REPUBLIC OF CROATIA
MINISTRY OF ENVIRONMENTAL
PROTECTION AND GREEN TRANSITION

Report on implementation of policies and measures that reduce greenhouse gas emissions by sources or enhance removals by sinks

Republic of Croatia

REPORT ON IMPLEMENTATION OF POLICIES AND MEASURES THAT REDUCE GREENHOUSE GAS EMISSIONS BY SOURCES OR ENHANCE REMOVALS BY SINKS

REPUBLIC OF CROATIA

Project coordinator

Tatjana Obučina, Ministry of Environmental Protection and Green Transition

List of authors

Project Coordinator: Valentina Delija-Ružić, Ekonerg ltd.

Authors:
Valentina Delija-Ružić, Ekonerg ltd.
Iva Švedek, Ekonerg ltd.
Renata Kos, Ekonerg ltd.
Veronika Tomac, Ekonerg ltd.
Andrea Hublin, Ph. D., Ekonerg ltd
Karlo Pešić, Ekonerg ltd.
Mirela Poljanac, Ekonerg ltd.
Berislav Marković, Ekonerg ltd.
Borna Glückselig, Ekonerg ltd.
Sara Bačeković, Ekonerg ltd.
Vladimir Jelavić, Ph. D., Ekonerg ltd.
Delfa Radoš, Ekonerg ltd.
Stjepan Hima, Ekonerg ltd.
Morana Česnik Katulić, Ph. D., Ekonerg ltd.

Zagreb, March 2025

REPORT ON IMPLEMENTATION OF POLICIES AND MEASURES THAT REDUCE GREENHOUSE GAS EMISSIONS BY SOURCES OR ENHANCE REMOVALS BY SINKS

REPUBLIC OF CROATIA

March 2025

EKONERG – Energy Research and Environmental Protection Institute
Koranska 5, 10000 Zagreb, Croatia

Ordered by: Ministry of Environmental Protection and Green Transition

Contract No.: KLASA: 406-07/24-01/58
URBROJ: 517-02-3-1-24-11

Title:

REPORT ON IMPLEMENTATION OF POLICIES AND MEASURES THAT REDUCE GREENHOUSE GAS EMISSIONS BY SOURCES OR ENHANCE REMOVALS BY SINKS REPUBLIC OF CROATIA

Project Coordinator: Valentina Delija-Ružić

Authors:
Valentina Delija-Ružić
Iva Švedek
Renata Kos
Veronika Tomac
Andrea Hublin, Ph. D.
Karlo Pešić
Mirela Poljanac
Berislav Marković
Borna Glückselig
Sara Bačeković
Vladimir Jelavić, Ph. D.
Delfa Radoš
Stjepan Hima
Morana Česnik Katulić, Ph. D.

Atmospheric Protection and Climate Change Department Manager:
Valentina Delija-Ružić

General Manager:
Elvis Čukon, MBA

Zagreb, March 2025

Contents

1. Introduction

'Report on implementation of policies and measures that reduce greenhouse gas emissions by sources and enhance removals by sinks' (hereinafter: the Report) is an integral part of the national system for policies and measures as well as projections of greenhouse gas emissions related to the fulfilment of commitments under the United Nations Framework Convention on Climate Change (hereinafter: the Convention) and the Paris Agreement. The Republic of Croatia is required to report to the European Commission on monitoring the implementation of these policies and measures and emission projections, based on the EU legislation.

The legal basis for preparation of the Report in the national legislation is in Act on Climate Change and Ozone Layer Protection (OG 127/2019).

Regulation (EU) No 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council – consolidated text (hereinafter: Regulation (EU) No 2018/1999) and Commission Implementing Regulation (EU) 2024/1281 of 7 May 2024 amending Implementing Regulation (EU) 2020/1208 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council (hereinafter: Implementing Regulation (EU) No 2024/1281) are applicable regulations of the European Union which prescribe obligations and way of reporting for Member States.

Article 18 and Annex VI of the Regulation (EU) No 2018/1999 prescribe the content of the report. The report on the implementation of policies and measures to reduce emissions and increase removals of greenhouse gases for 2025 therefore has:

- Description of national system for reporting on policies and measures and for reporting on projections of emissions by sources and removals by sinks of greenhouse gases,
- Information regarding Low-Carbon Development Strategy until 2030 with a view to 2050,
- Objectives of the policy and measures,
- Description of the policy and measures,
- Type of policy instruments,
- Status of implementation of the policy or measure,
- Indicators for the projections with the aim of policies and measures implementation assessment,
- Quantitative estimates of the effect of policies and measures on emissions by sources and removals by sinks of greenhouse gases,
- An assessment of the contribution of the policy or measure to the realization of Low-Carbon Development Strategy until 2030 with a view to 2050,
- Amount of annual national emission allocation,
- Anticipated progress in meeting the emission limits to the amount of annual national quota,
- Information on planned additional policies and measures to achieve greater emission limits of the amount of annual national quota,
- Information on the link between different policies and measures.

2. National system for reporting on policies and measures and for reporting on emissions projections by GHG sources and removals by sinks

The Ministry of Environmental Protection and Green Transition is responsible for the overall national policy of environmental protection, including climate change and reporting on the implementation of policies and measures and on emission projections by sources and removals by sinks of greenhouse gases. The Institute for Environment and Nature, which operates within the Ministry of Environmental Protection and Green Transition is responsible for organizing the preparation of the Inventory of greenhouse gas emissions, data collection, preparation of quality assurance and quality control plan and selection of an authorized institution for a three-year period. It is also responsible for organizing the preparation of the Report on the implementation of policies and measures to reduce emissions and enhance sinks of greenhouse gases and Report on projections of greenhouse gas emissions by sources and their removals by sinks. Update of the listed reports is organised in two-year cycles, according to Regulation (EU) No 2018/1999.

Ekonerg - Energy Research and Environmental Protection Institute is an institution that was awarded in a public tender for a three-year period to prepare annual National Inventory Document of greenhouse gas emissions, Report on projections of greenhouse gas emissions by sources and their removals by sinks and Report on policies and measures to reduce emissions and enhance sinks of greenhouse gases. The current contract expires in 2027, when a new tender will be published.

In accordance with the Act on Climate Change and Ozone Layer Protection (OG 127/2019) for monitoring and evaluation of the implementation and planning of policies and measures for mitigation and adaptation to climate change in the Republic of Croatia as well as participating in the review and giving opinions on Report on implementation of policies and measures that reduce greenhouse gas emissions by sources or enhance removals by sinks and Report on projections of greenhouse gas emissions by sources and their removals by sinks, the Commission for inter-sectoral coordination of policies and measures for mitigation and adaptation to climate change (OG 9/2018) was established. The Committee members include representatives of relevant central government bodies at the level of assistants to the Ministers. The composition of the Commission, tasks and functioning of the Commission is determined by the Croatian Government on the proposal of the ministry responsible for environmental protection.

3. Information regarding Low-Carbon Development Strategy until 2030 with a view to 2050

On June 2, 2021, the Croatian Parliament adopted the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050 (OG 63/2021) is a basic document by which the obligations to reduce greenhouse gas emissions will be transferred into certain sectoral policies. The goal of the Low-Carbon Development Strategy is to achieve a competitive low-carbon economy by 2050, in line with the European Strategic Guidelines and in accordance with the obligations of the United Nations Framework Convention on Climate Change (UNFCCC).

The Strategy is a fundamental document in the field of climate change mitigation and a main economic, development and environmental strategic document. The Strategy lays opportunities to stimulate economic growth through innovation, the transfer of advanced technologies and structural change.

Low-Carbon Development Strategy provides the basis for policy decisions and guidelines that will need to be implemented by all sectors of the economy, starting with energy, transport, industry, construction, waste management, agriculture, tourism, services, to significantly reduce greenhouse gas emissions. Low-Carbon Development Strategy should enable a transition to a low-carbon and more competitive economy based on sustainable development.

In order to achieve the goals of the more ambitious scenario from the Low-Carbon Development Strategy, which achieves an 80% reduction in emissions compared to 1990 by 2050, there are major challenges, but analyses show that investments and the implementation of the measures determined by the Strategy will cause an increase in all the most important macroeconomic indicators in the Republic of Croatia.

Implementation of the Low-Carbon Development Strategy is closely linked to the Integrated National Energy and Climate Plan for the Republic of Croatia for the period 2021-2030 (NECP), which defines specific targets and policies for emission reductions. NECP provides a framework for monitoring progress and adjusting measures in response to technological advancements and socio-economic changes. Regular assessments and updates ensure that Croatia remains on track toward its climate goals while taking into account new challenges and opportunities.

Financial support for the Strategy's implementation comes from various sources, including the EU's Just Transition Fund, the Modernization Fund, and national investments. These resources are crucial for funding research and development in green technologies and capacity-building initiatives.

The transition to a low-carbon economy presents challenges, including financial constraints, administrative complexities and the need for technological transformation. However, it also brings significant opportunities, such as job creation in the green sector, increased energy independence, and improved public health due to reduced air pollution. Croatia’s commitment to the Low-Carbon Development Strategy underscores its role in contributing to the EU’s climate neutrality objective while fostering sustainable economic growth and environmental protection.

4. Description of policies and measures included in the projections

4.1. General information

Policies and measures that are subject of this report are included in the 'with existing measures' and 'with additional measures' scenarios in the "Report on projections of greenhouse gas emissions." The above report has been prepared as a separate document.

Policies and measures to reduce emissions from sources and increase sinks of greenhouse gases are shown separately for the following sectors:

- Energy,
- Transport,
- Industrial processes and product use,
- Waste,
- Agriculture,
- Land use, land use change and forestry (LULUCF),
- other (cross-cutting) policies and measures.

Measures described below are taken from NECP and legislative framework and from other legislation of the Republic of Croatia or the EU that contributes to the reduction of greenhouse gas emissions.

The presented policies and measures include not only those with the most significant impact on greenhouse gas emissions, but also other measures, which could have a very low or difficult to measure impact on greenhouse gas emissions.

In Croatia, most measures are implemented at the national level, often based on EU and national legislation. However, there are also a certain number of measures that are implemented at the local level, and their implementing bodies are regional and local self-government units. Regional and local self-government units adapt the measures and their implementation to the specific needs and characteristics of their communities. Synergy and cooperation between national and local measures is important for achieving comprehensive and effective policies and initiatives related to climate change.

4.2. Energy

Important current strategies and plans include the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050 (OG 63/2021), the Energy Development Strategy of the Republic of Croatia until 2030 with a view to 2050 (OG 25/2020), Long-term Strategy for the Renovation of the National Building Fund until 2050 (OG 140/2020), Integrated Energy-Climate Plan of the Republic of Croatia for the period from 2021 to 2030.

A number of programs in the field of energy efficiency were adopted: Program for the development of circular management of space and buildings for the period from 2021 to 2030 (OG 143/2021), Program combating energy poverty, which includes the use of renewable energy sources in residential buildings in subsidized areas and areas of special state care for the period up to 2025 (OG 143/2021), Program for the Development of Green Infrastructure in Urban Areas for the Period from 2021 to 2030 (OG 147/2021)

and programs related to energy renovation of buildings: Program for energy renovation of multi-apartment buildings for the period until 2030 (OG 143/2021), Program for energy renovation of buildings that have the status of cultural property for the period until 2030 (OG 143/2021), Program for energy renovation of public sector buildings for the period up to 2030 (OG 41/2022).

ENU-1: Energy Efficiency Obligation System for Suppliers

The Energy Efficiency Obligation System was established by the Energy Efficiency Act (OG 127/2014, 116/2018, 25/2020), and the Ordinance further defines its functioning on the Energy Efficiency Obligation System (OG 41/2019). With the entry into force of the Energy Efficiency Act (OG 41/2021), the Ordinance on the system of energy efficiency obligations (OG 41/2019) ceases to be valid. The elements of the system of energy savings obligations and the manner of its implementation are transferred to the Ordinance on the system for monitoring, measuring and verifying energy savings (OG 98/2021, 30/2022). The obliges of the energy efficiency obligation system are energy suppliers. The obliges of the energy efficiency obligation system are energy suppliers. The system has been functional since 2019 when suppliers who delivered more than 300 GWh of energy to the market in 2017 entered it. In 2020, the suppliers who delivered more than 100 GWh of energy to the market in 2018 entered the system of obligations, and from 2021 onwards, all those suppliers who supplied more than 50 GWh of energy to the market during the previous year. From 2021 to 2030, the goal is to achieve cumulative energy savings in final consumption by achieving new annual savings every year. According to Directive 2018/2002, amending Directive 2012/27/EU on energy efficiency, the system is set up so that it is necessary to achieve savings of 0.8 % of annual final consumption every year. According to the agreed amendments to the 2023 Energy Efficiency Directive, these targets change and are as follows: in the period from 2021 to 2023, the goal is to achieve savings of 0.8 %, from 2024 to 2025 1.3%, and from 2026 to 2027 1.5 % and from 2027 to 2030 1.9% of annual final energy consumption. It raises the national target of the Republic of Croatia from the previous 125.3 PJ (2,993.7 kten) to 180.6 PJ (4,313.6 kten).

According to the Energy Efficiency Act, the goal is to achieve 70 % of the savings from Article 8(7) of the Energy Efficiency Directive through the system of energy efficiency obligations. Analyses were carried out concerning the new goal, and a new distribution of the goal between alternative policy measures and the obligation system was determined at 50:50%. The same needs to be prescribed through amendments to the Act.

ENU-2: Promoting the decarbonisation and application of the "energy efficiency first" principle in buildings

The Charter of Cooperation for the Decarbonisation of Buildings by 2050, initiated by the Ministry of Physical Planning, Construction and State Property, which supports the EU's vision of decarbonisation of buildings by 2050, was undertaken to improve cross-sectoral communication and cooperation between state administration bodies and the private sector. Through workshops and the Open Partner Dialogue, the aim is to create a broad network of connected professionals ready to engage in dialogue and contribute to decarbonising the building stock by 2050. Open Partner Dialogues bring together representatives of state and local government, the academic community and the professional public, the construction and energy sectors, and related industries at thematic workshops organised by the Ministry. The contents of the Charter include the achievement of energy and climate targets at the national and EU levels through the decarbonisation of the building stock, renovation of buildings and construction of nearly zero energy buildings, awareness of the importance of further reduction in greenhouse gas emissions, increasing the share of renewable energy sources, improving energy security and introducing innovation and smart technologies that allow buildings to support the overall decarbonisation of the

economy. The signing of the Charter encourages continuous cooperation on the development of the Long-Term Strategy for the Renovation of the National Building Stock and the transition to a nearly zero energy building standard (nZEB). The signatories to the Charter support and promote the decarbonisation of buildings in their future activities, wherever possible. Current activities should be expanded per EU guidelines, and the principle of "energy efficiency first" should be encouraged.

In addition to networking with experts through the partners' dialogue, the general public and target groups will be informed by organising targeted "Energy efficiency first" information campaigns related mainly to energy renovation and decarbonisation of buildings. Applying the principles of green building (building on the principles of sustainability) as an essential segment of sustainable development and circular economy will be promoted. It is necessary to strengthen and support the hitherto adopted policies of the Republic of Croatia in the field of sustainable development, energy efficiency and national guidelines for building quality and culture (ApolitikA) to apply the best global standards of green building (e.g. international green building certificates), to develop the national green building system, and to raise awareness of the untapped opportunities and risks (if not implemented) and of the various opportunities (if implemented) that arise from applying the principles of green building to the individual and the community as a whole, to the private and social sectors of the economy and investment.

ENU-3: Energy renovation programme for apartment buildings

By decision of the Government of the Republic of Croatia, the Program for energy renovation of multi-apartment buildings for the period up to 2030 was adopted (OG 143/2021). Several categories of renovation are foreseen (integral energy renovation, in-depth renovation, comprehensive renovation) and three implementation models (renovation of apartment buildings not damaged in the earthquake, renovation of apartment buildings damaged in the earthquake, financial support for citizens at risk of energy poverty). It is necessary to encourage the restoration to the nZEB standard more strongly. In addition, it is necessary to consider establishing a special fund from which the costs will be reimbursed to energy-poor households or households at risk of energy poverty to remove the obstacle to securing a sufficient number of co-owners consent for energy renovation. The implementation of the Programme must be accompanied by strong promotional activities and technical assistance to applicants, and it is necessary to ensure the monitoring of energy consumption before and after energy renovation, for which it is necessary to create preconditions within the ISGE. A total of 6.27 million m^2 of multi-apartment buildings should be renovated up to 2030, in line with the Long-Term Strategy for the Renovation of the National Building Stock. It plans to renovate an average of about 700,000 m^2 of multi-apartment buildings annually.

ENU-4: Energy renovation programme for family houses

The programme needs to be conceptualised as a continuation of the implementation of the Energy Efficiency Programme for single-family homes from 2014 to 2020, with co-financing from the Environmental Protection and Energy Efficiency Fund. It is necessary to ensure the continued implementation of the renovation of family homes by renewing public calls for grants every year for 2021-2030. The primary sources of co-financing should be revenues from the sale of emission units from the EU ETS and revenues from fees paid by suppliers in the energy efficiency obligation system in case of non-fulfilment of their obligations. Several categories of renovation are envisaged (implementation of individual energy renovation measures, integrated energy renovation, deep renovation, comprehensive renovation) and three implementation models (renovation of family houses undamaged by the earthquake, renovation of family houses damaged by the earthquake and renovation of family houses of citizens at risk of energy poverty). The Programme will allow for implementing individual

measures, but considering the order of measures (e.g., replacing the heating system with a more efficient system that uses RES should only be possible for those houses with good thermal characteristics and do not require any interventions on the building envelope). Renovations up to the nZEB standard should be encouraged. Substantial promotional activities must accompany the implementation of the Programme. In total, over 11.5 million m2 should be renovated by 2030. It would mean the annual renovation of an average of 13,500 houses or 1.35 million m2 annually.

