



GEO THERM-FORA Deliverable D5.1

# First Mapping of relevant policy and regulatory issues

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## 1 Introduction

Geothermal energy is a heavily regulated sector, and usually requires a specific support framework. When regarding the framework conditions for research in geothermal, it appears that they are highly influenced by the energy, climate and research policies. To improve this framework, it is necessary to influence these policies.

It can be done by communicating and promoting the messages laid out in the Geotherm Fora Project, the ongoing Strategic Research and Innovation Agenda and the future Implementation roadmap to the relevant policy makers, at both regional, national and EU level.

In order to reach these objectives, the detailed mapping of relevant policy and regulatory issues described in this report aims to set the context by presenting the policy and regulatory framework impacting geothermal RD&I. The goal is to highlight the main issues in order to make sure that the geothermal sector vision and research priorities are translated into political priorities and coherent policy messages.

After an overview and a mapping of the main European policies and regulations applying to geothermal energy, this report provides an inventory of the main European funding streams for innovative geothermal projects, which also influence the regional and national frames.

When considering the European regulatory and policy framework, the various interlinked regulations and policies create a complex regulatory background. Although this may not necessarily result in an overregulation of geothermal projects, and may indeed provide a consistent and robust framework that allows confidence in geothermal deployment, the lack of readability may be a deterrent for the emergence of new geothermal markets.

Geothermal energy is promoted at the European level in the framework of the EU's Climate and Energy objectives, which aim to put the European economy on a pathway compatible with maintaining climate change below 2°C. As a renewable energy source, geothermal energy is indeed a solution that can contribute to meet this objective. However, the specific requirements of geothermal, namely drilling, geothermal fluid extraction and possible gas emissions, put geothermal projects within the scope of several European environmental legislations. In addition, as geothermal development is still new in many markets, geothermal projects usually benefit from European policies to support research, development and innovation.

The overview provided in this report aims to present the most general regulatory and policy framework, the European one, while acknowledging the role of national and regional authorities in providing additional frameworks that are adapted to local specificities. National and regional frameworks may indeed vary significantly from the European one, by proposing more robust and more specific policies according to the issues specific to a territory. According to the principle of subsidiarity, the EU proposes regulations that leave large margin for national, regional and local authorities to set more ambitious thresholds or to implement a detailed framework. However, the analysis of support frameworks for geothermal energy at the national and regional level goes beyond the scope of this paper.

## Main content

This publication presents an overview of the regulatory and policy framework that affects investments in RD&I in geothermal energy. To that end, three main policy and regulation areas have been identified as being instrumental:

- Climate and energy
- Environment
- Research, development and innovation

Geothermal energy is a renewable energy source. It is among the resources that the EU's climate and energy aim to develop in order to mitigate climate change. As such the EU climate and regulatory framework is a major factor for geothermal RD&I developments. In addition, the general RD&I policy and regulatory framework in the EU is another factor, notably to provide funding from public institutions. Finally, the environmental policy and regulatory framework has a role in determining RD&I orientation, and somehow directing funding, as it sets objectives for mitigating the environmental impacts of projects, which may require innovation and research and development.

## 2 Overview on the European policy and regulatory framework for geothermal energy

### 2.1 European Climate and Energy Framework

The choice of the energy mix is done by the Member States but energy policy is becoming increasingly a competence of the EU institutions. It is the response to critical supra-national issues such as climate change and security of supply that made the development of a more comprehensive EU energy policy indispensable.

#### 2.1.1.1.1 The European Energy Union

In 2015, the European Commission has reorganised all the EU actions in the field in a framework strategy towards the establishment of a 'resilient Energy Union with a forward-looking climate policy'. The strategy is being built around the following five dimensions:

- 1) Security, solidarity and trust: diversifying Europe's sources of energy and ensuring energy security through solidarity and cooperation between EU countries;
- 2) A fully integrated internal energy market: enabling the free flow of energy across the EU through adequate infrastructure and without technical or regulatory barriers;
- 3) Energy efficiency: improved energy efficiency will reduce dependence on energy imports, lower emissions, and drive jobs and growth;
- 4) Decarbonising the economy: the EU is committed to a quick ratification of the Paris Agreement and to retaining its leadership in the area of renewable energy;
- 5) Research, innovation and competitiveness: supporting breakthroughs in low-carbon and clean energy technologies by prioritising research and innovation to drive the energy transition and improve competitiveness.

Moreover, in 2019 the national energy and climate plans (NECPs) were introduced by the Regulation on the governance of the energy union and climate action (EU)2018/1999<sup>1</sup>, agreed as part of the Clean energy for all Europeans package<sup>2</sup>.

The national plans outline how the EU countries intend to address the 5 dimensions of the energy union listed above (decarbonisation, energy efficiency, energy security, internal energy market, research, innovation and competitiveness). This approach requires a coordination of purpose across all government departments and it provides a level of planning that will ease public and private investment.

Under the governance regulation Member States had to submit their draft NECPs for the period 2021-2030 to the Commission by 31 December 2018. These were analysed by the Commission with an overall assessment and country-specific recommendations published in June 2019. Taking these

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<sup>1</sup> [https://energy.ec.europa.eu/topics/energy-strategy/energy-union\\_en#regulation-on-the-governance-of-the-energy-union-and-climate-action](https://energy.ec.europa.eu/topics/energy-strategy/energy-union_en#regulation-on-the-governance-of-the-energy-union-and-climate-action).

<sup>2</sup> [https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package\\_en](https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package_en).

recommendations into account, Member States were then required to submit their final NECPs by 31 December 2019<sup>3</sup>.

On 17 September 2020, the Commission published a detailed EU-wide assessment of the final NECPs. As a follow-up, and as part of the 2020 energy union report, the Commission published individual assessments of each of the national plans for further guidance.

Each country must submit a progress report every 2 years, according to the structure, format, technical details and process set out in the Implementing Regulation<sup>4</sup>. The Commission will, as part of the state of the energy union report, monitor the EU's progress as a whole towards achieving these targets. To better develop and implement the plans, the Member States were required to consult citizens, businesses and regional authorities in the drafting and finalisation process. The governance regulation also required Member States to submit by the start of 2020 national long-term strategies looking forward to 2050.

By 30 June 2023, Member States were due to submit their draft updated NECPs in line with article 14 of the Governance Regulation. The Commission will comment on these drafts by December 2023, while the official deadline for the submission of the final version of the updated NECPs is set for June 2024.

#### 2.1.1.1.2 The new EU climate and energy ambitions

The European Green Deal<sup>5</sup>, approved in 2020, is a set of policy initiatives by the European Commission with the overarching aim of making the EU climate-neutral in 2050. The plan was to review each existing law on its climate merits and introduce new legislation including on the circular economy, building renovation and innovation.

To deliver the Green Deal, existing legislation is revised, and new legislative initiatives are put in place, under the "Fit for 55" package<sup>6</sup>, launched in 2021. These legislative proposals under the "Fit for 55" package are intended to ensure the EU achieves the -55% emission reduction target by 2030 compared with 1990 levels. In particular, the package launched the revision process of key legislation for the geothermal sector such as the Renewable Energy Directive (RED), the Energy Efficiency Directive (EED) and the Energy Performance of Buildings Directive (EPBD).

Moreover, in May 2022, the Commission presented its REPowerEU plan<sup>7</sup> as a response to the hardships and global energy market disruption caused by Russia's invasion of Ukraine. The main purpose of the plan is to save energy, produce clean energy and diversify EU energy supplies. Among others, this plan has also translated into further measures to be included in the RED, EED and EPBD revision.

