Renewable Fuels And Bioenergy For A Low-Carbon Europe
- Accelerating the implementation of the SET Plan

Policy perspective on development and deployment of bioenergy and renewable fuels

Five steps for acceleration across Europe and beyond

Title

Policy perspective on development and deployment of bioenergy and renewable fuels – Five steps for acceleration across Europe and beyond

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The original documents and authors are cited in the references.

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. SET4BIO activates stakeholders, mobilizes resources for stimulating the investments for the deployment of bioenergy and renewable fuels at large-scale in Europe, and stimulates innovation.
www.set4bio.eu

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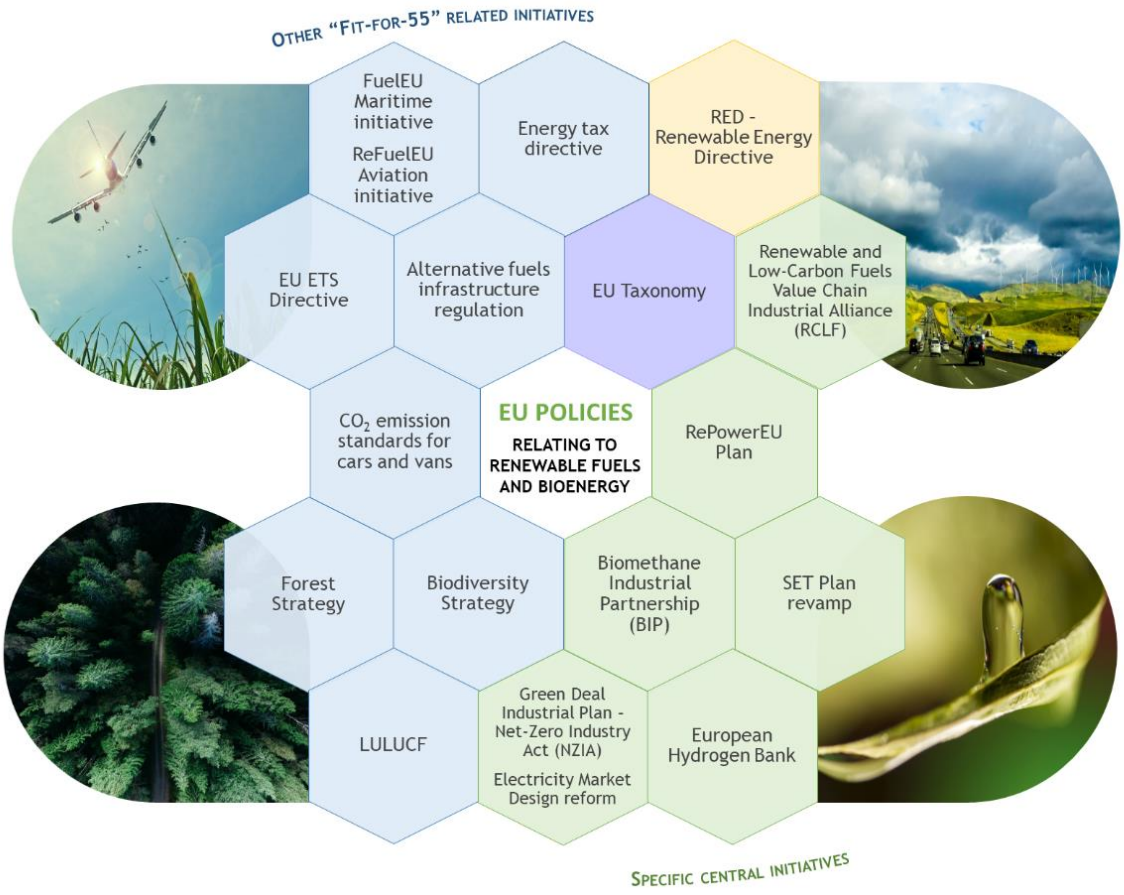
1 Policy landscape for renewable fuels and bioenergy in EU

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 renewable fuels, 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.



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.

References and further resources

Chapter from SET4BIO Deliverable 5.3 - Report on R&D&D frameworks and policy recommendations

2 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[1].

1

[1] European Commission, (2022). SET Plan Progress Report 2022. https://publications.jrc.ec.europa.eu/repository/bitstream/JRC131032/online_setplan_template_report_2022_1.pdf

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.