ENU-5: Energy renovation programme for public sector buildings

The measure represents the continuation of implementing the Program for Energy Renovation of Public Sector Buildings from 2016 to 2020. The Government of the Republic of Croatia adopted the Energy Renovation Program for the Public Sector up to 2030 (OG 41/2022). The NPRR and the PCC have provided funds for the period up to the end of 2026 for 2021-2027 (with implementation until 2030) to ensure the activation of private capital and the ESCO market, especially for buildings that are suitable for such financing models (buildings with continuous operation, such as hospitals, prisons, homes for the elderly, etc.) and which belong to the category of central government buildings, for which there is a binding renovation goal defined in Energy Efficiency Directive 2012/27/EU. Market models need to be combined with grants to meet the nZEB standard. In addition to EU funds. Grants should be provided under the same conditions for buildings unsuitable for market models. The renovation of the public sector building must be directed to the nZEB and ZEB standards wherever technically feasible. Approximately 350,000 m^2 of public buildings are planned to be renovated annually.

ENU-6: Energy renovation programme for buildings that have the status of cultural property

By decision of the Government of the Republic of Croatia, the Program for energy renovation of buildings with cultural property status until 2030 was adopted (OG 143/2021). Protected buildings within the meaning of this Programme can be classified into two categories: Individually protected cultural property (individual buildings and building complexes) and Buildings within a protected cultural and historical unit. The programme does not cover buildings protected as preventively protected cultural or registered cultural property. The programme has developed two basic approaches to the energy renovation of buildings, which are the subject of this programme: a holistic (integral) approach and an approach with the application of individual energy renovation measures.

ENU-7: Systematic energy management in the public sector

The public sector in Croatia is obliged to systematically manage energy, which is specifically regulated by the Energy Efficiency Act (OG 127/2014, 116/2018, 25/2020, 41/2021), or the Ordinance on Systematic Energy Management (OG 18/2015, 6/2016). The basis of this measure is an Information System for Energy Management (ISGE). The goal is to include and regularly monitor with ISGE all public sector buildings and public lighting systems by the end of 2030.

ENU-8: Energy renovation programme for public lighting

Energy renovation of public lighting in the Republic of Croatia is currently being carried out using ESI (European Structural and Investment) Funds from the European Regional Development Fund. Given the significant potential that exists in public lighting systems, it is planned to use ESI Funds in the next programming period from 2021 to 2027. By programming a larger allocation of funds for this purpose, the existing potential could be used by the end of 2030, which is estimated at around 225-280 GWh. At

the same time, the renovation of public lighting would meet the technical standards for road lighting, which means that traffic safety would be improved and light pollution would be reduced. The financing models that will be used in the next period should also enable the mobilization of private capital through energy services or public-private partnerships, in order to achieve the best possible multiplier effect. Models that are to be considered include interest rate subsidies on commercial loans/required returns to the service provider and guarantees, while it is necessary to provide grants for projects requiring investment in new public lighting infrastructure (poles, additional luminaires, etc.) to meet standard lighting requirements.

ENU-9: Green Public Procurement

Public authorities are big consumers, so the share of public procurement in GDP varies from 14-17%. Therefore, by including environmental criteria in public procurement, i.e. by increasing the demand for green products and services, the development of the green market can be strongly influenced. Green products and services have a smaller environmental and carbon footprint. Therefore, green public procurement is a priority for the circular economy, energy efficiency and other energy-climate-environmental policies.

The implementation of green public procurement in Croatia was introduced with the 1st National Action Plan in 2015, following which numerous education and communication measures were initiated. The Law on Public Procurement (OG 120/2016, 114/2022) obligates using the most economically advantageous offer (ENP) criteria in public procurement procedures. The public contracting authority may not specify only the price or only the cost as the only criterion for selecting the offer. In that case, the relative weight of the price or cost may not exceed 90 %. It enables the inclusion of green public procurement criteria in public procurement procedures, which achieves multiple positive environmental, social and financial effects.

The decision of the Government of the Republic of Croatia on green public procurement in central public procurement procedures (OG 49/2021) obliges the Central State Office for Central Public Procurement, which is one of the significant contracting authorities in Croatia, to apply green public procurement criteria in its procedures to the extent that it is under technical suitability, financial possibilities, broader sustainability and a sufficient level of market competition. The Ministry responsible for environmental protection publishes the annual savings of carbon dioxide emissions resulting from implementing this Decision.

The Ministry of Economy conducts information and educational activities on green public procurement. It maintains a national website that serves as a communication channel for standards, examples of good practices, education, and other information related to green public procurement (www.zelenanabava.hr).

According to the latest Statistical Report on Public Procurement in the Republic of Croatia, concerning the value of the concluded contracts, about 10 % of them used green public procurement criteria.

To further encourage green public procurement, binding goals and deadlines, improved monitoring and reporting, and hard work on education and information are necessary.

ENU-10: Systematic energy management in the business (service & production) sector

Although large companies are obliged to conduct regular energy audits, this obligation does not ensure continuous care for energy consumption in the company, nor does it cover small and medium-sized enterprises. In order to encourage companies to introduce certified energy management systems (such as ISO 50001), a comprehensive analysis of the possibilities of using the tax system (including taxes and

parafiscal levies) will be made to encourage companies to introduce such a system and thus ensure continuous care for energy consumption.

ENU-11: Information on energy efficiency

Providing information to the general public and target groups shall be conducted by organising targeted information campaigns related to specific programmes encouraging energy efficiency, particularly energy renovation of buildings. The National Coordination Body for Energy Efficiency (NCB) will maintain the national energy efficiency portal and provide up-to-date information to ensure the continued promotion of energy efficiency and energy services. Particular attention should be given in the following period to informing consumers of the supplier's obligations within the obligation system.

ENU-12: Development of a framework to ensure adequate skills in the context of green jobs required for building renovation

Training will be achieved by implementing the existing measure and adapting the activities to the needs and the actual situation. It is essential to systematically work on attracting young people to construction and other technical occupations, which will contribute to the availability of professional staff to implement energy renovation of buildings in the long run, which is the basis for achieving the set energy and climate targets. Through education in the field of energy efficiency, the principles of green building will be set and applied: it is necessary to encourage the promotion and implementation of green building (building on the principles of sustainability) as an essential segment of sustainable development and the circular economy. The aim is to develop a framework for ensuring adequate skills for a long-term, complex and systematic reconstruction process after the earthquakes by improving educational and training programs.

ENU-13: Energy efficiency of the power transmission network

Current losses in the transmission grid of the Republic of Croatia amount to about 2% of the transmitted electricity, which is the amount at the level of other operators in the ENTSO-E transmission system. An essential feature of the Croatian transmission grid regarding plant safety and support of market activities and losses is the powerful connection with neighbouring electricity systems (interconnections). On the one hand, this significantly increases the plant's safety, but on the other hand, the transmission increases the grid losses. CTSO (Croatian Transmission System Operator) will continue to implement measures related to the operation of the electricity system operation development and measures associated with the development of the transmission grid by 2030 to reduce technical losses in the grid further. For this measure, along with the provision of funds by CTSO, it is proposed to program the use of EU funds in the next programming period, 2021 - 2027.

ENU-14: Reduction of losses in the distribution power grid and introduction of smart grids

In the period of up to 2030, HEP-DSO will continue to conduct activities to reduce technical and non-technical losses in the distribution power grid. A detailed analysis will identify the causes of increased losses in some parts of the grid and the priorities for implementing activities to reduce technical and non-technical losses. Based on the experience gained from the implementation of a pilot project for the deployment of advanced grids in pilot areas using ESI (European Structural and Investment) funds, it is necessary to programme the continuation of the use of EU funds in the next programming period from 2021 to 2027 for the further development of advanced grids.

ENU-15: Increasing the efficiency of the district heating systems

In the existing large centralised heating systems, a significant source of losses is the deteriorated distribution network, and this measure foresees the continuation of the replacement of deteriorated steel hot water pipes and steam lines with new pre-insulated pipes and a technological shift towards the fourth generation of district heating. In smaller systems with their own boiler room, it is necessary to allow for the reconstruction of boiler rooms, in particular by replacing them with high-efficiency cogeneration systems or systems using heat pumps. The measure also envisages the development of new heating and cooling systems which use high-efficiency cogeneration or renewable energy sources. Given the provisions of Directive 2018/2002 on energy efficiency, and in particular with the introduction of the obligation of individual measurement at the level of the end-user, district heating systems have become systems with variable heat demand, which requires the introduction of advanced metering systems as an additional step towards the integration of different energy systems and increasing overall energy efficiency.

ENU-16: Increasing the efficiency of the gas system

The potential for increasing the energy efficiency of the gas transmission system is the largest in the consumption of natural gas, which is mostly (70%) consumed for preheating of natural gas before delivery to customers, and only a more minor part (30%) for heating of business premises and various technological burdens, i.e. blowing out the system. In the coming period, Plinacro will carry out energy efficiency improvement activities following the Ten-Year Plan for the Development of the Croatian Gas Transmission System 2021-2030.

ENU-17: Increasing energy efficiency and use of RES in manufacturing industries

EUR 60 million was secured from the ESI Funds in the past period, based on the OPCC. The absorption of funds was excellent, which proves that industrial plants in the Republic of Croatia have significant potential for improving energy efficiency, reducing energy consumption and reducing the share of conventional (fossil) fuels in total energy consumption by introducing renewable energy sources. This measure aims to ensure the continuation of co-financing of implementing such measures in manufacturing industries through grants and financial instruments.

ENU-18: Increasing the energy efficiency of public water supply, drainage and wastewater treatment systems

Water services are activities of general interest and are performed as a public service; the infrastructure is owned by the public sector, i.e. local self-government units and/or regional self-government units, and legal entities for the management of water services and water-communal projects are local and/or district (regional) utility companies. The most energy-intensive process in this sector is the supply of drinking water, which accounts for about 43.5% of the total electricity consumption of water services and 1.13% of the total electricity consumption in the EU. The water services sector is a significant electricity consumer and has excellent potential for reducing energy consumption through more efficient management of resources, applying energy efficiency measures and renewable energy sources. Increasing energy efficiency and the share of renewable energy sources in the water services sector would reduce operational costs and financial losses. The water services sector could be an excellent example of using the energy services of ESCO companies. It could also be considered the possible participation of the bond parties of the energy efficiency obligation system in achieving savings in the water services sector in proportion to the share of co-financing/encouragement in implementing

measures. Most estimates of potential energy efficiency savings for water utilities in the EU indicate that savings of 10-30% are possible through operational improvements and investment. In comparison, up to 50% of energy savings can be identified in wastewater treatment plants.

FUG-1: Modernization and transformation of refineries

Implement investments in the modernisation and improvement of production to maintain the competitiveness of refineries and reduce fugitive emissions from refineries. The measure includes the implementation of biofuel and sustainable fuel production projects of non-biological origin. The measure reduces the use of fossil fuels and contributes to increasing the share of RES in the transport sector. It is expected to replace about 415,000 GJ per year of energy in transport, which traditionally comes from fossil sources.

FUG-2: Measures to increase energy efficiency by improving processes and process units

Increasing energy efficiency is achieved by implementing measures that contribute to reducing energy intensity through more rational use of energy and raw materials, by adding additives and by altering production processes and equipment at pumping stations and refineries, which contributes to reducing fugitive emissions.

OIE-1: Information, education and capacity building for using RES

Informing all relevant stakeholders will be conducted by organising targeted informational campaigns related to investments in systems using renewable energy sources, especially in systems for their own needs. Information, education, and capacity building for the use of RES will be implemented at the national level. The target sectors are the energy sector (NACE code D), primary sector (NACE code A), manufacturing (NACE code C), construction industry (NACE code F) and the population of the Republic of Croatia (general population).

OIE-2: Spatial planning requirements for using RES

Analysis of the existing state of spatial capacities, defining guidelines and criteria for specific spatial planning elements for RES planning at the state, county and local level, further to the carried out activities of the professional background "Analysis of spatial capacities and conditions for the use of the potential of renewable energy sources in the Republic of Croatia" created for the needs of the State Spatial Development Plan[1].

OIE-3: Developing a regulatory framework for using RES

The existing legal framework must be reworked (completed and refined) to improve procedures and practice. The goal is to establish a rounded and functional regulatory framework and established procedures for planning and implementing RES projects at the state and local levels.

[1] https://mpgi.gov.hr/o-ministarstvu-15/djelokrug/zavod-za-prostorni-razvoj-4276/publikacije-i-strucne-podloge/4383

OIE-4: Use of RES for electricity production

Provide financial incentives for developing RES projects for electricity and heat production. The use of RES for electricity production will be encouraged at the national level.

OIE-5: Use of RES for thermal purposes

Providing financial incentives for developing RES projects for thermal needs.

OIE-6: Use of RES in centralised and closed district heating systems

Enable an increase in the share of RES in DHS by using available sources such as shallow and deep geothermal, solar energy, and water energy and allow the achievement of the status of efficient centralised heating and cooling for all heating systems in the Republic of Croatia. The key technologies are heat pumps in combination with heat tanks. In addition to promoting the use of low-temperature renewable energy sources, they enable the integration of the electricity and heating sectors and the balancing services of the electricity network.

OIE-7: Sharing Energy and Energy Communities

Supplementing the existing rules of access to the power grid, developing procedures and practices for exchanging information between system operators and users, and improving the possibilities of calculating energy exchange for energy communities (energy communities of citizens and renewable energy) are necessary. Support will be provided for the establishment of energy communities.

Several laws cover the current regulatory framework for the use of renewable energy sources, and the key laws in this regard are the Law on Renewable Energy Sources and High-Efficiency Cogeneration and the Law on the Electricity Market, with several by-laws. It is necessary to supplement and improve the laws mentioned above and corresponding by-laws to encourage the wider use of renewable energy sources in direct consumption to meet the set climate goals and harmonise the national regulatory framework with EU directives. It is needed to supplement by-laws and develop good practices to enable energy sharing, improve tariffs for more efficient distribution network use, and improve the rules and the possibility of accessing measurement or calculation data to improve the efficiency of performing energy activities, providing services and energy sharing.

The establishment and work of energy communities will be encouraged by building the capacity of stakeholders, the preparation of technical documentation and investment costs for projects owned by energy communities will be co-financed and under the framework for granting state aid, it will be possible to provide operational support for projects owned by energy communities.

OIE-8: Use of hydrogen and new technologies

Croatia will improve its use of hydrogen and new technologies to reduce greenhouse gas emissions in the transport sector and industry.

ES-1: Construction and use of energy storage facilities

It is planned to build additional energy storage tanks based on battery systems, hydrogen technology, and reversible hydroelectric power plants to increase the possibility of energy storage in the system and increase the regulatory possibilities of the electricity system then develop heat storage tanks with end customers, introduce charging stations for electric vehicles that enable energy storage, develop

underground energy storage in the form of compressed gas and use other innovative energy storage technologies (financed from EU funds).

ES-2: Improvement of the electricity system management

The current electricity system will not be able to accept many renewable energy sources planned by 2026 and 2030, which is necessary because producing energy from renewable sources is one of the most critical measures of decarbonization of the energy sector. So further development of techniques and procedures for managing the electricity system is expected through this measure, with the application of several modern tools that should enable a high level of automation of the management system, as well as the development of coordination with other transmission system operators in the region and beyond, together with the European coordination centres and communication with other participants of the electricity market. With the increasing share of renewable sources in the structure of electricity production, the need for sufficient regulatory capacity to run the electricity system has also increased. Maintaining a high level of security in the overall management system will be of particular relevance to prevent cyberattacks that could endanger the electricity system and power supply. The planning will also consider the risks of extreme weather, which climate change increases.

ES-3: Development and maintenance of the district heating systems

District heating systems have been defined as one of the priorities of the energy policy of the Republic of Croatia. The most significant potential for developing and improving existing district heating systems is primarily in increasing the energy efficiency of production units, infrastructure and equipment at end-users, measuring heat with charge according to actual consumption and increasing the reliability and security of energy supply. Today's inefficient second-generation central heating systems, designed for high temperatures in distribution networks, need to be improved by third-generation systems using pre-insulated pipes, compact heat substations or fourth-generation systems based on smart energy systems and a two-way central heating system. It is imperative to improve the DHS, primarily by reducing heat losses in the existing distribution network, as well as further development of production plants of existing central heating systems, which implies the integration of renewable energy sources and reducing the consumption of fossil fuels (fuel oil and natural gas). Therefore, this measure envisages the maintenance and upgrading of existing DHS systems, stopping the trend of disconnecting customers from the DHS systems, introducing heat storage tanks for thermal energy, and using RES for DHS and replacing existing DHS production with renewable sources (e.g. biofuels) as well as the use of heat pumps.

ES-4: LNG terminal capacity increase

The liquefied natural gas terminal on the island of Krk has been in operation since 1st January 2021. The initial gasification capacity of 2.6 billion m3/year was increased in April 2022 to 2.9 billion m3 of natural gas per year, the maximum capacity of the existing gas pipeline. In August 2022, the Government of the Republic of Croatia adopted the Decision on Increasing the Security of Gas Supply by building the Zlobin-Bosiljevo gas pipeline and increasing the capacity of the LNG terminal to 6.1 billion m3 of gas per year. The investment is estimated at EUR 180 million, of which EUR 25 million is planned to increase the terminal's capacity and EUR 155 million to build the Zlobin-Bosiljevo transport pipeline. The pipeline will be able to transport hydrogen when production sources and market conditions for hydrogen consumption are developed. The construction of this section of the gas pipeline will contribute to the security of the gas supply in the Republic of Croatia. Still, it will not increase the capacity for gas transport

to neighbouring countries. For a more significant regional impact, it is necessary to build transport pipelines to Hungary and Slovenia.