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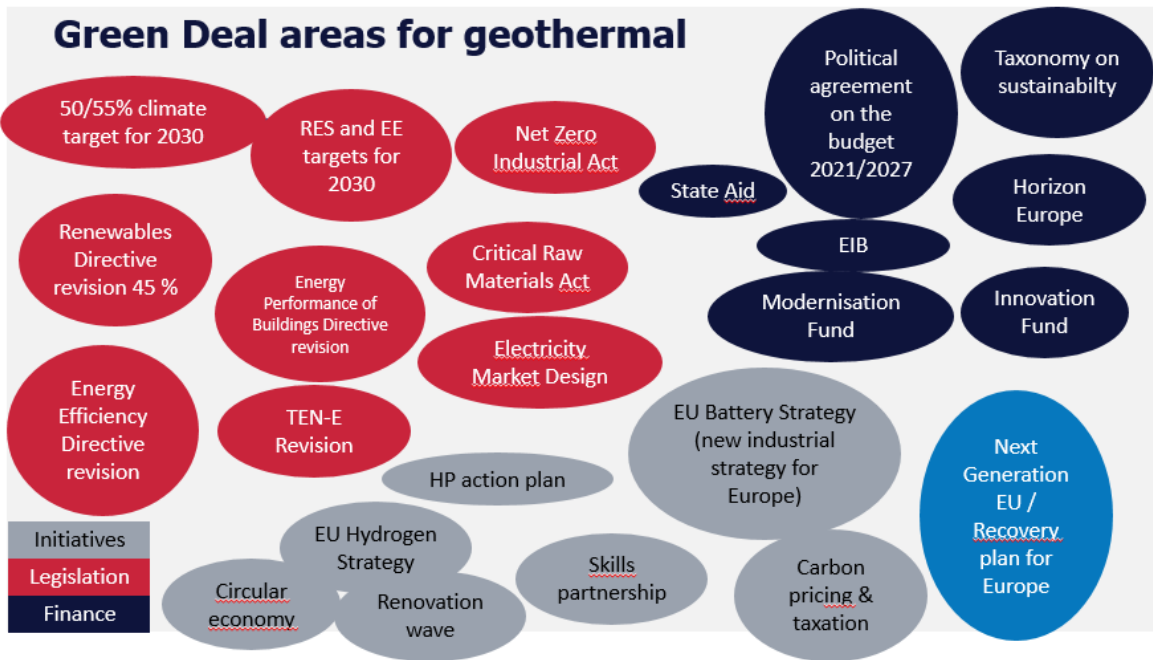
<sup>3</sup> See [https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans\\_en#documents](https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en#documents).

<sup>4</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R2299&qid=1669912064557>.

<sup>5</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN>.

<sup>6</sup> [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en).

<sup>7</sup> [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_22\\_3131](https://ec.europa.eu/commission/presscorner/detail/en/ip_22_3131).



All the abovementioned legislation is coherent in developing the new EU ambition towards a decarbonised and renewables-based economy. At the moment of drafting this deliverable, RED (now called RED III) and EED have completed their revision path, while EPBD is still under the revision process.

#### 2.1.1.1.3 RED III: relevant aspects for geothermal energy

The new RED addresses a number of key barriers for the deployment of geothermal such as lack of a widely accepted definition of geothermal energy, removal of administrative barriers, spatial planning, and certification of small-scale shallow geothermal installers.

According to the revised directive, Member States shall collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 42,5% and endeavour to increase this share to 45 %.

Moreover, to complement their national objectives and funding targets, to promote the production of renewable energy from innovative renewable energy technology and to safeguard the continued leadership of the Union in research and development of innovative renewable energy technology, each Member State should set an indicative target for innovative renewable energy technology of at least 5% of newly installed renewable energy capacity by 2030.

The revised directive provides also for a gradual increase in renewable targets for heating and cooling, with a binding increase of 0.8% per year at the national level until 2026 and 1.1% from 2026 to 2030 (Article 23). The previous target was an indicative 1.3% increase for the whole period. The minimum annual average rate applicable to all Member States is complemented with additional indicative increases calculated specifically for each Member State. The binding nature of the renewable heating and cooling sub-target is an important achievement, sending a clear signal to Member States.

#### *Assessment of the potential of energy from renewable sources*

New Article 23 on mainstreaming renewable energy in heating and cooling states that Member States shall now assess their potential for energy from renewable sources. The assessment shall consider the



available and economically feasible technologies for industrial and domestic uses to set out milestones and measures to increase the use of renewable energy sources in heating and cooling.

A mandatory assessment of this kind is to be welcomed as it duly takes into account the different renewable energy sources and their possible implementation considering different starting conditions. In this context, geoHC networks can be a useful solution which can prove to be a better option compared to other renewable energies in certain situations and under certain conditions, especially when combined with a comprehensive mapping of geothermal resources at the national level. In subsequent revisions of the directive, within the assessment of their potential of energy from renewable sources, Member States should carry out guidance on permitting modelled on a "traffic light system". This should include the production and publication of areas for geothermal where just a notification is requested, drilling is required, or where it is prohibited. This would assure a more levelised starting point for all renewable options in view of the assessment carried out by local authorities to choose the best solution for their community.

Moreover, Distribution Service Operators (DSOs) should also be given a mandate to prepare renewable heating & cooling plans. Many local authorities are either directly responsible for their DSOs legal requirements or devolve these legal requirements to a recognised entity. Gas DSOs and electricity DSOs, at present, do not have a clear mandate to plan and deliver renewables and renewable district heating and cooling networks of community schemes.

Threats can derive from the implementation and monitoring of this obligation. As mentioned before, NECPs should become more relevant and detailed documents reflecting both RED prescriptions and national measures put in place to reach them. The Commission should be strict in its monitoring activity.

#### *Implementing measures to promote the use of renewable energy in the heating and cooling sector*

Member States shall now implement at least two measures described in paragraph 4 of article 23 (before, indicatively one or more). The list has been further specified and enlarged, in particular with reference to local mapping and planning, risk mitigation frameworks, heating and cooling purchase agreements, local planning on H&C, promotion of DHC and specific renewable sources and technologies. Point (I) specifically mentions the "promotion of renewable based district heating and cooling networks, in particular by renewable energy communities, including through regulatory measures, financing arrangements and support".

The list of measures has been positively enlarged and made mandatory for at least two elements of Member States' choice. In particular, the list now includes: local mapping and planning, risk mitigation frameworks, heating and cooling purchase agreements, local planning on H&C, promotion of DHC and specific renewable sources and technologies. However, given the long list of measures and the limited obligation of choosing at least two, the risk is paying little attention to some of these measures and the tendency from Member States to consider their obligations achieved by focusing only on a couple of measures. In this context, some measures with favourable effects for geoHC networks, such as risk mitigation schemes and local mapping and planning, may not be the first choice for being considered expensive, resource-consuming and difficult to implement.

#### 2.1.1.1.4 New EED: relevant aspects for geothermal energy

##### *Heating and cooling assessment and planning*

The revised Article 25 paragraph 6 creates a new provision regarding local heating and cooling plans (LHCP). Member States shall ensure that municipalities with more than 45,000 inhabitants conduct LHCP. The article details some key principles for the goal, process and content of the LHCP. It also obliges Member States to develop recommendations and strong technical and financial support for local authorities. This article therefore greatly strengthens the local dimension of the decarbonisation of heating and cooling, as the 2018 version only vaguely encouraged this. Moreover, it specifically

mentions that these plans should “provide an estimate and mapping of the potential for increasing energy efficiency, *including via low-temperature district heating readiness*, high efficiency cogeneration, waste heat recovery, and renewable energy in heating and cooling in that particular area”.

