# D5.4 | Report on national policies, strategies, practices and non-technical bottlenecks in low-carbon energy technology implementation

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| **Deliverable:** | Report on national policies, strategies, practices and non-technical bottlenecks in low-carbon energy technology implementation |
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# The project in brief

The Energy Union Framework Strategy laid out on 25 February 2015 aims at fostering a cost-efficient energy transition able to deliver secure, sustainable and affordable energy to all European consumers. It has embraced a citizen-oriented energy transition based on a low-carbon transformation of the energy system. At the end of the day, the successful implementation of the Energy Union will materialise in a change in energy production and energy consumption choices. Such choices are heavily shaped by particular economic prerequisites, value systems, gender-based preferences, efficiency of governance and the maturity of civil society.

The ENABLE.EU project attempts to understand the key drivers of individual and collective energy choices, including in the shift to prosumption (when energy consumers start to become also energy producers). The project will develop participatory-driven scenarios for the development of energy choices until 2050 by including the findings from the comparative sociological research. As differences between European countries remain salient, ENABLE.EU will have a strong comparative component.

The final aim of this project is to contribute to more enlightened, evidence-based policy decisions, to make it easier to find the right incentives to reach the twin goals of successful implementation of the Energy Union and Europe's transition towards a decarbonised energy system. To reach this final aim, ENABLE.EU will seek to provide an excellent understanding of the social and economic drivers of individual and collective energy choices with a focus on understanding changes in energy choice patterns. Results will be disseminated to relevant national and EU-level actors as well as to the research community and a wider public.



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# 1. Introduction

The current report aims to present the governance bottlenecks in the implementation of national policies and strategies regarding technology-driven aspects of the transition to low-carbon energy systems, focusing on non-economic and non-technical factors that could affect the individual and collective energy choices and behaviours, including the SET Plan implementation in national context. Particularly, based on the identified bottlenecks, the report aims at drawing meaningful policy insights and actionable recommendations that could improve the governance in this area.

Based predominantly on the research done for the case study on governance of energy transition in the nine participating countries (Bulgaria, France, Germany, Hungary, Norway, Poland, Serbia, the United Kingdom and Ukraine)[1] and on additional research with a focus on the SET Plan implementation in the above countries, as well as on the various analyses prepared within the ENABLE.EU project (covering the above nine countries plus Spain and Italy)[2], the current report summarizes the findings and conclusions regarding non-technical and non-economic bottlenecks in the governance of technology-driven aspects of energy transition in Europe. The R&I pillar of the Energy Union framework calls for policies to support breakthroughs in low-carbon and clean energy technologies and thus driving energy transition and improving competitiveness of the European economy. To understand better these policies and how they are accepted and assessed by the European citizens, the current report focuses on two interrelated aspects – the experts' assessment of SET Plan implementation and the public opinion about the governance of technology-related aspects of energy transition.

The research methodology includes both qualitative and quantitative methods for data collection and analysis. The assessment of the SET Plan implementation is based on desk research and experts' assessment, collected through both in-depth interviews with experts and 19 responses from national experts of a short survey questionnaire, conducted via e-mail. The assessment of the governance of technology-related aspects is based on the results from three case studies (on low-carbon mobility, heating and cooling and governance of energy transition) and on the results from a nationally representative survey among the households in nine countries. In addition, the case studies implemented focus-groups, in-depth interviews and survey to collect the relevant information.[3]

[1] For more information, see "D5.2: Nine national case study reports on governance barriers to the energy transition" and "D5.3: Synthesis case study report on governance barriers to energy transition", elaborated within the ENABLE.EU project. Online available at http://www.enable-eu.com/downloads-and-deliverables/, accessed 14.12.2018.

[2] Here we refer specifically to D4.2 Synthesis report on the "low carbon mobility" case study, D4.3 Synthesis Report on the case study "From Consumer to Prosumer" and D4.4 Synthesis report on the "heating & cooling" case study, elaborated within the ENABLE.EU project and available online at http://www.enable-eu.com/downloads-and-deliverables/, accessed 14.12.2018.

[3] For more information on the separate case studies' methodologies, see the respective case study reports, cited above.



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# 2. Assessing the SET Plan implementation[4]

The growing global competition in the market for low-carbon and clean energy technologies, and the need for a transformation of the European energy system to meet EU climate targets[5] demands a European energy technology strategy. This paved the way for the formulation of the Strategic Energy Technology Plan (SET Plan) in 2007, which is part of a new European energy R&I approach designed to accelerate the transformation of the EU's energy system and to bring promising new low-carbon and clean energy technologies to the market.

According to the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA), the current level of investments in the energy sector needs to double worldwide to roughly $ 3.5 trillion every year until 2050 in order to achieve the Paris Agreement objective to keep the global temperature increase to well below 2°C and pursue efforts to keep it to 1.5°C. Since the start of the SET Plan, private investments in clean energy technology steadily increased from about 130 billion EUR in 2007 to 176 billion EUR in 2012. Since then, however, private investments fell sharply. Several governance bottlenecks were identified, including the inadequate funding support to strategic energy-related investments and the delayed and insufficient participation of the Central and Eastern European (CEE) countries. As the analysis of stakeholders' opinions below has showcased, to overcome these bottlenecks, European and national policies need to improve the awareness of the SET Plan among the general public and mainly among businesses, and to provide incentives for CEE countries to take part in its implementation. There is also a need to further align national public funding sources, incl. the programming of European Social and Investment Funds (ESIF) with the SET Plan activities and targets to attain synergies and maintain the momentum of promoting the needed investment in energy technologies.

## 2.1. Introduction to the SET Plan

The SET Plan aims to make the European technology market more competitive by

[4] This chapter is based on "D5.4a Report on the Design and Implementation of the Strategic Energy Technology Plan", ENABLE.EU working report (unpublished), prepared by Arlan Brucal and Raphaela Kotsch, Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

[5] The EU key climate and energy targets are set up in the "2020 climate and energy package", "2030 climate and energy framework" and the latest "2050 low-carbon framework". The first package set up the binding targets 20/20/20 referring respectively to 20% cut of the GHG emissions from 1990 levels, 20% of EU energy from renewables and 20% improvement in energy efficiency. (See COM (2010)2020 final. Europe 2020 A strategy for smart, sustainable and inclusive growth). The 2030 climate and energy framework sets three key targets for the year 2030 - at least 40% cuts in greenhouse gas emissions from 1990 levels, at least 27% share for renewable energy and at least 27% improvement in energy efficiency (See COM (2014)015 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A policy framework for climate and energy in the period from 2020 to 2030). In its latest long-term vision, the EC calls for a climate-neutral Europe by 2050. (See COM (2018) 773 final. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank. A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy)



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addressing barriers to market deployment and by lowering costs and improving the performance of low-carbon technologies. Characterising the state of the European Energy policies a "jigsaw"[6] of energy and climate policies and measures, the European Commission proposed a joint strategic planning approach following the Triple Helix concept[7]. This would bring together decision-makers from Member States, industry and research and ensure better coherence and alignment of national and regional efforts. In order to kick off a coherent European approach towards energy technologies, a new governance structure and institutions were created such as the European Industrial Initiatives (EIIs) and the European Energy Research Alliance (EERA).

A stakeholder consultation on the state of the SET Plan was launched in 2014 and resulted in the SET-Plan Integrated Roadmap report published by the European Commission's Joint Research Centre (JRC). The report gives an overview of the research and innovation challenges and needs of the EU energy system. It identifies four key challenges: engaging customers, increasing energy efficiency, optimising the energy system and achieving secure, cost-effective, clean and competitive energy supply. The report also derives a set of key actions embracing the innovation chain, the value chain and the energy system.[8]

Since its creation, the SET-Plan was neglecting a holistic approach, which would address the transformation of the energy system as a whole. The creation of separate EIIs for each energy technology promoted the cooperation within specific research fields but did not promote interdisciplinary cooperation. To cope with this problem of "technology silos", the SET-Plan was revised in 2015 and aligned with the R&I priorities as defined in the Energy Strategy of the Energy Union[9]. The r three key priorities of the Energy Union for energy R&I are: becoming the world leader in renewable energy technologies, facilitating consumer participation in smart energy systems, and developing sustainable transport systems. Additional secondary priorities are carbon capture and storage and nuclear energy. The resulting *Integrated SET Plan* translated the previous actions into 10 key actions in support of the key Energy Union priorities (See Figure 11). In declarations of intent, the SET Member States and stakeholder agreed on strategic targets for each action. Implementation Plans (IPs) defining the approach to reach these targets have been prepared by Temporary Working Groups (TWG). These TWGs are composed of SET Plan countries interested in the particular action and willing to use their national energy R&I activities to implement selected activities, and relevant stakeholders. Each led by one Member State and co-led by representatives from the industry, the TWGs have delivered 14 IPs thus far. These IPs identify priority activities and non-technical barriers, provide an estimate of needed funding at national level[10], identify flagship activities and international cooperation activities and monitor the progress. With the completion of all IPs in 2018, the crucial phase of putting

6 COM(2006) 105 final Green Paper: A European strategy for sustainable, competitive and secure energy, p.2

7 Etzkowitz, Henry and Leydesdorff, Loet, The Triple Helix -- University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development (January 1, 1995). EASST Review, Vol. 14, No. 1, pp. 14-19, 1995. Available at SSRN: https://ssrn.com/abstract=2480085

8 European Commission (2017): SET Plan Implementation Progress Report: The Strategic Energy Technology (SET) Plan. At the heart of Energy Research & Innovation in Europe