ES-5: Security of natural gas supply for EU countries

The evaluation of the European Network of Transmission System Operators for Gas (ENTSOG) has shown that, in the medium term, the expansion of the capacity of the LNG terminal on the island of Krk will further help to alleviate the dependence on gas supply from Russia it would be necessary to improve the Croatian transport network towards Slovenia and Hungary to reap these benefits.

ES-6: Security of natural gas supply for the Western Balkans

The evaluation of the European Network of Transmission System Operators for Gas (ENTSOG) showed that projects of common interest and additional projects identified in the REPowerEU plan, if implemented, would provide additional benefits to the Energy Community Contracting Parties, whose needs would be fully met. By completing the projects recognized by Flagship 5 of the Economic Investment Plan for the Western Balkans (EIP projects), the Energy Community Contracting Parties will have access to various alternative sources and directions.

All pipelines can transport hydrogen when production sources and market conditions for hydrogen consumption are developed.

ES-7: Construction and improvement of gas transmission system management

This measure envisages the construction of new gas infrastructure and the renewal and upgrade of the monitoring and management system following the Ten-Year Plan for the Development of the Gas Transmission System to increase the security of the natural gas supply and improve the supervision and management of the gas transmission system.

ES-8: Exploration of potential hydrocarbon deposits in Slavonija, the Dinarides and the Adriatic

The aim is to mitigate the decline in oil and gas production and thus reduce dependence on imported energy.

ES-9: Reduction in fossil fuel usage for heating needs in individual heating systems

Phasing out the use of fossil fuels for individual heating needs. When replacing individual thermo-technical systems in buildings, it is necessary to apply technologies that use renewable energy sources, either in individual systems or through new or existing high-efficiency centralized heat systems, which meet the criteria given in Directive (EU) 2023/1791 on energy efficiency. At the same time, finding an optimal solution for each building is necessary, respecting the principle of "energy efficiency in the first place".

ES-10: Cybersecurity

Achieving resilience, reducing cybercrime, developing cyber defence policy and cyber defence capability, developing industrial and technological resources and establishing a coherent international cyberspace policy with three areas highlighted: (1) resilience, technological sovereignty and leadership, (2) building

operational capacity for prevention, deterrence and retaliation, (3) developing global and open cyberspace.

ES-11: Establishment of a hydrogen-based economy

The measure aims to develop a hydrogen-based economy encompassing the entire value chain, including the production, storage, transportation, and use of renewable hydrogen while strengthening research and development. The measure will also encourage the use of hydrogen in traffic.

UET-1: Development of the electricity transmission grid

Croatian Transmission System Operator ltd. (CTSO) is responsible for the management, operation, maintenance, development and construction of the electricity transmission network in the Republic of Croatia and is obliged to develop and adopt ten-year, three-year and one-year investment plans for developing the transmission network every year. At the time of adoption of this document, the Ten-Year Transmission Grid Development Plan 2022-2031 has been in force. During the entire implementation of this document, annual amendments to the Ten-year Development plan will be made.

UET-2: Development of gas transmission system

Planning the development of the gas transmission system is carried out through the development of the 10-year plan for the development of the gas transmission system. Under the Gas Market Act (OG 18/2018, 23/2020), the transmission system operator is obliged to prepare a ten-year plan for developing the transmission system and submit it to Croatian Energy Regulatory Agency (HERA) for approval every two years. At the time of preparation of this document, the Ten-Year Gas Transmission System Development Plan of the Republic of Croatia 2021-2030 has been in force. The plan will be continuously updated throughout the implementation period of this document.

UET-3: Equipping the gas transmission system for the future possibility of transmission of up to 100% hydrogen

This measure includes the project of planning and reconstruction of gas nodes and safety and measuring equipment for the reception and addition of decarbonized gases to the gas transmission system. It includes the development of a 'smart gas network' including advanced digital systems and components, control systems, sensor technologies, gas flow and quality management devices (compressors, gas flow control kits, reconstruction and chromatography equipment, etc.), to enable interactive and intelligent monitoring, measurement, quality control and management of the reception and transmission of decarbonised gases. The implementation of the project will allow the reception and mixing of decarbonised gases (biomethane and hydrogen) into the gas transmission system, which will reduce greenhouse gas emissions and facilitate the transition to a transmission system that will transport 100 % of decarbonised gases in the future. The project will contribute to achieving the objectives set by the European Green Deal. The implementation of this measure is expected in the next 10-15 years, and according to the first indicative estimates, the required investments amount to EUR 54 million.

UET-4: Analysis of the impact of demand response pilot projects on the distribution network

Implementation of pilot projects and analysis of their impact on the distribution network.

UET-5: Co-financing the implementation of demand response projects

EPEEF will co-finance their implementation based on public calls to encourage the broader implementation of demand response projects. Demand response projects will be implemented with large customers (industry, services) and households. The response to the demand will be achieved through equipment installed at the customer's premises and connected to the control and measurement system. The public call will use the results of analyses to measure UET-4 (Analysis of the impact of demand response pilot projects on the distribution network). In addition to using funds from the income from the sale of emission units from the EU ETS, MEPGT and the Ministry of Economy will determine other sources of financing for the co-financing of these projects.

UET-6: Development of the National Balancing Market

The aim is to increase competition in the national balancing market and enable all transmission and/or distribution network users to participate in the national and EU balancing market.

UET-7: Elaboration of the regulatory framework for active participation of gris users in the electricity market

It is necessary to amend and supplement the existing regulatory framework, including the implementing rules to enable the active role of grid users in the electricity market. The introduction of the aggregator as a market participant and enabling the launch of pilot projects for the provision of ancillary services will analyse in detail the services that users can provide to the distribution or transmission system operator. It will also analyse the potential for the provision of ancillary services and flexibility services through demand response, the needs of the system operator for ancillary services and their possible types, scope, mode and period of provision. Obstacles to using ancillary services will be identified, and suggestions will be made for removing them. Implementing this measure will also consider new technologies (battery tanks, electric vehicle charging stations, etc.), whose more comprehensive application also requires the amendment of the regulatory framework.

UET-8: Introduction of advanced consumption measurement systems and measurement data management

To enable the further development of the electricity market and the active role of electricity buyers in the markets, advanced metering devices, measurement data management systems, and systems at the consumption level are planned to be introduced.

UET-9: Implementation of the Programme for the reduction of energy poverty

Development of programmes to combat energy poverty, alleviate energy poverty and the degree of vulnerability to it; establishment of an energy poverty monitoring system; creation of a program to fight poverty in terms of mobility, alleviating poverty in terms of mobility and the degree of vulnerability to it; establishment of a poverty monitoring system in terms of mobility.

UET-10: Implementation of the Programme for Combating Energy Poverty, which includes the use of renewable energy sources in residential buildings in assisted areas and areas of special state care for the period up to 2025

The Program for combating energy poverty, which includes the use of renewable energy sources in residential buildings in areas of special state care for the period 2021-2025 identifies 413 residential buildings. Renovation priorities were determined according to the perceived deficiencies of the buildings, and the possible savings in energy for heating and primary energy, which will be realized by the renovation of the buildings, were estimated. The total target area of renovation is 297,575 m^2. The total possible saving of primary energy in all buildings amounts to 27 GWh per year. The program involves the financing of reconstruction from the funds of the fund for recovery and resilience.

4.3. Transport

TR-1: Regulatory instruments to promote a cleaner transport system

The measure aims to encourage changes in the transport system to reduce environmental pollution and achieve a more sustainable transport system. This measure includes the application of regulatory instruments such as regulations, standards and taxes that will encourage the use of low-emission vehicles and increase the use of public transport and pedestrian and bicycle paths.

TR-2: Programme for co-financing the purchase of new alternative fuel vehicles and the development of alternative fuel infrastructure in road transport

In the context of co-financing of cleaner transport projects, special lines of co-financing for specific purposes will be defined for purchasing vehicles of all categories with alternative energy sources. Incentives for co-financing the purchase of vehicles will be conducted consistently, transparently and continuously. One of the activities will be the development of financial instruments such as interest subsidies based on subsidising financing costs under credit programs and ensuring more favourable financing conditions for targeted investment projects in new vehicles with zero CO_2 emissions.

To achieve the appropriate modal integration of Croatian transport flows with the European Union transport network, the Republic of Croatia is obliged to carry out activities that will result in the construction of alternative fuels infrastructure on the trans-European transport network located geographically in the territory of the Republic of Croatia. In this regard, the Republic of Croatia is obliged to implement the transition initiative towards the use of alternative energy sources in the transport sector in a way that encourages the construction of publicly available infrastructure for alternative fuels. By adopting and implementing the Programme to promote the construction of alternative fuels infrastructure in the Republic of Croatia, the Republic of Croatia will endeavour to provide sufficient infrastructure to supply alternative fuels to light and heavy road transport vehicles.

TR-3: Improving the public transport system and promoting sustainable integrated transport

The measure aims to promote the sustainable development of urban transport systems through the optimisation of freight transport logistics and intelligent management of public parking areas, the introduction of platforms for integrated passenger transport, the introduction of car-sharing systems in cities, the introduction of low-emission zones in cities, the introduction of public urban bicycle systems and the construction of associated cycling infrastructure, intelligent traffic management (upgrading, adaptation and replacement of obsolete signalling devices and equipment, the installation of advanced

traffic equipment and smart traffic lights equipped with an autonomous system of power from renewable sources, the construction and equipping of central operational centres for supervision and management of intersections with set traffic lights). At the local level, it is necessary to continuously prepare and implement Sustainable Mobility Plans in cities, as well as strategic plans that build on the existing planning practices, and consider integration, participation and evaluation principles to meet the citizens' mobility needs now and, in the future, and ensure a better quality of life in cities and their surroundings. Appropriate outreach campaigns will accompany the activities. This measure aims to cover all counties, large cities (with more than 35,000 inhabitants) and municipalities and cities that together form a geographical entity with more than 35,000 inhabitants.

In addition, the measure aims to modernise regular public urban and suburban bus traffic passengers by procuring new electric or hydrogen propulsion vehicles and building the necessary infrastructure to promote vehicles with reduced CO_2 emissions. The aim is also to modernise the tram fleet in Osijek and Zagreb to provide a better and faster public transport service and increase the number of passengers using public transport, ultimately reducing CO_2 emissions in transport.

The measure will also encourage projects to develop and implement urban mobility ecosystems (i.e., the so-called MaaS – mobility as a service), closely integrated with public urban transport, consisting of three key components necessary for fully autonomous vehicles to function and participate in traffic. These are: (i) fully autonomous electric vehicles of the fifth level of autonomy, (ii) development and construction of specialised infrastructure for autonomous and electric vehicles integrated with public urban transport, (iii) development of a software platform for managing the complete system.

TR-4: Development of energy-efficient maritime transport and inland navigation

The measure encourages the construction of an onshore electricity supply system for seagoing ships and inland waterway vessels. Supply of electricity from the mainland for ships and vessels On-Shore Power Supply (OPS) is a distributed energy system that reduces the need for ships and vessels to use built-in generators and helps reduce air pollution and noise in ports. In addition, the measure also envisages encouraging the construction of publicly available stations for the supply of hydrogen, ammonia and/or liquefied natural gas to seagoing ships and/or inland waterway vessels powered by hydrogen, ammonia or liquefied natural gas. Likewise, the measure involves co-financing the procurement of ships and alternative fuel vessels.

TR-5: Development of energy-efficient rail transport

This measure establishes the aim of constructing an appropriate number of stations for the supply of electricity or hydrogen from electric trains with a battery storage system and from hydrogen-powered trains on sections of the basic and comprehensive TEN-T network whose electrification is not possible for technical or cost reasons. In addition, in the period up to 2030, additional investments will be made in the renovation, modernisation, construction and maintenance of the railway infrastructure to enable better quality rail transport services, increase the number of service users, and thus increase the share of rail transport in total traffic. The National Plan for the Development of Railway Infrastructure until 2030 established the implementation framework and action plan, which determined the concrete measures to be implemented to achieve the special goals of the National Plan.

TR-6: Development of energy-efficient air transport

The electricity supply should replace liquid fuel consumption in airports to reduce greenhouse gas and pollutant emissions. All aircraft in the commercial transport function should be able to use the external electricity supply while parked at exits or positions away from terminals at TEN-T airports. In this respect, it is necessary to build infrastructure for the electricity supply of stationary aircraft and infrastructure for the supply of preconditioned air (fixed or mobile systems that enable the external supply of conditioned air for cooling, ventilation or heating of stationary aircraft cabins).

TR-7: Developing a low-carbon fuel market

Increasing the share of RES in transport by 2030 through developing the market for low-carbon fuels and achieving the planned share of fuels produced from renewable energy sources in final energy consumption in transport. The measure's implementation is based on amendments to the relevant laws and by-laws based on the Renewable Energy Directive. The measure also implies the creation of a long-term sustainable supply chain of biomass and the constructing a bio-industrial complex designed to produce advanced biofuels with negative net greenhouse gas emissions. Likewise, the measure implies the creation of preconditions for investment to enable sustainable business models for investment in the construction of synthetic fuel plants.

In addition to reducing greenhouse gases and diversifying energy sources, the goal is to encourage the development of new business models for the production and use of biofuels, launch pilot projects for the production and use of biofuels, stimulate growth and innovation, and create new jobs. The measure will focus on sustainable and environmentally friendly biofuels, and the goal is to encourage the development and implementation of new technologies for the production and use of biofuels, financing of pilot projects, education and training.

In addition, this measure aims to gradually introduce sustainable aviation fuels ("SAFs") to the civil aviation market in Croatia, following the provisions of the Regulation on ensuring equal conditions of market competition for sustainable air transport (ReFuelEU Aviation). The aim is to encourage the reduction of greenhouse gas emissions from aviation and promote sustainable practices in the air transport sector.

4.4. Industrial processes and product use

The large emission sources within this sector - production of cement, lime and other mineral products, production of ammonia and nitric acid and production of steel, together with large energy sources, are included in the EU ETS system. Climate and energy policy framework until 2030 extends free allocation, still based on comparisons with benchmarks for products, heat, district heating and fuel. For the industry, the price of emission units on the ETS market, i.e. signals related to long-term price predictability will be the main drive.

Process emissions from economic activities, which, according to the IPCC methodology, are included in the sector of industrial processes and product use, are estimated on the basis of detailed sectoral projections of cement industry and of using N_2O for medical purposes and in the food industry and projected macroeconomic indicators of gross value added by other industries, annual growth rate of gross domestic product and population decline. The application of measures defined by strategic and planning sectoral documents of producers is included, which is conditioned by market requirements,

laws and regulations and requirements for the application of best available techniques in production processes.

Projections also include assumptions on limiting and reducing the use of fluorinated greenhouse gases, in accordance with the provisions of Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024 on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014 and Directive 2006/40/EC of the European Parliament and of the Council of 17 May 2006 relating to emissions from air conditioning systems in motor vehicles and amending Council Directive 70/156/EEC and in accordance with the expert assessment based on the continuation of the downward trend in emissions of these pollutants.

The following measures are included in projections:

IP-1: Reducing the share of clinker in cement production

Measure includes gradual substitution of clinker with alternative materials in cement production which leads to reduction in clinker production. The share of used clinker substitutes depends on the composition of other raw materials used, availability of materials of appropriate composition on the market and market requirements for cements of certain composition.

IP-2: Limiting fluorinated greenhouse gas emissions

In accordance with the Regulation (EU) 2024/573 the measure defines activities and procedures for reducing fluorinated greenhouse gas emissions, conducting equipment leakage checks, using equipment with leakage detection systems, keeping records of equipment on which leakage checks should be carried out, collection of fluorinated greenhouse gases to ensure their recovery, recovery or destruction, the development of a producer responsibility system for the collection of fluorinated greenhouse gases and their renewal, recovery or destruction, and the implementation of training and certification programmes.

4.5. Agriculture

The positive impact of the implementation of measures on overall greenhouse gas emissions in the agriculture sector is reflected in the direct reduction of methane and nitrogen compounds emissions.

Measures included in the formation of scenarios of gradual transition of agriculture in relation to the referent scenario:

POLJ-1: Improving storage capacity and practices when handling manure

The measure aims to reduce methane, nitrogen, and ammonia emissions through manure collection and storage. The manure management category is the source of nitrogen compounds, ammonia, and particulate emissions. Emissions come from the excrement of animal manure deposited in and around the dwellings and collected as liquid manure, solid manure, or manure in a pit in the yard, with the latter two being viewed together as solid manure. Emissions come from animal housing, the yard, storage areas, and manure application on the soil and during grazing. In practice, several measures are mainly

applied at the same time, with different measures that can have a significant impact on emission reductions, such as:

- Changes in the fertilisation system (type of manure) and improvement of manure collection facilities,
- General improvement measures encourage the implementation of animal husbandry practices such as keeping animals on pasture. This dramatically affects emissions reduction because the depositing and manipulation of manure inside and outside the animal breeding facility is significantly reduced. Additionally, through the grazing of animals, it is possible to deposit manure on the pasture where it is directly absorbed by the plants and its absorption by the soil is carried out,
- Education of farmers on practices that contribute to the reduction of greenhouse gas emissions.

POLJ-2: Anaerobic manure decomposition and biogas production

The introduction of biogas plants reduces methane emissions due to the use of litter as a renewable source for electricity production. The measure is linked to the measures in Renewable sources in the production of electricity and heat and Construction of cogeneration plants from the Energy sector. Anaerobic breakdown helps biogas plants to reduce the source of easily degradable carbon in the manure that is applied to agricultural land, but it also potentially reduces the process of nitrification and N_2O emissions (lower emissions during application, but higher during storage The measure aims to reduce agricultural holdings' dependence on fossil fuels and methane emissions from cattle and pig manure management systems by increasing the share of biogas plants.

