



# **EU research and innovation policies for advanced biofuels and bioenergy**

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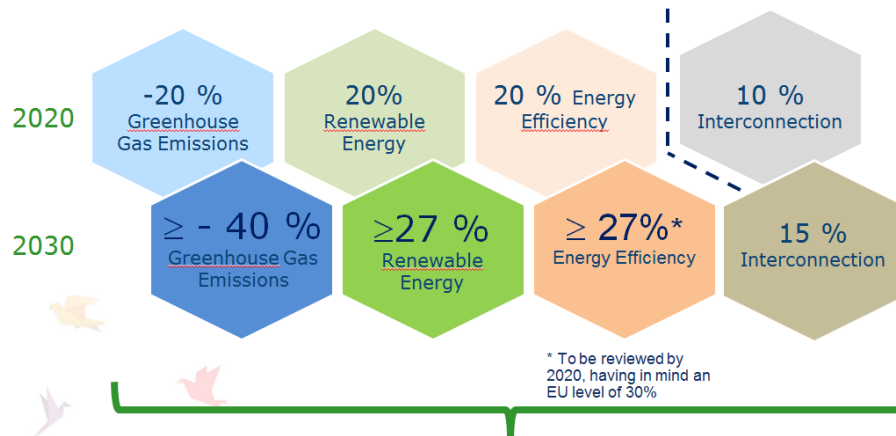
# Policy Framework



## "Clean Energy for all Europeans"

- Putting energy efficiency first
- Demonstrating global leadership in renewables
- Delivering a fair deal for consumers

Agreed headline targets



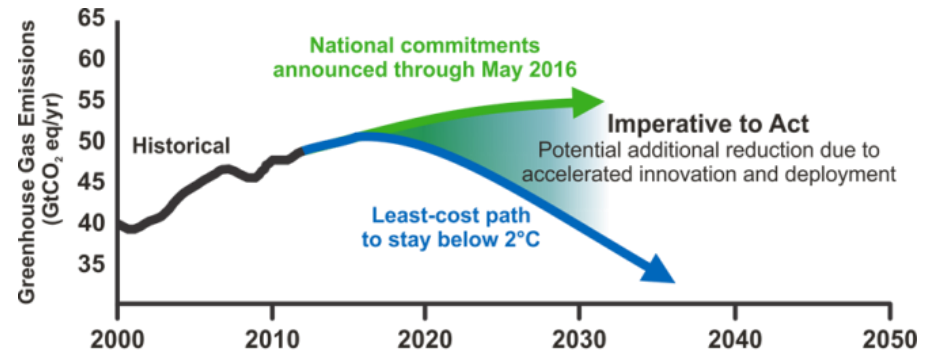
New governance system + indicators

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## Paris Agreement

Holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels

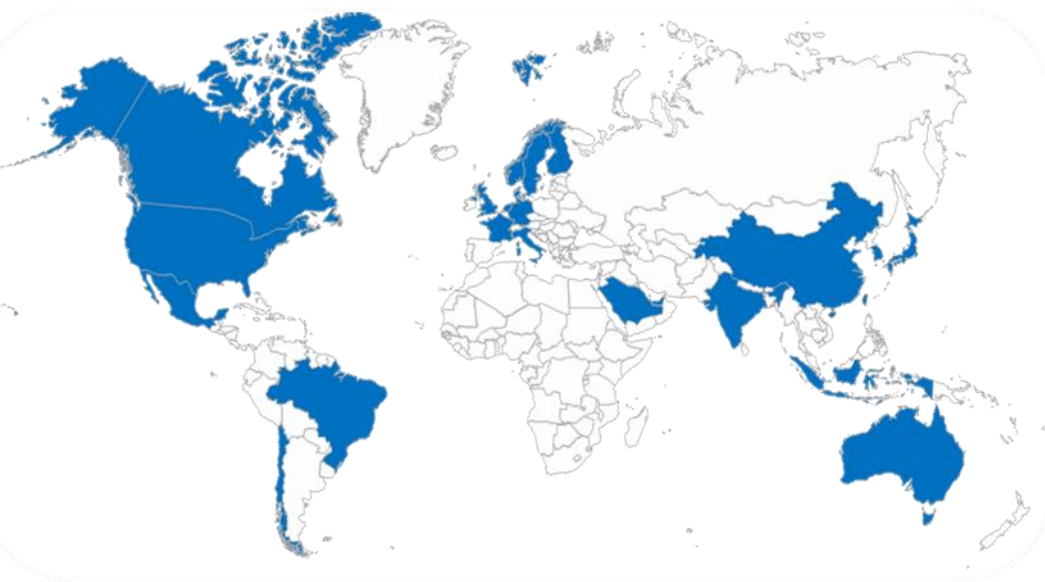
Accelerating, encouraging and enabling **innovation** is crucial...



Adapted from UNFCCC, Synthesis report of INDCs, May 2016

## Other EU policy priorities

- Digital Single Market
- Jobs, Growth and Investments
- EU as a strong global actor
- ...