9 C(2015) 6317 final: Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation

10 EU financing is available in case the activity complies with the legal framework and adds a strong EU value.



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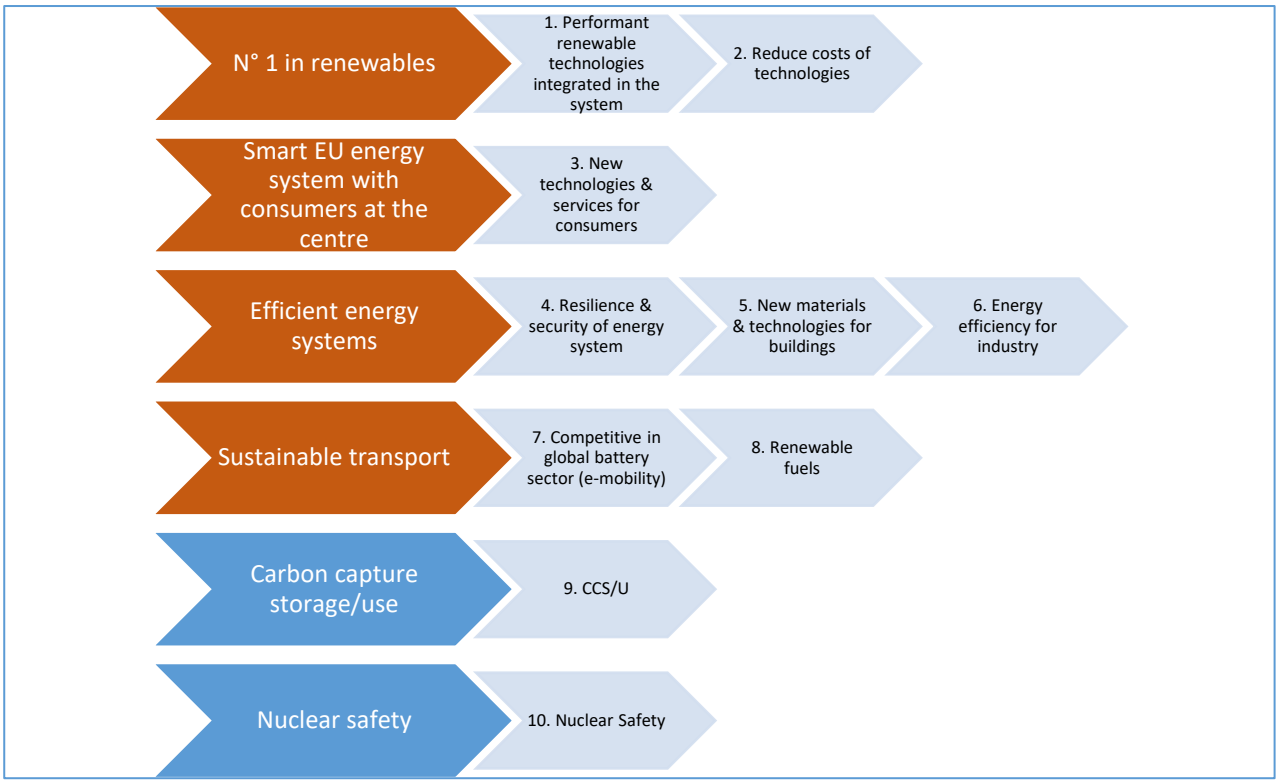
these plans into practice has started.

*Figure 1: Overview of the EU Energy Union R&I priorities and the 10 key SET Plan actions.*




*Source: D5.4a Report on the Design and Implementation of the Strategic Energy Technology Plan, ENABLE.EU working report*

## 2.2. SET Plan targets setting and implementation

The translation of the 10 key actions of the SET Plan into specific targets for R&I actions and policy measures started with the publication of a series of issue papers. These issue papers were prepared by the EC, and contain specific targets. The EC invited selected stakeholders to take position to the proposed targets. Stakeholders could respond with input papers, which give the consolidated view of each technology sector or organisation they represent. The EC reviewed the inputs and invited the most relevant stakeholders to discuss the input papers at the SET Plan Steering Group meeting. After the Steering Group defined the targets of the SET Plan actions, considering the inputs of stakeholders and discussions, relevant stakeholders were invited to participate in Temporary Working Groups (TWGs) and to contribute to joint Implementation Plans (IPs). The TWGs developed 14 Implementation Plans for each priority area, which should contain concrete implementation actions for the private and public sector at national level, related funding, expected deliverables and timelines for achieving results.

All IPs have been finalised by the TWG and endorsed by SET Plan Steering committee. Some IPs are more elaborated figuring concrete targets in terms of improvement of performance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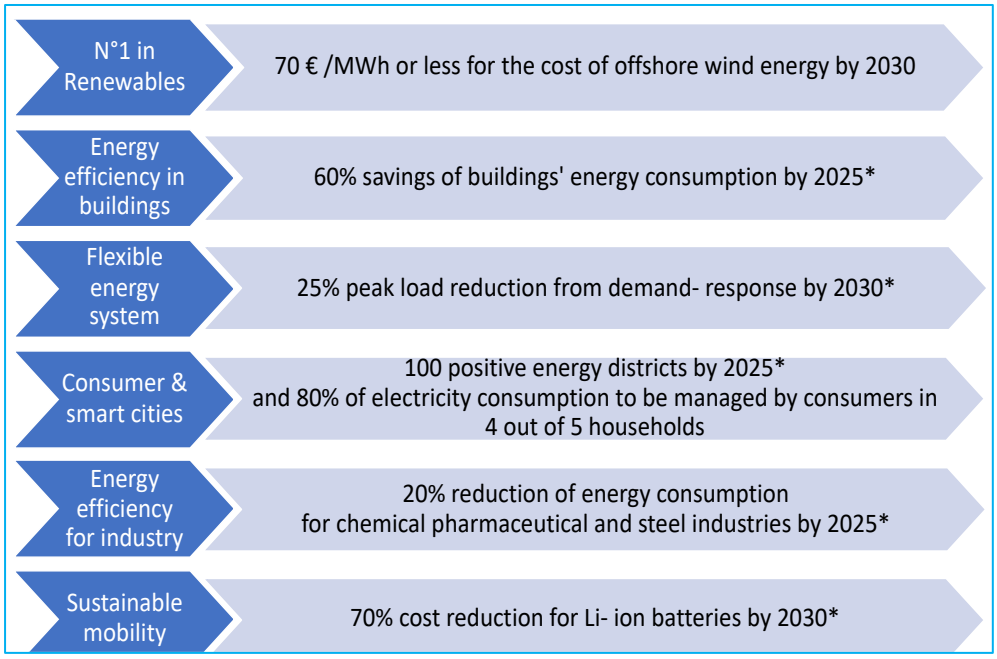
and cost reductions of specific technologies. Most IPs contain estimates of the total investments required. However, interviewed experts criticised the lack of transparency in the process since it is not clear how the needed budget is calculated by the members of the TWGs and reporting is not consistent. The next step will be to mobilise the necessary funding to realise the actions suggested in the IPs and take action.

*Figure 2. SET Plan strategic targets*




*Source: EC (2017)*

### Monitoring of the SET Plan

In order to monitor the progress of the SET Plan the SETIS database was created. However, the data in SETIS is not updated on a regular basis and the information are very limited and lacks the results and achievement of projects. A significant disadvantage is that the data structure and consistency does not correspond to the Energy Union R&I priorities and SET Plan actions. This makes it hard to get an accurate picture of the implementation process. Most data come from international data sources such as the International Energy Agency (IEA) and the European Patent Office (EPO) and as such should be valid and continuous. However, several Eastern and Central European countries are not member of the IEA. For this reason, public investment data is missing for these countries and cannot be monitored (countries: BG, HR, CY, LV, LT, MT, RO, SI). JRC recently started collecting data for Romania and Lithuania to fill the gap.

### R&I Funding under the SET Plan

With the launch of the SET Plan, the European Commission intended to promote a more targeted and efficient R&I spending. In contrast to the research and innovation framework programmes, which have their own EU budget, the SET Plan is not designed as a funding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mechanism, rather an instrument to coordinate private and national R&I budgets[11,12]. In most cases, each country funds its own research projects with their national and international partners and without European funding. However, some EU funds are available to support the SET Plan activities. In 2015, 5% of the total of 23.1 billion EUR in R&I funding in support of the SET Plan came from EU funding[13].

The EU dedicates funding for R&I activities which show a high European added value. There exists a variety of instruments supporting research and innovation in the field of energy technologies. The following are the key EU financial instruments to support the SET Plan activities:

- Framework Programme Horizon2020: Most funding from the European Commission comes through its eighth Framework Programme for Research and Innovation (Horizon2020). In 2014, ten European Research Areas (ERA)-NET Co-funds have been launched as part of the Horizon2020 support for public-private partnerships. A sub-group of the SET-Plan Steering Group, the Joint Actions Working Group, developed the energy joint programming activities ERA-NET networks in support of the SET Plan.
- InnovFin: The InnovFin is a joint initiative launched by the European Investment Bank Group in cooperation with the European Commission. The risk finance instrument is designed to bridge the "valley of death" addressing the challenges of first-of-a-kind demonstration projects reaching a commercial-scale. InnovFin, which started as a pilot financial facility in June 2015, provides debt financing support (loans and loan guarantees) covering up to 50% of the project's total costs.
- European Structural and Investment Funds (ESIF): Additional support may come from the ESIF, which dedicates 40 billion EUR for research and innovation.

Overall, the key player in advancing the SET-Plan is the private sector. In 2015, they contributed more than 77% of R&I funding for clean energy technologies.