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 Implementation Working Group and Implementation Plan 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.

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.

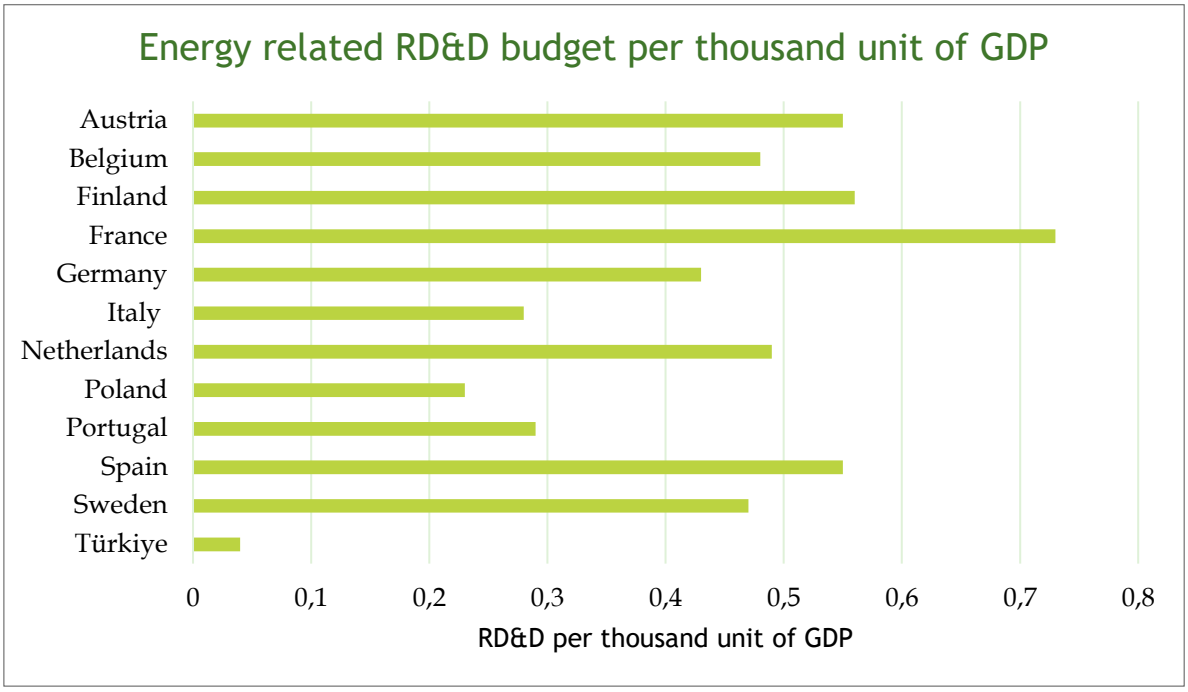
Funding and financing available for renewable fuel and bioenergy projects

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. However, these numbers include all energy topics.