The mandatory nature of this article for Member States provides a strong push to implement a local transition in heating and cooling. The article also contains strong wording on the obligation for Member States to provide technical and financial support to local governments to achieve this, and to propose recommendations for local decarbonisation. It also explicitly supports DHC and RES and is relatively precise on the content of the plans, which may avoid certain pitfalls, such as having local plans focused only on security of supply issues.

However, the obligation does not rest directly on the municipalities, for the sake of subsidiarity, so it is up to each Member State to transpose this article at the national level and therefore to design the structure that suits it best for creating LHCPs.

Also, the recommendations included in the LHCPs are not mandatory to implement. The powers of local authorities vary greatly from one country to another, and most currently lack the appropriate skills to carry out LHCPs. There is therefore a risk that if the support mechanism is not optimal, these plans will be reworked on the margins and that they will never be implemented. A number of European countries have already introduced this type of obligation or incentive for local authorities, and can therefore serve as a model to inspire other Member States.

#### *Specific criteria for district heating and cooling systems to qualify as efficient*

The new article 26 sets specific criteria<sup>8</sup> for district heating and cooling systems to qualify as efficient, particularly when they are built or substantially refurbished. It also ensures that DHC systems, to comply with the definition, newly built or refurbished, should not use fossil fuels, except natural gas until 2030.

By discouraging fossil fuel use and promoting the use of renewable energy, it guarantees the development of renewable energy sources, the utilisation of waste heat in DHC and the contribution to reducing GHG emissions and environmental impacts associated with heating and cooling systems. The ban on new fossil fuel capacity, in particular natural gas from 2030, is a progress but could

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<sup>8</sup> These criteria are listed in paragraph 1:

*“In order to ensure more efficient consumption of primary energy and to increase the share of renewable energy in heating and cooling supply going into the network, an efficient district heating and cooling system is a system which meets the following criteria:*

- a. until 31 December 2027, a system using at least 50% renewable energy, 50% waste heat, 75% cogenerated heat or 50% of a combination of such energy and heat;*
- b. from 1 January 2028, a system using at least 50% renewable energy, 50% waste heat, 50% renewable energy and waste heat, 80% of high-efficiency cogenerated heat or at least a combination of such thermal energy going into the network where the share of renewable energy is at least 5% and the total share of renewable energy, waste heat or high-efficiency cogenerated heat is at least 50%;*
- c. from 1 January 2035, a system using at least 50% renewable energy, 50% waste heat, 50% renewable energy and waste heat or a system, where the total share of renewable energy, waste heat or high-efficiency cogenerated heat is at least 80% and in addition the total share of renewable energy or waste heat is at least 35%;*
- d. from 1 January 2040, a system using at least 75 % renewable energy, 75% waste heat or 75% renewable energy and waste heat, and using at least 95% renewable energy, waste heat and high-efficiency cogenerated heat and in addition the total share of renewable energy or waste heat is at least 35%;*
- da. from 1 January 2045, a system using at least 75 % renewable energy, 75% waste heat or 75% renewable energy and waste heat.*
- e. from 1 January 2050, a system using only renewable energy, only waste heat, or only a combination of renewable energy and waste heat.”*

represent a difficulty for backup capacity in case of peak load, as there is no exemption. In this sense, geothermal energy should be considered as the most valid solution to give reliable baseload capacity.

#### 2.1.1.1.5 New EU rules on permitting for renewables

In December 2022, Member States agreed on accelerated permitting rules for renewables. These rules have been now integrated into the new RED directive<sup>9</sup>.

In particular, the concept of “renewable go-to areas” has been introduced. These have been defined as the areas for the deployment of renewable energy to identify the domestic potential and the available land surface, subsurface, sea or inland water as necessary for the installation of plants for the production of energy from renewable sources, and their related infrastructure necessary for national contributions towards the 2030 renewable energy target. Each Member State will have to map these areas within 18 months after the entry into force of this directive and adopt a plan or plans designating 'renewables go-to areas' within 27 months.

In the designated renewable go-to areas, permit-granting processes should not take longer than one year for renewables projects, and two years for offshore renewables projects (with exceptions). Moreover, a shorter deadline of 6 months for areas already designated as suitable for an accelerated renewables deployment. As for the repowering of plants and new installations with an electrical capacity of less than 150 kW, and co-located energy storage facilities as their grid connection, the processes should be limited to six months, and one year if they concern offshore wind energy projects (with exceptions).

For areas outside go-to areas, the permit-granting processes should not exceed two years, and three years for offshore renewables projects (with exceptions). The time during which the plants, their grid connections and the related necessary grid infrastructure are being built or repowered should not be counted within these deadlines.

It is welcome that for the first time, such a mapping is mandatory and involves Member States together with the relevant national, regional and local authorities. This "renewables acceleration areas" system will be very useful for a fast deployment of renewable energy sources by accelerating the permitting processes where possible and at the same time reducing as much as possible the negative environmental impacts as.

Availability and flexibility are key aspects when considering the deployment of renewable energy solutions for heating and cooling. Having seen the Member States' delays in the implementation of the RED II, the risk is that the deadlines of 18 and 27 months after the entry into force will not be respected in some cases. The Commission should be strict in its monitoring activity, as the provision states that the plan or plans designating renewables acceleration areas shall be made public and shall be reviewed periodically, as appropriate, in particular in the context of the update of the NECPs.

Moreover, digitalisation of the ‘renewable go-to areas’ data would facilitate the licensing and permitting process as new capacity is added and recorded. Thus, the EU legislator should specify that such continuous updates should always be in electronic format to facilitate the permitting process and in favour of easy access from the stakeholders involved.

Lastly, with Council Regulation 2022/2577 of 22 December 2022 laying down a framework to accelerate the deployment of renewable energy, the EU legislator agreed on some temporary measures to

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<sup>9</sup> See in particular articles 15b, 15c, 16, 16a, 16b, 16c 16d.

accelerate the deployment of renewable energy<sup>10</sup>. This Council Regulation will be valid for 18 months, after which the Commission will review whether it is appropriate to extend it. The most important provision is the one stating that renewable energy plants would be presumed to be of overriding public interest (article 3). This would allow new permitting procedures to benefit with immediate effect from a simplified assessment for specific derogations foreseen in EU environmental legislation.

#### 2.1.1.1.6 Net-Zero Industry Act (NZIA)

Strategic net-zero technologies are selected based on the three following criteria:

- 1) technology readiness level
- 2) contribution to decarbonisation and competitiveness
- 3) resilience of the energy system

The list includes the following technologies:

- Solar photovoltaic and solar thermal technologies
- Onshore and offshore renewable technologies
- Battery/storage technologies
- Heat pumps and geothermal energy technologies
- Electrolysers and fuel cells
- Sustainable Biogas/Biomethane technologies
- Carbon Capture and Storage (CCS) technologies
- Grid technologies

Seven “pillars” for strengthening the competitiveness of Europe’s net-zero technology manufacturing ecosystem.