## Overall objective:

To reinvigorate global efforts in clean energy innovation, Mission Innovation members share a common goal to **develop and scale** breakthrough technologies and substantial **cost reductions**. MI members aim to seek to **double public clean energy research & development investment** over 5 yrs

## 23 Members worldwide – 8 Innovation Challenges

- ✓ smart grids, off-grid access to electricity, CCS, H2 biofuels, converting solar, clean energy materials, H&C buildings

## Tangible results in the near future (end 2020)

- ✓ encourage public sector support for clean energy R&I
- ✓ Promote private sector engagement
- ✓ Boost international collaboration
- ✓ EU engaged in all the ICs, co-leads Solar Fuels and H&C buildings, invests 150 Million € on MI-relevant calls by 2020

# Accelerating Clean Energy Innovation

Centered on Research & Innovation



- Mission Innovation
- EU-Africa cooperation

**EU's  
global role**

- Subsidies
- Innovation-principle
- Public Procurement
- Standards

**Policy  
Signals**

**"Accelerating  
Clean Energy  
Innovation"**  
(COM(2016)763)

**Funding  
Energy  
Science and  
Technology**

- InnovFin  
EDP
- EFSI

**Financial  
Instruments**

- > EUR **2.2 billion** in H2020 2018-2020
  - Decarbonising EU building
  - EU leadership in renewables
  - Energy storage
  - E-mobility
  - European Innovation Council

# The Strategic Energy Technology Plan (SET Plan) - *coordinating research and innovation across Europe*



**Overall objective:** Accelerating the development and deployment of low-carbon technologies through cooperation among EU countries, companies, research institutions, and the EU itself, based on **common priorities, targets and actions**.

## Priority Actions:

- 1&2. Improving performance and reducing cost of renewable energy
3. Smart solutions for consumers
4. Smart Resilience and Secure Energy System
5. Energy Efficiency in Buildings
6. Energy Efficiency in Industry
7. Batteries and e-Mobility
8. **Renewable Fuels and Bioenergy**
9. Carbon Capture Utilisation and Storage
10. Nuclear Safety

### Defining priorities

- SET-Plan Communication 2015

### Setting targets

- Declaration of Intent

### Implementation Plans (IP)

- Temporary Working Groups

### Execution of IPs



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# Action 8 - Renewable Fuels and Bioenergy

- ✓ Targets in Declaration of Intend – November 2016
- ✓ Implementation Plan with 12 MS – June 2018
- ✓ R&I activities:
  1. Advanced liquid and gaseous biofuels
  2. Other renewable liquid and gaseous fuels
  3. Renewable hydrogen
  4. High efficiency large scale biomass CHP
  5. Solid, liquid and gaseous intermediate bioenergy carriers

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# Action 8: Bioenergy and Renewable Fuels for Sustainable Transport

Table 1: Total investment for R&I activities

		Billions €	Industry		MS Funding		EU	
<b>Total Bioenergy and Renewable Fuels for Sustainable Transport</b>		<b>106,61</b>	<b>77,74</b>	<b>73%</b>	<b>22,23</b>	<b>21%</b>	<b>6,64</b>	<b>6%</b>
<b>Renewable Fuels for Sustainable Transport</b>		<b>84,81</b>	<b>62,34</b>	<b>74%</b>	<b>17,48</b>	<b>21%</b>	<b>4,99</b>	<b>6%</b>
<b>Advanced Biofuels</b>		<b>73,00</b>	<b>53,75</b>	<b>74%</b>	<b>15,00</b>	<b>21%</b>	<b>4,25</b>	<b>6%</b>
#1	Development	1,00	0,25	25%	0,50	50%	0,25	25%
#2	Demonstration	2,00	1,00	50%	0,50	25%	0,50	25%
#3	Scale-Up	70,00	52,50	75%	14,00	20%	3,50	5%
<b>Other renewable liquid and gaseous fuels</b>		<b>11,40</b>	<b>8,35</b>	<b>73%</b>	<b>2,36</b>	<b>21%</b>	<b>0,69</b>	<b>6%</b>
#4	Development	0,20	0,05	25%	0,10	50%	0,05	25%
#5	Demonstration	0,40	0,20	50%	0,10	25%	0,10	25%
#6	Scale-Up	10,80	8,10	75%	2,16	20%	0,54	5%
<b>#7 Renewable Hydrogen</b>		<b>0,41</b>	<b>0,24</b>	<b>59%</b>	<b>0,12</b>	<b>28%</b>	<b>0,05</b>	<b>13%</b>
	TRL 2-6 (Development)	0,10	0,03	25%	0,05	50%	0,03	25%
	TRL 7-8 (Demonstration)	0,06	0,03	50%	0,02	25%	0,02	25%
	TRL 9 (Scale-Up)	0,25	0,19	75%	0,05	20%	0,01	5%
<b>Bioenergy</b>		<b>11,30</b>	<b>8,03</b>	<b>71%</b>	<b>2,45</b>	<b>22%</b>	<b>0,83</b>	<b>7%</b>
#8	Development	0,50	0,13	25%	0,25	50%	0,13	25%
#9	Demonstration	0,80	0,40	50%	0,20	25%	0,20	25%
#10	Scale-Up	10,00	7,50	75%	2,00	20%	0,50	5%
<b>Intermediate Bioenergy Carriers</b>		<b>10,50</b>	<b>7,38</b>	<b>70%</b>	<b>2,30</b>	<b>22%</b>	<b>0,83</b>	<b>8%</b>
#11	Development	0,50	0,13	25%	0,25	50%	0,13	25%
#12	Demonstration	1,00	0,50	50%	0,25	25%	0,25	25%
#13	Scale-Up	9,00	6,75	75%	1,80	20%	0,45	5%