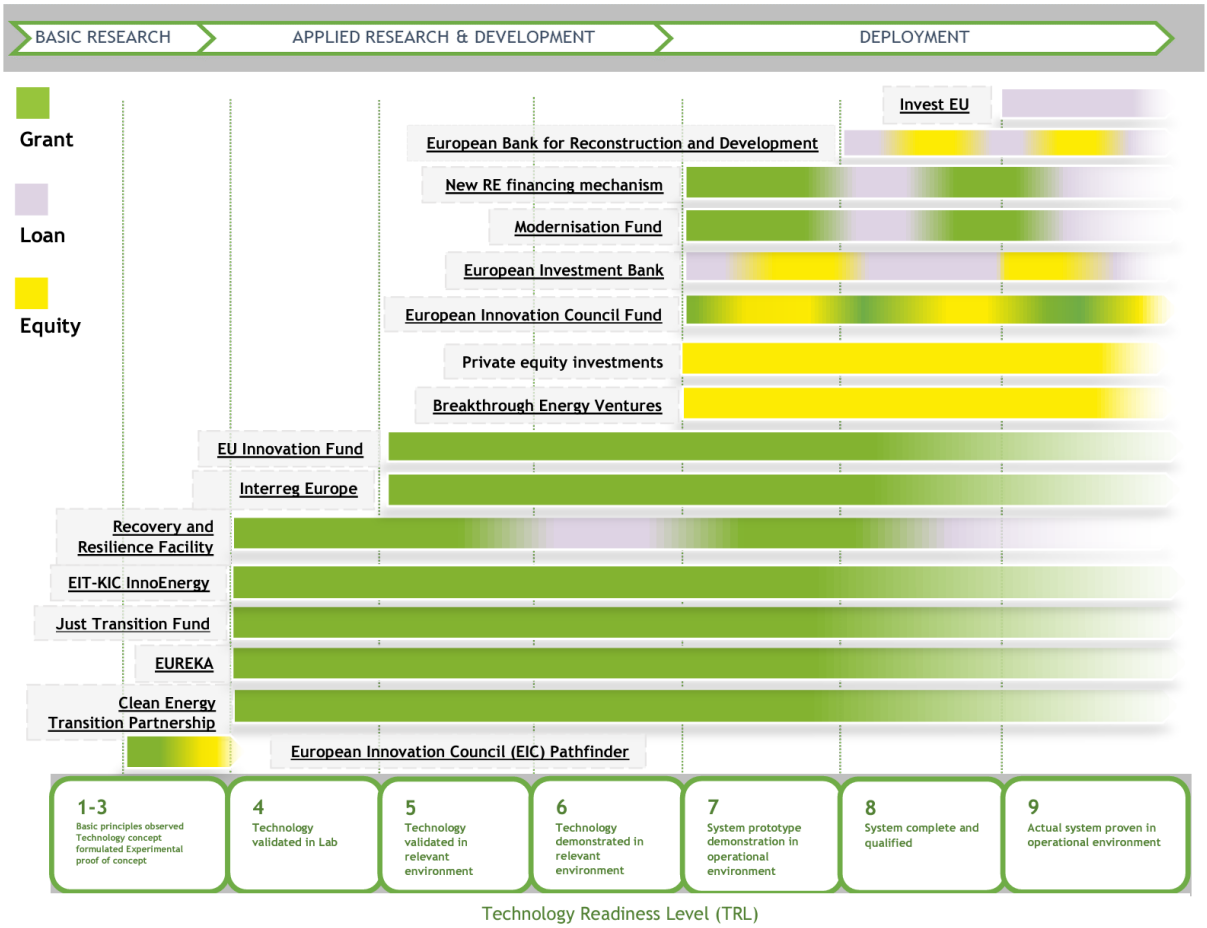


RD&D budget per thousand unit of GDP in countries associated to Implementation Plan 8. Depending on country's data availability, the amounts shown are based on energy RD&D budgets in 2019-2022. Data source: IEA.

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 the figure below.