Introducing biogas plants reduces greenhouse gas emissions due to the disposal of used litter and produces electricity from a renewable source. Additionally, apart from the fact that anaerobic digestion in biogas plants reduces the source of readily degradable carbon in manure applied to agricultural land, the nitrification process (N_2O emission) is also potentially reduced.

The digester or fermenter is the central part of the biogas plant and bears the highest investment costs of the biogas plant. It also has the highest operating costs resulting from energy consumption for heating.

POLJ-3: Improving and changing the soil tillage system (reduced tillage)

Increasing soil carbon sequestration through improvements and modifications to soil treatment systems.

Soil treatment systems are crucial for the parameters important for storing soil water, in general, water-air relationships, water losses by evapotranspiration, soil thermal state, and thus microbial activity and soil respiration.

Reduced tillage is the application of scientific research and practical checks that change the conventional tillage system by reducing the depth of basic and supplementary tillage, omitting one or more working operations, reducing the frequency of tillage, or entirely omitting tillage.

POLJ-4: Extension of crop rotation with higher share of legumes

Retention of carbon in the soil by ensuring an optimal ratio of carbon and nitrogen, protection of soil and water from nitrate pollution by growing legumes to reduce or completely omit the use of nitrogen fertilizers. Cultivation of legumes promotes soil biogenicity and fertility, improves soil structure and prevents erosion.

Increasing soil carbon sequestration through crop rotation.

Fertilization is a system of plant production practised on arable land, representing the regular, spatial and temporal crop rotation (swapping crop). When determining crop rotation, care must be taken of soil type and fertility, pH value, climatic conditions, and the impact of culture on soil fertility, structure, and nutrient supply. Fertilization is planned individually for each economy according to production requirements, where adherence to the recommended sequence of cultures is essential. Crop rotation must include three primary groups of plants - arable crops, cereals, and legumes.

Today, crop rotation and soil treatment systems strongly influence soil's organic matter content changes. The crop rotation intended to have a long-term impact on maintaining the same humus level should include leguminous crops, clovers, and clover grass mixtures. It should, where possible, include the sowing of second crops for green harvests.

Sowing leguminous crops has many beneficial effects on agricultural soils. This binds atmospheric nitrogen, which is used immediately for protein synthesis and prevents the risk of groundwater contamination by nitrates that otherwise occur with the intensive application of mineral nitrogen fertilizers. The soil is enriched with organic matter, which has multiple positive effects on improving and maintaining the soil's favourable physical, chemical, and biological properties. Soil fertility is maintained, and cultures that follow in the crop rotation are allowed to use biologically bound atmospheric nitrogen. Individual crops (clover) can be effective in soil carbon sequestration. Furthermore, growing leguminous crops reduces the amount of nitrogen-rich organic fertilizers. As a rule, they do not need to be fertilized except in small amounts at the beginning of their vegetation for initial growth and development until they form root knots and until the nitrogen fixation process begins.

POLJ-5: Intensification of crop rotation by using intercrops

Changes in organic matter content/increase of carbon sequestration in soil and reduction of nitrate leaching by sowing intercrops.

The principles of good agricultural practice in soil and water protection against nitrates recommend the introduction of intercrops (second crops) between the harvest of the main crops. Sowing intermediate crops that can be used to feed livestock or plough for green fertilization will utilize residual nutrients, prevent further evaporation of soil water, reduce carbon loss from soil (eliminating the negative effect of "bare soil"), prevent nitrogen leaching into groundwater (especially in lighter soils) and increase organic mass on farms that have a narrow crop rotation on their arable land. Leguminous crops bind nitrogen from the air to enrich the soil, preserve and stimulate microbial activity, and prevent soil erosion. The increased cost of agricultural production per hectare is usually offset by savings in animal feed preparation or reduced need for mineral fertilizers. The problems in this process generally concern the time and farm work organisation. Still, they are solvable, which can only be conditionally said for the drought that can occur at the time after the harvest of the cereals, whereby the sowing of second crops is questionable.

POLJ-6: Improvement of organic fertilizer application methods

Increasing carbon sequestration in the soil by improving the methodology of applying organic fertilizers.

The application of organic fertilizers is important for the circulation of organic matter in the soil, about which there is a relatively large database at the global level.

Organic fertilizers stimulate the activity of soil microbes much more strongly than mineral fertilizers, and with them, much less salt and acids are introduced into the soil. The effectiveness depends on the

microbiological activity in the soil, that is, at what speed they are broken down and transformed into nutrients suitable for adoption. Organic fertilizers have a much longer decomposition time, extending their effect over several years. Regular application of organic fertilizers increases the amount of humus in the soil. It improves soil properties, especially the structure, which results in a better water-air relationship, excellent water retention, greater availability of all nutrients and stronger resistance to erosion on sloping surfaces.

Underground application: Direct injection into the ground using an injector prevents the loss of ammonia and reduces or eliminates the spread of unpleasant odours. This method is applicable for applying liquid beef and pig manure, where the NH3 emission is lower by up to 30%.

When using the injector, although the loss due to volatilization is reduced, i.e. the amount of nitrogen available to plants increases, it is also possible to increase the loss of nitrous oxide from the soil. Therefore, the importance of proper dosage and application of fertilizers (organic and mineral) increases even more.

The limiting factor in increasing the use of specialized equipment for injecting organic fertilizer is the relatively high price of the equipment itself. Therefore, such an investment is indicated for more extensive (or consolidated) farms with the need for large fertilization capacities.

POLJ-7: Agroforestry

Application of agroforestry technologies to increase carbon sequestration in the soil and define the potential for developing agroforestry systems in suitable areas.

Agroforestry encompasses technologies used in forestry and agriculture to create greater productivity, economic viability, environmental friendliness, and sustainable land use. Agroforestry is a common name for land management systems whereby permanent woody species are integrated with cultivating crops and/or animals in the same area unit. The integration can be spatial or in a time sequence. Ecological-economic interaction between forestry and agricultural components is standard. The goal is to create diverse, productive, profitable, healthy, and sustainable land management systems. The production capacity of the land is used to a greater extent. Still, at the same time, a balance is reached between economic viability and habitat protection based on sustainability or sustainable development. Research shows that, with all the other benefits, some agroforestry systems (e.g., agro silviculture) are significant carbon sinks.

Agroforestry is applied worldwide to agricultural and forestland, including areas with degraded habitats (erodible areas, economically poorly valued devastated and degraded areas. Through experiments, agroforestry should show its applicability in our conditions concerning different forms, divisions, and other needs. It is essential to point out that some elements of agroforestry have been recorded throughout history in our country's coastal and littoral areas. First, cultivating land on terraces that were used to raise perennial plantations, olive groves, vineyards, and various fruit trees could only be used for animal husbandry in a limited manner.

POLJ-8: Hydro-melioration interventions and system of protection against natural disasters

Increasing the share of agricultural areas under irrigation and reducing nitrate leaching from agricultural soils.

More than any other activity, agriculture pollutes the water with nitrogen (nitrates), phosphates and plant protection products (pesticides). The intensification of agriculture has led to the intensification of

agrochemical pollution. Environmentally friendly agriculture means controlled application of mineral fertilizers, controlled drainage, re-use of drained water and use of water of appropriate quality.

Irrigation with larger rations than necessary can result in increased nutrient leaching from the arable horizon, especially nitrogen, into deeper horizons, resulting in the need for additional fertilization and, thus, increased emissions and increased costs. Drainage drains excess water from an agricultural surface, which most often occurs after heavy rain. Also, changes in soil air-water relationships affect the activity of beneficial microorganisms.

Proper irrigation and drainage of excess water enhance microorganism activity, reducing soil degradation and, thus, CO_2 losses. Earthworm activity is also increased, transferring carbon into deeper layers where it is longer-lasting.

In Croatia, surface drainage systems are built on an area of about 1,519,000 ha, and underground drainage systems are built on an area of about 166,542 ha. Most of the systems are over 25 years old.

Hydro-amelioration systems play a significant role in sustainable development. Significantly improve the properties of existing hydro-amelioration systems. Human interventions in water control include applying technologies and new management to ensure adequate quantities of water for plants, prevent excessive soil moisture and salinization, protect the soil from flooding, and maximize profits by using water. These interventions take place within economic, social, and environmental constraints.

Croatia is in a good position because it has a sufficient water supply. However, successful technological innovations in drainage and irrigation systems depend primarily on the sector's research programmes and personnel education. The main goals are, therefore, the growth of agricultural production and the system's sustainability.

POLJ-9: Introduction of new cultivars, varieties and crops

Determining the potential of new cultivars, varieties, and crops to increase soil carbon sequestration. The introduction of new cultivars, varieties and crops is, in principle, subject to emergency adaptation measures (per the UNDP) - i.e., time-critical measures that also include the implementation of the system as a defence measure against climate change impacts on food production or achieving lower emissions.

In this context, it is vital to encourage the development, education, and implementation of technologies at the national and regional levels, including promoting the transition and adaptation of producers (as well as consumers, and therefore of the entire production chain) to the production of new crops, or by enabling and encouraging the use of cultivars and varieties which are more resistant to drought or disease, have a smaller carbon footprint or have other benefits.

An example of a possible strategy is the more rational production and use of new leguminous crops in response to the lack of protein in animal feed, the need to reduce the use of mineral fertilizers and the reduction of soil fertility.

Due to their considerable protein, naturally occurring legumes require a large amount of N. They can provide a large part (or complete need) of this nutrient from the atmosphere through biological fixation, provided they live in symbiosis with the effective strains of root nodule bacteria. It is for these reasons that little-known plant species that have a symbiotic relationship with root nodule bacteria have been recently investigated, such as Galega orientalis Lam., a new perennial forage legume living in effective symbiosis with Rhizobium galegae.

4.6. Waste

The amount of landfilled solid waste will be reduced to a minimum by preventing waste generation and using separate collection, recycling and recovery of waste. All landfills will be remediated, waste management centres will apply modern technologies that enable material recovery and chemical recycling of waste, thus obtaining various chemical compounds that can be used in industrial production (ethylene, ammonia, etc.) as well as various fuels (hydrogen, synthetic gas, liquid fuels). The new landfills will be arranged in such a way that their impact on the environment is negligible. Establishing a waste management system in accordance with the principles of the circular economy will contribute to resource efficiency with less negative impact on people and the environment.

The following measures are included in the projections:

GO-1: Prevention and reduction of waste generation

Waste prevention is a priority in waste management. The prevention and reduction of waste generation is achieved through reuse procedures, establishing centres for reuse, using by-product instruments, eliminating waste status, and restricting the placing of certain products on the market. The measure should be achieved through cleaner production, education, information and awareness-raising projects on sustainable waste management, economic instruments, the application of regulations governing waste management and investments in modern technologies that prevent and/or reduce waste generation.

GO-2: Increasing the amount of separately collected and recycled waste

Municipal waste management, as one of the priority categories of waste in terms of quantity and composition, is conditioned by the legislative framework. Quantitative goals and deadlines for increasing the mass of separately collected and recycled waste are incorporated into the measure:

- separate collection of problematic waste, paper and cardboard, glass, plastic, biowaste, metal, textiles and bulky waste;
- meeting the goals of preparation for reuse, including repair and recycling, through the separate collection of paper and cardboard, metal, plastic, glass, biowaste and bulky waste;
- disposal limit for all waste that is suitable for recycling and other material and energy recovery procedures until 2030;
- limitation on the amount of municipal waste;
- mandatory processing of waste before disposal;
- reduction of the amount of biodegradable municipal waste disposed of in landfills.

GO-3: Reducing the amount of disposed biodegradable waste

The measure aims to reduce the mass of the biodegradable fraction of waste disposed of in landfills, thereby reducing the emission of methane produced by anaerobic processes of waste decomposition. This measure incorporates the objectives:

- All permits for waste management in the Republic of Croatia allow the disposal of a maximum of 264,661 tons of biodegradable municipal waste in one calendar year (35% of the mass of biodegradable municipal waste produced in 1997);
- Improve the system for collecting and recovering biowaste, separate collecting and recycling 36% of biowaste from municipal waste.

Applying binding goals related to the disposal and recycling of waste described in measure GO-2 reduces the mass of disposed biodegradable waste.

GO-4: Ensuring a system for the treatment and use of landfill gas

The Ordinance on Landfills (OG 4/2023) stipulates the operating conditions for landfills, which reduce the possible adverse environmental effects of landfills. Landfill gas is collected from all landfills receiving biodegradable waste. The collected landfill gas should be treated and used. If the collected gas cannot be used to generate energy, it should be incinerated, and methane emissions into the atmosphere should be prevented.

Applying binding targets for the disposal and recycling of waste, as described in the measure GO-2, positively affects the reduction of landfill gas generated.

GO-5: Reduction of food waste following the guidelines for the development of a bioeconomy

Food waste prevention is carried out through the implementation of the Plan for the prevention and reduction of food waste for the period from 2023 to 2028, which continued planning activities to increase the amount of donated food, reduce food waste, and increase the food security of poorer population groups.

The plan includes the continuation of measures and activities that will contribute to further progress in the prevention and reduction of food waste in all stages of the food chain, from primary production through processing and production, trade, catering, and institutional kitchens to households, but also to the achievement of the sustainable development goal of the United of the people to reduce food waste per capita at the retail and consumer level by 50 % and to reduce food loss in production and supply chains by 2030.

The measures include encouragement and further improvement of the food donation system in the Republic of Croatia; encouraging the reduction of food waste generation; promotion of social responsibility of the food sector; raising awareness and informing consumers about preventing and reducing food waste; monitoring the amount of food waste and investing in research work and innovative solutions that contribute to the prevention and reduction of food waste.

GO-6: Circular economy measures to increase resource efficiency and business application models based on repair, recycling and recovery

The new action plan for the circular economy (COM(2020) 98 final) introduces measures to reduce waste production and the good functioning of the EU internal market for high-quality secondary raw materials. The action plan for the EU's circular economy is aimed at changing the way of production, empowering consumers to make sustainable decisions in business and everyday choices and applying a production and consumption model that includes sharing, reusing, repairing and recycling existing products and materials as long as possible. Thus, the lifetime of products and raw materials is simultaneously extended, and the waste mass is reduced. Therefore, introducing circular economy principles minimises the pressure on the environment, increases the security of raw material procurement, competitiveness and innovation, creates new jobs, and consumers have longer-lasting, more resistant and more valuable products.

The goal of the circular economy concept is to separate economic growth from the use of natural resources, which can be achieved by removing waste and pollution already at the stage of conception/design of products and materials by keeping them in use as long as possible. True circularity

requires products that can be reused, repaired, refurbished, reworked and repurposed, thus preventing product value from declining and can even gain quality the longer they circulate through the system.

Waste management, including the collection and processing of waste, is critical to increasing the circularity of the Croatian economy and reducing landfills' negative impacts on the environment, human health, and greenhouse gas emissions. Municipal waste accounts for the largest share of total waste in Croatia; the municipal waste recycling rate 2022 was only 34 %, compared to the EU average of 49 %.

4.7. LULUCF

LUF-1 Establishment, maintenance and upgrading of the National Information System for land in the Republic of Croatia

By 2025, it is necessary to create a Maintenance Plan for the National Information System for Land in the Republic of Croatia. For its development, it is essential to implement projects that:

- Establish a unique land information system in the Republic of Croatia or determine the areas of each LULUCF land category by using spatially correctly determined data for each land category and each land conversion type from one land category to another.
- Analyse all LULUCF land categories depending on the cover, land use, and management practices used on each land and the associated emissions/sinks to consider the potential of each of the storage areas within each LULUCF land category to reduce emissions and increase greenhouse gas sinks.
- After conducting the above analysis, make detailed projections for developing future emissions/sinks in the LULUCF sector.

LUF-2 Carbon sequestration on areas of existing forests

Implement activities that increase the carbon content of forests and biomass storage and implement activities that ensure removal in each period. According to the Regulation 2018/839 amendment, which entered into force in May 2023, targets have been set for 2030 for two periods: from 2021 to 2025 and from 2026 to 2030.

LUF-3: Implementation of afforestation works

Afforestation in non-forest areas (in terms of IPCC methodology) is an activity that generates sinks. The Republic of Croatia is not able to dispose of all grassland areas (according to the national regulation: non-vegetated productive forest land) for afforestation due to the obligations it has taken regarding the preservation of particular habitat types of interest to the European Union. Considering that there are agricultural areas in the Republic of Croatia where agricultural production does not take place and which have been neglected for many years, the problem of these areas must be adequately addressed when creating the Land Management Strategy. It is necessary to evaluate the justification for converting these areas into forest areas regarding vegetation or through implementing afforestation. It should be borne in mind that there is no restriction on applying the number of outflows when calculating outflows due to afforestation and that these outflows are fully considered in the calculation. Guidelines for further development must be drawn based on the knowledge and experience gained from implementing afforestation activities. Suppose an afforestation measure is introduced on land that will not be used for agricultural production. In that case, it will require strengthening seed production and nursery services

in the forestry sector and providing forest reproduction material necessary for implementing these works.

LUF-4: Manufacture and use of wood and wood products

Harmonize the available data and statistical reports and use new research to harmonise the information available for different reporting to international organisations to provide accurate, transparent, and high-quality reporting, as well as to create harmonised bases for the adoption of medium and long-term strategies in the forestry and wood processing sector. It implies the mapping of forestry and timber industrial production. Encourage using wood products in traditional and new products to increase outflows and reduce greenhouse gas emissions in the wood storage facility. This also requires the regulation of exports of untreated and semi-treated timber, which encourages the development of the domestic timber industry, and the regulation of energy timber exports increases the share of energy production from renewable sources, thus fulfilling international commitments. Outflow-generating activities must be promoted to ensure that wood products and wood are used for energy purposes in ways that contribute to meeting both EU targets by 2030 (reducing emissions and increasing the share of renewables in total energy consumption) and are beneficial to climate and environment. Guidelines for further development must be drawn based on the knowledge and experience gained from implementing this measure.

