

# SET4BIO

## RENEWABLE FUELS AND BIOENERGY FOR A LOW-CARBON EUROPE - ACCELERATING THE IMPLEMENTATION OF THE SET-PLAN ACTION 8

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## EXECUTIVE SUMMARY

This report, *D5.3 Report on R&D&D frameworks and following policy recommendations summarised in Summary paper for policy makers*, is part of Work Package 5 Monitoring and coordination of SET Plan actions, and specifically Task 5.4 Summary for policy makers. The objective of the Task is to summarize outcomes and lessons learnt in SET4BIO project and convert them to policy-relevant recommendations to further accelerate development of bioenergy and renewable fuels sectors.

The report presents the policy landscape for bioenergy and renewable fuels sectors, in particular in the SET Plan context, as well as the methodology how the policy recommendations were formulated. The recommendations, synthesizing the findings that accumulated during the project lifetime, are listed in the report. However, the comprehensive description of the recommendations is given in the Summary paper for policy makers: *'Policy perspective on development and deployment of bioenergy and renewable fuels - Five steps for acceleration across Europe and beyond'*, which is available at the SET4BIO website: <https://www.etipbioenergy.eu/set4bio/outputs-and-resources>.

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### Statement of Originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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## Introduction

Climate change and the sustainability challenge in general demand fast and timely action from society and EU at large. As we are far from achieving targets of being in balance with nature strong policies and ambitions are needed. It is clear that a large number of solutions will need to be deployed with varying roles depending on local circumstances. Bioenergy and renewable fuels are part of the available palette of technology options, supporting the reduction of greenhouse gas emissions in the EU energy mix, decreasing fossil fuel dependency, and building a circular economy. As climate change demands swift action it is vital to have a comprehensive, clear, and uncomplicated policy framework so that all key technologies can develop and unlock their full potential.

The Strategic Energy Technology Plan (SET Plan) is considered as the reference framework for addressing clean energy research and innovation in Europe. Its key purpose is to influence R&I agendas and leverage resources for efficient and cost-competitive low-carbon energy technologies. Connecting and aligning R&I priorities of EU, Member States, and industry is a central part of SET Plan actions. The changing EU energy agenda creates a challenge for the SET Plan to keep up with EU policies. As a result, a SET Plan revamp is currently taking place to align it with the recently adopted policies, e.g., European Green Deal, the Fit-for-55 package, and the REPowerEU Plan.

One of the 14 SET Plan Implementation Working Groups (IWGs), bioenergy and renewable fuels working group<sup>1</sup>, was established in 2016 and focuses on bioenergy and renewable fuels for sustainable transport. It has set up an Implementation Plan (IP) in 2018 to influence R&I agendas and leverage resources on EU and national level and in industry. The IP and its Implementation Working Group number 8 (IWG8) form an important forum for the stakeholders to discuss, share knowledge and best practices, and create a common understanding of possible ways forward.

SET4BIO is a collaborative Horizon 2020 Coordination and Support Action (CSA) project to support the implementation of the SET Plan Action 8 - Bioenergy and renewable fuels by acting as a competence center for the IWG8. According to its strategy designed around three pillars, SET4BIO activates stakeholders, mobilizes resources, and stimulates innovation. SET4BIO project has observed a significant potential for a stronger implementation of the SET Plan in the EU Member States and vice versa a great potential for Member States to strengthen the SET Plan as such.

SET4BIO collected data from multiple sources and produced a number of outputs during its lifetime (March 2020 - August 2023). The outputs aim at activating stakeholders, mobilizing resources, and putting new innovations in the development pathway to support the goals of the SET Plan in the field of bioenergy and renewable fuels. This report presents the policy landscape for bioenergy and renewable fuels sectors, in particular in the SET Plan context, and describes the methodology to synthesize the SET4BIO findings in the policy recommendations that aim at supporting the implementation of the SET Plan both at EU and national level. A comprehensive description of the recommendations is given in the Summary paper for policy makers: *'Policy perspective on development and deployment of bioenergy and renewable fuels - Five steps for acceleration*

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<sup>1</sup> [https://setis.ec.europa.eu/implementing-actions/renewable-fuels-and-bioenergy\\_en](https://setis.ec.europa.eu/implementing-actions/renewable-fuels-and-bioenergy_en)

across Europe and beyond’, which is available at the SET4BIO website: <https://www.etipbioenergy.eu/set4bio/outputs-and-resources>.