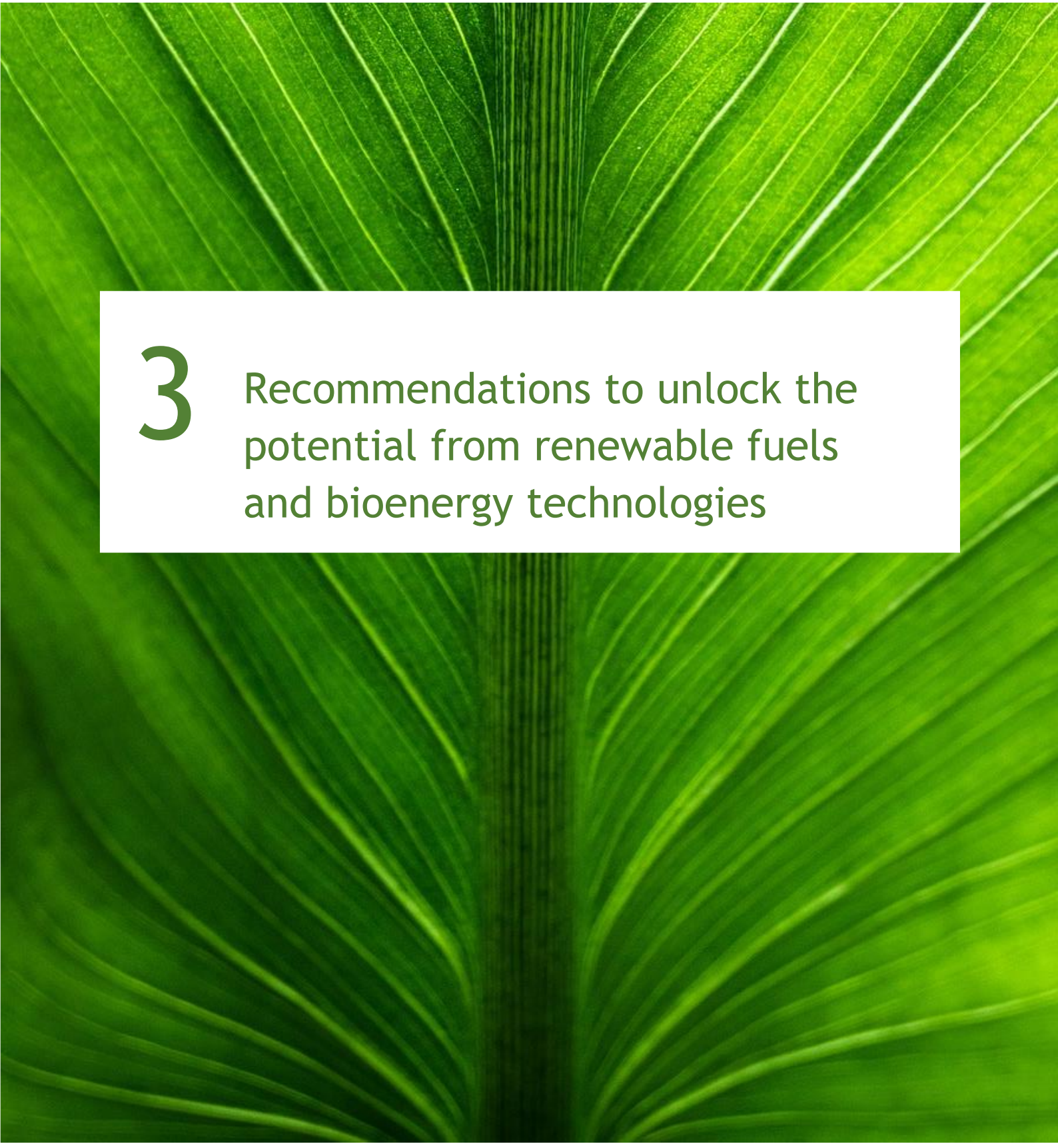
Funding instruments available for renewable fuels and bioenergy, classified to grants, loans, and private equity according to TRL scale. Typically, low TRL is covered by grants, and higher TRL by loans and private equity. Figure: SET4BIO.

Multiple Implementation Plan 8 relevant projects have been funded through Recovery and Resilience Facility (RRF), IPCEI[2], 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.

References and further resources

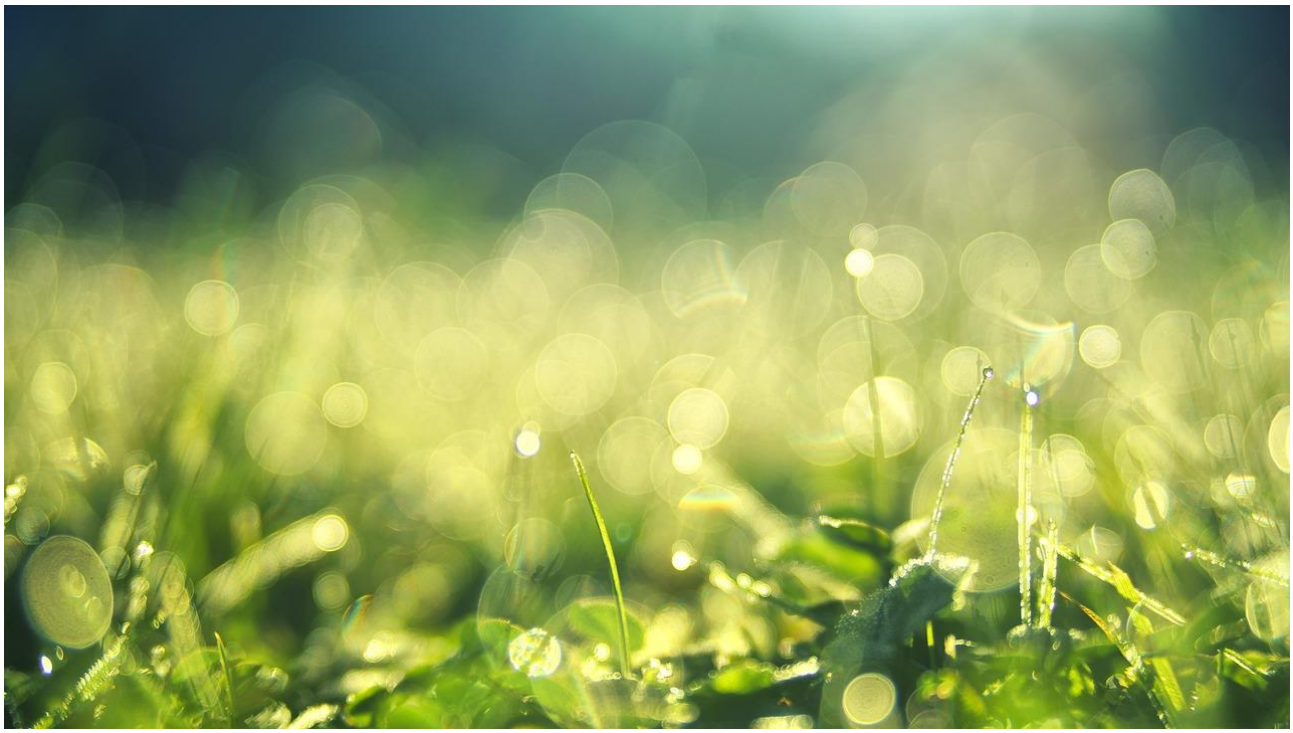
Chapter from SET4BIO Deliverable 5.3 - Report on R&D&D frameworks and policy recommendations