LUF-5: Land under managed crops

To implement activities in managing agricultural production areas in a way that contributes to reducing emissions. Land management practices that can affect emissions and sinks, for example, in soil storage, are soil treatment methods, plantation/crop life (rotation period), crop/plantation type, fertiliser application, residue management, erosion control, application of irrigation systems etc.). Manner of area management in a climate and environmentally beneficial manner should be promoted, and guidelines for further development should be drawn up based on the knowledge and experience gained from implementing this measure.

The method of managing agricultural categories of land that applies emission reduction measures, conserving and increasing the soil's carbon content, is called 'carbon agriculture'. Carbon farming is the premise of agricultural development on the road to a climate-neutral economy. The obstacle is that no carbon maps have been made in agricultural soil. The EU is introducing the certification of outflows, which is intended to provide additional funding for carbon farming.

LUF-6: Managed grassland

By implementing activities in pasture management in a way that contributes to reducing emissions. Manner of area management in a climate and environmentally beneficial manner should be promoted, and guidelines for further development should be drawn up based on the knowledge and experience gained from implementing this measure.

LUF-7: Implementation of technical projects and scientific research in the LULUCF sector

Until 2030, it is necessary to provide financial resources for implementing technical and scientific projects in the LULUCF sector. Given the cost-effectiveness of measures in the LULUCF and agriculture sectors, the multiple positive indirect effects, and the state of available data and uncertainty, research in LULUCF projects should be prioritised. Scientific projects should enable the development of different models to

move to a higher level of IPCC methodology (Tiers 2 and 3) to determine the GHG emissions/sinks as accurately as possible and, consequently, plan measures to reduce emissions and increase sinks. In doing so, climate change projections, risk assessments, vulnerability to climate change, and their negative or positive impact on greenhouse gas emissions/sinks in the LULUCF sector should be considered.

LUF- 8: Activities to build the WAM scenario

The aim is to create a WAM scenario that increases the sink by 2030.

4.8. Other (cross-cutting) policies and measures

MS-1: Strengthening governance to achieve climate goals

Under the Air Protection Act (OG 127/2019), the Committee for Intersectoral Coordination for policy and measures for mitigation of and adaptation to climate change was established by the Decision of the Government of the Republic of Croatia in 2014 (OG 114/2014, 9/2018). The Committee recommends the Government of the Republic of Croatia on the overall policy and measures for climate change mitigation and adaptation. It ensures political support for implementing the policy and climate change mitigation and adaptation measures. The composition, tasks, and manner of work of the Committee shall be determined by the Government of the Republic of Croatia at the suggestion of the ministry responsible for the environment.

A decision is underway to establish a new Commission for Cross-Sectoral Coordination for Policies and Measures for Climate Change Mitigation and Adaptation with two technical working groups on 1) climate change mitigation and 2) climate change adaptation.

A system will be established to monitor the implementation of the Integrated Energy and Climate Plan concerning the reduction of national and sectoral greenhouse gas emissions and other goals by dimensions to achieve the green transition and EU climate goals more effectively. An adequate management system is necessary to determine promptly that measures from NECP are not being implemented, to identify and remove barriers, and to achieve the required speed of the low-carbon transition, to achieve Croatia's goals within the framework of EU legislation and climate neutrality until 2050.

An analysis of the potential for reducing greenhouse gas emissions by individual measures will be made, and a proposal will be made for sectoral targets to reduce emissions in sectors outside the ETS. It is planned to distribute the burden of reducing greenhouse gas emissions in such a way as to legally introduce the responsibility of each sector, which will be achieved through the Amendments to the Act on Climate Change and Protection of the Ozone Layer.

MS-2: Establishment of regional energy and climate agencies and capacity building

Regional energy agencies do not currently operate on the entire territory of the Republic of Croatia, and capacity building of existing regional energy agencies in the field of climate change mitigation and resilience and adaptation to climate change and their transformation into energy and climate agencies is needed. This measure aims to encourage establishing regional energy and climate agencies for the

areas of the Republic of Croatia where they do not operate, as well as capacity building aimed at transforming existing energy agencies into energy and climate agencies.

MS-3: The EU emissions trading system

The EU Emissions Trading System (EU ETS) includes all activities listed in Annex I of Directive 2003/87/EC on the establishment of a system of trading in greenhouse gas emission units within EU. Through an even allocation of emission allowances, participants in the system from all Member States took on an obligation of lowering emissions to contribute to a reduction in emissions by at least 63% by 2030 compared to 2005 levels. This leads to the conclusion that the decrease in emissions from activities within the EU ETS is regulated at the EU level (2030 Climate and Energy Policy Framework). Since 1st January 2013, the Republic of Croatia is integrated into the EU ETS. Following the EU ETS rules, operators of facilities and aeroplane operators obtained greenhouse gas emissions permits. They established a regime for monitoring emissions and delivering verified reports to the competent authority. All operators, except electricity producers, have submitted their requests for emission units, which are allocated free of charge. Free emission allowances are allocated to facilities based on benchmarks defined under the reference value for 10% of the most efficient facilities in the same sector. Operators who will not have enough free allowances to cover their greenhouse gas emissions have the option of purchasing emission allowances through auctions or on the secondary ETS market.

The existing ETS system is being reformed, shipping is introduced into the system, and a separate ETS system for road transport and construction is being established, the so-called EU ETS 2.

MS-4: Strategic planning at the regional and local level

Regional and local self-government units play a vital role in achieving climate goals. Through strategic planning, they define measures for climate change mitigation and adaptation for their territory.

Counties, the City of Zagreb, and large cities are obliged to adopt programs for climate change mitigation, adaptation to climate change and protection of the ozone layer, which is an integral part of the umbrella program of environmental protection.

In 2008, the European Commission launched the European Covenant of Mayors for Climate and Energy initiative to encourage and assist local authorities in implementing climate and energy objectives. Cities and municipalities are voluntarily involved, individually or jointly, and by signing the Covenant, commit to act and develop a Sustainable Energy Development and Climate Adaptation Action Plan (SECAP) and report on its implementation every two years.

This initiative was endorsed by more than 160 cities and municipalities in the Republic of Croatia. Hence, the Covenant of Mayors covers over two million inhabitants, but only some have adopted documents and prepared reports.

Therefore, this measure aims to improve strategic planning at the regional and local levels.

MS-5: Development and implementation of CO_2 collection, transport and storage projects (CCS)

Technologies for capturing, storing and using CO_2 are one of the possible solutions for reducing greenhouse gas emissions in industry. This technology can reduce emissions in certain industrial branches, which is challenging to implement with other measures, such as in the cement, steel, chemical, or petrochemical industries. Investment decisions and operator participation in CCS projects will depend on several factors, such as, among others, the costs of emission units, fuel and electricity prices, and the availability of alternatives to reduce CO_2 emissions. The challenge for developing CCS projects is the

high cost of infrastructure construction and the need for coordination along the entire value chain. The final assessment of the potential for the development of CCS technology in Croatia also depends on a detailed evaluation of the CO_2 storage capacity.

The issue of geological storage of CO_2 is covered by the Act on Exploration and Exploitation of Hydrocarbons (OG 52/2018, 52/2019, 30/2021), which enables the storage of CO_2 on the territory of the Republic of Croatia. This method needs to be further developed, and the potential and opportunities for this technology at the state level should be considered. By the end of 2026, a pilot project will be implemented to enable the development and commercialisation of capturing and storing CO_2, for which an investment of around EUR 14 million is foreseen through the NPRR. By 2028, the implementation of the KOdeCO net zero project worth 237 million EUR is planned. The project includes the design, construction, installation, and integration of units to capture, liquefaction and purify CO_2 that will be transported and permanently stored in the Mediterranean.

MS-6: Improving the sustainability of urban areas

This measure aims to encourage cities and municipalities to build projects to revitalise and develop new urban environments on sustainability principles. The first step in achieving this goal was the development of the Programme for the Development of Green Infrastructure in Urban Areas for the period 2021-2030 and the Circular Spatial and Building Management Development Programme for the period 2021-2030, which were adopted by the Government of the Republic of Croatia in December 2021 and represent the national framework for the development of sustainability in urban areas. The programmes aim to improve the environmental, economic and social benefits of sustainable development by increasing the energy efficiency of buildings, developing green infrastructure in urban areas, reducing the temperature in the areas of heat islands, and encouraging circularity measures when planning new buildings, reusing abandoned and/or neglected existing spaces and buildings, reducing the amount of construction waste in urban areas. The next step is the implementation of the adopted Programmes, which envisages the development of studies, strategies and/or urban development plans in which, based on the analysis of the current situation and the development of studies and strategies, development projects will be defined to improve the development of cities and municipalities.

MS-7: Greening of the public and private sector

The measure aims to improve the environmental properties of the public administration and the private sector, enabling systematic action to improve environmental properties and contribute to the greening of the public and private sectors. The introduction of a system for improving environmental properties will encourage continuous action towards reducing the negative impact on the environment, which results from everyday direct and indirect actions (reduce the environmental footprint, take responsibility for your impact on the environment and the economy, improve your environmental efficiency and inform the public and stakeholders about that performance).

The Republic of Croatia is in the process of becoming a full member of the OECD. The accession process implies adopting the OECD's legal instruments within the competence of individual working bodies of the OECD and evaluating the policies and practices of the candidate country. The guidelines for improving the environmental characteristics of the administration are drawn up to align with the OECD Recommendation for improving the environmental characteristics of public administration OECD/LEGAL/0283. The Republic of Croatia joined the Lead by-example initiatives: Net-Zero Government Initiative (NZGI) and Green Government Initiative (GGI), where the bond to achieve net zero

emissions from the business processes of public state bodies administration by 2050 at the latest and establishing a plan to achieve the commitment to that goal.

The program for calculating and reducing the carbon footprint of entities outside the ETS system (business entities and the public sector) aims to reduce total greenhouse gas emissions for all activities for which the entity is responsible or on which it is dependent. It is necessary to calculate direct emissions and removal of greenhouse gases at the subject's location, either due to fuel combustion in the thermal power plant, from the production process, from the vehicle fleet, and fugitive emissions, then indirect emissions that occur outside the subject's location, and are related to the purchase and consumption of electricity, heat and cooling energy, but also other indirect emissions/removals related to flows of people and materials.

Calculating the carbon footprint will enable subjects to familiarize themselves with the structure of greenhouse gas emissions and determine the activities that contribute the most to reducing emissions. It is a sound basis for defining and implementing the Action Plan to reduce carbon footprint. Implementing the Action Plan would reduce greenhouse gas emissions and mitigate climate change, i.e., more effortless fulfilment of the obligations assumed by the Paris Agreement and, simultaneously, to the sustainability of their business.

MS-8: Improvement of the IT platform for waste management

The new Circular Economy Action Plan, COM (2020) 98 final, presents a set of interconnected initiatives to establish a robust and coherent policy framework in which sustainable products, services and business models become the standard and consumption patterns are transformed so that waste is not produced. This product policy framework is gradually introduced, with value chains of essential products as a priority.

The circularity rate of the Croatian economy is very low, which means that most of the materials we consume do not return to the economy as raw materials. It is necessary to elaborate a systematic approach in all value chains relevant to the Croatian economy, which includes measures listed in the New Circular Economy Action Plan, based on which the EC integrates the principles of the circular economy into the production and consumption of plastic, water management, food systems, management of special waste flow, etc.

A successful transition of Croatia to a circular economy requires a political and economic response that requires close cooperation from all stakeholders: government, companies, civil society, academic community, media, and citizens. With this aim, the Committee for Circular Economy, an interdisciplinary advisory body of MEPGT, was established. Board members come from fourteen organizations and professional associations representing all critical public, private, scientific-research and civil sectors. The task of the Committee is to exchange knowledge and provide expert support to strengthen cooperation between all sectors and guide the way of thinking to improve the longevity of products and their recycling. One of the initiatives of the Committee is the establishment of a digital platform for the circular economy, an integral part of the IT platform for waste management, which represents a space for exchanging knowledge, innovations, and best practices among all stakeholders to create and adapt circular technologies. According to the circular economy stakeholders, it is necessary to develop a National Action Plan to transition to a circular economy by adjusting the legislative framework. Including representatives of the Republic of Croatia in the European Circular Economy Stakeholder Platform enables direct access to innovations, best practices, and cooperation in them.

MS-9: Transformation of the bioeconomy sector

In the Bioeconomy Strategy 2018[2], the European Commission additionally emphasised the importance of the bioeconomy as a sector that, in addition to increasing the competitiveness of production and creating new jobs in the EU, will significantly contribute to mitigating climate change. The European Commission added reducing dependence on non-renewable sources, strengthening European competitiveness, and creating jobs to the goals of the 2012 Bioeconomy Strategy (achieving food security, sustainable management of natural resources and mitigating and adapting to climate change).

It is necessary to connect three key aspects: developing innovative technologies and processes, market development, the competitiveness of bio-based sectors, and political will for policy and stakeholder cooperation to encourage the development of the bioeconomy in Croatia. It will ensure the transformation of the existing "traditional" stakeholders of the bioeconomy from the agriculture, forestry, fishing and aquaculture sectors as well as the food, beverage, tobacco, wood and furniture products, textiles, clothing and leather, paper, chemicals and chemical products, pharmaceutical products and preparations, plastic, rubber, bio waste into new, modern stakeholders of the low-carbon bioeconomy. For the transition to a low-carbon bioeconomy, it is necessary to connect stakeholders (producers, industry, researchers, with policymakers) to exchange information and establish value chains following market requirements.

MS-10: Legal adjustments and technical bases for the introduction of hydrogen into the energy system

The role of hydrogen in future energy and transport systems is expected to be more significant, especially as the goals for reducing greenhouse gas emissions are more ambitious. It is therefore necessary to promptly identify the opportunities associated with the use of hydrogen, consider its use in the coming decade, and explore the possibilities of financially stimulating hydrogen production and consumption. To this end, a hydrogen technology platform will be established, bringing together national stakeholders relevant to the research and application of hydrogen technology, monitoring the development of hydrogen technologies at the EU and international levels, and serving as a link between national, EU and international levels. The measure aims to present possible areas of development, financing, and support in implementing the strategy and specific projects for developing hydrogen technology to achieve the objectives defined in the Strategy. In addition, it is necessary to adopt a relevant legislative framework that will enable the implementation of hydrogen in the energy system.

MS-11: Reducing an individual's carbon footprint by changing lifestyle habits

By changing the lifestyles and styles of individuals and society, a significant reduction in resource consumption and greenhouse gas emissions can be achieved. Therefore, this measure aims to encourage changes in consumer habits, dietary habits in the direction of including/using more food of plant origin, habits related to transport and travel, ways of using and owning various appliances in households, etc., which can be expressed through the reduction of an individual's carbon footprint. However, to change our habits, we need to be aware of the impact of our own carbon footprint and know how to reduce it. The cultivation of grain for animal feed produces much more greenhouse gases than the production of grain for human consumption. Increasing the consumption of foods of plant origin contributes to better health, and significant reductions in emissions and water and energy savings can be achieved. Therefore,

[2] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Sustainable bioeconomy for Europe: Strengthening the link between economy, society and environment

it is proposed that activities be carried out to educate and encourage citizens to change their lifestyle and eating habits and adopt energy-efficient practices.

MS-12: Collecting and processing of biomass from agriculture, forestry, fishing and aquaculture

According to the European Commission, Croatia's annual biomass production is 9.3 million tons, 70 % of which comes from agriculture and 30% from forestry. This relatively large biomass could produce biobased products (food products, beverages and tobacco products, textiles, clothing and leather, wood products and furniture, paper, chemicals and chemical products, pharmaceutical products and preparations, plastics, rubber, etc.).

An obstacle to using biomass in agriculture is the dispersion of production, which increases the collection costs. Croatia does not have adequate capacities for the collection and processing of biomass, and by organising centres for the collection and processing of biomass, opportunities will be created to increase the competitiveness of producers through the valorisation of biomass in innovative value chains in the bioeconomy. In addition, the return of biomass to the production cycle contributes to the reduction of the economy's CO_2 footprint and the efficient use of existing natural resources.

Centres for collecting and processing biomass represent places where biomass generated in agriculture, forestry, fishing, and aquaculture production is collected, sorted, and prepared for the market. Since biomass is a renewable carbon source, its use in new value chains will significantly reduce CO_2.

MS-13: Elimination of fossil fuel subsidies

It is necessary to analyse the current system of subsidies, establish accompanying social programs that will reduce the impact on the poorest citizens, and define a plan for their cancellation, all to determine the dynamics of the cancellation of all fossil fuel subsidies, primarily the exemptions from excise duties in transport and agriculture on fossil fuels.

MS-14: Carbon Removal Certification

Carbon removal certification should enable a significant increase in carbon removal to achieve the goal of a climate-neutral Union by 2050 and will help achieve the EU's ambitious climate goal. The carbon removal certification system is voluntary and encourages carbon removal activities. The importance of rewarding farmers and land managers for their ecological ambitions at the farm level is especially recognized. The proposed regulation will also help companies report on corporate sustainability reporting and provide greater transparency to public and private organizations' climate neutrality claims to avoid manipulative green marketing.

The Republic of Croatia will develop this measure following the progress made in the framework prepared by the European Commission.

MS-15: Creation and implementation of the Social Plan for Climate Policy

The Social Plan for Climate Policy is a document submitted to the European Commission by 30th June 2025 to be able to use the funds from the Social Fund for Climate Policy, and it must contain a mutually coordinated set of existing or new national measures and investments in response to mitigating the adverse effects of the EU ETS2 system on vulnerable households, vulnerable micro-enterprises and vulnerable users of transport services, and to ensure affordable heating, cooling and mobility, while simultaneously monitoring and accelerating the measures necessary to achieve the Union's climate

goals. The social plan for climate policy must contain a mutually coordinated set of existing or new national measures and investments in response to mitigate the adverse effects of the EU ETS2 system on vulnerable households, vulnerable micro-enterprises and vulnerable users of transport services and to ensure affordable heating, cooling and mobility, while simultaneously monitoring and accelerating the measures necessary to achieve the Union's climate goals. Measures from the Social Plan for Climate Policy will be intended for vulnerable households, vulnerable transport users and vulnerable micro-enterprises. The estimated costs of the plan will also include support given to public and private entities that implement measures and investments that benefit these vulnerable groups.