## 1. Methodology

Policy recommendations elaborated in SET4BIO are based on the findings from the bioenergy and renewable fuels sectors that were produced during the project lifetime (March 2020 - August 2023), using information from multiple sources. Furthermore, the process was accumulative as new information collected and elaborated was often built on the earlier findings, as well as iterative through updates of many deliverables during the project. The process of formulating SET4BIO policy recommendations starting from different data sources is summarized in Figure 1.

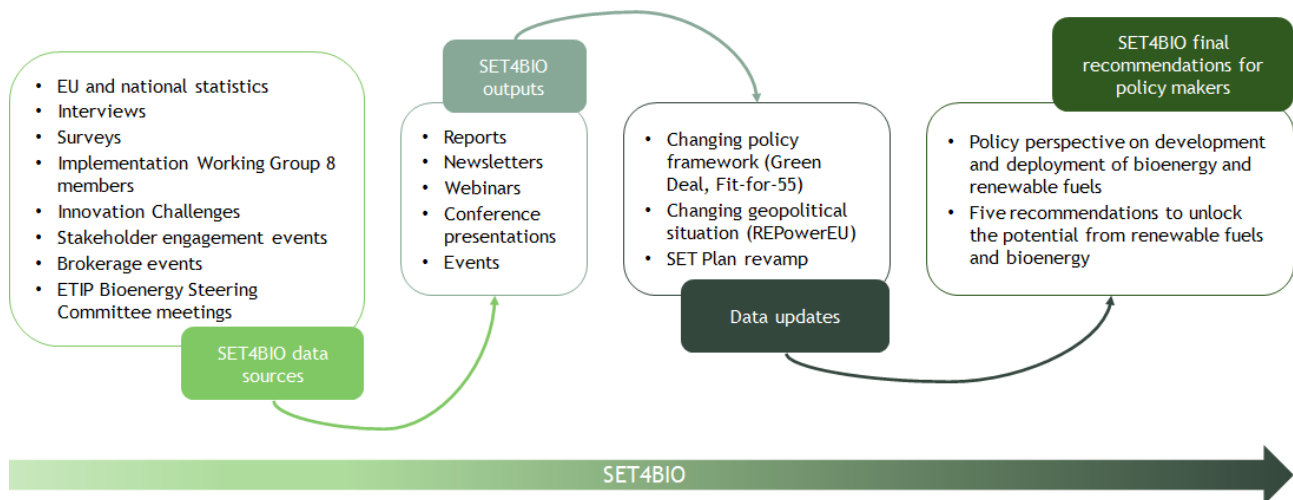


Figure 1. Process followed in SET4BIO to synthesize the project and provide policy recommendations.

The recommendations were elaborated from the work conducted and related findings in SET4BIO project. Varying types of information sources were used in the project, including statistics, interviews, and surveys. In additions, stakeholder views and other learnings were collected in events organized by the project, i.e., Innovation Challenges, brokerage events, and stakeholder engagement workshops. Furthermore, members of Implementation Working Group 8 and ETIP Bioenergy provided valuable inputs. Individual parts of the work conducted in SET4BIO are documented in multiple deliverables and other outputs, e.g., presentations and factsheets. Project deliverables that were used as a basis for policy recommendations are listed in Table 1. Many of the deliverables were updated during the project as planned in the Work Programme. Taken the fast-developing policy framework and changes in geopolitical situation in Europe, among other things, this approach revealed as a good one. Other project outputs that were used to formulate the policy recommendations can be found at the project website (<https://www.etipbioenergy.eu/set4bio/outputs-and-resources>).

Table 1. SET4BIO deliverables that were used as a basis for policy recommendations.