# Energy Financing in the Energy Union

1. The Juncker Investment Plan and the European Structural and Investment Funds
2. **The EU Horizon 2020 research and innovation framework programme 2014-2020** with more than 30 billion euros climate related budget and the SMEs instrument
3. The **Innovfin EDP** facility for loans, guarantees or equity type investments to risky first-of-a-kind commercial scale energy demonstration projects
4. The **NER** Innovation Fund for first-of-a-kind investments in RES, CCS and low-carbon innovation in energy intensive industry with about 400 million allowances from 2021

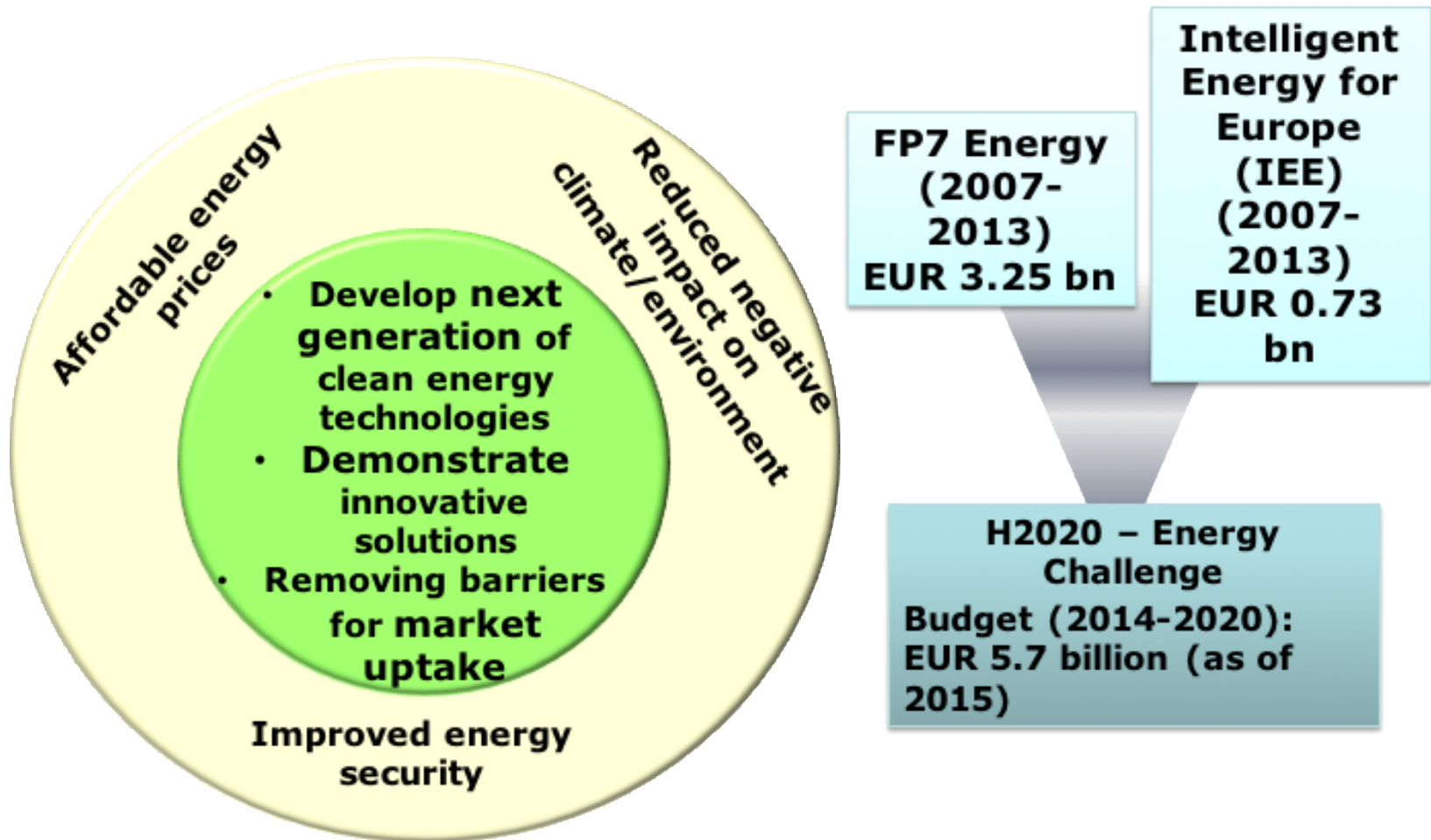
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# Research Policy Framework