MS-16: Green budget planning

The aim is to create an institutional framework for implementing the green state budget. A green budget helps to achieve environmental protection goals and consists of fiscal policy measures and rules to prevent environmental problems and improve existing damages. It implies using budget planning tools to achieve climate and environmental goals.

IIK-1: Establishment of a system for identifying and monitoring the achievement of research, innovation and competitiveness objectives

Development and establishment of a system for monitoring progress in the field of research and development, innovation and competitiveness related to the Energy Union; establishment of identifiers to establish the monitoring of scientific research/research and innovation activities, regardless of the source of funding, with a standard set of basic data: project duration, eligible costs, project participants, budget, sources of financing, area of action, project description, planned and achieved performance indicators.

IIK-2: Establishment of systematic financing of research and development projects

The measure creates preconditions for the continuous and systematic implementation of research and innovation and the strengthening of research capacities and plans to implement and co-finance research and innovation projects, including larger (strategic) scientific research projects, with large amounts of funding. It elaborates on objectives and indicators and establishes a system for monitoring the achievement of goals and indicators in the field of research and development, innovation and competitiveness; it develops criteria for grouping research teams (e.g. through the cooperation of several research institutions) and private partners and connecting scientific and research teams in the field of natural, technical, biomedical and biotechnical sciences with research teams in the field of social sciences and humanities to strengthen the transdisciplinary approach to solving critical societal challenges related to the Energy Union.

IIK-3: Strengthening competitiveness in the area of low-carbon economy

The measure encourages increased competitiveness in the field of low-carbon products and services by co-financing entrepreneurial activities related to the Energy Union.

Activities include to support entrepreneurs throughout the development stages of their business - from the idea's research and development to commercialisation, marketing, and intellectual property protection in the area of low-carbon products and services. Cooperation with scientific and research institutions and increased private investment in R&D will be encouraged. One possible activity is to fund

the Proof of Concept to support the transfer of research results from the public to the private sector to create new products and services.

IIK-4: Transfer of knowledge and technologies from science to the economy system with an emphasis on low-carbon technologies

The measure encourages the development of technology transfer offices or related organizational units in public scientific organizations to transfer knowledge and develop technologies to create a low-carbon economy.

Activities include provide annual support to public scientific organizations for the establishment of development companies or subsidiaries resulting from the results of scientific research; provide support for cooperation between entrepreneurs and the science system, business meetings, business consulting; preparation of business plans; pre-money valuation and mentoring the preparation of high-value projects and infrastructure projects; mentor the development of business plans and pitching to investors, finance experts on protection of intellectual property rights; finance grants for projects in the concept validation phase, etc. with a focus on sustainable technologies that contribute to low carbon development.

IIK-5: Strengthening the work of scientific centres of excellence established in the field of natural, technical, biotechnical and biomedical sciences

The measure encourages the continued work of established Centres of Excellence and those whose work has been positively evaluated in the periodic evaluation process to further development of a low carbon economy.

Activities include provide grants for industrial and experimental research of scientific centres of excellence, with the aim of further building on the results of research financed in the financial period 2014-2020.

IIK-6: Strengthening research and innovation and increase competitiveness in the field of low-carbon economy

Capacities of institutions involved in stimulating and monitoring research, innovation and competitiveness in the low-carbon economy will be built.

The activities relate to three different levels of action: activities of bodies responsible for planning and implementing public policies related to research and development activities, strengthening the capacity to encourage and monitor research at the level of individual scientific research institutions and selecting relevant research topics.

Representatives of all bodies involved in the implementation of measures IIK: 1 to IIK-5 will be supported to participate in lectures, workshops, working group meetings, and study tours with the aim of international integration and capacity building in setting goals, defining indicators and monitoring the achievement of set goals in the context research, innovation and competitiveness in the low carbon economy.

Support for participation in working bodies and working groups and committees of relevant European and international organizations (IEA, etc.), programmes (SET Plan, ETIP, EERA, Horizon Europa, Eureka, etc.), European Partnerships under the EU Framework Programme for the research and innovation in relevant Pan-European networks and consortia. The transfer of know-how with other EU Member States and other stakeholders within the Republic of Croatia will be organized if necessary.

IIK-7: Analytical substrates for the green transition

Analytical bases are needed that will enable decision-makers and policymakers to determine the position of the Republic of Croatia in the negotiations for the goals for 2040 and the achievement of climate neutrality in 2050. as well as all viewpoints related to climate goals.

Research is needed to move to higher levels of application of the Intergovernmental Panel on Climate Change (IPCC) methodology and improve the data collection system, including the energy balance on which the Inventory of Greenhouse Gas Emissions is based.

5. Overview of policies and measures by sectors

This chapter provides overview tables of policies and measures within each individual sector. Tables contain the code and title of the policy or measure, objective of implementation, identification of greenhouse gas affected by the policy or measure, type of policy instrument, status of implementation and implementing body.

In accordance with the recommendation from Annex XXIV. of the Commission Implementing Regulation (EU) 2024/1281, the types of instruments may be: economic, fiscal, agreement, regulatory, information, research, planning and other instruments.

The status of implementation that can be assigned to a policy or measure is: implemented, adopted or planned. Status "implemented" is assigned if national legislation is in force, voluntary agreements have been established, financial resources have been allocated or human resources have been mobilized. Status "adopted" is assigned to policies and measures for which an official government decision has been made and there is a clear commitment to proceed with implementation. For those policies and measures that are still under discussion and have a realistic chance of being adopted and implemented, status "planned" is chosen.

ENERGY

Table 5-1: Overview of policies and measures in Energy sector

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
ENU-1: Energy Efficiency Obligation System for Suppliers	Energy savings in final consumption	CO_2, CH_4, N_2O	regulatory	implemented	Ministry of Economy
ENU-2: Promoting the decarbonisation and application of the "energy efficiency first" principle in buildings	Efficiency improvements of buildings Increase in the number of nearly-zero energy buildings	CO_2, CH_4, N_2O	information	implemented	Ministry of Physical Planning, Construction and State Assets
ENU-3: Energy renovation programme for apartment buildings	Efficiency improvements of buildings	CO_2, CH_4, N_2O	economic	implemented	Ministry of Physical Planning, Construction and State Assets
ENU-4: Energy renovation programme for family houses	Efficiency improvements of buildings	CO_2, CH_4, N_2O	economic	implemented	Ministry of Physical Planning, Construction and State Assets Environmental Protection and Energy Efficiency Fund
ENU-5: Energy renovation programme for public sector buildings	Efficiency improvements of buildings	CO_2, CH_4, N_2O	economic	implemented	Ministry of Physical Planning, Construction and State Assets
ENU-6: Energy renovation programme for buildings that have the status of cultural property	Efficiency improvements of buildings	CO_2, CH_4, N_2O	economic	implemented	Ministry of Physical Planning, Construction and State Assets
ENU-7: Systematic energy management in the public sector	Efficiency improvement in services/ tertiary sector	CO_2, CH_4, N_2O	information	implemented	Agency for Legal Affairs and Real Estate

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
ENU-8: Energy renovation programme for public lighting	Efficiency improvement in services/ tertiary sector	CO_2, CH_4, N_2O	economic	implemented	Ministry of Economy
ENU-9: Green Public Procurement	Environmental criteria implemented in public procurement procedures	CO_2, CH_4, N_2O	information	implemented	Ministry of Economy Central State Office for Central Public Procurement
ENU-10: Systematic energy management in the business (service & production) sector	Efficiency improvement in services/ tertiary sector Efficiency improvement in industrial end-use sectors	CO_2, CH_4, N_2O	economic	planned	Ministry of Economy Ministry of Finance
ENU-11: Information on energy efficiency	Efficiency improvements of buildings Efficiency improvement in services/ tertiary sector Efficiency improvement in industrial end-use sectors Informing the public and target groups about energy efficiency promotion programs	CO_2, CH_4, N_2O	information	implemented	Ministry of Economy Ministry of Physical Planning, Construction and State Assets Environmental Protection and Energy Efficiency Fund
ENU-12: Development of a framework to ensure adequate skills in the context of green jobs required for building renovation	Efficiency improvements of buildings Educating workers on energy efficiency	CO_2, CH_4, N_2O	education	implemented	Agency for Vocational Education and Adult Education Croatian Employment Service
ENU-13: Energy efficiency of the power transmission network	Reduction of losses in the transmission network Efficiency improvement in the energy and transformation sector	CO_2, CH_4, N_2O	economic	implemented	Croatian Transmission System Operator

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
ENU-14: Reduction of losses in the distribution power grid and introduction of smart grids	Reduction of technical and non-technical losses in the electricity distribution network Efficiency improvement in the energy and transformation sector	CO_2, CH_4, N_2O	economic	implemented	HEP DSO (Distribution System Operator)
ENU-15: Increasing the efficiency of the district heating systems	Reduction of losses Efficiency improvement in the energy and transformation sector Efficiency improvement in services/ tertiary sector Efficiency improvement in industrial end-use sectors	CO_2, CH_4, N_2O	economic	implemented	Manufacturers, distributors and suppliers of heat from district heating system Ministry of Economy
ENU-16: Increasing the efficiency of the gas system	Reduction of losses Efficiency improvement of the gas transmission system	CO_2, CH_4, N_2O	economic	implemented	Plinacro ltd. Ministry of Economy
ENU-17: Increasing energy efficiency and use of RES in manufacturing industries	Energy efficiency Reducing energy consumption and reducing the share of fossil fuels in total energy consumption by introducing renewable energy sources.	CO_2, CH_4, N_2O	economic	implemented	Ministry of Environmental Protection and Green Transition Ministry of Economy Environmental Protection and Energy Efficiency Fund
ENU-18: Increasing the energy efficiency of public water supply, drainage and wastewater treatment systems	Reducing energy consumption through more efficient management of resources, applying energy efficiency measures and renewable energy sources	CO_2, CH_4, N_2O	economic	planned	Ministry of Environmental Protection and Green Transition Agency for Legal Affairs and Real Estate

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
FUG-1: Modernization and transformation of refineries	Efficiency improvement in the energy and transformation sector Control of fugitive emissions from energy production	CO_2, CH_4, N_2O	economic	planned	INA, d.d. (oil company) Ministry of Economy
FUG-2: Measures to increase energy efficiency by improving processes and process units	Efficiency improvement in the energy and transformation sector Control of fugitive emissions from energy production	CO_2, CH_4	economic	planned	Ministry of Economy INA, d.d. (oil company) distributors of liquid petroleum fuels
OIE-1: Information, education and capacity building for using RES	Increase in renewable energy sources in the electricity sector Increase in renewable energy in the heating and cooling sector Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	education, information	implemented	Ministry of Environmental Protection and Green Transition Ministry of Physical Planning, Construction and State Assets Environmental Protection and Energy Efficiency Fund
OIE-2: Spatial planning requirements for using RES	Increase in renewable energy sources in the electricity sector Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	regulatory	planned	Ministry of Physical Planning, Construction and State Assets Ministry of Economy Ministry of Environmental Protection and Green Transition Ministry of Culture and Media Ministry of Tourism and Sports Ministry of counties, cities and municipalities
OIE-3: Developing a regulatory framework for using RES	Increase in renewable energy sources in the electricity sector	CO_2, CH_4, N_2O	regulatory	implemented	Ministry of Economy

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
	Increase in renewable energy in the heating and cooling sector Promoting the use of renewable energy sources				Ministry of Physical Planning, Construction and State Assets Croatian Energy Operator (HROTE) Environmental Protection and Energy Efficiency Fund
OIE-4: Use of RES for electricity production	Increase in renewable energy sources in the electricity sector Increase in renewable energy in the heating and cooling sector Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	economic	implemented	Ministry of Economy Croatian Energy Operator (HROTE) Environmental Protection and Energy Efficiency Fund Hydrocarbon Agency Ministry of Agriculture, Forestry and Fisheries
OIE-5: Use of RES for thermal purposes	Increase in renewable energy sources for thermal needs Increase in renewable energy in the heating sector Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	economic	implemented	Ministry of Economy Environmental Protection and Energy Efficiency Fund Hydrocarbon Agency Ministry of Agriculture, Forestry and Fisheries
OIE-6: Use of RES in centralised and closed district heating systems	Increasing share of RES in district heating systems Increase in renewable energy in the heating sector Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	regulatory, economic	planned	Ministry of Economy Environmental Protection and Energy Efficiency Fund
OIE-7: Sharing Energy and Energy Communities	Establishing of energy communities Increasing share of RES in direct consumption	CO_2, CH_4, N_2O	regulatory, economic	planned	Ministry of Economy Environmental Protection and Energy Efficiency Fund Croatian Energy Operator (HROTE)

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
					Croatian Energy Regulatory Agency (HERA) HEP DSO (Distribution System Operator
OIE-8: Use of hydrogen and new technologies	Improving use of hydrogen and new technologies to reduce greenhouse gas emissions in the transport sector and industry	CO_2, CH_4, N_2O	economic	planned	Hydrocarbon Agency Ministry of Economy
ES-1: Construction and use of energy storage facilities	Increase in renewable energy sources in the electricity sector Efficiency improvement in the energy and transformation sector Increasing energy storage capacity Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	economic	implemented	Ministry of Economy
ES-2: Improvement of the electricity system management	Increase in renewable energy sources in the electricity sector Efficiency improvement in the energy and transformation sector Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	economic	implemented	Croatian Transmission System Operator (HOPS) HEP DSO (Distribution System Operator)
ES-3: Development and maintenance of the district heating systems	Reduction of losses Efficiency improvement in the energy and transformation sector Efficiency improvement in services/ tertiary sector	CO_2, CH_4, N_2O	economic	implemented	Thermal energy producers and distributors Ministry of Economy

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
	Efficiency improvement in industrial end-use sectors				
ES-4: LNG terminal capacity increase	Primary energy savings Switch to less carbon-intensive fuels	CO_2, CH_4, N_2O	economic	implemented	Plinacro ltd. Ministry of Economy
ES-5: Security of natural gas supply for EU countries	Primary energy savings Switch to less carbon-intensive fuels	CO_2, CH_4, N_2O	economic	planned	Plinacro ltd. Ministry of Economy
ES-6: Security of natural gas supply for the Western Balkans	Primary energy savings Switch to less carbon-intensive fuels	CO_2, CH_4, N_2O	economic	planned	Plinacro ltd. Ministry of Economy
ES-7: Construction and improvement of gas transmission system management	Primary energy savings Switch to less carbon-intensive fuels	CO_2, CH_4, N_2O	economic	implemented	Plinacro ltd. Ministry of Economy
ES-8: Exploration of potential hydrocarbon deposits in Slavonija, the Dinarides and the Adriatic	Declining of oil and gas production Reducing of dependence on imported energy	CO_2, CH_4, N_2O	economic	implemented	Hydrocarbon Agency
ES-9: Reduction in fossil fuel usage for heating needs in individual heating systems	Phasing out the use of fossil fuels for individual heating needs	CO_2, CH_4, N_2O	regulatory	planned	Ministry of Economy Ministry of Physical Planning, Construction and State Assets
ES-10: Cybersecurity	Achieving resilience, reducing cybercrime, developing cyber defence policy and cyber defence capability	CO_2, CH_4, N_2O	economic	planned	Ministry of Interior Croatian Cyber Emergency Response Team CERT SOA Cybersecurity Centre Information Systems Security Bureau (ZSIS)

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
					Croatian regulatory agency for network activities (HAKOM)
ES-11: Establishment of a hydrogen-based economy	Developing of hydrogen-based economy encompassing the entire value chain, including the production, storage, transportation, and use of renewable hydrogen while strengthening research and development	CO_2, CH_4, N_2O	economic, regulatory	planned	Ministry of Economy
UET-1: Development of the electricity transmission grid	Reduction of losses Safe and reliable operation of the transmission grid Primary energy savings	CO_2, CH_4, N_2O	economic, regulatory	implemented	Croatian Transmission System Operator (HOPS) Ministry of Economy
UET-2: Development of gas transmission system	Reduction of losses Safe and reliable operation of the gas transmission system Primary energy savings	CO_2, CH_4, N_2O	economic, regulatory	implemented	Plinacro ltd. Ministry of Economy
UET-3: Equipping the gas transmission system for the future possibility of transmission of up to 100% hydrogen	Primary energy savings	CO_2, CH_4, N_2O	economic, regulatory	implemented	Plinacro ltd. Ministry of Economy
UET-4: Analysis of the impact of demand response pilot projects on the distribution network	Primary energy savings	CO_2, CH_4, N_2O	economic, regulatory	planned	HEP DSO (Distribution System Operator) Croatian Energy Regulatory Agency (HERA)