## 2.3. Stakeholders assessment of the SET Plan implementation

In order to get insights on how the relevant stakeholders (policy-makers, academics and private businesses) view the design and implementation of the SET Plan, the GRI-LSE, in cooperation with the other ENABLE.EU partners, conducted an email-based survey with open-ended questions, consisting of strategically selected questions. The survey aimed at eliciting individual perspective about the SET Plan, with emphasis on the stakeholders' outlook about the attainment of SET Plan targets, the extent of their involvement in the implementation of the SET Plan, and the way the progress of the Plan is being monitored and disseminated in their countries.

A total of 19 experts' responses were collected, covering eight of the ENABLE.EU partner countries. Figure 33 illustrates the distribution of the responses across countries and types of individuals who responded to the questionnaires.

11 European Commission (2017): SET Plan Implementation Progress Report: The Strategic Energy Technology (SET) Plan. At the heart of Energy Research & Innovation in Europe.

12 This issue has also emerged in several interviews with experts and stakeholders involved in the design and/or implementation of the SET Plan.

13 Ibid.



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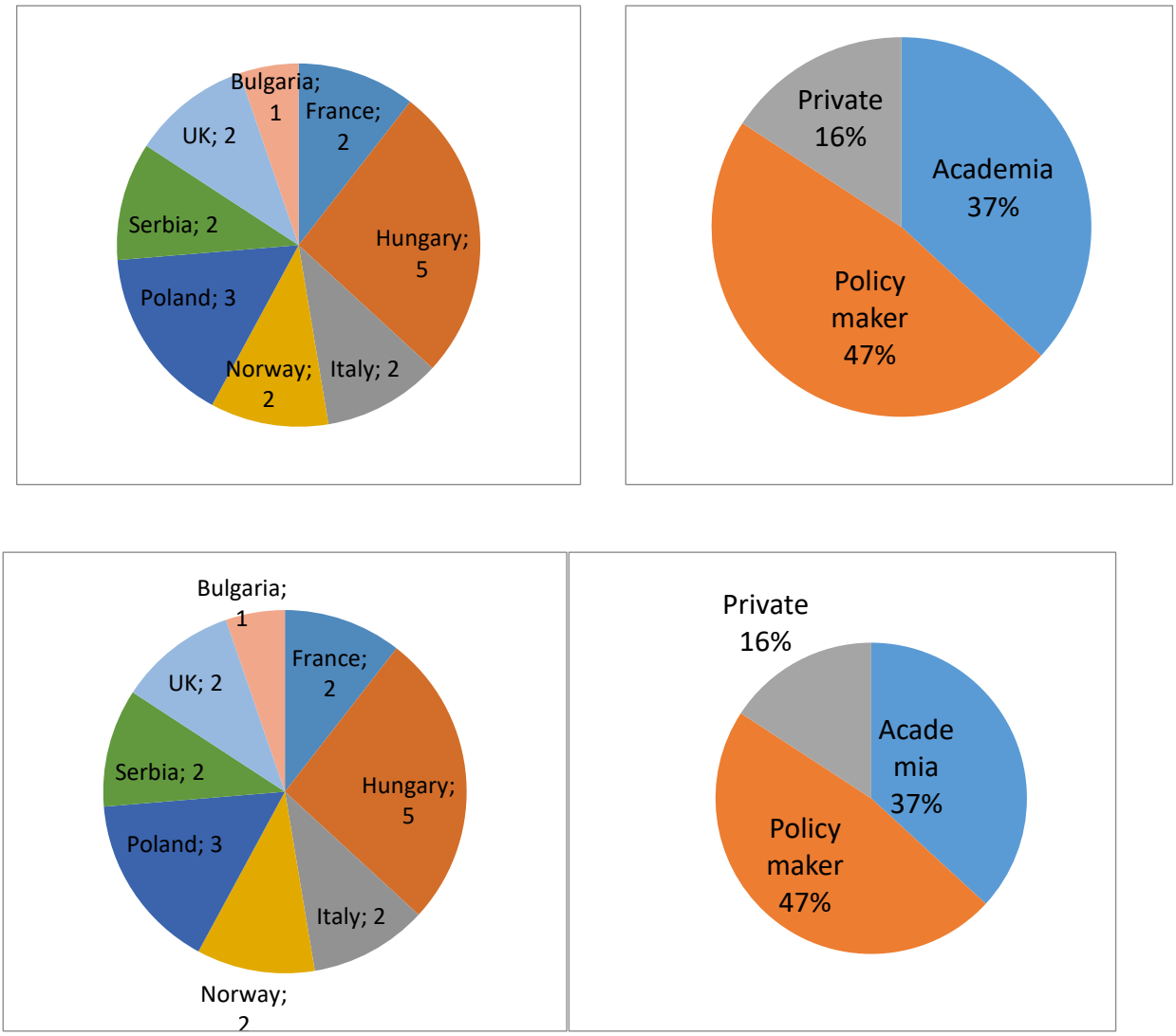
**Figure 3. Distribution of responses**




**Question 1: Do you believe the national targets set by the SET Plan can be attained within the agreed timeframe?**

When asked if they believe that the targets in the SET Plan could be attained within the agreed timeframe, 78% did not agree and only 22% remained positive (Figure 4). A number of reasons associated with the public's negative perception emerged. One of which is funding inadequacy, the need for capacity building and the lack of access of certain groups on this type of funding. For example, a respondent said, "*Indeed H2020 funding is extremely competitive, usually require to set up relatively large consortia, and not always suited to support SMEs*", while another respondent said "*…Building energy efficiency improvement will only happen if … 0% interest rate loans or non-refundable funds are available and the funds [should] focus on the building stocks where the most energy efficiency is available*". Others suggested that the "*Commission should provide a special*



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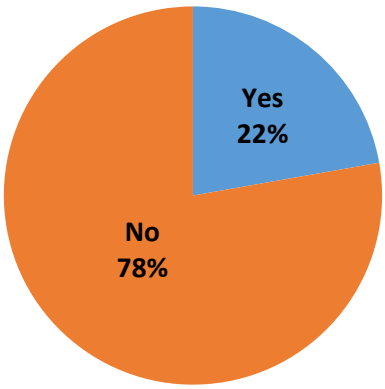
*support, both financial (that should be dedicated to maintain a national capacity on SET plan issues) and professional, with the help of more developed member states*".

Other responses in relation to inadequacy of funding support and country-specific capacity include the following:

"*Significantly more financial aid should be allocated for energy efficiency investments both from the European Structural Funds and from the MSs' own budget. A sort of energy efficiency bonus should be developed for the benefit of those businesses that spend certain amount of their revenues on increasing energy efficiency. Targets of the SET Plan should be placed more directly into the focus of the EU2030 strategy*"

"*The main bottleneck is the availability of adequate funding to support the development and demonstration activities of the technologies envisaged by the key actions of the SET Plan implementation plans*".

***Figure 4. Survey results: Do you believe the targets set by the SET Plan can be attained within the agreed timeframe?***




There were also issues with respect to the capacity of other countries to achieve the SET Plan targets. Accordingly, the capacity of countries to adhere to the R&I activities set within the Plan largely depends on the level of development and political commitment of a country. A respondent, in fact, claims that "*the economic and political situations varies a lot in the European countries*". Additionally, "*commitment can be ok, but the cost for meeting the targets will be the bottlenecks*".

Surprisingly, the year by which a country had joined the EU can also be a challenge. For example, a respondent stated that,

"*The engagement of some Member States, especially Eastern-Europeans, which joined the EU in the last 15 years, can be a problem. In a country, …, the national institutional set up has been focused on the priorities that helped to fulfil the mandatory tasks of the EU Accession Treaty (e.g. waste water connections etc.) so far. Therefore, there is no capacity allocated to fulfil innovation policy targets that are not obligatory, or which has no precedent of consequences. Eastern countries are definitely lagging behind in terms of innovation policy management that should be changed.*"

"*The country is not yet part of the EU, and does not participate in the SET plan. Renewable energy and energy efficiency targets are set in the Renewable Energy Action Plan and*



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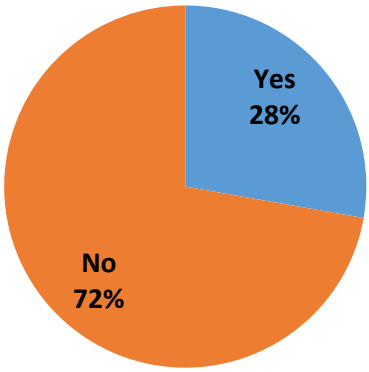
*Energy Efficiency Action Plan, which define the possible introduction of RES and EE in the future period. The action plans are revised and the monitoring of achieved targets is conducted. Generally speaking about the SET plan targets, the ambition in the country is obvious but the achievement of the set targets is far in the future*."

**Question 2: Do you feel that the civil society and consumers are sufficiently involved and represented in the decision-making processes in your country?**

The stakeholders' assessment about the level of civil society and consumers' involvement in the decision making process regarding the SET Plan implementation in their countries, shows that almost three fourth of the stakeholders see the low levels of public' and experts' awareness and engagement as a bottleneck for the implementation of the Plan and only 28% of them believe that they are sufficiently involved (Figure 5).

***Figure 5. Survey results: Do you feel that the civil society and consumers are sufficiently involved and represented in the decision-making processes in your country?***




In most of the countries, decision-making process is done with little involvement of the civil society and consumers and is seen by the stakeholders as a merely top-down approach in the governance of the SET Plan implementation. For example, a respondent claimed that "*the decision-making process on Energy and Climate Policy is run at political level, as well as the translation into the national context of the SET Plan objectives and policies*." The respondent added that "*the information regarding the Set Plan implementation so far has reached a restricted expert audience with limited involvement of civil society and consumers*." Some suggested the need for policymakers to "*present clear targets to the community and illustrate how they can contribute*", which reflects how some sectors might be willing to invest in certain technologies but were left unaware of the possibilities due to poor coordination and communication from the part of the implementers.