## Horizon 2020 (2014-2020) €70,2 billion

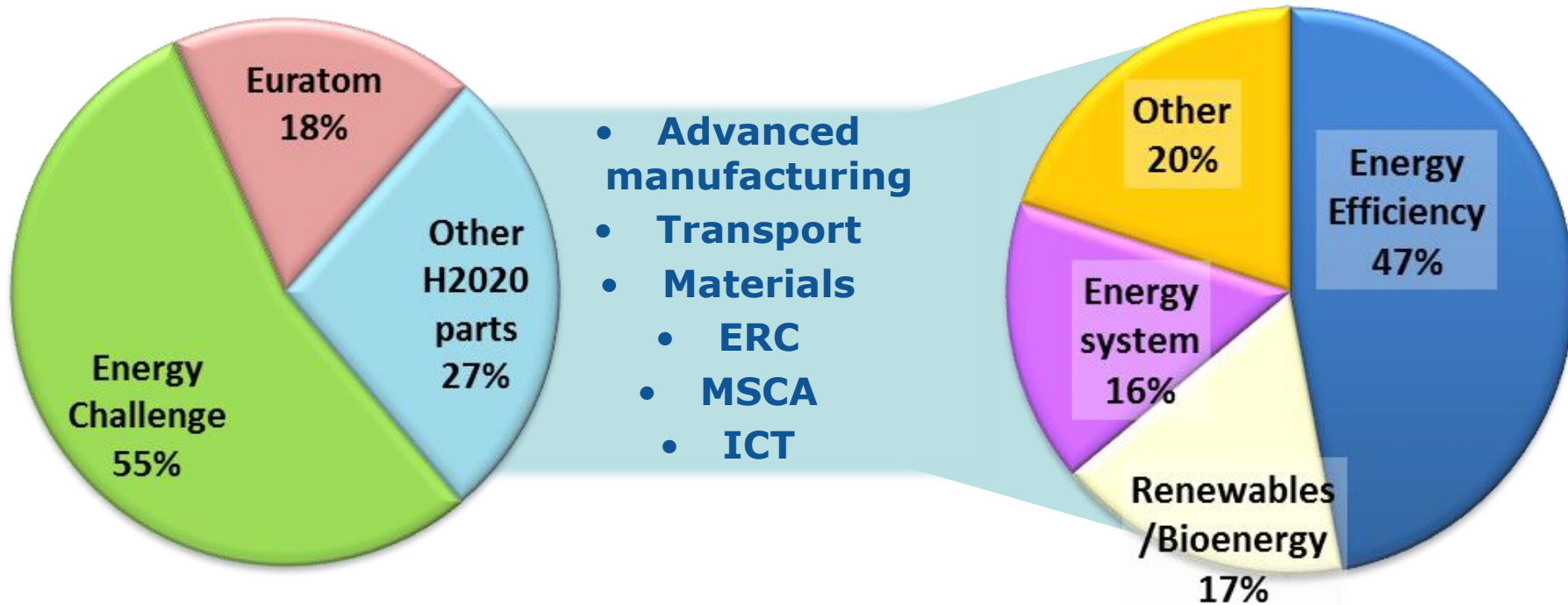
### H2020 ENERGY Challenge



**Total budget for energy in H2020: ~ EUR 8.5 billion**

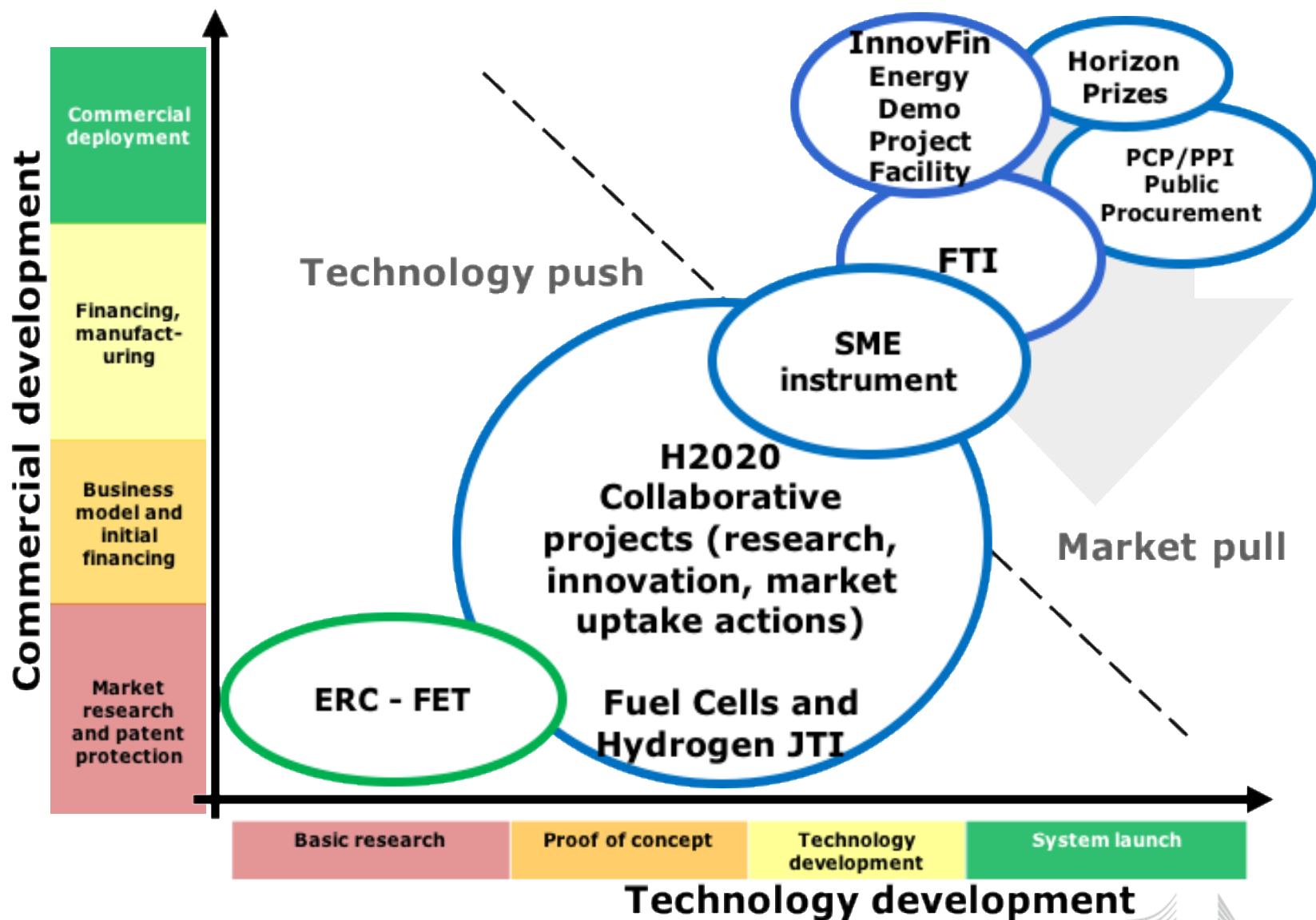
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# Energy in other parts of Horizon 2020



- ✓ Additional energy-related spending in H2020 outside Energy Challenge: ~ **50% of the Energy Challenge budget**
- ✓ Total budget for energy **11.4%** of the total H2020 budget

# Research Financing Instruments



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## Basic features

- Risk-finance instrument (loans/loan guarantees) - Pilot launched in June 2015 focused on renewable energy but scope is now enlarged
- Implemented by the EIB
- Budget up to € 800 million
- Single proponents are the norm
- Criteria are Innovativeness, Replicability, Bankability during operations (revenue stream), Commitment by promoters

## How it works

- Projects apply to the EIB  
<http://www.eib.org/products/blending/innovfin/products/energy-demo-projects.htm>
- EIB process: Eligibility (EC confirmation) → due diligence → approval
- EIB provides loans with max 15 years & covering up to 50% of project costs
- EC (via Horizon 2020) provides guarantee on loan covering riskiest phase of the project

# Opportunities and Challenges for Advanced Biofuels, Bioenergy & Renewable Fuels

- Advanced biofuels and bioenergy intermediates essential for both **energy storage and use** (grid balancing, use in electricity, heat and transport)
- Growing market for advanced biofuels
- Biofuels are the medium term solution for road & maritime and the **long-term** solution for air transport
- Reaching **competitiveness** by lowering production costs of advanced biofuels and addressing feedstock constraints
- European leadership in advanced biofuels technologies but little deployment in Europe
- **R&I** needed to improve cost, performance and sustainability
