reference for preventive public policies that is dynamic and that allows it to adapt naturally to the changes that occur in a constantly evolving environment. To this end, specific measures in each of the thematic areas have been avoided in advance, and will be agreed and planned according to the needs, priorities and resources available in the **biennial** Action Programmes. Thus, measures that we do not envisage today, but which may be essential in the coming years due to their relevance or urgency, may be included.

The set of actions and measures proposed in the Strategic Health and Environment Plan is very broad and ambitious. Therefore, this Strategic Plan aims to establish the strategic lines to be followed, supported by the knowledge of experts in the area, in order to achieve the proposed goals.

The Strategic Plan is a compendium of multiple actions, not all of which have the same priority and may differ in their geographical scope of application. Therefore, in order to achieve the objectives of the Plan in a feasible manner, **priority actions** will be established. These actions will be chosen based on the **evaluation of irrigation** in its current state through the monitoring of this Strategic Plan and in coordination with the **Autonomous Communities and Cities** and other **stakeholders** to assess the feasibility of the measures.

The Action Programmes will specify the entities responsible for the development of each action, the timeframe for implementation, the resources required and all other details necessary for the proper implementation of the measures. Continuous monitoring and evaluation through the Action Programmes will provide feedback on the suitability and effectiveness of the actions carried out, as well as on the lines of action agreed for the achievement of the Plan's objectives.

As stipulated in Article 44 of the General Law on Public Health, the Public Health Strategy will have a five-year duration and will be evaluated every two years. Thus, every two years, the set of priority measures for that period will be published along with their implementation planning (responsible persons, resources, deadlines, etc.) in a document that will serve as an **Action Programme** to carry them out.

11. FUNDING

In order to carry out the actions established within the lines of action of the different thematic areas, the Strategic Health and Environment Plan will allocate the necessary resources for the development and execution of such actions.

The Strategic Health and Environment Plan is carried out with funds from the Ministry of Health and the other administrations and entities involved. As mentioned above, this document establishes the lines to be followed in order to achieve the proposed objectives, from which the Action Programmes will derive, which will specify the execution of the actions. It is therefore in these programmes that the necessary funding for this will be specified, as it will depend on the nature and scope of the actions planned.

Thus, within each line of action, a series of actions common to all areas are envisaged in order to carry them out (Table 3). This makes it possible to estimate the resources that will be required for the various actions of the five lines of action proposed in each specific thematic area. However, these actions may be extended in cases in which they are deemed necessary and require specific actions.

Table 3. Common actions envisaged under each line of action.

Prevention and health protection	Management, organisation and coordination	Training	Communication and dissemination	Research
Accreditations	Publications	Courses	Publications and material resources (brochures, magazines...)	Material
Material	Activities	Educational material	Audiovisual elements (television, radio...)	Scholarships and grants
Certificates	Computer applications	Accreditations and certificates	IT resources (websites, blogs, social media...)	Publications
Publications		Scholarships and grants	Competitions and prizes	
Others	Others	Others	Acts and events	Others

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