Consequently, some of the respondents called for the improvement in terms of involving the general public (or at the very least informing them with the hope that they can participate effectively in the Plan). For example, a respondent said "*It is essential to include scientists and people closely involved with Strategic Energy Technology issues. We also recommend including members of the Program Committees and National Contact Points of the Ministry of Education and Science Network of the FP "Horizon 2020""*, while another



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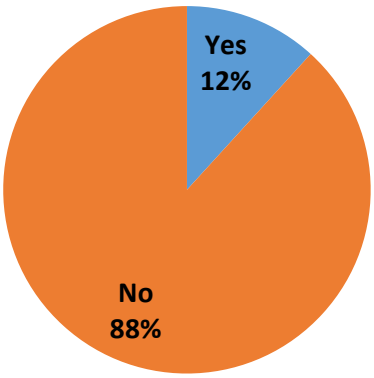
called for the involvement of "*the National Regulatory Authorities in the dissemination of the information on the SET Plan*". Meanwhile, other respondents called for the improvement in information simply because they believe that "*many of the set targets are market driven, and private sector will have a big role in achieving them*".

Surprisingly, not everyone is convinced that the civil society should take a decisive role in the decision making process. According to a respondent, "*civil society should be kept informed, but beyond that I do not see the point*."

**Question 3: Do you believe that the progress of the SET Plan is adequately monitored and disseminated to the public in your country?**

Having in mind the very low level of the stakeholders' involvement in the SET Plan decision-making on national level, highlighted by the majority of the stakeholders, it is not surprisingly that almost all of them assessed that the SET Plan is not adequately monitored in their countries. It is important to note, that there are no differences in the assessment across the countries, independent on their level of advancement in the area of energy transition. Results reflect the very low degree of public awareness about the Plan's progress. In particular, only 12% of the respondents believe that the Plan's progress is adequately monitored and disseminated to the public.

*Figure 6. Survey results: Do you believe that the progress of the SET Plan is adequately monitored and disseminated to the public in your country?*




Overall, the results of the survey reflected the seemingly distinctive set of groups where the progress of the SET Plan is normally being disseminated. There seems to be adequate information shared to the targeted community (mostly in energy) but significantly less to the general public and other non-energy related stakeholders. For instance, one of the respondents said that "*the SET Plan is not known by the public but only to experts in the energy sector*". Another respondent said that "*the information about the Set Plan implementation is adequately shared among experts, thanks to the efforts of some of the national representatives in the Working Groups, who are very active in monitoring and disseminating it*". Interestingly, it could also be a result of the lack of interest from the general public. For example, one of



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the respondents mentioned that "*[the Plan] is known in the energy community but it is not something the general public is really interested in*".



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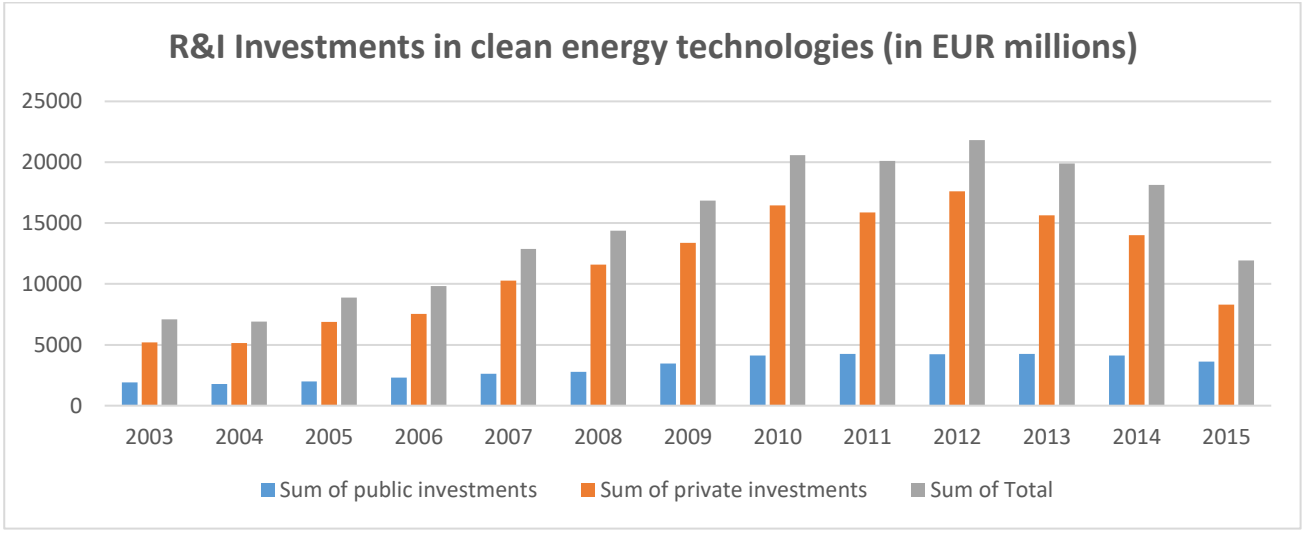
# 3. Policy and technological development of low-carbon and clean energy in Europe[14]

## 3.1 Plummeting private investments in low-carbon and clean energy

According to the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA), the current level of investments in the energy sector needs to double worldwide in order to keep the increase in global average temperature to well below 2°C above pre-industrial levels.[15] This translates to about 3.5 trillion USD investments annually until 2050.

Since the start of the SET Plan, private investments in clean energy technology steadily increased from about 10 billion EUR in 2007 to 17.6 billion EUR in 2012. Since then, however, private investments fell progressively (figure 7).

*Figure 7: Investments in clean energy technologies for EU28 from 2003 to 2015.*




*Source: JRC (2018).*

The decline in private investments had an immediate impact on the progress of new clean

[14] This chapter is elaborated in "D5.4a Report on the Design and Implementation of the Strategic Energy Technology Plan", ENABLE.EU working report (unpublished), by Arlan Brucal and Raphaela Kotsch, Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

15 The target is considered a compromise between what scientists thinks is necessary to avoid serious consequences of global warming (e.g., increased forest fires and droughts that are detrimental to human survival) and what is realistically achievable. The target was first put forward by the European Union in 1995, and was gradually adopted as a reasonable objective by governments and intergovernmental organisations.



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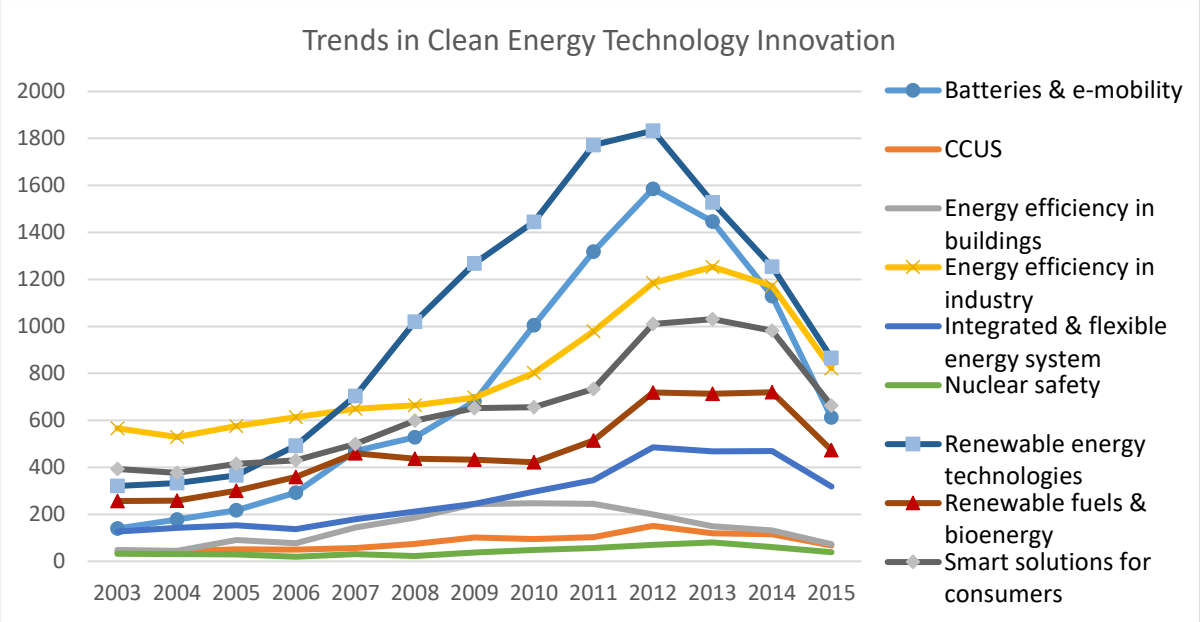
energy technologies. For example, the number of patents in low-carbon energy innovations plummeted since 2012 (See Figure 8). The results from expert interviews revealed that this trend can be attributed to the following factors:

- An important driver of R&I investments in energy technologies is the energy price. Since 2012, the oil price slumped from 110 to less than 40 US$/barrel. The low energy price decreases the value of the energy savings realised through new technologies and vanishes the incentive for new investments.
- In the past 20 years, there has been a 20-fold increase in the number of climate change laws around the world (Nachmany et al., 2017). However, interviewed experts deem the stringency of climate policies worldwide to be low. In Europe, the EU carbon price induced by the EU Emissions Trading Scheme (EU ETS) remained low and without great impact for decades. The absence of a carbon price did not help to promote innovations in clean energy technologies. However, as an interviewed expert highlighted, experts believe that the recent increase in the carbon price under the EU ETS is likely to lead to higher investments in the clean energy transition since R&I activities react very quickly to changes in the investment environment.
- Complementary to the previous point, expectations for future climate policies have an impact on investment decisions in clean technologies today. According to experts, expectations are very low that future climate policy will be more stringent. Despite the achievement of the Paris Agreement, climate targets remain non-binding, which could bring investors to pour investments towards non-clean but affordable (at least in the short-run) energy technologies.
- Finally, the aftermath of the financial crisis in 2008 might have contributed to the fact that investments have come to a halt.