[2] Important Projects of Common European Interest.



3 Recommendations to unlock the potential from renewable fuels and bioenergy technologies

1) Align RDI strategies and funding programs on national and EU level and with industry



Member States and regions within the EU have autonomy in establishing RDI strategies and funding schemes, leading to fragmentation at EU level. The national strategy is often aligned with the European strategies, but the extent varies. There is seldom alignment with other countries' strategies. Furthermore, many European countries are divided into regions with different levels of autonomy in research funding. Countries and regions often have many funding agencies. The level of coordination, cooperation, and information exchange between the national and regional funding agencies is unclear. Different value chains may also belong to different funding agencies. Different regions, languages as well as policy systems may jeopardize efficient implementation of SET Plan.

It is recommended that individual countries and regions harmonize their RDI policies and programs with each other and EU as well as with SET Plan, while keeping the national and regional interests. The cooperation between funding agencies and keeping each other informed is a key to work towards a common goal at country level, especially if the funding programs are developed by several funding agencies or ministries. It is also recommended to further strengthen partnerships, such as CET

Partnership, bringing Member States and the SET Plan closer together.

For instance, lack of alignment takes place at high TRL. While lower TRLs have accessible and well-described competitive research funding, funding for implementing research results from pilot/demo scale to near-commercial or commercial scale is not as straightforward and inconsistencies between countries exist. Consistency on public funding, e.g., within State Aid regulation, is needed to speed up investments.

Countries build the funding programs differently and the public-private share differs a lot from country to country. For instance, among others in Austria, Finland, and the Netherlands the funding instruments at development and demonstration scales are structured to support public-private partnerships. Alignment of research and industry funding priorities is advised to help attracting private funding. Strong industrial involvement in the projects increases the industrial relevance and chances to push the technology to higher TRL.

It is recommended to:

- Harmonize individual countries' and regions' RDI policies and programs with each other and with European Union.
- Tighten collaboration and information exchange between funding agencies to work for a common goal at country level.
- Strengthen partnerships.
- Align research and industry funding priorities.

References and further resources

D1.2 Institutional and competitive funding opportunities
D1.3 Report on private financing opportunities to support the realisation of the SET Plan IP8
Factsheet – Financing roadmaps and funding instruments for bioenergy
Interactive map – Financing opportunities for bioenergy

2) Harmonize data collection to facilitate monitoring and assessment of RDI contribution to targets

To create fact-based and relevant RDI strategies and funding programs, uniform and transparent data is the key. Practically in all countries the RDI projects are funded by funding agencies through competitive calls and that means that they have the capability of proposing future calls adjusting the focus to the needs of the Implementation Plan 8 according to its progress.