D#	Deliverable title	Lead Beneficiary	Type	Dissemination level
D1.1	<a href="#">Report on the state of play of the SET Plan IP8</a>	SINTEF	Report	Public
D1.2	<a href="#">Report on institutional and competitive public funding opportunities</a>	SINTEF	Report	Public
D1.3	<a href="#">Report on private financing opportunities to support the realisation of the SET Plan IP8</a>	CIRCE	Report	Public
D2.1	<a href="#">Industry stakeholder map</a>	FNR	Other	Public
D2.2	<a href="#">Report on industry stakeholder need and gap assessment</a>	FNR	Report	Public
D2.3	Assessment of options for industry commitment	FNR	Report	Confidential
D2.4	Report and documentation on commitment reached by industry stakeholders	FNR	Report	Public
D3.1	<a href="#">Innovation Challenge in SET4BIO</a>	RISE	Report	Public
D3.2	<a href="#">Experiences from the SET4BIO challenges</a>	RISE	Report	Public
D3.3	Summary paper, challenge schemes and lessons learned	RISE	Report	Public
D3.4	<a href="#">Identification of topics for SET4BIO Innovation Challenge</a>	RISE	Report	Public
D4.2	Outcomes of brokerage events organised across Europe	CIRCE	Report	Public
D4.3	Support activities to project coordinators	CIRCE	Report	Confidential
D4.4	<a href="#">Best practices and recommendations for project implementation support programmes</a>	CIRCE	Report	Public
D5.1	KPI proposal	RISE	Report	Confidential
D5.2	KPI report	RISE	Report	Public
D5.4	<a href="#">Global Outlook</a>	VTT	Report	Public

## 2. Policy landscape for renewable fuels and bioenergy in EU

Climate change and the sustainability challenge in general demand swift action from society and EU at large. To steer Europe in the right direction many initiatives and policies have been introduced and adapted since many years back. Climate change is directly related to the way we use energy and transport goods and people in our societies. As we are far from achieving target of being in balance with nature strong policies and ambitions are needed. How the end state with a truly sustainable society looks like is impossible to predict. However, it can be concluded that a large number of solutions will need to be deployed with varying roles depending on local circumstances. As climate change demands swift action it is also vital to have a comprehensive, clear, and uncomplicated policy framework so that all key technologies, including bioenergy and biofuels, can develop and unlock their full potential. In recent years a massive number of new policies have been introduced following the ambitions in the EU Green Deal (Figure 2).