1. **Enabling conditions for net-zero technology manufacturing** (faster permits, only one authority as reference, procedures for projects to apply and be recognised as net-zero strategic project by Member States)
2. **CO2 injection capacity** (storage)
3. **Access to markets** (facilitating access to markets in public procurement procedures and auctions, as well as schemes aimed at supporting private demand by consumers)
4. **Enhancing skills for quality job creation in net-zero technologies** (European skills Academies)
5. **Innovation** (regulatory sandboxes to test innovative net-zero technologies in a controlled environment for a limited amount of time)
6. **Governance** (Net-Zero Europe Platform, allowing the Commission to coordinate the above actions jointly with Member States)
7. **Monitoring**

## 2.2 Environmental regulations relevant to geothermal projects

Geothermal energy, as defined in the Renewable Energy Directive, is subjected to a wide array of environmental legislations that minimise the possible environmental impacts linked to the development of an industrial activity such as developing geothermal resources.

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<sup>10</sup> <https://data.consilium.europa.eu/doc/document/ST-16238-2022-INIT/en/pdf>.

The European, national and regional regulations about geothermal energy technologies aim to avoid environmental impacts for any segment of the value chain, from drilling to f-gas used in heat pumps for individual geothermal heating systems. These regulations can be laid out at the European level, through directive or regulations, and may be monitored by the European Environmental Agency. Enforcement however usually happens at the local level where national and regional authorities and agencies play a key role of advising new projects, monitoring existing installations and enforcing regulations in case of infringement.

Negative environmental impacts associated with geothermal energy are minor, especially if compared with conventional fossil fuels and nuclear power plants in a lifecycle analysis. As a matter of fact, a geothermal plant is located right above the resource and does not imply mining, processing, transporting the fuel over great distances, and combustion. Furthermore, the visual and land use impact can be negligible.

Nevertheless, as for every industrial activity, some potential and adverse effects exist such as some forms of gaseous emissions, induced seismicity, ground subsidence, noise during the construction phase, and temperature anomalies in the subsurface and the groundwater. These potential impacts vary depending on the geological settings as well as on the size and type of application. In all circumstances they can be avoided thanks to sound practice, technology developments, and compliance with environmental regulations.

Key environmental policies and regulations for the geothermal sector include:

- Water Framework Directive<sup>11</sup>
- Environmental Impact Assessment (EIA)<sup>12</sup>
- F-Gas regulation<sup>13</sup>

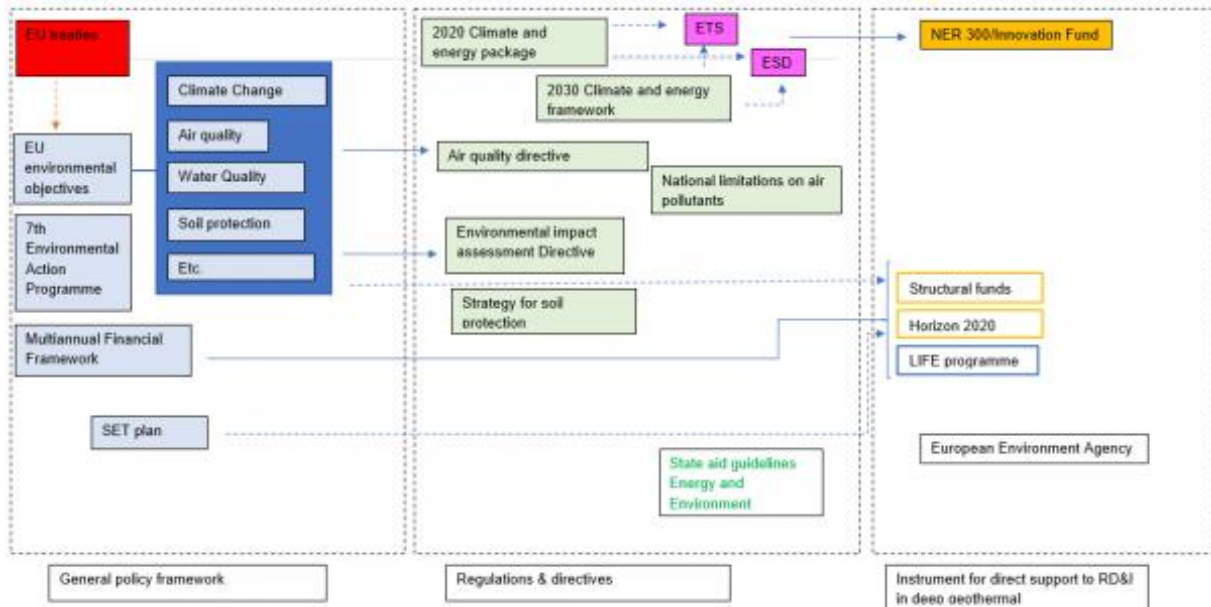
The European environmental regulatory framework for geothermal energy can be summarised in the following mapping:

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<sup>11</sup> [Directive](#) 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

<sup>12</sup> [Directive](#) 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

<sup>13</sup> [Regulation](#) (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006. This directive is currently being revised: see [Proposal](#) for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014.



### 2.2.1.1.1 Environmental assessment

An environmental assessment ensures that the environmental implications of a project are evaluated and taken into account. Environmental assessments can be undertaken for individual projects based on Directive 2011/92/EU (EIA Directive, as revised by Directive 2014/52/EU) or for public plans or programmes based on Directive 2001/42/EC (SEA Directive). Both Directives ensure that plans, programmes and projects likely to have significant effects on the environment are subjected to an environmental assessment before their approval or authorisation. According to the EIA Directive, the national authority determines whether and which geothermal drilling projects should be subject to an environmental impact assessment. A geothermal project has also to comply with Directive 92/43 on the conservation of natural habitats and wild fauna and flora (Habitats Directive). By Article 6 (3) of this directive, if a proposal is considered to have a significant effect on the conservation objectives of a Community Site an appropriate assessment will be required. One can distinguish cross-cutting themes - like water quality, air quality, waste and environmental liability - that apply to multiple environmental impacts, and themes that are specific to a particular impact. Each theme is covered by several EU directives as briefly described in the table below<sup>14</sup>.

<sup>14</sup> For more information see the [Geoenvi](#) project, and in particular the [Decision-making process mapping](#) (Deliverable 4.1).

Topic	EU legislation	Scope
Water quality	2000/60/EC 2008/105/EC	Water Framework directive: protection of inland surface waters, transitional waters, coastal waters and groundwater
	2006/118/EC	Specific measures to prevent and control groundwater pollution
	2013/39/EU	Priority substances in the field of water policy
	2014/80/EU	Threshold values for groundwater pollutants and indicators of pollution
Air quality	2008/50/EC	Air quality directive: Monitoring requirements and threshold values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM10 and PM2.5), lead, benzene, carbon monoxide, and ozone
	2016/2284	National Emission Ceilings Directive: 2016/2284/EU requires annual information on emissions of a number of pollutants from EU Members States
	2004/107/EC	Target values, mitigation measures, monitoring and information requirements for a specific group of pollutants (arsenic, cadmium, mercury, nickel, benzo(a)pyrene and polycyclic aromatic hydrocarbons)
	2003/87/EC	ETS Directive: establishing a scheme for greenhouse gas emission allowance trading (ETS)
Waste	2008/98/EC ; 2018/851 ; Decision 2014/955/UE and 2000/532/EC	Classifies different types of waste, inc. Ordinary Industrial Waste (most applicable for deep geothermal) and hazardous waste and stipulates requirements for handling hazardous waste
	2018/850/EC	Regulates landfill of waste targeting a progressive reduction and mitigate possible negative effects on the environment in line with the ambitions of a circular economy.
Noise and vibration	2000/14/EC	Harmonises the laws of the Member States relating to (amongst others) noise emission standards and data collection concerning the control of noise emission by outdoor equipment
	2002/49/EC	Regulates the assessment and management of environmental noise intended to mitigate the exposure to environmental noise
	2015/996/EC	Defines common assessment methods for the determination of the noise indicators
Landscape	2003/35/EC	Supports the involvement of the community in decisions concerning the landscape by providing for public participation in the preparation of plans and programmes relating to the environment
Soil quality	COM(2006) 232	Sets out common principles for protecting soils from various threats (e.g. erosion, decline in organic matter, contamination, sealing, compaction, decline in biodiversity, salinisation, floods, landslides)
Radioactivity	2013/59/Euratom	Safety standards and thresholds for dynamic and cumulative radioactive doses for any planned, existing or emergency exposure situation which involves a risk from exposure to ionizing radiation.
Pressure equipment	2014/68/EU	Sets requirements for the design, manufacture and conformity assessment of pressure equipment and assemblies (pressure > 0,5 bar) including e.g. inspection programs for different risk categories.
Liability	2004/35/EC	Liability directive: establishes a framework for environmental liability, based on the polluter-pays principle, for the prevention and remedying of environmental damage