***Figure 8. Number of Patents Registrations in EU-28 countries.***




*Source: JRC (2018)*



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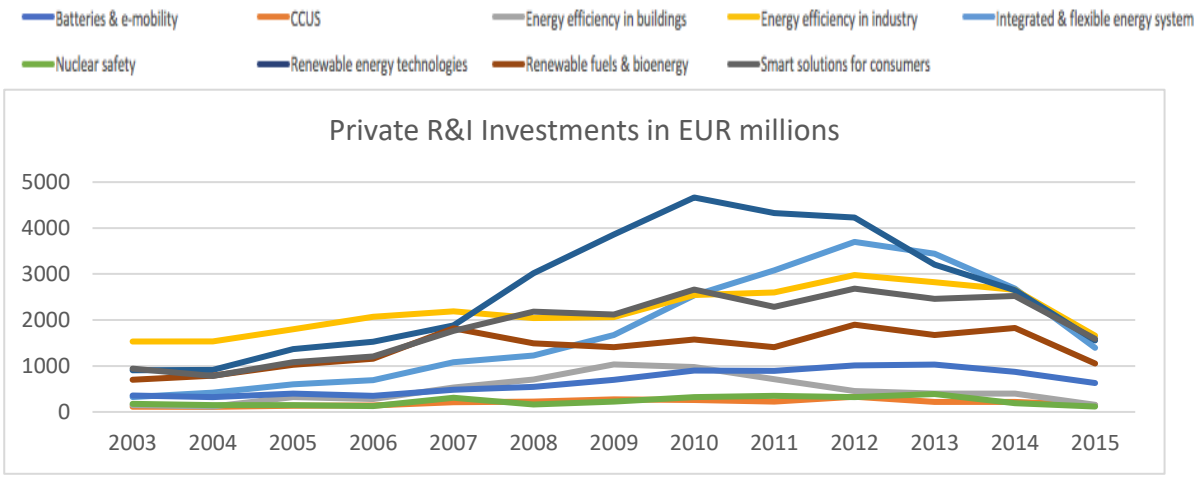
While this trend is true for all clean energy technologies under consideration, the drop in private R&I spending for renewables is particularly striking (See Figure 99). Within five years, private investments in renewable energy technologies has dropped by half, starting off at more than 4 billion EUR in 2010 to nearly 2 billion EUR in 2015. In contrast, public R&I investments on renewable energy slightly increased since 2003, and remained relatively flat at about 700 million EUR starting in 2010.

According to interviewed experts, traditional renewable technologies such as solar and wind already received sufficient investments from public institutions. However, more R&D spending and governmental support are needed for 1) technologies with very high upfront costs and 2) infrastructure projects with a strong public good component. Examples of these technologies include charging stations for electric vehicle, as well as innovative technologies like Carbon Capture, Utilization, and Storage (CCUS).[16]

The EU's political priorities for achieving its climate targets are focused mainly on energy efficiency and renewable energy. Yet, these priorities are not reflected in R&I investments in low-carbon technologies by both private and public donors. Since 2004, investments in nuclear safety, which only constitutes a secondary priority of the Energy Union's R&I strategy, have received most public funds. In contrast, it can be seen from figure 9 that renewables and in particular energy efficiency are underrepresented.

***Figure 9. Private and public R&I investments in energy technologies in EU-28 countries, in EUR millions across EU28 countries.***




16 This technology encompasses methods and technologies to remove carbon dioxide from the gas and from the atmosphere (usually from large point sources, such as fossil fuel power plants), followed by recycling the carbon dioxide for utilization and determining safe and permanent storage option (normally an underground geological formation)



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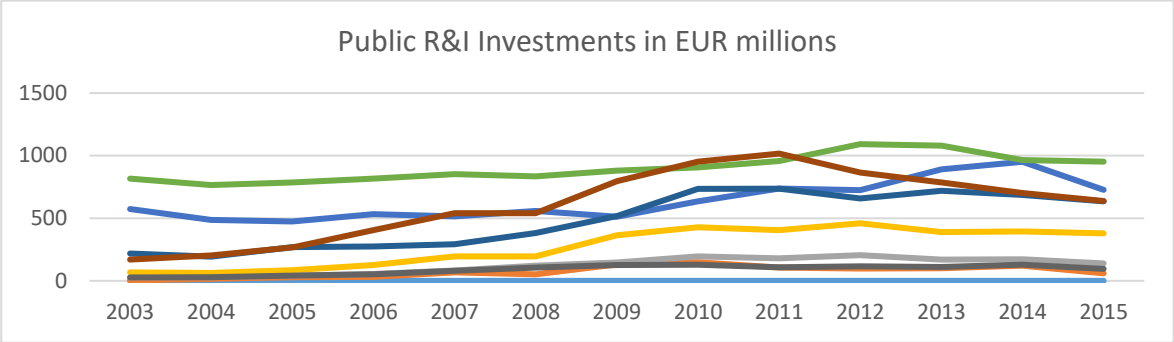


*Source: JRC (2018).*

## 3.2 Lacklustre participation from Central and Eastern European countries

The countries contributing to the SET Plan the most are Germany and France. From figure 10, it can be seen that French public investments account for almost 30% of public investments in low-carbon energy technologies from all EU Member States. While in combination with the public investments from Germany, the two countries account for almost half (46.4%) out of the EU28. Almost half of all private investments in energy technologies come from Germany and together with France, they account for 62% out of the EU28. In the same manner, Germany is the key innovator in clean energy technologies with almost 50% of low-carbon energy patents coming from this country (See Figure 10.).[17] Newer member states from Central and Eastern Europe are underrepresented or marginally contributing to the R&I activities in the field of clean energy technologies in Europe.

***Figure 10. Cumulative share of EU28 countries in total public and private investments and patent registrations, 2005-2015.***

[17] Here, we assume that patents are a good indicator of innovation. We, however, recognize that patents can also be correlated with the maturity off a technology and the figures presented can be artificially boosted by 'patent holdup' phenomenon. We also recognize that patents do not account for social innovation.



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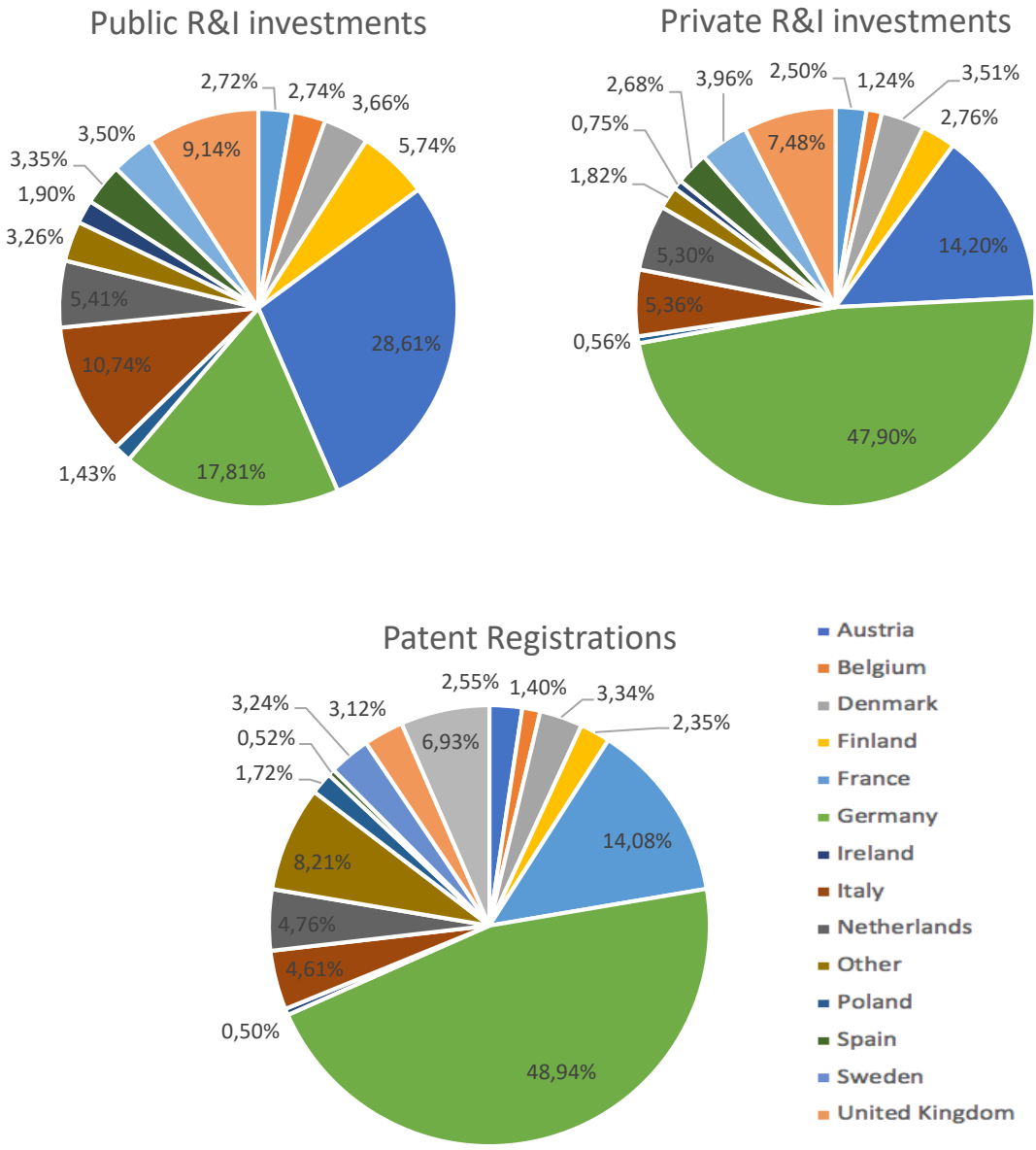