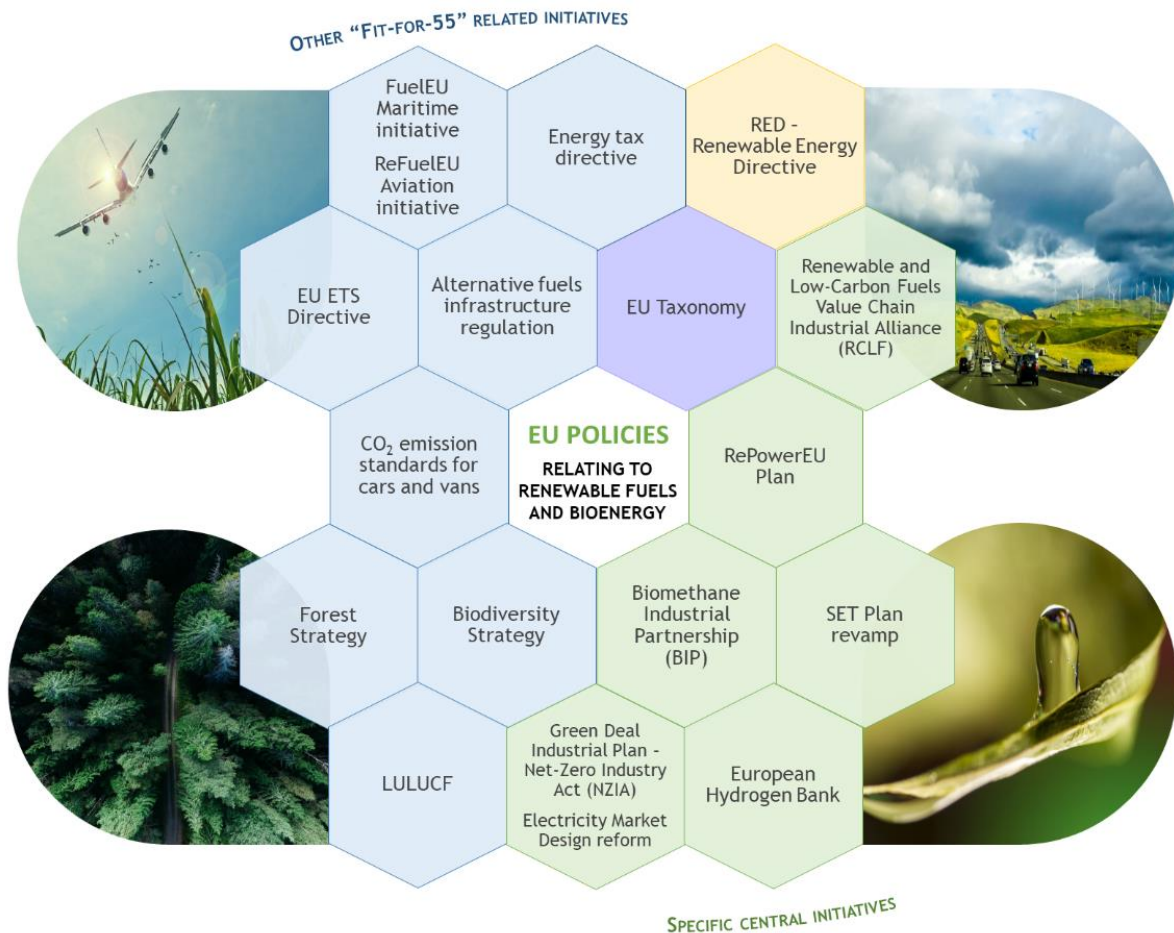


Figure 2. EU policies relating to renewable fuels and bioenergy. Figure: SET4BIO.

The recent changes in the frame conditions, not least the Russian invasion of Ukraine in 2022 and tightened climate change mitigation targets in EU have given renewed importance to **decarbonizing energy and transport sectors and securing energy supply**. Renewable fuels and bioenergy are one of the few solutions that exist to make a direct impact in the short-term for the **hard-to-abate sectors and complementing other renewables in the green transition**. In particular, aviation, heavy duty road transportation, and maritime are sectors that could benefit



from biofuels rapidly. However, the prevailing policy framework and certainty of its stability define whether biofuels and bioenergy can play these roles or not. Instead, solutions that are still far away from massive market deployment are achieving attention.

### 3. SET Plan as a stepping-stone framework to accelerate the deployment of green technologies

[SET Plan](#) - Strategic Energy Technology Plan - is considered as the reference framework for addressing clean energy research and innovation in Europe. Its key purpose is to influence R&I agendas and leverage resources for efficient and cost-competitive low-carbon energy technologies both at European and national level by bringing together and aligning R&I priorities from EU, Member States, and industry.

A lot of changes in the policy landscape has taken place since the launch of SET Plan in 2007. As a results, the latest revision of the SET Plan in 2015 aligned it with the Research, Innovation and Competitiveness Dimension of the Energy Union framework strategy, and 10 actions and 14 corresponding Implementation Working Groups were set up. The changing EU energy agenda creates a challenge for the SET Plan to keep up with EU policies. As a result, a SET Plan revamp is taking place to align it with the European Green Deal, the Fit-for-55 package, the REPowerEU Plan, and the European Research Area Agenda.<sup>2</sup>

The aim of the revamp is to create a stronger role for SET Plan in the alignment of EU, national, and industrial energy R&I actions. This also means finding and capitalizing synergies between regional, national, and EU R&I funding schemes. Some of the targets of the revamp include better engagement of SET Plan countries, making SET Plan more visible at European and national level, and strengthening industrial involvement through European Technology and Innovation Platforms (ETIPs).

The SET Plan should be a central piece of the future energy strategy in Europe and act as a stepping-stone to accelerate and deploy technologies. In the SET Plan context, a lot of plans were set with a multi-technology and neutral approach. It would be a missed opportunity to not fully integrate the SET Plan utilizing all the work and knowledge that has already been gathered for many years when evolving the policy framework. Time is short to act, and it is important to push technologies. However, it is important to continue having a technology neutral approach together with innovative support schemes for new solutions and combination of already known ones. Often the SET Plan is absent or not visible in new policies relating to energy both on EU and Member State level. The SET4BIO project has observed a significant potential for a stronger implementation of the SET Plan in the EU Member States and vice versa a great potential for Member States to strengthen the SET Plan as such.