Table: Main EU directives and legislation for the environmental themes considered (source: <https://www.geoenvi.eu>)

As regards the national legislation, the Geoenvi project illustrated that many of the environmental impacts related to deep geothermal associated with water quality, noise and energy regulations are well established in a large majority of countries in Europe. Other impacts like visual impacts on the landscape, or pressure and temperature decline at the production site, are less well regulated, although generally included in EIAs required for obtaining permits<sup>15</sup>.

## 2.3 Research, development and innovation relating to geothermal projects

### 2.3.1.1.1 Emissions Trading Scheme, Effort Sharing Decision, Modernisation Fund

The Emission Trading Scheme is the European carbon market for large facilities. The Effort Sharing Decision governs how “non-ETS” emissions reductions should be allocated among EU Member States. Within the Directives setting the ETS and the ESD, facilities to support the development of innovative renewable energy projects have been set up.

<sup>15</sup> For more information see the [Geoenvi](#) project, and in particular the [Decision-making process mapping](#) (Deliverable 4.1).

Among those, the Modernisation Fund is a dedicated funding programme to support 10 lower-income EU Member States in their transition to climate neutrality by helping to modernise their energy systems and improve energy efficiency.

The beneficiary Member States are Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia. In the provisional deal reached on the strengthened EU Emissions Trading System on 18 December 2022 the Modernisation Fund will increase its size, providing financial assistance to three additional Member States with their transition (Portugal, Greece and Slovenia).

The Modernisation Fund is funded from:

- revenues from the auctioning of 2% of the total allowances for 2021-30 under the EU Emissions Trading System (EU ETS)
- additional allowances transferred to the Modernisation Fund by beneficiary Member States – 5 opted to do so (Croatia, Czechia, Lithuania, Romania and Slovakia).

It operates under the responsibility of the beneficiary Member States, who work in close cooperation with the European Investment Bank (EIB), the Investment Committee set up for the fund and the European Commission. In 2021, the Fund made available €898.43 million to eight beneficiary countries.

The Modernisation Fund supports investments consistent with the 2030 climate and energy objectives of the Union, as well as the Paris Agreement. The majority of the resources of the Modernisation Fund (at least 70%) must be invested in priority areas specified in Article 10d(2) of the ETS Directive. Investments in these areas are referred to as '**priority investments**':

- generation and use of electricity from renewable sources;
- improvement of energy efficiency (including in transport, buildings, agriculture, waste, and except in energy efficiency related to energy generation using solid fossil fuels);
- energy storage;
- modernisation of energy networks (including district heating pipelines, grids for electricity transmission, increase of interconnections among Member States); and
- support to a just transition in carbon-dependent regions in the beneficiary Member States (including support to the redeployment, re-skilling and up-skilling of workers, education, job-seeking initiatives and start-ups, in dialogue with social partners).

All investments qualifying for the Modernisation Fund, but falling outside the priority areas are considered as '**non-priority investments**'. The Modernisation Fund can cover up to 70% of the relevant costs of non-priority investments, as long as the remaining costs are financed from private sources.

#### 2.3.1.1.2 Innovation Fund

Another tool financed with ETS revenues is the Innovation Fund. Just like its predecessor, NER300, the Innovation Fund is one of the world's largest funding programmes for demonstration of innovative low-carbon technologies and a key funding instrument for delivering the EU's economy-wide commitments under the Paris Agreement. It will provide around €40 billion of support over 2020-2030, depending on the carbon price, for the commercial demonstration of innovative low-carbon technologies, aiming to bring to the market industrial solutions to decarbonise Europe and support its transition to climate neutrality.



The Innovation Fund launches calls for funding for large, medium and small-scale projects focusing on: innovative low-carbon technologies and processes in energy-intensive industries, including products substituting carbon-intensive ones; carbon capture and utilisation (CCU); construction and operation of carbon capture and storage (CCS); innovative renewable energy generation; energy storage.

Projects will be selected based on:

- effectiveness of greenhouse gas emissions avoidance
- degree of innovation
- project maturity
- scalability
- cost efficiency

### 2.3.1.1.3 European Structural and Investment Funds (ESIF) – Cohesion policy

The 'Cohesion policy' is behind the hundreds of thousands of projects all over Europe that receive funding from the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund (Cohesion Fund applies to EU Member States which have a GDP lower than 90% of the EU-27 average – the average is calculated not including Croatia).

Economic and social cohesion – as defined in the 1986 Single European Act – is about 'reducing disparities between the various regions and the backwardness of the least-favored regions'. The EU's most recent treaty, the Lisbon Treaty, adds another facet to cohesion, referring to 'economic, social and territorial cohesion'.

EU Structural and Investments Funds dedicated to Cohesion policy of interest for the geothermal sector are the following ones:

- The Cohesion Fund
- The European Regional Development Fund (ERDF)
- The European Social Fund (ESF)
- The European Agricultural Fund for Rural Development (EAFRD)

The purpose of all these funds is to invest in job creation and a sustainable and healthy European economy and environment. The ESIF mainly focus on 5 areas: research and innovation, digital technologies, supporting the low-carbon economy, sustainable management of natural resources, and small businesses. All these funds are managed by the EU countries themselves, by means of partnership agreements. Each country prepares an agreement, in collaboration with the European Commission, setting out how the funds will be used during the respective funding period.

The ESIF are allocated via different types of schemes:

- direct aid to investment in companies (notably SMEs) to create sustainable jobs;
- infrastructures linked notably to research and innovation, telecommunications, environment, energy and transport;
- financial instruments (capital risk funds, local development funds, etc.) to support regional and local development and to foster cooperation between towns and regions;
- technical assistance measures.

Due to their long-term nature, the implementation of some structural funds projects can extend beyond the period of the long-term budget. For the 2014-20 MFF, Member States can still commit

funds until the end of 2023. For an overview of these funds, see 2014-2020 European structural and investment funds<sup>16</sup>.

#### 2.3.1.1.4 Financial Instruments (FI)

Financial instruments take an increasing importance in the attribution of Cohesion Policy funds, as the European Commission sees them as a solution for a “more efficient” use of the Structural Funds. For the European Institutions, Financial Instruments are a solution to maximise the impact of the Structural Funds by relying on mechanisms other than grants. Typical examples of financial instruments include technical assistance (such as pioneered by ELENA), soft loan schemes or revolving funds.