- Coordinated R&I funding and risk-funding availability needed for **market-uptake**
- R&I needed for **renewable fuels** that **outperform** fossil fuels

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# Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 <sup>(1)</sup>

- Bottom-up approach to long-term research and technology development
- Advance and demonstrate the technology, reduce its costs, improve its performance and prove its reliability
- Technology-specific demonstration activities
- Support mechanisms for first-of-a-kind plants with a higher leverage than 'standard grants' (e.g. through the Innovfin EDP facility)
- Market up-take measures
- Breakthrough market-creating innovation
- EU contribution under ENERGY calls ~ €350 Mio

# Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (2)

*Overall strategy is to target the following sector challenges*

- Technology and cost competitiveness
- Feedstock availability
- Market up-take
- Sectorial transport particular needs
- Complete fossil fuel replacement
- Global societal challenges through international cooperation

*in order to create*

- **Positive social and economic impact** by targeting Europe's competitiveness, environmental benefits and energy security

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# Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 <sup>(3)</sup>

## *Next renewable energy solutions*

- **LC-SC3-RES-1-2019-2020**: sustainable renewable fuels
- LC-SC3-RES-2-2018: the Bionic leaf technology

## *Market Uptake Support*

- **LC-SC3-RES-28-2018-2019-2020**: bioenergy specific

## *Renewable energy solutions for energy system implementation*

- LC-SC3-RES-11-2018: small/medium scale CHP
- LC-SC3-RES-12-2018: large scale CHP
- **LC-SC3-RES-16-2019**: bioenergy intermediate carriers
- **LC-SC3-RES-17-2019**: bioenergy intermediate carriers

# Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (4)