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<sup>2</sup> European Commission, (2022). SET Plan Progress Report 2022.

[https://publications.jrc.ec.europa.eu/repository/bitstream/JRC131032/online\\_setplan\\_template\\_report\\_2022\\_1.pdf](https://publications.jrc.ec.europa.eu/repository/bitstream/JRC131032/online_setplan_template_report_2022_1.pdf)

#### 4. Implementation Plans as strategic elements for SET Plan implementation

The target of the 14 SET Plan Implementation Working Groups (IWGs) is to set common EU, national, and industrial research priorities on low-carbon energy to influence R&I agendas and leverage resources. This is done by setting up and updating Implementation Plans (IPs) by each IWG. One of 10 SET Plan actions is *Bioenergy and renewable fuels for sustainable transport*, which has a dedicated [Implementation Working Group](#) and [Implementation Plan 8](#) carrying the same name. The IP and its Implementation Working Group form an important forum for the stakeholders to discuss, share knowledge and best practices, and create a common understanding of possible ways forward.

IWGs are supported by European Technology and Innovation Platforms (ETIPs), the European Energy Research Alliance (EERA), and ad-hoc project support.

#### 5. National Energy and Climate Plans connecting SET Plan to national level

One way the SET Plan is connected to Member State level is through [National Energy and Climate Plans \(NECPs\)](#), especially through their Research, Innovation and Competitiveness Dimension of the Energy Union framework strategy. This dimension in a NECP should describe national objectives and funding targets for R&I, how the SET Plan objectives and policies are being translated to a national context, status of low-carbon technologies, and level of spending on low-carbon technologies.

However, in many cases the connection between SET Plan R&I actions and objectives, and Member State objectives, policies, and measures seems to be missing. The SET Plan R&I actions and monitoring of NECPs are not connected and nomenclature is not aligned. However, positive signs of alignment have been seen, Spain being a good example as it defines the country's objectives for energy and climate R&I partly based on those set out in the SET Plan. One of the SET Plan revamp targets is to create a stronger role for SET Plan in improving the way that NECPs are prepared, updated, and monitored.

#### 6. Funding and financing available for renewable fuel and bioenergy projects

Several funding and financing opportunities are available at European, national, and regional level across the Technology Readiness Level (TRL) scale.

**Public institutional funding** is usually given to universities and research organizations to cover large thematic areas relevant to the ministries allocating the funds.

**Competitive public funding** usually provides short-term funding for a certain research project or infrastructure. In most countries, the fund budgets are allocated by the government or ministries and distributed through competitive calls by various funding agencies. This means that the

fundings agencies have the capability of proposing future programs and calls adjusting the focus to the needs of the Implementation Plan 8 according to its progress. The trend in public funding programs is towards public-private partnerships.

In Europe, public funding is provided mainly for lower TRL projects (up to TRL 6). Countries associated to Implementation Plan 8 use 0.04-0.73% of the countries' GDPs to finance energy-related RD&D (Figure 3). However, these numbers include all energy topics.