The challenge is that country-level data may not be available, or it is not exclusive for only Implementation Plan 8 relevant budgets, calls, and projects. Even though well-documented, the data does not follow the definitions and boundaries of SET Plan. Often the data is merged with other areas of renewable energy and data covers several value chains, also those not relevant to Implementation Plan 8. Although this does not directly affect the implementation of Implementation Plan 8, the lack of information makes monitoring of the progress fairly impossible. The same problem is likely to occur in the other Implementation Plans as well.

The mentioned fragmentation in RDI policies and funding programs appears also in data recording as the countries record and store data related to Implementation Plan 8 differently and data is often stored at several entities of the given country. Aligned data recording would support coordinated actions between the Member States.

Possible measures to improve data recording, availability, and quality are development of SET Plan wide taxonomy for value chains, making better use of existing databases, and development of a centralized database for all Implementation Plans. In the case of a centralized database, avoiding overlaps and extra administration must be paid attention.

The proposed measures support:

- Creating transparency in progress monitoring of energy technologies and facilitating corrective actions in research policies,
- Improving monitoring and coordination between the Member States,
- Supporting coordination between Implementation Plans, especially related to cross-cutting topics (e.g., hydrogen), and
- Increasing visibility and usability of data, e.g., best practices of funding mechanisms.

It is recommended to:

- Develop SET Plan wide taxonomy to characterize value chains and projects.
- Make better use of existing national and EU-wide databases.
- Develop a centralized database for all Implementation Plans.

References and further resources

D1.1 Report on the state of play of the SET Plan IP8

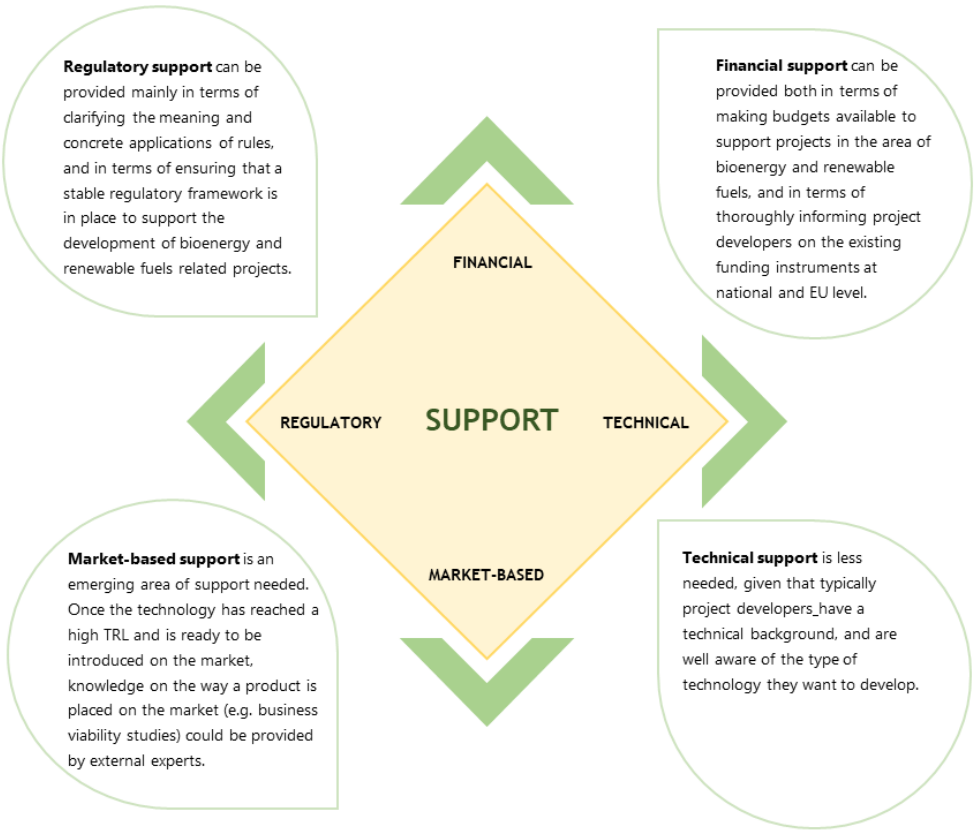
Factsheet – Mapping bioenergy R&I projects

Interactive map – National bioenergy projects

3) Support innovation actions throughout the TRL scale

Many stumbling blocks can be faced by project developers during the journey from an idea to a real-world, proven technology. These challenges are often thought to be technical, but can also relate to finance, regulations, or markets. The challenges vary along the technical readiness level scale (TRL). Support programs are one way to help bridging the gaps between TRLs and boosting the solution to the next level. As public funding at high TRLs is not as straightforward as at lower TRL, the relevance of other support programs increases.