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
UET-5: Co-financing the implementation of demand response projects	Primary energy savings	CO_2, CH_4, N_2O	economic, regulatory	planned	Environmental Protection and Energy Efficiency Fund Ministry of Environmental Protection and Green Transition
UET-6: Development of the National Balancing Market	Primary energy savings	CO_2, CH_4, N_2O	regulatory	planned	Manufacturers, system operators, aggregators Croatian Energy Regulatory Agency (HERA)
UET-7: Elaboration of the regulatory framework for active participation of gris users in the electricity market	Primary energy savings Promoting the use of renewable energy sources	CO_2, CH_4, N_2O	regulatory, information	implemented	Ministry of Economy Croatian Energy Regulatory Agency (HERA)
UET-8: Introduction of advanced consumption measurement systems and measurement data management	Primary energy savings	CO_2, CH_4, N_2O	economic	implemented	HEP DSO (Distribution System Operator) Croatian Energy Regulatory Agency (HERA)
UET-9: Implementation of the Programme for the reduction of energy poverty	Reducing energy poverty	CO_2, CH_4, N_2O	economic, information	implemented	Ministry of Economy Ministry of the Sea, Transport and Infrastructure
UET-10: Implementation of the Programme for Combating Energy Poverty, which includes the use of renewable energy sources in residential buildings in assisted areas and areas of special state care for the period up to 2025	Efficiency improvements of buildings Reducing energy poverty	CO_2, CH_4, N_2O	economic, information	implemented	Ministry of Physical Planning, Construction and State Assets Environmental Protection and Energy Efficiency Fund

TRANSPORT

Table 5-2: Overview of policies and measures in Transport sector

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
TR-1: Regulatory instruments to promote a cleaner transport system	Low carbon fuels/electric cars Improved transport infrastructure Increasing the share of RES in final energy consumption in transport Increasing the share of clean vehicles in road transport	CO_2, CH_4, N_2O	regulatory	implemented	Ministry of the Sea, Transport and Infrastructure Ministry of the Interior Ministry of Economy Environmental Protection and Energy Efficiency Fund
TR-2: Programme for co-financing the purchase of new alternative fuel vehicles and the development of alternative fuel infrastructure in road transport	Efficiency improvements of vehicles Low carbon fuels/electric cars	CO_2, CH_4, N_2O	economic	implemented	Ministry of Economy Ministry of the Sea, Transport and Infrastructure Environmental Protection and Energy Efficiency Fund
TR-3: Improving the public transport system and promoting sustainable integrated transport	Modal shift to public transport or non-motorized transport Low carbon fuels/electric cars Improved transport infrastructure	CO_2, CH_4, N_2O	information, economic	implemented	Ministry of the Sea, Transport and Infrastructure Environmental Protection and Energy Efficiency Fund
TR-4: Development of energy-efficient maritime transport and inland navigation	Reduce emissions from maritime transport and inland navigation	CO_2, CH_4, N_2O	economic	implemented	Ministry of the Sea, Transport and Infrastructure Ministry of Economy Environmental Protection and Energy Efficiency Fund
TR-5: Development of energy-efficient rail transport	Increasing the share of RES in transport	CO_2, CH_4, N_2O	economic	implemented	Ministry of Economy Ministry of the Sea, Transport and Infrastructure

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
TR-6: Development of energy-efficient air transport	Increasing the share of RES in transport	CO_2, CH_4, N_2O	economic	planned	Ministry of Economy
TR-7: Developing a low-carbon fuel market	Low carbon fuels/electric cars Increasing the share of RES in transport	CO_2, CH_4, N_2O	regulatory, economic	implemented	Ministry of Economy INA, d.d. (oil company)

INDUSTRIAL PROCESSES AND PRODUCT USE

Table 5-3: Overview of policies and measures in Industrial processes and product use sector

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
IP-1: Reducing the share of clinker in cement production	Reducing CO_2 emissions Reduction in clinker production	CO_2	economic	planned	Cement manufacturers
IP-2: Limiting fluorinated greenhouse gas emissions	Improved control of manufacturing, fugitive and disposal emissions of fluorinated gases Replacement of fluorinated gases by other substances Reducing greenhouse gas emissions	SF_6, HFCs	education, regulatory, education	implemented	Ministry of Environmental Protection and Green Transition

AGRICULTURE

Table 5-4: Overview of policies and measures in Agriculture sector

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
POLJ-1: Improving storage capacity and practices when handling manure	Reduction of methane, nitrogen, and ammonia emissions through manure collection and storage	CH_4, N_2O	economic, education	implemented	Ministry of Agriculture, Forestry and Fisheries
POLJ-2: Anaerobic manure decomposition and biogas production	Reduction of methane emissions from manure management systems for cattle and pigs by increasing the share of biogas plants	CH_4	economic	planned	Ministry of Agriculture, Forestry and Fisheries
POLJ-3: Improving and changing the soil tillage system (reduced tillage)	Increasing soil carbon sequestration through improvements and modifications to tillage systems	CO_2	economic, education	planned	Ministry of Agriculture, Forestry and Fisheries
POLJ-4: Extension of crop rotation with higher share of legumes	Defining the potential for change in organic matter content / increasing soil sequestration of carbon	CO_2, N_2O	economic, education	implemented	Ministry of Agriculture, Forestry and Fisheries
POLJ-5: Intensification of crop rotation by using intercrops	Increasing soil carbon sequestration and reducing nitrate seepage	CO_2, N_2O	economic, education	implemented	Ministry of Agriculture, Forestry and Fisheries
POLJ-6: Improvement of organic fertilizer application methods	Reducing emissions by improving the application methodology of organic fertilizers	N_2O	economic	implemented	Ministry of Agriculture, Forestry and Fisheries
POLJ-7: Agroforestry	Defining the potential and benefits of various agroforestry technologies with the aim of increasing soil sequestration	CO_2	economic, education	planned	Ministry of Agriculture, Forestry and Fisheries

POLJ-8: Hydro-melioration interventions and system of protection against natural disasters	Increasing the share of agricultural soils under irrigation, reducing the leakage of nitrates from agricultural soils	N_2O	economic, education, information	implemented	Ministry of Agriculture, Forestry and Fisheries
POLJ-9: Introduction of new cultivars, varieties and crops	Determining the potential of new cultivars, varieties and crops to increase soil carbon sequestration	CO_2, N_2O	information, education	planned	Ministry of Agriculture, Forestry and Fisheries

WASTE

Table 5-5: Overview of policies and measures in Waste sector

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
GO-1: Prevention and reduction of waste generation	Prevention and reduction of waste generation	CH_4	regulatory, economic, education	implemented	Ministry of Environmental Protection and Green Transition
GO-2: Increasing the amount of separately collected and recycled waste	Reduced landfilling	CH_4	regulatory, economic, education	implemented	Ministry of Environmental Protection and Green Transition
GO-3: Reducing the amount of disposed biodegradable waste	Reduce the mass of the biodegradable fraction of waste disposed of in landfills	CH_4	regulatory, economic, education	implemented	Ministry of Environmental Protection and Green Transition
GO-4: Ensuring a system for the treatment and use of landfill gas	Enhanced CH_4 collection and use Reduce methane emissions in the atmosphere	CH_4	regulatory, economic, education	implemented	Ministry of Environmental Protection and Green Transition
GO-5: Reduction of food waste following the guidelines for the development of a bioeconomy	Implementation of the Plan for preventing and reducing food waste	CO_2, CH_4	regulatory, economic, education	implemented	Ministry of Agriculture, Forestry and Fisheries
GO-6: Circular economy measures to increase resource efficiency and business application models based on repair, recycling and recovery	Implementation of the establishment of a sustainable and efficient waste management system - introduction of the principles of circular economy	CO_2, CH_4	regulatory, economic, education	implemented	Ministry of Environmental Protection and Green Transition

LULUCF

Table 5-6: Overview of policies and measures in LULUCF sector

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
LUF-1 Establishment, maintenance and upgrading of the National Information System for land	Increase removal and reduction of greenhouse gas emissions from the LULUCF sector Align the EU's targets for increasing the share of energy from renewable sources with emission reduction requirements	CO_2	economic, regulatory, information	implemented	Ministry of Agriculture, Forestry and Fisheries Ministry of Environmental Protection and Green Transition
LUF-2 Carbon sequestration on areas of existing forests	Conservation of carbon in existing forests Enhancing production in existing forests Enhanced forest management Prevention of deforestation Strengthening protection against natural disturbances Ensuring the maintenance of a defined, reference level for forests	CO_2	economic	implemented	Ministry of Agriculture, Forestry and Fisheries Ministry of Environmental Protection and Green Transition
LUF-3: Implementation of afforestation works	Enhanced forest management Strengthening protection against natural disturbances Restoration of degraded lands Examining the justification of measures to sinks increase	CO_2	economic	implemented	Ministry of Agriculture, Forestry and Fisheries Hrvatske šume d.o.o.

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
LUF-4: Manufacture and use of wood and wood products	Increasing the removal of carbon dioxide in Harvested Wood Products (HWP) Increasing the quality and harmonization of information on wood products	CO_2	regulatory, economic, education, information	implemented	Ministry of Agriculture, Forestry and Fisheries Hrvatske šume d.o.o.
LUF-5: Land under managed crops	Reducing greenhouse gas emissions by changing and improving the way cropland is managed	CO_2, N_2O	economic	implemented	Ministry of Agriculture, Forestry and Fisheries Ministry of Environmental Protection and Green Transition
LUF-6: Managed grassland	Reducing greenhouse gas emissions by changing and improving the way grassland is managed	CO_2	economic	implemented	Ministry of Environmental Protection and Green Transition Ministry of Agriculture, Forestry and Fisheries
LUF-7: Implementation of technical projects and scientific research in the LULUCF sector	Research in the LULUCF sector	CO_2, CH_4, N_2O	regulatory, information, research	implemented	Ministry of Environmental Protection and Green Transition Ministry of Science, Education and Youth Ministry of Agriculture, Forestry and Fisheries
LUF- 8: Activities to build the WAM scenario	Creation of a WAM scenario that increases the sink by 2030	CO_2	research	planned	Ministry of Environmental Protection and Green Transition Ministry of Agriculture, Forestry and Fisheries

CROSS-CUTTING POLICIES AND MEASURES

Table 5-7: Overview of cross-cutting policies and measures

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
MS-1: Strengthening governance to achieve climate goals	Monitoring the implementation of policies and measures for mitigation and adaptation to climate change	CO_2, CH_4, N_2O, HFCs, SF_6	regulatory	implemented	Ministry of Environmental Protection and Green Transition Ministry of Economy
MS-2: Establishment of regional energy and climate agencies and capacity building	Establishment of energy and climate agencies and transformation of existing regional energy agencies into regional energy and climate agencies	CO_2, CH_4, N_2O	economic	implemented	Regional and local self-government units
MS-3: The EU emissions trading system	Reduction of the GHG emissions by operators under EU ETS	CO_2, N_2O	economic, regulatory	implemented	Ministry of Environmental Protection and Green Transition
MS-4: Strategic planning at the regional and local level	Accelerating decarbonisation of cities and municipalities Improvement strategic planning at the regional and local levels with integrating low-carbon and climate change adaptation measures	CO_2, CH_4, N_2O	voluntary agreement	planned	Regional and local self-government units
MS-5: Development and implementation of CO2 collection, transport and storage projects (CCS)	Preparation of bases for CCS projects in the Republic of Croatia	CO_2	economic, research	implemented	Ministry of Economy
MS-6: Improving the sustainability of urban areas	Accelerating decarbonisation of cities and municipalities	CO_2, CH_4, N_2O	economic	planned	Ministry of Physical Planning, Construction and State Assets Regional Local Support Units

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
					City of Zagreb
MS-7: Greening of the public and private sector	Improvement of the environmental properties of the public administration and the private sector Enabling systematic action to improve environmental properties and contribute to the greening of the public and private sectors Reducing the carbon footprint of businesses	CO_2, CH_4, N_2O, HFCs, SF_6	regulatory	planned	Ministry of Environmental Protection and Green Transition Environmental Protection and Energy Efficiency Fund
MS-8: Improvement of the IT platform for waste management	Demand management/reduction Enhanced recycling Reduced landfilling Efficiency improvement in the energy and transformation sector Integration the principles of the circular economy in plastic production	CO_2, CH_4, N_2O	education, information, regulatory	implemented	Ministry of Environmental Protection and Green Transition
MS-9: Transformation of the bioeconomy sector	Adaptation of the agriculture, forestry and waste management sectors to the transition to the bioeconomy	CO_2, CH_4, N_2O	education, information, regulatory, economic	planned	Ministry of Agriculture, Forestry and Fisheries Ministry of Environmental Protection and Green Transition Ministry of Economy Ministry of Science, Education and Youth Ministry of Regional Development and EU Funds

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
MS-10: Legal adjustments and technical bases for the introduction of hydrogen into the energy system	Present possible areas of development, financing, and support in implementing specific projects for developing hydrogen technology Adopt a relevant legislative framework that will enable the implementation of hydrogen in the energy system	CO_2, CH_4, N_2O	regulatory, economic	planned	Croatian Hydrocarbon Agency Ministry of Economy
MS-11: Reducing an individual's carbon footprint by changing lifestyle habits	Changes in consumer habits, dietary habits in the direction of including/using more food of plant origin, habits related to transport and travel, ways of using and owning various appliances in households, etc., which can be expressed through the reduction of an individual's carbon footprint	CO_2, CH_4, N_2O	information	planned	Environmental Protection and Energy Efficiency Fund Ministry of Health Croatian Institute of Public Health
MS-12: Collecting and processing of biomass from agriculture, forestry, fishing and aquaculture	Organisation of centres for the collection and processing of biomass Creation of opportunities to increase the competitiveness of producers through the valorisation of biomass in innovative value chains in the bioeconomy	CO_2, CH_4, N_2O	information, economic	planned	Ministry of Agriculture, Forestry and Fisheries Ministry of Regional Development and Funds of the European Union Ministry of Environmental Protection and Green Transition
MS-13: Elimination of fossil fuel subsidies	Development of a plan to abolish the fossil fuel subsidy system and propose alternative	CO_2, CH_4, N_2O	economic	planned	Ministry of Environmental Protection and Green Transition

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
	measures to permanently reduce the need to use fossil fuels				
MS-14: Carbon Removal Certification	Development of a public certification scheme and establishment of a national framework for certification and verification of carbon removal	CO_2, CH_4, N_2O	regulatory, economic	implemented	Ministry of Environmental Protection and Green Transition
MS-15: Creation and implementation of the Social Plan for Climate Policy	Development and implementation of a social plan for climate policy	CO_2, CH_4, N_2O	economic	planned	Ministry of Environmental Protection and Green Transition Ministry of Economy Ministry of Finance Ministry of Physical Planning, Construction and State Assets Ministry of the Sea, Transport and Infrastructure Ministry of Labour, Pension System, Family and Social Policy
MS-16: Green budget planning	Create an institutional framework for implementing the green state budget	CO_2, CH_4, N_2O	regulatory, economic	planned	Ministry of Finance
IIK-1: Establishment of a system for identifying and monitoring the achievement of research, innovation and competitiveness objectives	Defined national development goals in the context of low carbon transition, set up a system for monitoring achievement, defined key technologies	CO_2, CH_4, N_2O	regulatory	planned	Ministry of Economy Ministry of Science, Education and Youth
IIK-2: Establishment of systematic financing of	Conducting research projects of priority for the Republic of Croatia	CO_2, CH_4, N_2O	economic	planned	Ministry of Economy Ministry of Science, Education and Youth

Name of PAM	Objective	Greenhouse gas	Type of instrument	Status	Implementing body
research and development projects					Croatian Science Foundation HAMAG-BICRO
IIK-3: Strengthening competitiveness in the area of low-carbon economy	Low-carbon products and services placed on the market	CO_2, CH_4, N_2O	economic, research	planned	Ministry of Economy Ministry of Science, Education and Youth HAMAG-BICRO
IIK-4: Transfer of knowledge and technologies from science to the economy system with an emphasis on low-carbon technologies	Technology transfer Low-carbon products and services placed on the market	CO_2, CH_4, N_2O	economic, research	planned	Ministry of Science, Education and Youth
IIK-5: Strengthening the work of scientific centres of excellence established in the field of natural, technical, biotechnical and biomedical sciences	Industrial and experimental research in the field of low carbon development	CO_2, CH_4, N_2O	economic, research	planned	Ministry of Science, Education and Youth
IIK-6: Strengthening research and innovation and increase competitiveness in the field of low-carbon economy	Research, innovation and increasing competitiveness	CO_2, CH_4, N_2O	information, research	planned	Ministry of Economy Ministry of Science, Education and Youth HAMAG-BICRO
IIK-7: Analytical substrates for the green transition	Research to move to higher levels of application of the IPCC methodology	CO_2, CH_4, N_2O, HFCs, SF_6	regulatory, education	planned	Ministry of Environmental Protection and Green Transition

6. Projections indicators for monitoring and assessing progress in policies and measures implementation

Table 6-1: Projections indicators for monitoring and assessing progress in policies and measures implementation, 'with existing measures' scenario

No	Indicator	2025	2030	2035	2040	2045	2050
1	Carbon Intensity of the overall economy [tCO_2eq/GDP]	382.086	349.333	306.399	265.038	224.030	188.434
2	GHG intensity of domestic power and heat generation [tCO_2eq/MWh]	1.174	1.053	0.964	0.834	0.651	0.515
3	GHG intensity of final energy consumption in Transport sector [tCO_2eq/toe]	3.0149	2.9610	2.9578	2.9547	2.9511	2.9477
4	GHG intensity of final energy consumption in Industry [tCO_2eq/toe]	2.9913	3.0326	3.0266	3.0201	3.0122	3.0037
5	GHG intensity of final energy consumption in Residential sector [tCO_2eq/toe]	1.1447	1.1073	1.0933	1.0776	1.0665	1.0539
6	GHG intensity of final energy consumption in Commercial sector [tCO_2eq/toe]	2.7705	2.7459	2.7430	2.7401	2.7436	2.7472
7	CH_4 emissions from manure management [kt CH_4/year]	14.18	15.08	15.61	16.17	16.82	16.97
	Direct N_2O emissions from soils due to synthetic fertilizer application [kt N_2O-N/year]	1.54	1.51	1.47	1.43	1.40	1.36
	Direct N_2O emissions from manure management [kt N_2O-N/year]	0.13	0.12	0.11	0.10	0.10	0.09
	Dairy cattle population [1000 heads]	99	85	83	79	77	76
8	Specific CH_4 emissions from landfills [kt/kt]	0.09	0.14	0.21	0.19	0.16	0.14
	CH_4 emissions from landfills [kt]	48.70	41.16	32.27	23.32	17.36	13.29
	Municipal biodegradable solid waste going to landfills [kt]	558	301	151	124	107	97

Table 6-2: Projections indicators for monitoring and assessing progress in policies and measures implementation, 'with additional measures' scenario

No	Indicator	2025	2030	2035	2040	2045	2050
1	Carbon Intensity of the overall economy [tCO_2eq/GDP]	362.250	286.840	226.764	159.832	125.947	96.368
2	GHG intensity of domestic power and heat generation [tCO_2eq/MWh]	1.080	0.877	0.690	0.471	0.374	0.288
3	GHG intensity of final energy consumption in Transport sector [tCO_2eq/toe]	2.9684	2.8291	2.7725	2.6796	2.5131	2.1064
4	GHG intensity of final energy consumption in Industry [tCO_2eq/toe]	2.9829	2.9272	2.9032	1.6381	1.5147	1.5484
5	GHG intensity of final energy consumption in Residential sector [tCO_2eq/toe]	1.1672	1.1688	1.1271	1.0241	1.0148	0.9799
6	GHG intensity of final energy consumption in Commercial sector [tCO_2eq/toe]	2.7877	2.7903	2.8259	2.8758	2.8936	2.9205
7	CH_4 emissions from manure management [kt CH_4/year]	11.26	10.71	9.84	8.89	6.56	0.58
	Direct N_2O emissions from soils due to synthetic fertilizer application [kt N_2O-N/year]	1.49	1.43	1.37	1.31	1.25	1.17
	Direct N_2O emissions from manure management [kt N_2O-N/year]	0.13	0.11	0.11	0.10	0.09	0.09
	Dairy cattle population [1000 heads]	99	85	83	79	77	76
8	Specific CH_4 emissions from landfills [kt/kt]	0.09	0.14	0.21	0.19	0.16	0.14
	CH_4 emissions from landfills [kt]	48.70	41.16	32.27	23.32	17.36	13.29
	Municipal biodegradable solid waste going to landfills [kt]	558	301	151	124	107	97

7. Quantitative estimates of the effects of policies and measures on emission by sources and removals by sinks of greenhouse gases

Quantitative estimates of the effects of policies and measures on emissions by sources and removals by sinks of greenhouse gases for years 2025, 2030, 2035, 2040, 2045 and 2050 for two scenarios are given in table 7-1 below.