## *Renewable Fuels for transports*

- LC-SC3-RES-21-2018: road transport
- LC-SC3-RES-22-2018: retrofitted industrial installations
- **LC-SC3-RES-23-2019**: aviation and shipping
- **LC-SC3-RES-24-2019**: pre-commercial production of advanced aviation biofuels

## *International cooperation*

- LCE-22 WP2016: EU - Brazil on advanced biofuels

## *Joint actions and Cross-cutting issues*

- LC-SC3-JA-1-2018: ERANET Cofund
- **LC-SC3-JA-2-2018-2019**: Implementation Plans of SET Plan
- LC-SC3-CC-4-2018: Support to Renewable Fuels and Bioenergy ETIP

# Renewable Fuels for transports

## LC-SC3-RES-23-2019

*Decarbonise the aviation and shipping transport sectors, which are expanding fast and increasing the overall fossil fuel consumption*

*TRL 3 to 5*

*RIA*

*EUR 3 to 5 million*

*20 million budget*

*Deadline:*

**27 August 2019**

### **Development of next generation biofuel and alternative renewable fuel technologies for aviation and shipping**

Non-food/feed drop-in biofuel and alternative renewable fuel technologies for aviation and shipping

Liquid jet-like biofuels and alternative renewable fuels **from biogenic residues and wastes by chemical, biochemical and thermochemical pathways**, or a combination

**Bunker fuel-like biofuels** for shipping uses

**Improved conversion efficiency**, cost and feedstock supply

**Reduce costs and improve fuel performance** for environment and society

# Renewable Fuels for transports

## LC-SC3-RES-24-2019

*Reduce the carbon foot-print of aviation in the long-term by producing drop-in advanced biofuels for aviation at pre-commercial scale*

*TRL 5 to 7*

*IA*

*EUR 15 to 20 million*

*20 million budget*

*Deadline:*

**11 December 2018**

### **Boosting pre-commercial production of advanced aviation biofuels**

Demonstrate **pre-commercial production** of sustainable and cost-competitive advanced biofuels for **aviation** for boosting their market up-take

**Large-scale production** of aviation biofuels from **non-food/feed** sustainable feedstock and certified pathways according to international aviation fuel standards

**30 to 50 thousand tonnes of aviation biofuel** and continuous plant operation of 1000 hr **within project**

Pre-commercial plants

Facilitate market entry and increase **commercial capacity of advanced biofuels for aviation**

Deployment will allow the competitive production of bio-jet fuels on a commercial scale



European  
Commission

# Renewable energy solutions for energy system level implementation

## LC-SC3-RES-16-2019

*Increase the potential and performance of dispatchable technologies to provide flexibility services to the energy system*

**TRL 3-4 to TRL 4-5**

**RIA**

**EUR 3 to 5 million**

*Deadline:*

**27 August 2019**

**Development of solutions based on renewable sources that provide flexibility to the energy system**

**Bioenergy** Development of intermediate bioenergy carriers for energy and transport from biogenic residues and wastes and energy crops from marginal lands not applicable to food or feed production, through feedstock flexible technologies at a conversion cost reduced by at least 25% from the state-of-the-art, with increased energy density storage and trade characteristics and improved GHG performance;

...

*Penetration of a higher share of variable output renewables in the energy mix without affecting system stability*

# Renewable energy solutions for energy system level implementation

## LC-SC3-RES-17-2019

*Increase the potential and performance of dispatchable technologies to provide flexibility services to the energy system*

**TRL 5 to 7**

**IA**

**EUR 12 to 15 million**

*Technologies that allow plant and system operators to operate successfully in the modern power markets*

**Demonstration of solutions based on renewable sources that provide flexibility to the energy system**

**Bioenergy** Demonstration of the most cost-efficient intermediate bioenergy carrier pathways for energy and transport, addressing solid, liquid and gaseous intermediate bioenergy carriers from biogenic residues and wastes with increased energy density, storage and trade characteristics (where relevant) and improved GHG performance. Production at a scale of up to 5000 tons and process feasibility through applications to fuel production including for the heavy duty, maritime and aviation sectors, as well as to combined heat and power generation, are to be included.

.....

**Deadline: 27 August 2019**

# Market-uptake support

## RES-28-2018-2019-2020

**Challenges** for large-scale deployment of RES: initial high cost, consumer acceptance, legal and financial barriers, competition with incumbent solutions

**Support for a broad range of issues**, including:

- Recommendation for harmonisation of regulations, life cycle assessment approaches, environmental impact methodologies of renewable energy solutions;
- Development of additional features for RES to be compliant with the electricity market requirements, making them 'market fit';
- Sharing of best practice between public funding bodies for the cross-border participation in RES electricity support schemes
- Increasing the use of the 'RES co-operation mechanisms'
- Development of insurance schemes
- Development of innovative financing mechanisms/schemes
- Support tools to facilitate export markets
- ...