In addition to financial support through funding instruments, support in terms of providing information about their availability and appropriateness is valuable for project developers. Furthermore, support programs can be based on technical, regulatory, and market-related support. It is recommended to develop support programs at national level according to specific national needs and circumstances, in alignment with funding programmes.



Four categories of support programs. Figure: SET4BIO

Furthermore, the existing programs could be utilized more effectively by making them visible at national and EU level. The views and needs of programme developers/managers and project developers may differ and it is important to bring the stakeholders closer to each other.

To drive and stimulate the innovation in the renewable fuels and bioenergy sector, stakeholders need to be active. It is essential also to bring new actors in and share knowledge and experiences. One way to structure innovation is to use the innovation contest approach, which suggests to support renewable fuels and bioenergy value chain development in terms of value chain potential, innovation height, business viability, and scalability. The approach is also a way to build an innovation community around a certain theme. In a bigger picture, a strong open innovation community should be built and fostered at higher level to spark collaboration and solutions that we are not aware of today.

It is recommended to:

- Develop support programs at national level according to specific national needs and circumstances, in alignment with funding programmes.
- Make existing programs visible at national and EU level.
- Bring support programme managers and project developers together.
- Build a strong open innovation community at higher level to spark innovation and collaboration.

References and further resources

D2.4 Report and documentation on commitment reached by industry stakeholders

D3.1 Innovation Challenge in SET4BIO

D3.2 Experiences from the SET4BIO challenges

D3.3 Summary paper, challenge schemes and lessons learned

D3.4 Identification of topics for SET4BIO Innovation Challenge

D4.4 Best practices and recommendations for project implementation support programmes

Ideas and programmes to support project developers in the area of bioenergy and biofuels, Paola Mazzucchelli, Hendrik Steinort, Antonio Pantaleo, Presentation at EUBCE 2023.

4) Clear, stable, and predictable framework to guarantee the market pull

The current EU policy framework concerns renewable fuels and bioenergy on many occasions. In principle, Fit-for-55, REPowerEU Plan, and the Green Deal Industrial Plan create a supportive scene for investments at the moment even though details are still to be sorted out. However, in addition to being supportive, the policy framework needs to remove uncertainty and be clear, stable, and predictable. This is utmost important for industry and investors as we talk about complex and investment-intensive technologies that are designed for lifetime of several decades, thus requiring a clear and stable vision over the next 15 to 20 years.

Many dimensions and layers in today's policy framework create complexity, which might hamper investment willingness. Combined implications and possible side effects of all the policies and initiatives concerning renewable fuels and bioenergy should be thoroughly analysed to make sure that market actors can grasp the implications and side effects. There is a risk of delayed or withdrawn investments if the policy framework is not well-understood or it is considered as too complex.

The mindset in regulation of 'picking future winners' should be turned to swiftly phasing out fossil resources that are incompatible with climate change mitigation targets. As an example, Net-Zero Industry Act proposal does not list advanced biofuels as strategic net-zero technologies though they fulfil the criteria of being commercially available and having significant scale-up potential. It is vital to ensure a balanced approach between energy solutions while keeping in mind the timeline how technologies can deliver towards the targets.

As important as coherent policy framework is its implementation at national level. Coordinated, aligned, and informed processes are needed to put directives into practice at Member States level. Here, Implementation Working Group on *Bioenergy and Renewable Fuels for Sustainable Transport* and ETIP Bioenergy can serve as central connected platforms for information exchange, coordinated actions, and progress monitoring in the sector among all stakeholders.

Finally, the focus in the investment-intensive field is often on value chains and their technical development and technical readiness level (TRL). More market orientation could be brought into discussion by introducing, as an example, Commercial Readiness Index (CRI) and Societal Readiness Level (SRL) next to TRL as market readiness and societal acceptance are crucial elements for market uptake.