The effects are presented for the sectors covered by the EU ETS, the non-ETS sectors according to Regulation (EU) 2023/857 (ESR sectors) and LULUCF according to Regulation (EU) 2023/839.

Table 7-1: Quantitative estimates of the effects of policies and measures [kt CO_2eq]

'With existing measures' scenario	2025	2030	2035	2040	2045	2050
ETS sectors	6,465.91	6,803.06	6,124.23	5,445.36	5,168.56	4,891.69
ESR sectors	17,363.11	16,571.14	15,495.79	14,428.33	12,701.84	10,964.37
LULUCF	-4,533.87	-3,957.87	-3,940.98	-4,247.18	-4,330.18	-4,586.21

'With additional measures' scenario	2025	2030	2035	2040	2045	2050
ETS sectors	5,946.61	4,598.13	3,676.95	2,042.15	18,37.43	16,66.08
ESR sectors	16,483.17	14,212.21	11,741.70	9,004.61	7,124.50	5,179.89
LULUCF	-4,533.87	-3,957.87	-3,940.98	-4,247.18	-4,330.18	-4,586.21

7.1. Total effects of implementation of policies and measures

The effects of individual measures on the reduction of emissions have not been determined and the effects of group measures are available for the scenario 'with existing measures' and for the scenario 'with additional measures'. Group measures are defined at the sector or sub-sector level.

The effects of cross-sectoral measures whose impact leads to certain activities are integrally included in the projections, to the extent possible.

The overall effects of implementation of policies and measures to reduce greenhouse gas emissions are shown in Tables 7-2 and 7-3. Tables show the difference between emissions in 2022 (the reference year for projections) and emissions in 2025, 2030, 2035, 2040, 2045 and 2050.

Table 7-2: Total effects of implementation of policies and measures for the 'with existing measures' scenario, kt CO_2eq

'With existing measures' scenario	2022	2025	2030	2035	2040	2045	2050
Energy	**10,140.8**	52.6	-234.7*	786.3	1,807.3	2,387.7	2,968.0
Transport	**6,7310.0**	439.5	336.3	664.7	992.4	2,142.8	3,290.1
Industrial processes and product use	**3,277.1**	51.0	446.6	663.6	879.7	999.4	1,119.3
Waste	**1,935.3**	253.5	682.6	853.6	1,021.1	1,167.9	1,314.8
Agriculture	**2,467.9**	-98.1*	-75.4*	-58.7*	-44.6*	-38.6*	-18.8*
LULUCF	**-4,867.2**	-333.3**	-909.3**	-926.2**	-620.0**	-537.0**	-281.0**
TOTAL (excluding LULUCF)	**24,552.0**	698.5	1,155.4	2,909.6	4,655.8	6,659.1	8,673.4
TOTAL (including LULUCF)	**19,684.8**	365.2	246.1	1,983.4	4,035.9	6,122.1	8,392.4

* negative value indicates an increase in emissions compared to 2022

** negative value indicates a decrease in removals compared to 2022

Table 7-3: Total effects of implementation of policies and measures for the 'with additional measures' scenario, kt CO_2eq

'With additional measures' scenario	2022	2025	2030	2035	2040	2045	2050
Energy	**10,140.8**	1,070.5	2,695.4	4,378.8	6,612.8	7,267.6	7,855.5
Transport	**6,7310.0**	733.0	1,120.6	2,353.6	3,583.6	4,659.3	5,732.4
Industrial processes and product use	**3,277.1**	60.6	1,184.5	1,441.9	2,136.3	2,264.3	2,392.3
Waste	**1,935.3**	253.5	682.6	853.6	1,021.1	1,167.9	1,314.8
Agriculture	**2,467.9**	-19.4*	37.4	87.1	136.0	219.3	402.9
LULUCF	**-4,867.2**	-333.3**	-909.3**	-926.2**	-620.0**	-537.0**	-281.0**
TOTAL (excluding LULUCF)	**24,552.0**	2,098.2	5,720.5	9,115.1	13,489.8	15,578.3	17,698.0
TOTAL (including LULUCF)	**19,684.8**	1,764.9	4,811.2	8,188.9	12,869.8	15,041.4	17,417.0

* negative value indicates an increase in emissions compared to 2022

** negative value indicates a decrease in removals compared to 2022

Projections of emissions (excluding LULUCF) show a reduction in the period until 2050 compared to 2022, which is the reference year for projections. Projections of removals by sinks show a decrease in the period until 2050, compared to the sink levels in 2022.

The total effects of implementation of policies and measures to reduce greenhouse gas emissions shown as the difference of total emissions (excluding LULUCF) from the scenario 'with existing measures' and the scenario 'with additional measures' are shown in Table 7-4 and 7-5.

Table 7-4: Total effects of implementation of policies and measures – difference between the 'with existing measures' and 'with additional measures' scenario, kt CO_2eq

	2025	2030	2035	2040	2045	2050
'With existing measures' scenario	23,853.5	23,396.6	21,642.4	19,896.1	17,892.9	15,878.6
'With additional measures' scenario	22,453.8	18,831.5	15,436.9	11,062.2	8,973.6	6,854.0
Difference between scenarios	1,399.7	4,565.1	6,205.5	8,834.0	8,919.3	9,024.6

Table 7-5: Total effects of implementation of policies and measures – difference between the 'with existing measures' and 'with additional measures' scenario by sectors, kt CO_2eq

	2025	2030	2035	2040	2045	2050
Energy	1,018.0	2,930.1	3,592.4	4,805.5	4,879.9	4,887.5
Transport	293.5	784.3	1,688.9	2,591.2	2,516.6	2,442.2
Industrial processes and product use	9.5	737.9	778.4	1,256.7	1,264.9	1,273.1
Waste	0.0	0.0	0.0	0.0	0.0	0.0
Agriculture	78.7	112.9	145.9	180.6	257.9	421.8
TOTAL	1,399.7	4,565.1	6,205.5	8,834.0	8,919.2	9,024.6

8. Assessment of the contribution of the policies and measures to the achievement of the Union's climate-neutrality objective and to the realization of the Low-Carbon Development Strategy until 2030 with a view to 2050

The Republic of Croatia is implementing various policies and measures to achieve the objectives of the Low-Carbon Development Strategy. This strategy serves as a key document for reducing greenhouse gas emissions and guiding the economy toward climate neutrality.

The assessment of the contribution of policies and measures to the achievement of the goals of the Low-Carbon Development Strategy is conducted through monitoring the implementation and achievement of measures defined in NECP. The NECP serves as the main instrument for defining specific measures and targets for reducing greenhouse gas emissions across sectors such as energy, transport, industry, agriculture and waste management.

The implementation of measures within the NECP enables continuous monitoring of progress in emission reductions and the adjustment of policies based on actual results and new technological solutions. Regular evaluations of the effectiveness of measures ensure alignment with long-term climate policy goals and allow for the adaptation of the strategy in accordance with national and international changes. Since the NECP contains key measures and scenarios for emission reductions, achieving its goals directly contributes to the realization of the Low-Carbon Development Strategy. Therefore, the effects of policies and measures are not assessed in isolation, but through their integration into the NECP, ensuring a comprehensive approach to achieving climate neutrality by 2050.

Croatia evaluates the contribution of its policies and measures to achieving the EU's climate neutrality objective through national greenhouse gas inventories which enable the quantification of policy impacts, tracking progress toward targets and optimizing strategies based on new scientific findings and technological innovations. Furthermore, the assessment of policy effectiveness includes the analysis of economic and social indicators, such as the creation of green jobs, investments in sustainable technologies, and improvements in energy efficiency.

To fully assess the contribution of existing policies and measures in achieving the Low-Carbon Development Strategy's goals, additional analyses are needed. These analyses should include a quantitative assessment of the impact of measures on greenhouse gas emissions across sectors.

The successful implementation of the Low-Carbon Development Strategy requires significant investments in innovation, research, and development, as well as the use of financial instruments such as the Just Transition Fund and the Modernization Fund. Croatia also collaborates with other EU member states to ensure synergies and accelerate decarbonization at the regional level.

Despite challenges such as financial constraints and the need to strengthen administrative capacities, Croatia continuously adapts its strategies and measures to effectively contribute to achieving the EU's climate neutrality goal by 2050. An integrated approach, focused on innovation and sustainable development, is essential for the long-term resilience of the economy and society to climate change.

9. Annual emission allocations

9.1. Amount of annual emission allocation

Outside the EU ETS, Member States' emission reduction targets are set on the basis of GDP per capita under Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999 (hereinafter: Regulation (EU) 2023/857). The Republic of Croatia has determined the necessary reduction of greenhouse gas emissions outside the EU ETS by 16.7 % by 2030 compared to 2005.

Commission Implementing Decision (EU) 2023/1319 of 28 June 2023 amending Implementing Decision (EU) 2020/2126 to revise Member States' annual emission allocations for the period from 2023 to 2030 determined the allocation expressed in absolute terms for Croatia from 2021 to 2030 (Table 9-1).

9.2. Expected progress in meeting the emission limit up to the amount of the national annual allocation

Table 9-2 shows estimate of the amount of greenhouse gas emissions of the Republic of Croatia in the period 2021-2030 and the differences achieved in relation to national annual quotas. The differences were calculated by subtracting the amount of the national annual allocation and the estimated annual emissions of the sector outside the EU ETS, in accordance with Regulation (EU) 2023/857 (ESR sector).

Table 9-1: Annual emission allocations for the Republic of Croatia for the period 2021-2030 [kt CO_2eq]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Annual emission allocation	17,661.355	16,544.497	16,357.415	16,170.092	15,982.770	-	-	-	-	-

Table 9-2: Projected development in relation to the national annual allocation in period 2021 – 2030 [kt CO_2eq]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Annual allocation	17,661.355	16,544.497	16,357.415	16,170.092	15,982.770	-	-	-	-	-
Scenario										
'With measures' scenario	17,418.18	18,070.82	17,570.65	17,410.58	17,363.11	17,204.48	17,045.96	16,887.60	16,729.29	16,571.14
'With additional measures' scenario	17,418.18	18,070.82	17,359.88	16,864.94	16,483.17	16,030.44	15,577.76	15,125.19	14,672.61	14,212.21
Difference										
'With measures' scenario	243.17	-1,526.32	-1,213.24	-1,240.49	-1,380.34	-	-	-	-	-
'With additional measures' scenario	243.17	-1,526.32	-1,002.46	-694.85	-500.40	-	-	-	-	-

9.3. Information on planned additional policies and measures for achieving larger emission limitations than the amount of national annual allocation

The Act on Climate Change and Ozone Layer Protection (OG 127/2019) requires that for each year in the period from 2021 to 2030, the greenhouse gas emissions of the Republic of Croatia emitted from sectors not covered by the ETS are limited to the amount of the national annual allocation.

It is also stipulated that compliance with the obligation to limit emissions to the national annual allocation is the responsibility of state administration bodies responsible for environmental protection, energy, industry, transport, construction, economy, entrepreneurship, agriculture, forestry and tourism.

The Ministry of Environmental Protection and Green Transition monitors the implementation of measures through the compliance process, which must be implemented by all EU Member States. Also, the Government of the Republic of Croatia, at the proposal of the Ministry of Environmental Protection and Green Transition, may decide to determine additional measures to reduce greenhouse gas emissions in order to meet the obligation.

In line with these obligations, Croatia's NECP outlines over 100 measures aimed at reducing emissions across all relevant sectors.

Efforts to reduce greenhouse gas emissions in Croatia are ongoing and will continue to intensify in the coming years, with a strong focus on strengthening the implementation and enforcement of the measures outlined in NECP. This process involves ensuring that existing measures are applied effectively across all sectors. This will require enhanced coordination between relevant government bodies, local authorities, and key stakeholders from the private sector, civil society, and academia.

One of the priorities is to improve monitoring, reporting, and verification systems to track the progress of implemented measures and assess their impact on emission reductions. This will enable timely adjustments and the introduction of corrective actions if certain measures do not produce the expected results. Additionally, financial incentives, including subsidies and grants, will be expanded to encourage investments in renewable energy projects, energy efficiency improvements, and the modernization of industrial processes.

Another crucial element involves capacity-building efforts, aimed at providing technical support and training for institutions and professionals engaged in implementing climate measures. Public awareness campaigns will also play a vital role, helping to promote sustainable practices among citizens and businesses, thereby fostering a culture of environmental responsibility.

10. Information on the links between different policies and measures

The Act on Climate Change and Ozone Layer Protection (OG 127/2019) stipulates that development documents of certain areas and activities must be harmonized with the principles, basic goals, priorities and measures of low-carbon development for certain sectors determined in the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050 (OG 63/2021).

The objectives and measures envisaged by the Low-Carbon Development Strategy and NECP should enable the Republic of Croatia to harmonize policies in all sectors in order to achieve economic growth and at the same time reduce greenhouse gas emissions. Such integration is essential for ensuring that policies across various sectors complement each other in meeting emission reduction targets. By aligning these policies, Croatia can achieve synergy, where each policy and measure supports the broader goal of climate neutrality by 2050.

Different policies, measures, and instruments often complement and support each other, making them more effective in the global and national fight to reduce emissions. Here are some key linkages:

- Energy efficiency and renewable energy policies

  Energy efficiency policies are often linked to measures that promote renewable energy sources. For example, investing in energy-efficient technologies reduces energy consumption, while implementing measures for renewable sources reduces dependence on fossil fuels, which directly reduces greenhouse gas emissions.

- Carbon tax and emissions trading policies

  Carbon taxes and emissions trading systems are designed to increase the cost of greenhouse gas emissions, creating an economic incentive for emission reductions. The use of these financial mechanisms can stimulate businesses to adopt cleaner technologies and reduce emissions.

- Transport and urban planning policies

  The transport sector is a significant contributor to greenhouse gas emissions and policies aimed at sustainable mobility, including the promotion of cleaner transportation alternatives and reduced reliance on private vehicles, can help mitigate these emissions. Additionally, urban planning strategies that prioritize sustainability and energy-efficient infrastructure can further contribute to emission reductions.

- Agricultural and forestry policies

  Agriculture and forestry also play a significant role in reducing greenhouse gas emissions. Agro-technical measures that involve improving farming methods and soil management can reduce emissions of methane and other gases. Forest conservation and reforestation policies can also have a large impact on reducing emissions as forests act as carbon sinks.

- Educational and informational policies

  Raising awareness among citizens and industry sectors about the importance of emission reductions and sustainable behaviour can also have long-term effects. Policies that promote education on climate change can encourage changes in consumption behaviour, waste reduction and increased interest in sustainable products and services.

References

1. First Biennial Transparency Report of the Republic of Croatia under the Paris Agreement, Ministry of Environmental Protection and Green Transition, 2024
2. Croatian greenhouse gas inventory for the period 1990-2022 (National Inventory Document 2024), Ministry of Environmental Protection and Green Transition, 2024
3. Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050 (OG 63/2021)
4. Energy Development Strategy of the Republic of Croatia until 2030 with a view to 2050 (OG 25/2020)
5. Integrated National Energy and Climate Plan of the Republic of Croatia for the period from 2021 to 2030, Ministry of Economy, 2024
6. The Long-term Strategy for the Renovation of the National Building Fund in Croatia (OG 140/2020)
7. Waste Management Strategy of the Republic of Croatia (OG 130/2005)
8. Waste Management Plan of the Republic of Croatia for the period 2023-2028 (OG 84/2023)

List of tables