The success of the SET Plan stands and falls with the commitment of the Member States. While the SET Plan comes without dedicated EU budget and without binding legal basis, it created a "coalition of the willing" and helps to bring together the European member states and exchange their ideas. With the finalisation of the implementation plans, the SET Plan is now entering a very critical phase. The question is now if the targets set in the implementation plans can be translated into actionable policy proposals with dedicated financial and legal instruments and planned time-frames. One of the urgent needs should be to ensure that Central and Eastern European countries accelerate and strengthen their contribution to the SET Plan implementation, including though ensuring wider stakeholder participation in the decision-making, increasing sharply public and private investments and raising awareness of the SET Plan among businesses, expert communities and general public. With the recent increase in carbon price triggered by the planned introduction of


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the Market Stability Reserve of the EU ETS, it is expected that investors will invest more in clean technologies in the future. Yet, with energy prices remaining low, a strong signal through further environmental policy is needed to push the SET Plan implementation.



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# 4. Public attitudes and opinions towards energy transition policies

The research on governance of energy transition in Europe within the ENABLE.EU project has outlined various bottlenecks in the implementation of national policies and strategies regarding technology-driven aspects of the transition to low-carbon energy systems. The findings and conclusions, presented below are based on both qualitative and quantitative data and methods, used in the implementation and analysis of the case studies on "low-carbon mobility", "heating and cooling" and governance practices, as well as on the results from the nationally representative household survey in eleven countries. Both the case studies and the survey have been designed to allow for comparative analyses of results across the countries, each of them following its own common methodological framework.

## 4.1. Public opinions towards technology-driven policy measures of energy transition

### The case of transport electrification

The qualitative part of the case study on low-carbon mobility has focused on shared mobility and in particular on car-sharing as a potential solution and an example of best practice, which could contribute to change current mobility practices and thus, change individual and collective behaviour patterns.[18] Car-sharing is developing differently from country to country in terms of prevalent mode between free-floating and station-based models[19] but both policy-makers and suppliers/customers in all studied countries[20] see the potential and real electrification of the service as one of its major advantages. On one side, policy-makers assess positively the electrification of car-sharing services as an important step towards meeting emissions limits in cities and nationally, through achieving both an optimization (and decrease) in the use of private vehicles, and a support for the introduction of e-vehicles despite their high up-front cost. On the other side, suppliers (businesses) and customers see the electrification of car-sharing as a shift towards more sustainable transport, which benefits from an integrated system in which car-sharing and public transport are connected and complement each other to facilitate reaching destinations poorly connected by public transport due to the location or the time-tables. Moreover, as the report underlines[21], most of the users who have experienced electric vehicles through a car-sharing service are positively evaluating the technology and express

[18] See D4.2 Synthesis report on the "low carbon mobility" case study, elaborated within the ENABLE.EU project and available online at http://www.enable-eu.com/downloads-and-deliverables/, accessed 14.12.2018.

[19] In the free-floating model, vehicles are freely parked on the streets, where they can be localized and booked again, while in the station-based model, the vehicles must be dropped by the users to specific reserved parking lots.

[20] The case study covers Hungary, Italy, Norway, Poland and Spain.

[21] D4.2 Synthesis report on the "low carbon mobility" case study, available online at http://www.enable-eu.com/downloads-and-deliverables/, accessed 14.12.2018.



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their preferences for it as compared to conventional vehicles. Thus, the use of e-vehicles in the car-sharing services bring twofold results. On one hand, it raises the awareness among general public towards more sustainable individual behaviour regarding transportation modes and regarding new prospective technology. On the other hand, it creates a demand for development of e-charging infrastructure and increases the share of e-vehicles used in the countries, and thus increase the support for the implementation of the respective policy measures. The latter should not be underestimated having in mind that some of the measures for emission limits could hardly hit specific groups of society (e.g. living in city-centres with limited access of vehicles and high parking fees, economically-poor people having older vehicles bearing higher taxes, etc.)

In general, the electrification of car-sharing services is assessed by all stakeholders as fostering alternative (based on hybrid and electric vehicles) mobility and developing measures to make it competitive with the conventional one. In this respect it is seen also as incentivising R&I for the related technologies and for increasing both private and public investments in the process. Particularly, the technological development in the fields of batteries and charging infrastructure is benefiting from the wider use of e-vehicles, incl. for the car-sharing services.

If the electrification of vehicles in general is concerned, then beside the economic (e.g. market and financial) constraints, the major governance bottlenecks regarding the technology driven aspects of the energy transition policies, experienced by the studied countries[22] seems to be the lack of long-term political commitment and insufficient policy coordination but also a lack of prior technological and regulatory developments to ensure large-scale car electrification, such as grid flexibility.[23] The only country, where the experts assess positively the national policies for technological development in this field is Germany, where the federal government is seen as strongly supporting the R&D to the level, which creates favourable conditions for development of the respective technologies. Still, due to incumbent interests, the decarbonisation of the transport sector is considered by the experts to be the most difficult that Germany is facing due to ad-hoc decision-making without long-term thinking as well as strong lobbying from car manufacturers.

In France, the major technology-related barrier in the national policies for electrification of vehicles seems to be the lack of policy coordination in the planning and development of charging infrastructure according to some interviewed experts. Although in early 2018, the 150,000 EVs in France were relying on a network of 23,300 charging stations, representing 5-6 vehicles per charging point, above the recommendation from the EC of one charging station for 10 EVs, the network of charging stations does not cover the country equally with some poorly connected areas. The situation is similar in Hungary, where experts assess the public interventions as poorly designed e.g. regulation transposing the Alternative Fuels Infrastructure Directive prescribing the establishment of charging-stations accessible in shopping centres according to the size of their floor area, instead of estimating the demand

[22] The governance case study covers Bulgaria, France, Germany, Hungary, Norway, Poland, Serbia, the UK, and Ukraine.

[23] For more information, see "D5.2: Nine national case study reports on governance barriers to the energy transition" and "D5.3: Synthesis case study report on governance barriers to energy transition", available online available at http://www.enable-eu.com/downloads-and-deliverables/, accessed 14.12.2018.



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for charging-stations in different urban or rural settlements. Another constraint is seen to be the joint licence for both installation and operations / maintenance of charging infrastructure, which need to be separated given that these activities may be carried out by separate actors. In Bulgaria, where policies supporting the electrification of vehicles are in very initial stages, the topic is mentioned in strategic documents but without setting any specific national targets both in terms of technological and market development.[24]

The case studies' results demonstrate that relevant stakeholders highlighted only a limited number of technology-related aspects in the national policies of the studied countries towards low-carbon mobility as compared to the policies regarding heating and cooling. Among them are for instance legal and financial instruments incentivizing R&I and production of e-mobility related technologies, development of charging infrastructure, and the need for technological upgrade and renovation of the grid to achieve better flexibility, incl. in terms of supporting future fleet of e-vehicles. Unlike the policies for low-carbon mobility, the stakeholders' assessment of the governance of energy transition in the area of heating and cooling (H&C) outlines much more technology-driven aspects, related to technical characteristics and age of H&C systems and end-user appliances, technical characteristics of the buildings and separate dwellings within them, availability and technical features of metering and controlling (e.g. thermostats) devices, type of fuels, advantages and disadvantages of different technologies for generation, transport and conversion of heat and energy, etc.

### The case of heating and cooling

The information about H&C is based on the results of a case study on this topic, which covers France, Germany, Hungary, Spain and Ukraine. Information about relevant policy options was collected and analysed only with qualitative methods and namely – through a common methodology for focus groups, following the method of participatory systems mapping.[25] The case study focuses on an analysis of the factors influencing households' and individual behaviours related to H&C and on developing shared scenarios regarding challenges and potential strategies for saving on H&C-related expenses. Particularly the elaborated strategies refer to a series of policy measures regarding pure technical aspects of various issues that need to be considered for achieving the energy transition. The case study results highlighted that regulatory measures and interventions would be more effective when they account for the different consumer practices that influence the behaviour of individuals and households, which are determined by an interplay of various factors, including socio-cultural characteristics, attitudes, values and beliefs, as well as technical and institutional constraints.

The major technology-driven aspects in the governance of H&C, mentioned above, appear to be important in all studied countries, even if they have different manifestation and to a different extent. Among them are:

- **Technical characteristics of buildings and H&C systems.** Relatively old buildings (the

[24] The only specific measure refers to financial incentives – hybrid and e-vehicles benefit from abolishment of annual taxes and lower purchase and registration fees.

[25] For more information see D4.4 Synthesis report on the "heating & cooling" case study, available online at http://www.enable-eu.com/downloads-and-deliverables/, accessed 14.12.2018.