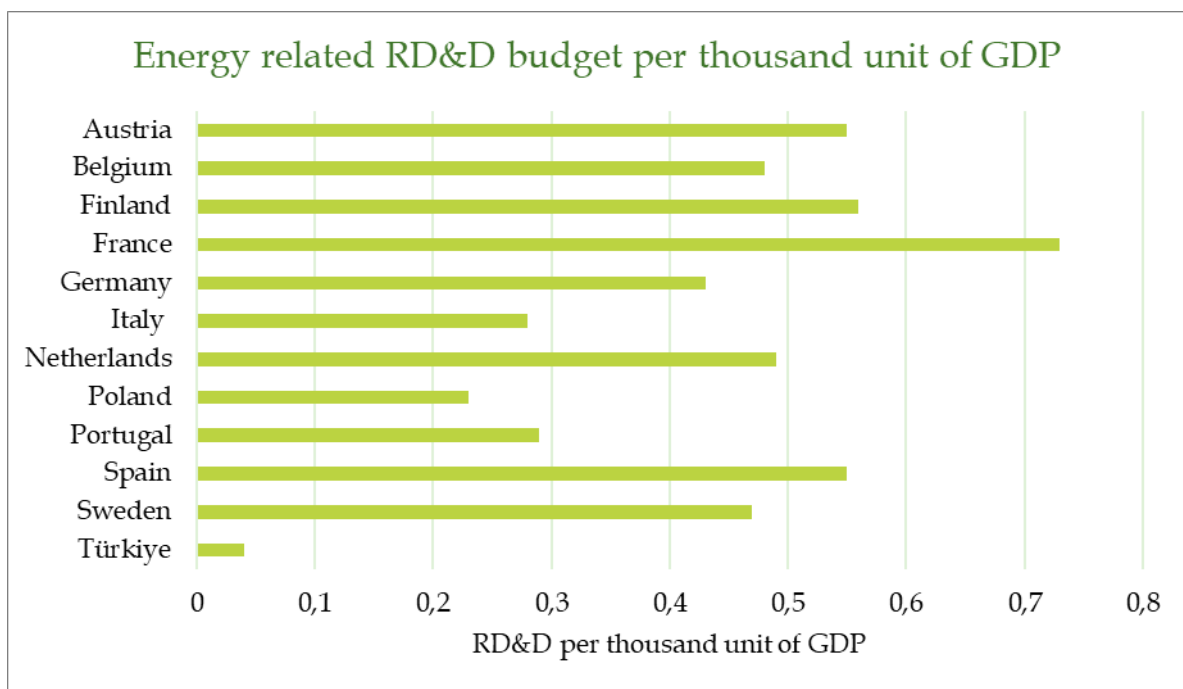


Figure 3. RD&D budget per thousand unit of GDP in countries associated to Implementation Plan 8. Depending on country's data availability, the amounts are shown are based on energy RD&D budgets in 2019-2022. Data source: IEA.

**Private financing** is normally based on equity investments, and loans. However, it can be integrated with the use of grants, which are normally disbursed by public-related organizations. Some semi-private organizations can also disburse grants. In recent years, public organizations have also been developing blended instruments.

Private funds are used to finance the entire TRL range, but typically the focus is at high TRL, commercialization, and scale-up.

Understanding of the types of financing existing (grant, equity, and loan) and their availability in terms of TRL and volume per project is important information for project developers. One way to support them to identify suitable financing option is shown in Figure 4.