The definition of these instruments allows a “bottom-up” deployment, where the Managing Authorities of the ESIF, or the project leaders, can set up a Financial Instrument to fit their purposes. Their establishment does not require a modification of the Operational Programme, which makes it easy for a Managing Authority to repurpose ESIF funds to set up a FI.

#### 2.3.1.1.5 Horizon Europe

Horizon Europe is the EU’s main framework programme for research and innovation which succeeds Horizon 2020. It will run from 2021 till 2027 with a total budget of €95.5 billion<sup>17</sup>.

While Horizon 2020 was structured around seven main Societal Challenges, Horizon Europe identifies several new features:

- I. Global Challenges for action grouped in the so-called Clusters:
  1. Health
  2. Culture, Creativity & Inclusive and Secure Society
  3. Civil Security for Society
  4. Digital, Industry and Space
  5. Climate, Energy, and Mobility
  6. Food, Bioeconomy, Natural Resources, Agriculture and Environment
- II. Introduction of 5 mission areas: adaptation to climate change including societal transformation, cancer, climate-neutral and smart cities, healthy oceans, seas, coastal and inland waters, soil health and food. Each mission will have a dedicated mission board and assembly.
- III. New generation of European Partnerships regrouped into three new types of partnerships (co-funded, co-programmed, institutionalised). The Clean Energy Transition Partnership will be crucial for supporting innovation within the renewable energy industry.

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<sup>16</sup> EUR 351.8 billion were set aside for cohesion policy measures in the 28 EU member countries for the 2014-2020 period. This amounts to about one third of the EU budget.

[https://commission.europa.eu/funding-tenders/find-funding/funding-management-mode/2014-2020-european-structural-and-investment-funds\\_en](https://commission.europa.eu/funding-tenders/find-funding/funding-management-mode/2014-2020-european-structural-and-investment-funds_en).

<sup>17</sup> [https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe\\_en](https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en).

All the calls for funding are included in the Horizon Europe Work Programme that is prepared for each Cluster and covers a period of 2 to 3 years. The WP 2025/2027 is under preparation.

In December 2022, the European Commission has adopted the 2023-24 Work Programme of Horizon Europe<sup>18</sup>. With a budget of around €13.5 billion, this will enable researchers and innovators in Europe to pursue breakthrough solutions for the big environmental, energy, digital and geopolitical challenges facing our economies and societies today.

This includes the specific work programme for Cluster 5-Climate, Energy and Mobility<sup>19</sup>, the part of Horizon Europe managed by CINEA. The cluster aims to tackle climate change by improving understanding of its causes and impacts, and by making the energy and transport sectors more climate and environment-friendly, efficient and competitive, smarter, safer and more resilient.

### ***European Innovation Council (EIC)***

The European Innovation Council (EIC) has been established under the EU Horizon Europe programme. It has a budget of €10.1 billion to support game changing innovations throughout the lifecycle from early-stage research, to proof of concept, technology transfer, and the financing and scale up of start-ups and SMEs<sup>20</sup>.

The strategy and implementation of the EIC is steered by the EIC Board, which has independent members appointed from the world of innovation (entrepreneurs, researchers, investors, corporates and others from the innovation ecosystem).

Among the EIC Funding calls:

#### ➤ **EIC Pathfinder**

With its Pathfinder programme the EIC supports the exploration of bold ideas for radically new technologies. It welcomes the high-risk/high-gain and interdisciplinary cutting-edge science collaborations that underpin technological breakthroughs.

Applicants participating in EIC Pathfinder projects are typically visionary scientists and entrepreneurial researchers from universities, research organisations, start-ups, high-tech SMEs or industrial stakeholders interested in technological research and innovation.

Projects typically involve consortia of researchers and other partners from at least three different countries, but there are also opportunities for individual teams and small consortia (two partners). Key topic for geothermal: clean and efficient cooling. Research teams can apply for up to €3 or €4 million in grants.

#### ➤ **EIC Accelerator Challenge**

The EIC Accelerator supports individual Small and Medium Enterprises (SMEs), in particular Startups and spinout companies to develop and scale up game-changing innovations. In some cases small mid-caps (up to 500 employees) are supported.

The EIC Accelerator provides substantial financial support with:

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<sup>18</sup> [https://cinea.ec.europa.eu/news-events/news/horizon-europe-work-programme-2023-24-now-available-2022-12-07\\_en#:~:text=New%20Horizon%20Europe%20work%20programme%20for%202023%2D24%20now%20available,-](https://cinea.ec.europa.eu/news-events/news/horizon-europe-work-programme-2023-24-now-available-2022-12-07_en#:~:text=New%20Horizon%20Europe%20work%20programme%20for%202023%2D24%20now%20available,-The%20European%20Commission&text=With%20a%20budget%20of%20around,our%20economies%20and%20societies%20today.)

[The%20European%20Commission&text=With%20a%20budget%20of%20around,our%20economies%20and%20societies%20today.](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-8-climate-energy-and-mobility_horizon-2023-2024_en.pdf)

<sup>19</sup> [https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-8-climate-energy-and-mobility\\_horizon-2023-2024\\_en.pdf.](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-8-climate-energy-and-mobility_horizon-2023-2024_en.pdf)

<sup>20</sup> [https://eic.ec.europa.eu/about-european-innovation-council\\_en.](https://eic.ec.europa.eu/about-european-innovation-council_en)

- grant funding (non-dilutive) of up to €2.5 million for innovation development costs,
- investments (direct equity investments) of up to €15 million managed by the EIC Fund for scale up and other relevant costs. Companies working on technologies of strategic European interest can apply for EIC investments of more than €15 million.

In addition, EIC selected companies receive coaching, mentoring, access to investors and corporates, and many other opportunities as part of the EIC community.

Key topics for our sector:

- Energy storage (develop a range of breakthrough solutions for electrical and thermal energy storage).
- New European Bauhaus and Architecture, Engineering and Construction digitalisation for decarbonization.

#### 2.3.1.1.6 Clean Energy Transition Partnership

The Clean Energy Transition Partnership (CETPartnership) is a multilateral and strategic partnership of national and regional research, development and innovation (RDI) programmes in European Member States and Associated Countries aiming to boost and accelerate the energy transition and to support the implementation of the European Strategic Energy Technology Plan (SET Plan).

The CETPartnership enables 50 national and regional RTDI programme owners and managers from 30 countries to align their priorities, pool national budgets of 210 Mill EUR for two joint calls in 2022 and 2023, as well as to implement annual joint calls from 2022 to 2027.

The CETPartnership Joint Call 2023<sup>21</sup> is a 2 stages call structured around 12 Call modules. It aims to fund projects that develop applicative solutions and provide results for the clean energy transition. This new call presents for the first time a module dedicated to geothermal energy, the module **CM2023-07: Geothermal energy technologies**<sup>22</sup>.

#### 2.3.1.1.7 Research Fund for Coal and Steel (RFCS)

The Research Fund for Coal and Steel (RFCS) co-finances through grants research and innovation projects in the areas of coal and steel. Every year, the fund supports projects at universities, research centres, and private companies.

RFCS is a EU funding programme supporting research projects in the coal and steel sectors. The RFCS has its own legal bases and stands outside the Multiannual Financial Framework. It is funded via the revenues generated by the European Coal and Steel Community (ECSC) in liquidation assets, which are exclusively devoted to research in the sectors related to the coal and steel industry, in accordance with the provisions of Protocol (37) to the Treaties.

On 16 July 2020, the Commission adopted a package of proposals to revise the three legal bases regulating the Research Programme of the Research Fund for Coal and Steel.

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<sup>21</sup> <https://cetpartnership.eu/calls/joint-call-2023>.