**Engagement of relevant stakeholder and market actors is crucial!**

CSA, recommended EU contribution: EUR 1-3 million/project





# Market-uptake support

## Bioenergy specific:

- Determining conditions and defining options for retrofitting existing energy and industrial installations for the complete or partial integration of bioenergy, with concrete proposals for such retrofitting for the different cases..., on the basis of the assessment of the capital expenditure (CAPEX) reduction and market benefit;
- Development of optimisation strategies regarding cost, energy-performance and LCA for bioenergy and sustainable renewable fuels in upgraded energy and industrial installations;
- Development of cost-effective logistics, feedstock mobilisation strategies and trade-centres for intermediate bioenergy carriers

## Impact

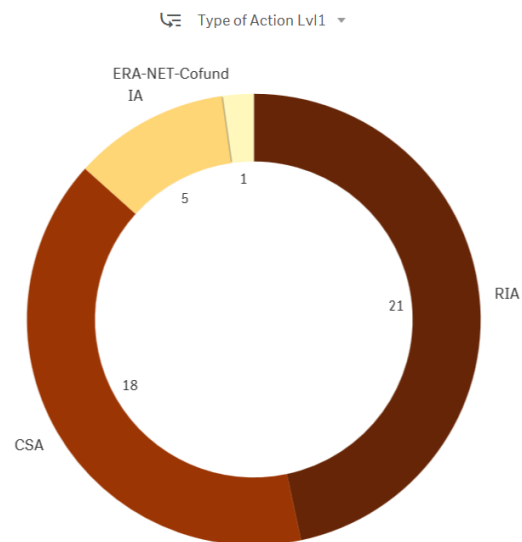
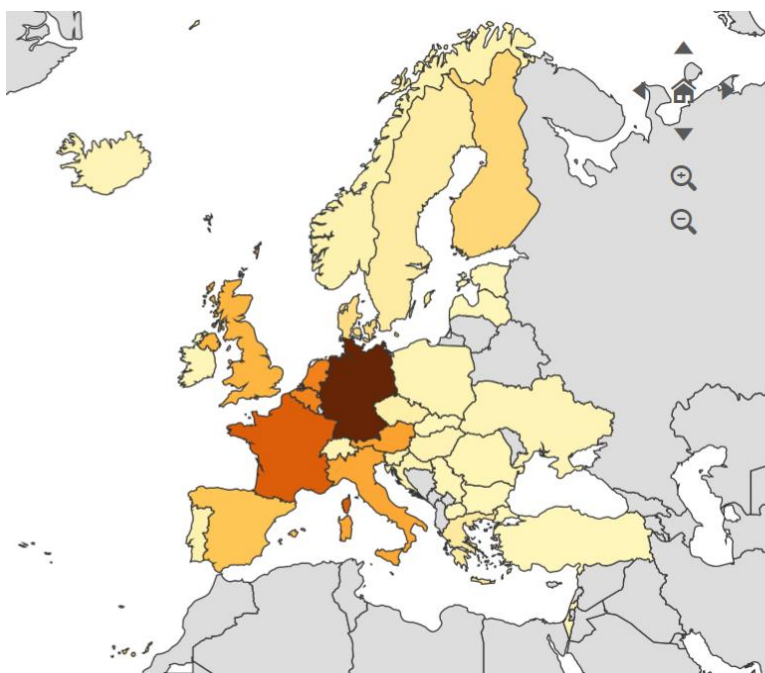
- Facilitate the introduction of these technologies and increase the share of renewable energy in the final energy consumption;
- Lead to substantial and measurable reductions for project developments, whilst still fully addressing the needs for environmental impact assessments and public engagement;
- Develop more informed policy, market support and financial frameworks, notably at national, regional and local level, leading to more cost effective support schemes and lower financing costs for RES facilities.

**Deadline: 11 December 2018**

# Horizon 2020 funded projects in advanced bioenergy, biofuels and renewable fuels under "Secure Clean and Efficient Energy"

H2020 Signed Grants <b>450,24%</b> of H2020	H2020 EU Contribution <b>204,2M</b> 0,65% of H2020	H2020 Total Cost <b>244,7M</b> 0,63% of H2020	Average Participation per Project <b>10,18</b>	Average EU Contribution per Project <b>4,54M</b>	Average Total Cost per Project <b>5,44M</b>
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## Participant EU contribution by Country Signed Grants by type of Action



(Selection of relevant projects in Cordis/Dashboard, excluding projects signed in 2018)

**WP 2016-2017 InnovFin EDP Pilot Facility: 30 M€ loan from EIB to CHO Tiper flagship project on large scale biomass cogeneration supported by H2020 for renewable energy**

# The way forward for Bioenergy, Advanced Biofuels and Renewable Fuels

## *Key messages*

- A vast portfolio of technologies and value chains combining feedstock types to conversion processes exists now at different TRL and breakthrough technologies are emerging
- Support is necessary at all TRL stages and value chains including new
- Flexibility of installations to feedstock type and conversion technology needed for cost-effective products
- Collaboration across EU and internationally is key
- Understanding innovation potential needed at early development stage
- Ensuring financing at later stages of development is necessary engaging public and private bodies
- Regional approach and clustering of market players crucial for market uptake
- Value added from social and environmental benefits should be associated to products
- Communication and education essential for implementation of technologies