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most critical of which are detached houses and panel-block buildings with poor insulation) and low-efficient in-building heating systems are among the major challenges for the governance in all of the countries but particularly important in Hungary and Ukraine. Moreover, in both countries and especially in Ukraine, district heating systems are generally outdated and in bad technical conditions, further decreasing heating efficiency. The required policy measures include both changes in the legislation (e.g. introduction of technical standards or energy audits) and financial and non-financial incentives for investment in renovations and decentralized energy sources.

    - The use of low-efficient and/or technically outdated end-user appliances is also an issue, common for all the studied countries. It is strongly linked to the issue of energy (and income) poverty and refers to various measures needed: e.g. information campaigns to educate people, and especially vulnerable groups, introduction of metering devices in order to give realistic information about energy consumption, replacement of devices with newer and more energy efficient ones, etc.

- **Controllability of indoor-temperature** (e.g. setting different temperatures depending on the time of the day and. indifferent parts of the dwelling) has been also a common problem but appear as more important for France and Hungary. In France it is seen mostly as lack of control over heating (and the related bills) in buildings, using district heating, where the households are not able to turn the heating off, even if they want to do it. In Hungary it is seen mostly as a lack of required thermostats or other related technologies for control of the temperature but also as a lack of knowledge and awareness about the existing technical solutions. In Spain for example, the technologies for controlling in-door temperature are wider spread in buildings/dwellings with individual heating systems as compared to central (incl. district) heating systems.
- **Increasing competition among suppliers and type of energy sources**. Even seen as a primary market-related issue, it has also important technology-related consequences as the switching between different type of energy sources (and suppliers) could require changes in heating system's infrastructure, introduction of new technologies and related knowledge and know-how for operating with them.
- **Digitalisation of heating systems**. Particularly mentioned in Germany, the issue refers to the opportunities for significant reduction of heating costs through the introduction of ICT technologies for smart and remote control of H&C systems and appliances. Especially, the use of mobile apps for both better understanding of heating expenditures and real-time remote adjustment or pre-defined control of energy consumption is seen as decisive for changes in individual behaviour. In addition, because of the gamification of the use of mobile apps, they could be more attractive for less educated individuals.
- **Availability and technical features of metering devices**. The introduction of metering devices is underlined in all of the countries, and according to stakeholders' opinion, better informed user will have stronger energy conscious behaviour, which is not backed by the existing studies that show that being informed not necessarily and even rarely lead to more conscious behaviour. However, the existing studies confirms


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better information provision to users, incl. through implementation of metering devices, can contribute to raising awareness about one's energy consumption. In addition, depending on the technology, the metering devices could offer also controlling functions. A particular issue is the installation of individual metering devices in countries where district heating systems do not offer such an option (e.g. in Ukraine or Serbia) and the heating cost is distributed between inhabitants of a building based on shared calculation and not on households' actual consumption. In some of the countries (e.g. Ukraine and Serbia but also in Bulgaria) the existing "vertical system" of heat pipelines within the building does not allow for actual consumption to be fully metered, even if individual metering devices are introduced on all heaters in the dwelling and the shift to full-scale individual metering requires important infrastructure changes in the heating system to transform it into "horizontal system".[26]

**The need for insulation and retrofitting of existing buildings** also raises several technology-related aspects in addition to the poverty and affordability issues. On one side, the regulatory requirements for achieving specific level of energy efficiency through the technical characteristics of insulation and retrofitting are in place in all countries, where the respective measures are supported through financial instruments with public investments. On the other side, often the retrofitting is related to or requires a strengthening of the building's construction elements, especially in the case of panel-blocks. Besides the required regulations, incl. implementation of common and sometimes obligatory technical standards, the policy measures in this area should also take into account the high upfront costs of investing in energy efficiency measures, especially for low-income households. In addition, the need households for insulation and retrofitting of existing buildings on a large-scale, could be used by national policy-makers to create incentives for R&I in the related technological fields.

In order to supplement the qualitative results from the project's case studies and to check how non-economic and non-technical factors could affect the individual and collective energy choices and behaviours, including in cases when technology-related aspects of energy transition are considered, we applied also statistical analysis of the household survey results. The survey was designed and conducted within the ENABLE.EU project as nationally representative for all project's partner countries. The analysis applies multiple regression models, which were explored with the respondents' attitudes towards different policy options as the dependent variables and with gender, age, income group, size of the settlement and education as independent variables.

[26] Vertical system of district heating (typical for all post-socialist countries) refers to a model, where several separate heat pipelines are entering into a single flat going vertically from the basement to the roof of the building, which does not allow: 1) a separate flat to stop fully using the district heating and to change to another heating option because cannot stop the flow of heat through the flat; even if owners want to do this, they should continue to pay a fee, irrespective of the consumed heat; 2) the user has to pay for the actual consumption even if metering devices are installed on all separate heaters in the flat because there is always a supplement fee for the "vertical system". In "horizontal system", the heat enters into a separate flat through a single "entry point" and allows both to stop using it or to have an individual metering device, which reports for the total actual consumption.



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## 4.2. Opinions and attitudes towards national energy transition priorities

A socially acceptable and affordable price of energy is pointed out as a key national policy priority by the majority of people in all countries. More than half of the people see administrative regulation of prices by the government as the main pathway for achieving affordability and social acceptability of prices. Accordingly, the support for liberalization of the market is the lowest. In general, irrespective of the country, the study shows as a main energy transition governance barrier, the lack of critical mass, supporting energy transition policies mainly due to economic reasons.

*Figure 11. What should be the main energy national priorities (%, base 7929)*

| | Development of clean energy sources, e.g. RES | **Price of energy, socially acceptable and affordable for all people** | Energy efficiency of private and public buildings | Power, gas and heating prices should be regulated by the government consistent with the living standards in the country | Power markets should be fully liberalized, so that energy prices are dependent only on the market | Phasing-out nuclear power plants (if any) |
|---|---|---|---|---|---|---|
| Bulgaria | **29.8%** | **82.6%** | 44.0% | 58.3% | **18.0%** | **6.6%** |
| France | 56.5% | 54.3% | 38.7% | 47.5% | 14.4% | **28.4%** |
| Germany | **60.9%** | **95.3%** | 33.9% | **26.0%** | NA | NA |
| Hungary | 44.0% | 53.5% | **25.7%** | 50.5% | 16.1% | 14.2% |
| Poland | 49.0% | 73.2% | 42.2% | **60.7%** | 14.9% | NA |
| Serbia | 40.7% | 69.3% | **29.0%** | **63.0%** | **22.6%** | NA |
| Ukraine | 50.1% | 75.8% | 34.7% | **62.0%** | **19.1%** | 21.5% |
| United Kingdom | **64.8%** | 74.8% | **54.0%** | 51.8% | 15.9% | **23.9%** |
| average | **49.5%** | **72.3%** | **37.8%** | **52.5%** | **17.3%** | **18.9%** |

Source: ENABLE.EU survey, 2017

The multiple regression analysis shows that **gender** does not has large effects on the attitudes towards energy prices and price regulation. However, men tend to approve market liberalization more than women, while the latter are slightly more inclined than the former to support paying higher prices for electricity, if it is generated from renewable energy sources.

With regard to **education**, there are small and ambiguous effects regarding energy price and its regulation: on the one hand, respondents with higher education are less likely to point to "price of energy, which is socially acceptable and affordable for all people" as an important priority for the country. On the other hand, they tend to see price regulation by the government[27] as a priority more often than people with lower education. These slightly self-contradictory results could be due to difference in educational structure between the

[27] People with higher education are more likely to support the statement "Power, gas and heating prices should be regulated by the government consistent with the living standards in the country" as a priority for their country



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countries. However, education is a strong predictor towards national priorities for development of RES and nuclear power. Higher education social strata support more often the development of clean energy sources like RES (solar, wind, hydro, biomass) and are more inclined to support phasing-out of the nuclear power plants in the country (if they exist).

**Age** is a weak but consistent predictor for positive attitudes towards market liberalization and development of clean energy sources as key national priorities. Younger people (up to 35 years) are more likely to agree to pay higher price for electricity, if it is generated from renewable energy sources and feel more inclined towards market liberalization. At the same time younger people consider "socially acceptable" energy prices and price regulation by the government to be less of a priority. More younger people also think of the phasing-out of nuclear power plants in their country (if such exist) as a priority. To sum up, even age is a weak predictor, there is stable trend that younger people support policy priorities in line with the goals of energy transition.

The **sizes of the settlement** is a strong and consistent driver for public attitudes and people from smaller settlements are generally against market liberalization and development of clean energy sources but in favour of government regulation and socially acceptable and affordable price of energy. People from smaller settlements are respectively less inclined to pay higher price for electricity, even if it is generated from renewable energy sources. Accordingly, people form larger settlements tend to have contrary opinions about "desired" national priorities of energy transition policies.

**Income** is by far the strongest and most consistent driver of attitudes and opinions regarding energy prices and market liberalization. Lower income groups are strong proponents for "socially acceptable and affordable" energy price and at the same time see government regulation as the path to achieving this affordable price, "consistent with the living standards in the country". Market liberalization is generally seen as a threat to the notion of affordable energy by the lower income groups. People with lower income are markedly against paying higher prices for energy, even if it originates from renewable sources.

Interestingly, while statistically significant support among the low-income groups for government regulation of energy prices is observed for the overall sample as well as for France, Germany, Hungary and Ukraine, the trend in Bulgaria seems to be exactly opposite: higher income groups are more likely to support government regulation of prices as compared to the low-income groups in the country. Possible explanation for this "illogical" result could be the fact that due to decade-long regulation of electricity price, kept artificially lower with administrative methods and constantly subsidized, the majority of mid- and high- income households are using electricity as their main energy source (e.g. for heating) because it has the lowest cost on the market as compared to other energy sources (see Figure 12).