<sup>22</sup> <https://cetpartnership.eu/cm2023-07-geothermal-energy-technologies>.

On 19 July 2021, the EU adopted the new RFCS package. This modernisation act will enable the fund to use a portion of the assets of the European Steel and Coal Community (ECSC) in liquidation for the period 2021-27 in order to provide an annual RFCS allocation of € 111 million.

The Commission has the mandate, through its budgetary services, to manage the assets of the ECSC in liquidation.

This will contribute towards the funding of large clean steelmaking research and innovation breakthrough projects, leading to near zero-carbon steel making by 2030; and research projects for the coal sector, to assist the just transition of formerly operating coal mines or coal mines in the process of closure, and related infrastructure in line with the Just Transition Mechanism.

Specifically to the sector related to the steel industry, the Commission will aim to support research projects via a dedicated Clean Steel co-programmed partnership in synergy with other European Union's programmes, especially with Horizon Europe.

RFCS funded projects will cover:

- steel production processes
- optimised utilisation and conservation of resources, energy savings and industrial efficiency improvements
- health and safety at work
- environmental protection
- technologies supporting coal regions in transition
- emission reductions from steel production

As regards the opportunities for the geothermal sector, coal mines in the process of closure represent an opportunity for geothermal deployment thanks to “energy recovery associated with the mitigation and monitoring of methane emissions and/or with geothermal energy systems” and “repurposing of former coal and lignite mines as well as coal-related infrastructure, including power supply services, with projects for energy storage, renewable energy, hydrogen or hybrid solutions”<sup>23</sup>.

#### 2.3.1.1.8 TEN-E revision

The Trans-European Networks for Energy<sup>24</sup> (TEN-E) and the Connecting Europe Facility<sup>25</sup> (CEF) for Energy provide a framework for the selection and, if needed and justified, financing of cross-border infrastructure projects. The TEN-E is based on Europe-wide infrastructure planning and provides a framework to identify Projects of Common Interest (PCIs)<sup>26</sup>. These projects contribute to the internal energy market, security of supply and sustainability in pre-defined energy infrastructure priority corridors and thematic areas. To be defined as a PCI, projects must have a significant benefit for at least two EU countries and must increase competitiveness, enhance the EU's energy security and contribute to sustainability. Financial assistance provided under CEF Energy aims to maximise its added value towards the decarbonisation of the energy sector. Geothermal energy is locally sourced and thus less subject to geopolitical tensions that might affect the supply of fossil fuels. By diversifying the energy mix to include more geothermal energy, the EU can enhance its energy security.

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<sup>23</sup> See for example the call [RFCS-2023-JT - RFCS-2023-JT-Big Tickets for Coal](#).

<sup>24</sup> See [https://energy.ec.europa.eu/topics/infrastructure/trans-european-networks-energy\\_en](https://energy.ec.europa.eu/topics/infrastructure/trans-european-networks-energy_en).

<sup>25</sup> [Regulation](#) (EU) 2021/1153 of the European Parliament and of the Council of 7 July 2021 establishing the Connecting Europe Facility and repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014.

<sup>26</sup> See [https://energy.ec.europa.eu/topics/infrastructure/projects-common-interest\\_en](https://energy.ec.europa.eu/topics/infrastructure/projects-common-interest_en).

The 5th PCI list currently in force, adopted in November 2021, is defined under the rules set out in the Trans-European Network-Energy Regulation 2022/869<sup>27</sup>. This TEN-E Regulation has been revised in June 2022. The revision entails updated infrastructure categories supporting renewable and low-carbon gases, such as hydrogen, and excludes gas infrastructure and oil pipelines.

Cross-border renewable energy projects aim to enable the cost-effective deployment of renewable energy. Any project meeting the criteria may obtain the status of cross-border renewable energy project (CB RES status) and therefore enter a list of projects eligible for CEF funding (CB RES list). In the current call for CB RES status, they expect applications from projects that promote cross-border cooperation between EU Member States in the field of renewable energy, as well as projects facilitating RES integration through energy storage facilities and contributing both to the strategic uptake of innovative renewables technologies and to the EU's long term decarbonisation strategy.

CB RES projects should contribute to the generation of renewable energy from, for example, on- and offshore wind, solar energy, sustainable biomass, ocean energy, geothermal energy or combinations thereof, their connection to the grid and additional elements such as storage or conversion facilities. CB RES projects are not limited to the electricity sector and can cover other energy carriers and potential sector coupling with, for example, heating and cooling, power-to-gas, storage and transport. As an example, in the list of renewable energy cross-border projects adopted by the Commission on 30 August 2022, there is a cross-border district heating. Located near the cities of Goerlitz and Zgorzelec, between Germany and Poland, this project will be based on a mix of different RES, among which geothermal energy<sup>28</sup>.

#### 2.3.1.1.9 European Investment Bank

The EIB is the European Union's bank. It is owned by the Member States and acts according to their policy priorities. The Bank works closely with other EU institutions to implement EU policy. It focuses on specific priorities including climate action and strategic infrastructure.

The EIB can intervene to support project through different channels such as:

- Loans: recipients range from large corporations to municipalities and small and medium-sized enterprises;
- Technical Assistance: which is provided by a team of experts (economists, engineers and sectoral specialists) to complement EIB financing facilities;
- Guarantees;
- Venture Capital: channeled through intermediaries.

The EIB lending policy forces the Bank to account for issues such as the climate impact of its investment portfolio. The EIB has steadily increased the proportion of financing for climate action, from 25% in 2014 to 31% in 2019<sup>29</sup>. Over the last few years, renewable energy and energy efficiency projects constituted approximately one half of the Bank's climate action projects, equivalent to around 40 percent of total climate action lending.

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<sup>27</sup> See [Regulation](#) (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013.

<sup>28</sup> See [https://ec.europa.eu/energy/maps/cbres\\_fiches/CbresFiche\\_2022-10.pdf](https://ec.europa.eu/energy/maps/cbres_fiches/CbresFiche_2022-10.pdf).

<sup>29</sup> [https://www.eif.org/news\\_centre/publications/eib\\_group\\_climate\\_bank\\_roadmap\\_en.pdf](https://www.eif.org/news_centre/publications/eib_group_climate_bank_roadmap_en.pdf).

### 2.3.1.1.10 Strategic Technologies for Europe Plan (STEP)

On 20 June 2023, the Commission issued a Proposal for a Regulation proposing a new Strategic Technologies for Europe Platform (STEP)<sup>30</sup>.

While the EU has been providing steady financing both to the green and digital transitions, the funds are generally spread across various spending programmes and following different rules. Leveraging on existing instruments and governance frameworks will speed-up the implementation and allow to mobilise higher amounts of financial support. This is the aim of the STEP.

On that basis, the objective of the STEP is three-fold:

1. Providing flexibility in existing instruments
2. Reinforcing the firepower of existing instruments
3. Creating synergies among existing instruments

To strengthen European sovereignty and security, accelerate the Union's green and digital transitions and enhance its competitiveness, reduce its strategic dependencies, favour a level playing field in the Single Market for investments throughout the Union, and promote inclusive access to attractive, quality jobs, the Platform shall pursue the following objectives:

(a) supporting the development or manufacturing throughout the Union, or safeguarding and strengthening the respective value chains, of critical technologies in the following fields:

(i) deep and digital technologies

**(ii) clean technologies**

(iii) biotechnologies

(b) addressing shortages of labour and skills critical to all kinds of quality jobs in support of the objective under point (a).