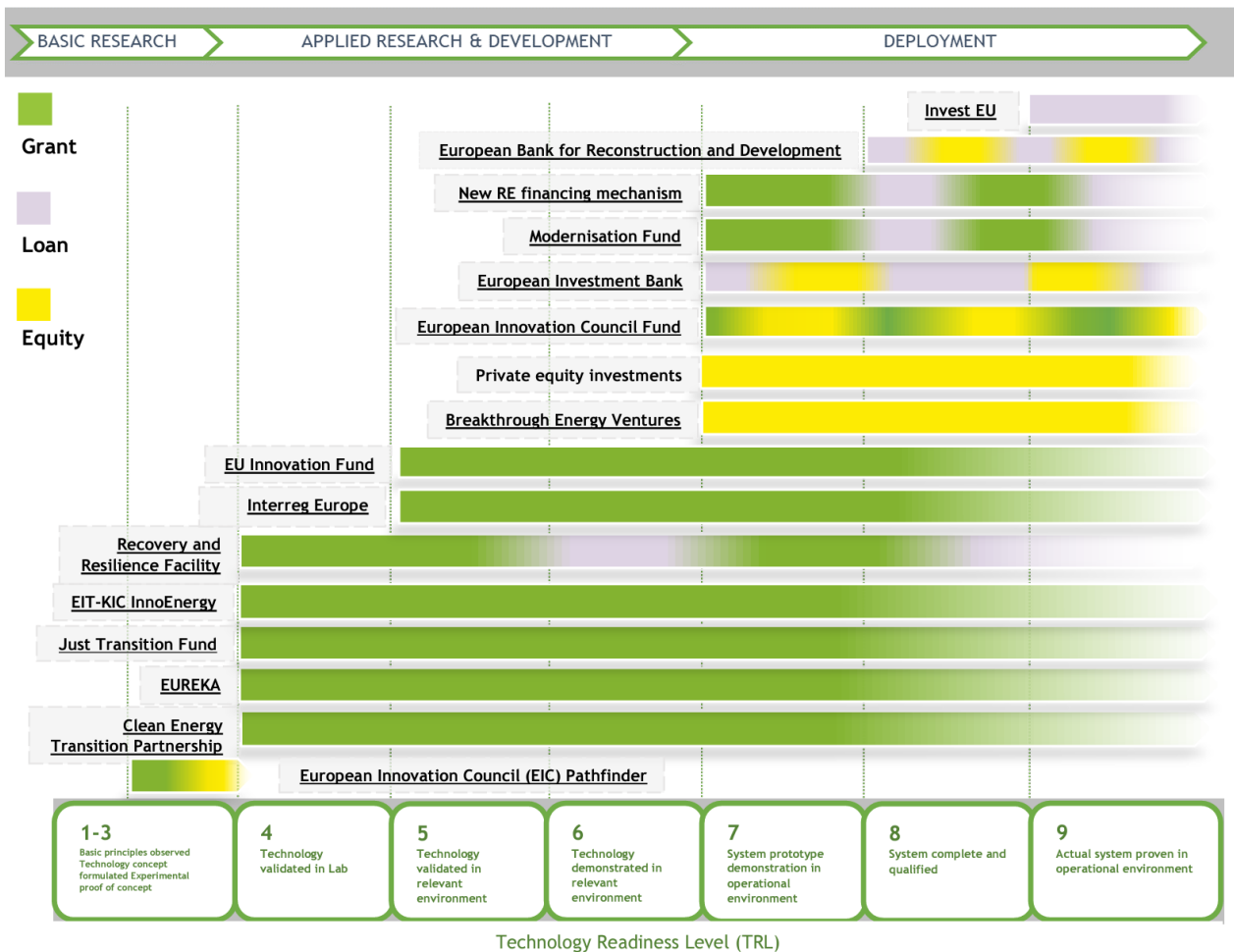


Figure 4. Funding instruments available for renewable fuels and bioenergy, classified to grants, loans, and private equity according to TRL scale. Typically, low TRL is covered by grants, and higher TRL by loans and private equity. Figure: SET4BIO.

Multiple Implementation Plan 8 relevant projects have been funded through Recovery and Resilience Facility (RRF), IPCEI<sup>3</sup>, and Innovation Fund instruments as well as under Horizon Europe for lower TRL levels. Temporary RRF instrument was introduced by the European Commission in 2020 as a part of the Next Generation EU to support the economic recovery from the COVID-19 pandemic. RRF and IPCEI came in force as a result of Fit-for-55 package, REPowerEU, and Russian Invasion of Ukraine. Projects financed through these schemes are close to commercialization with TRLs of 7-8. As a direct result of IPCEI and to some extent RRF, the investment interest in renewable hydrogen projects is high and many projects are in the pipeline.

<sup>3</sup> Important Projects of Common European Interest

## 7. Recommendations to unlock the potential from renewable fuels and bioenergy

Based on the data collected from different sources and further elaborated in SET4BIO project between March 2020 and August 2023, the following policy recommendations can be given. The final goal of the recommendations is to support and accelerate the implementation of Implementation Plan 8 both on Member States' level and on EU level.

SET4BIO recommendations for policy makers:

1. Align RDI strategies and funding programs on national and EU level and with industry
2. Harmonize data collection to facilitate monitoring and assessment of RDI contribution to targets
3. Support innovation actions throughout the TRL scale
4. Clear, stable, and predictable framework to guarantee the market pull
5. Enhance complementary collaboration at EU and global level

The full description of policy recommendations is provided in the Summary paper for policy makers: 'Policy perspective on development and deployment of bioenergy and renewable fuels - Five steps for acceleration across Europe and beyond', which is available at the SET4BIO website: <https://www.etipbioenergy.eu/set4bio/outputs-and-resources>.