# Horizon Europe (2021-2027)

## The next EU R&I Framework Programme

### €100 billion



**Pillar 1**  
Open Science

**Pillar 2**  
Global Challenges and  
Industrial Competitiveness

**Pillar 3**  
Open Innovation

First Work Programmes in  
**summer 2019**

**Total budget for Climate, Energy and  
Mobility Cluster: € 15 billion**



# Horizon Europe

is the Commission proposal for a **€ 100 billion** research and innovation funding programme for seven years (2021-2027)



**to strengthen the EU's scientific and technological bases**



**to boost Europe's innovation capacity, competitiveness and jobs**



**to deliver on citizens' priorities and sustain our socio-economic model and values**

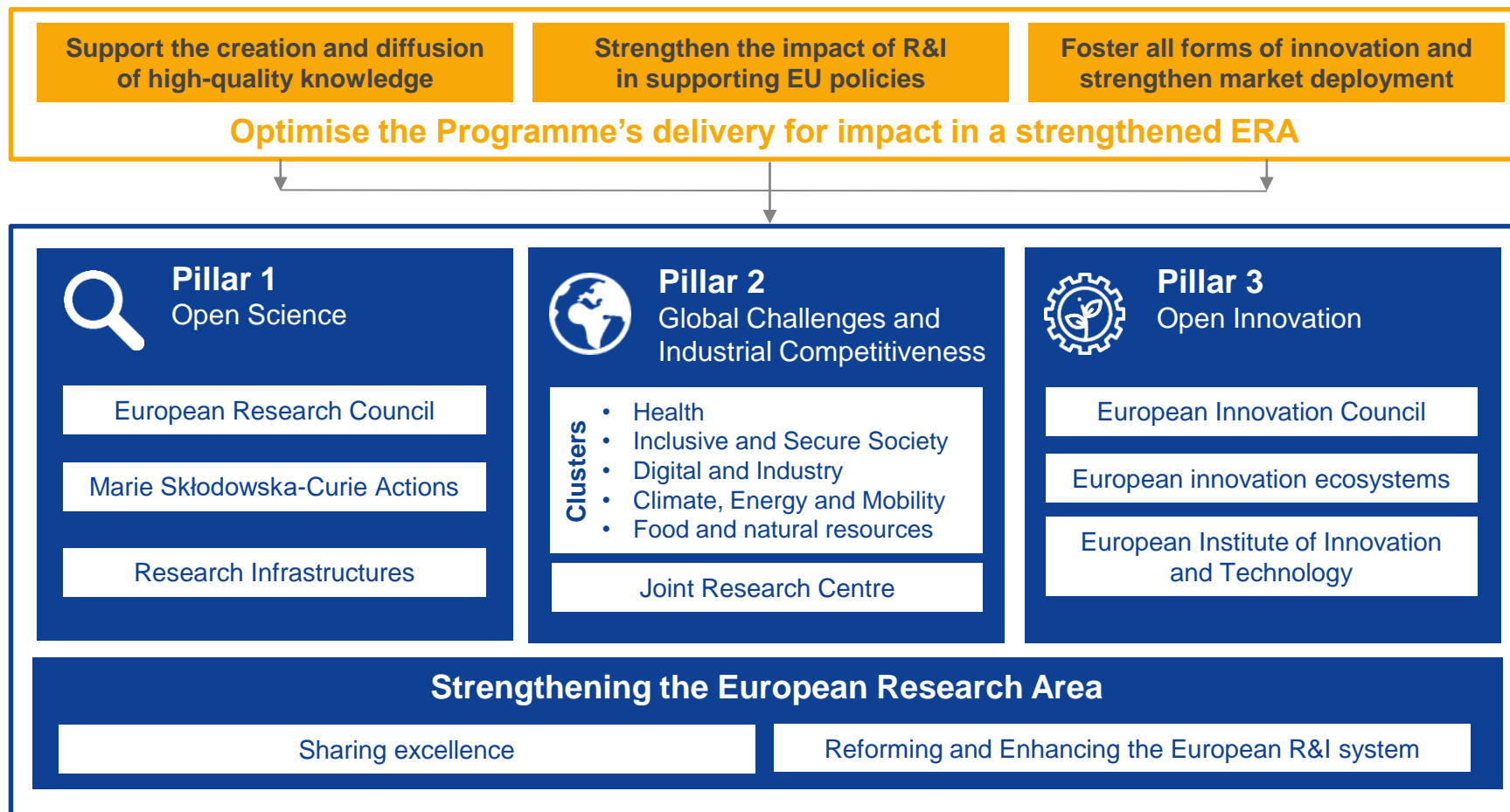
Additional **€ 4.1 billion** are proposed to be allocated for defence research, in a separate proposal for a European Defence Fund

# Horizon Europe: investing in R&I to shape our future

- The vision:  
" a Europe that protects,  
a Europe that empowers,  
a Europe that defends"  
*Jean-Claude Juncker*
- Tackling **climate change**  
(35 % budgetary target)
- Helping to achieve **Sustainable Development Goals**
- Boosting the Union's  
**competitiveness and growth**



# Horizon Europe: Specific Objectives of the Programme







# **Thank you for your attention!**

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