The technologies referred to above shall be deemed to be critical where they meet at least one of the following conditions:

- (a) bring an innovative, cutting-edge element with significant economic potential to the Single Market;
- (b) contribute to reduce or prevent strategic dependencies of the Union.

#### **Providing flexibility in existing instruments to better support relevant investments**

Cohesion funds: to incentivise Member States, the Commission proposes a new priority across all major funds the European Regional Development Fund (ERDF), Cohesion Fund (CF), and the Just Transition Fund (JTF). The Commission also proposes to open up those funds for large companies in less developed and transition regions, as well as in more developed regions of Member States with a GDP per capita below the EU average, to unleash greater investments in the target areas of the STEP. By providing financial incentives in the form of higher pre-financing and EU financing, Member States are encouraged to reprioritise their programmes. Under those funds, the Commission also proposes a 30% pre-financing in 2024 to incentivise uptake and an increase the EU financing to 100% for STEP projects.

InvestEU: to incentivise Member States to provide resources to InvestEU, the EU flagship programme to boost investments in critical industries, the Commission proposes to increase the transfers to InvestEU from the recovery and resilience plans from 4% to 10%.

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<sup>30</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0335>.

RRF: to facilitate the RRF related contributions to the Member State compartment of InvestEU and its uptake, the Commission will adapt the Technical guidance on the application of 'do no significant harm' under Regulation (EU) 2021/241 to ensure that financial products implemented under the InvestEU Fund can indicate, where applicable the absence of significant harm to the six environmental objectives set out in Article 17 of Regulation (EU) 2020/852 by applying InvestEU rules in combination with the relevant implementing partner's policies.

Innovation Fund: new STEP priorities will be included in the Innovation Fund, which is a funding programme for the deployment of net-zero and innovative technologies; the European Defence Fund, which is a funding programme for the research and development of defence technology, and the European Innovation Council (EIC) under Horizon Europe, which is Europe's flagship innovation programme to identify, develop and scale up breakthrough technologies.

European Innovation Council (EIC): this initiative expands types of support that can be provided through the EIC by allowing to provide equity-only to non-bankable SMEs and small mid-caps carrying out breakthrough and disruptive innovation in critical technologies and regardless of whether they previously received other types of support from the EIC Accelerator. The proposed extension would provide equity-only support to high risk, high potential companies targeting investments in the range of EUR 15 to 50 million and catalysing financing rounds with co-investors in the range of EUR 50 to 250 million.

#### **Reinforcing the firepower of existing instruments to speed up relevant investments**

In terms of resources, it is proposed that an additional total amount of EUR 10 billion is allocated to support existing and well-proven EU investment schemes aimed at strengthening STEP investments.

- InvestEU: this calls for reinforcing the EU guarantee by an additional EUR7.5 billion; requiring a financial top-up of EUR 3 billion with a 40% provisioning rate. This additional guarantee should be exclusively used for project contributing to STEP priorities and has the potential to trigger up to EUR 75 billion of investments with an average multiplier of 10.
- European Innovation Council (EIC): a EUR 0.5 billion budgetary reinforcements combined with EUR 2.13 billion from redeployment and de-commitments will enable the EIC to provide unprecedented equity investments for tickets between EUR 15 million and EUR 50 million. With an average multiplier of 5, this can lead to EUR 13 billion of fresh equity support to non-bankable SMEs and small mid-caps.
- Innovation Fund: to respond to the growing needs for innovation to maintain the EU's competitiveness on global markets, the size of the Innovation Fund should be increased by EUR 5 billion. In line with the objectives of ensuring cohesion and promoting the Single Market, and in order to support the green transition and the development of clean technologies throughout the Union, the additional financial envelope shall be made available through calls for proposals open to entities from Member States whose average GDP per capita is below the EU average of the EU-27 measured in purchasing power standards (PPS) and calculated on the basis of Union figures for the period 2015-2017. Taking into account experience to date, this should result in overall investments of around EUR 20 billion.
- European Defence Fund: to respond to growing needs, the European Defence Fund should be increased by EUR 1.5 billion. Taking into account the limited experience to date, this could result in overall investments of around EUR 2 billion.



Taken together, the reinforcements of the foregoing four programmes and instruments (InvestEU, European Innovation Council, Innovation Fund, European Defence Fund) can be expected to lead to additional investments in the critical technologies covered by STEP of around EUR 110 billion.

By providing financial incentives in cohesion policy funds in the form of higher pre-financing and co-financing, Member States are encouraged to reprioritise their programmes. Every 5% of reprogramming towards STEP priorities leads to EUR 18.9 billion of resources made available, in addition to EUR 6 billion to be paid out from the Just Transition Fund. The increase of the ceiling under the RRF to use resources for InvestEU products via its national compartments represents an additional flexibility for Member States of EUR 30 billion potentially available for such sovereignty investments. Altogether, the total estimated amount of new investments through STEP could reach up to EUR 160 billion.

### **Creating synergies among instruments to better support relevant investments**

Sovereignty Portal: to access those funds, companies and project promoters will be able to consult a new publicly available website (the 'Sovereignty Portal'). This Portal will provide information about relevant funding opportunities with the ongoing and upcoming calls under the EU programmes contributing to the STEP objectives as well as guidance and contacts to the existing advisory hubs.

Sovereignty Seal: a 'Sovereignty Seal' will be awarded to projects contributing to the STEP objectives, provided that the project has been assessed and complies with the minimum quality requirements, in particular eligibility, exclusion and award criteria, provided by a call for proposals under Horizon Europe, the Digital Europe programme, the EU4Health programme, the European Defence Fund or the Innovation Fund, and regardless of whether the project has received funds under those instruments. These minimum quality requirements will be established with a view to identify high quality projects. This Seal offers a unique opportunity to build on the applicable high-quality evaluation processes under those instruments. This Seal will be used as a quality label and will help projects attract public and private investments by certifying its contribution to the objectives of the STEP and therefore guiding market participants in their investment decisions. Moreover, the Seal will promote better access to EU funding and financing, notably by facilitating cumulative or combined funding from several Union instruments. This would, for instance, allow Member States to grant support from ERDF and ESF+ to projects having been awarded a Sovereignty Seal directly, subject to compliance with applicable State aid rules. The Commission is also working to ensure synergies between the rules of the Innovation Fund and the State aid rules to ensure a more streamlined process.

### 3 Conclusions

Geothermal energy has the characteristics to play a crucial role in our future energy mix: decarbonised, providing affordable heating and cooling for society, and allowing competitiveness of European industry.

On policies and regulations, the status quo shows that important steps have recently been made, but the key legislation adopted in the framework of the EU Green Deal and the REPowerEU Plan must be implemented.

As regards research and innovation, an important provision is included in Article 3 of the revised Renewable Energy Directive. This provision states that to complement their national objectives and funding targets, to promote the production of renewable energy from innovative renewable energy technology and to safeguard the continued leadership of the Union in research and development of innovative renewable energy technology, each Member State should set an indicative target for innovative renewable energy technology of at least 5% of newly installed renewable energy capacity by 2030. Only time will tell us whether this provision will be duly implemented at national level.

Moreover, the European climate and energy policy framework is a major element driving financing to geothermal RD&I. The European Union in general has set up many facilities that direct financing to innovation in geothermal at every stage, from early research to the demonstration of deep geothermal energy project at scale. However, more should be done at EU level to provide a fair level playing field for geothermal technologies in accessing funding for RD&I. Non-price criteria, for example, should be taken more in account in order to better assess the comparative advantages of geothermal technologies in comparison to other renewable solutions.