It is recommended to:

- Analyze combined effect and possible side effects of all the policies and initiatives concerning renewable fuels and bioenergy.
- Focus on the common goal through technology-neutrality instead of picking winning technologies.
- Strengthen the role of Implementation Working Group and ETIP Bioenergy to coordinate aligned and informed processes to put policies into practice at Member States.
- Consider market readiness and societal acceptance next to technology readiness.

References and further resources

D5.2 KPI report

Position paper – Bioenergy for a green economy. SET Plan Implementation Working Group 8, 2020.

Navigating in the complex policy landscape, Patrik Klintbom, Presentation at EUBCE 2023.

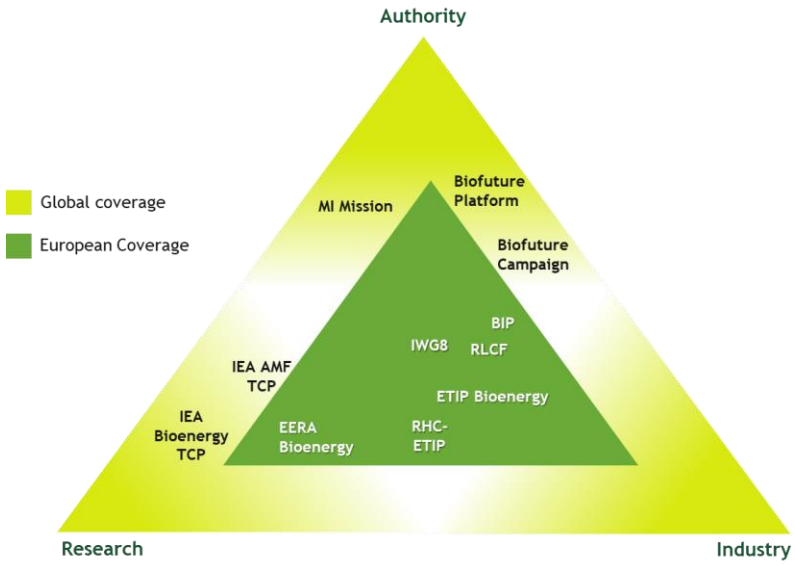
5) Enhance complementary collaboration at EU and global level

Actors in bioenergy and renewable fuels sector collaborate actively through a number of platforms and initiatives. They have different missions and targets, geographical focuses, scopes (value chains, end-use sectors), stakeholders, and dialog levels. The platforms and initiatives cover different stakeholders, namely policy makers, NGOs, industry, research, and academia. Typical means of collaboration include sharing knowledge and best practices, producing jointly policy recommendations and research and innovation agendas, and establishing R&D&D schemes.

It is recommended to clearly define the scope and activities of different platforms and initiatives to enhance the complementarity of actions and avoid overlaps and, thus, guarantee efficient collaboration. SET Plan is a common backbone for many European platforms, such as Implementation Working Group 8, EERA Bioenergy Joint Programme, ETIP Bioenergy, and RHC-ETIP. In the European context, defining the relations of these key SET Plan pillars is of special importance.

Platforms that bring together different operators, namely authority, industry, and research, have the strength of covering the focus areas from multiple perspectives and enhancing coordinated actions between the operators. To fully benefit from collaboration, the collaboration structures and partnerships should be formalized. Furthermore, European platforms could strengthen their collaboration at global level to better understand the global operating environment.

The strong Member States' presence in platforms would enable efficient information exchange, enhancing coordinated actions and alignment e.g., in research and funding programs, implementation of policies between Member States, and monitoring of sector development. Thus, it is recommended to strengthen the Member States' presence in SET Plan rooted platforms in a structured way.



European and global platforms in the field of bioenergy and renewable fuels that focus on research, collaboration, innovation, and deployment mapped according to their dialog level. Figure: SET4BIO.

It is recommended to:

- Define the scope and activities of different platforms and initiatives to enhance the complementarity of actions and avoid overlaps.
- Formalize the collaboration structures and partnerships.
- Strengthen the outreach and collaboration of European platforms at global level to better understand the global operating environment.
- Strengthen the Member States presence in SET Plan rooted platforms in a structured way.

References and further resources

D2.1 Industry stakeholder map

D2.2 Report on industry stakeholder need and gap assessment

D5.4 Global Outlook

Interactive map - Platforms and initiatives in the field of bioenergy and renewable fuels