***Figure 12. "Which of the descriptions below comes closest to how you feel about your household's income nowadays" and "Power, gas and heating prices should be regulated by the government consistent with the living standards in the country" (% mentioned)***



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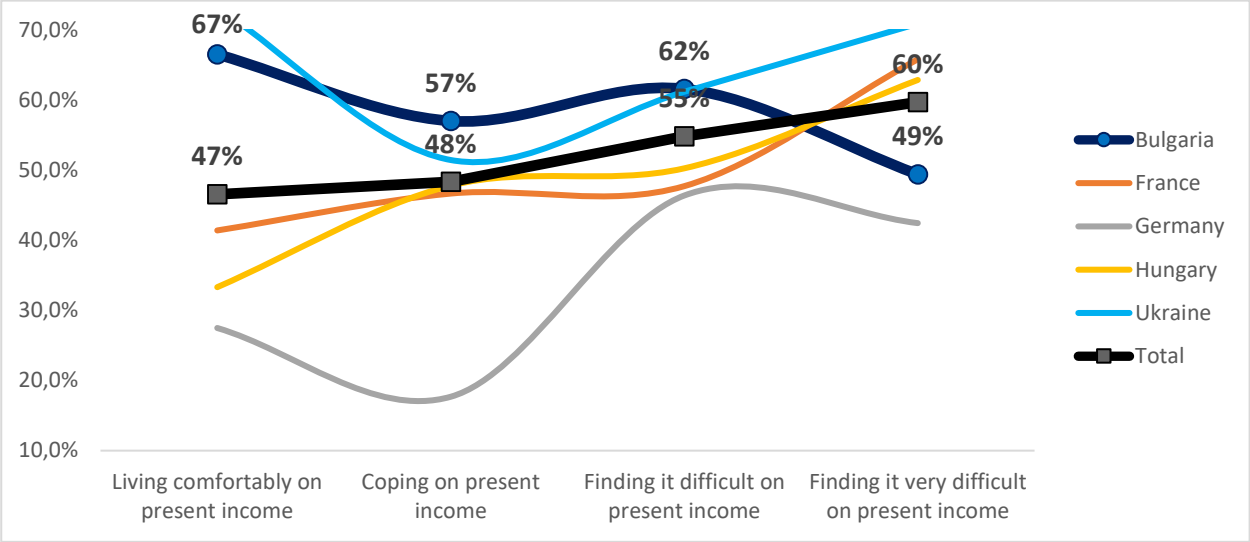


Source: ENABLE.EU survey, 2017

When it comes to policy measures supporting low-carbon mobility options and goals as part of energy transition agenda, most of the socio-demographic characteristics are also strong predictors of people's attitudes.[28] **Women** are more open than men to the idea that cars' usage in city centres should be severely limited in order to lower the air pollution. **Younger** people however tend to disagree with such policy more often. Education is the only factor, which fails to reach significance when determining the pattern of answers to all questions about low-carbon mobility measures.

People from **smaller settlements and suburbs** are more likely to disagree with the idea that car traffic should be limited in city centers. Possible explanation is that these groups of people would have more difficulties commuting to the city/town if such policies are implemented and at the same time they wouldn't experience direct benefit for themselves from lowering air pollution in the cities through traffic limitation. People living in smaller settlements also disagree with a policy, which incentivise owners of cars with higher environmental standards through smaller taxes.

*Figure 13. Mean values, respondents answer on a scale from 1 (totally agree) to 5 (totally disagree)*

[28] Attitudes are tested through 5-item Likert scale for expression of agreement with pre-defined statements: A. Cars' usage in city centres should be severely limited in order to lower the air pollution; C. Owners of cars that meet higher environmental standards should pay smaller taxes; E. There should be tax exemptions or tax reliefs, if someone buys an electric or hybrid car.



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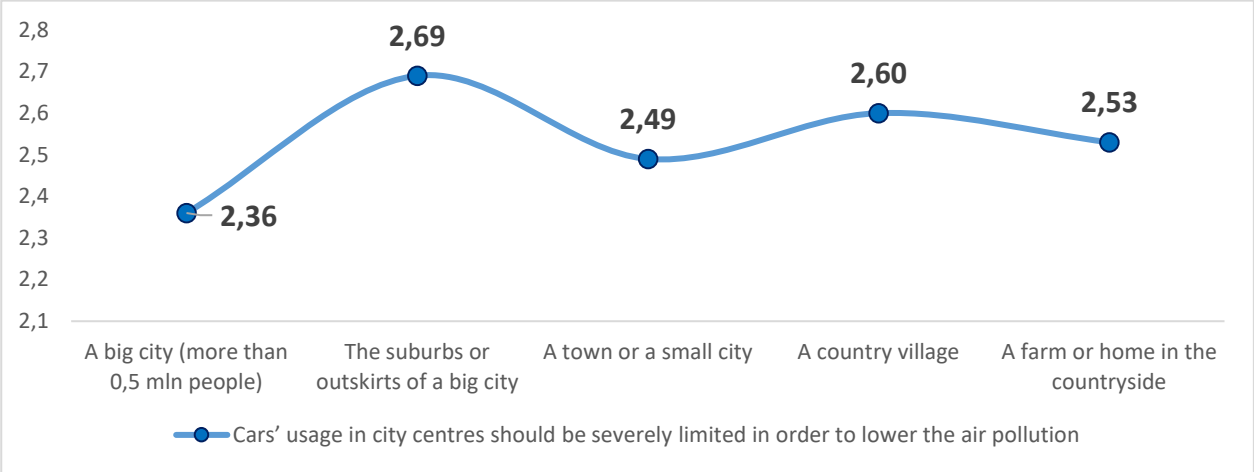


Source: ENABLE.EU survey, 2017

Surprisingly, lower **income** groups are more likely to agree that owners of cars with higher environmental standards should pay smaller taxes as well as with the statement that cars' usage in city centres should be severely limited in order to lower the air pollution. One possible explanation is that the attitudes of lower-income strata are predetermined by preferences for healthier and "low-cost" alternatives of city transportation like biking, using public transport and walking.

In general, the regression analysis demonstrates that the major socio-demographic characteristics (e.g. gender, age, education, income group, type of settlement) are strong predictors for the attitudes and opinions towards the specific options in the energy transition policies. Younger people and these with higher education and from higher income groups are more inclined to support energy transition goals, e.g. phasing-out nuclear power and development of RES in their countries or paying higher price for energy from RES. Moreover, younger people and those from higher income groups are less likely to support social or politically-administrative reasons for energy price formation and regulation, as compared to market-based mechanisms. Just the opposite is the opinion of people from smaller settlements and belonging to low-income groups, but surprisingly the higher age is not associated with such a clear distinction in the public opinion. Thus, the governance of the energy transition on national and regional/local level could take into consideration the above distinctions and elaborate policy measures, targeted towards specific groups in society, in order to tackle their "opposition" views or to incentivise their wanted behaviours, depending on where the group belongs to.


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# 5. Conclusions and recommendations

The analysis of governance bottlenecks and constraints in the implementation of national policies and strategies regarding technology-driven aspects of the transition to low-carbon energy systems, shows that beside some country specific features, there are many similarities across the European countries studied, and often these similarities are based on the more general knowledge and understanding of technology-driven aspects of the respective policies instead of going deeper into complex technical matter. Particular focus on non-economic and non-technical factors that could affect the individual and collective energy choices, tested with the socio-demographic characteristics as predictors for specific attitudes or opinions, demonstrates also that there are more similarities than differences across the countries and that especially socio-demographic characteristics strongly predict the anti- or pro- energy transition goals' attitudes and opinions.

In general, the stakeholders' assessment of the SET Plan implementation progress in the countries has been not positive and the Plan is not seen as enhancing the policy coordination and support for R&I related issues in the national policies. Among the main reasons about this are on the one hand, the low level of knowledge about it and involvement of wider stakeholders' community in the decision making and implementation processes and on the other hand – the lack of active engagement on country (e.g. governmental) level with the SET Plan of some member states, e.g. Central and Eastern European ones. In addition, even the coordination of the SET Plan on EU level, incl. the creation of specific monitoring mechanisms to track its progress, is seen as ineffective mostly due to the non-binding targets and requirements related with it. For example, the alignment of the EU framework programme for research and innovations Horizon 2020 with the SET Plan priorities, which is intended to channel substantive part of the available funding to topics, related to the Plan, is seen as inadequate as the access to this funding is locked in by established players and not suitable for important groups, such as SMEs.

***Recommendations:***

- Set up a monitoring tool or initiative on EU level, which requires every country to report the implementation of the Set Plan priorities on policy level according to pre-defined set of criteria. The monitoring process should prioritize the provision of information by national representatives instead of collection of information from a centralized point (e.g. current JRC-based monitoring);
- EC could support capacity building initiatives for SET Plan working groups' members in order to support them to achieve better coordination on national level, incl. through sharing of good practices or provision of information and data about expected future developments on EU and national levels;
- Make more clear and direct links between SET Plan priorities and targets into the 2030 climate and energy framework and 2050 low-carbon framework;
- Support the implementation of bottom-up approach and wider stakeholders' involvement in the design and implementation of climate and energy policies, particularly in Central and Eastern European Member States, including with the aim to enhance the management of general innovation policies in these countries;



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- Require SET Plan targets and priorities to be align more directly with the planning and implementation of ESIF funded programmes on national level;
- Widen the inclusion of member states' representatives into the group of people, who received information on or are consulted for the SET Plan implementation, e.g. members of the relevant H2020 Program Committees and National Contact Points.

The stakeholders also assess as insufficient the public awareness and knowledge about the SET Plan, including among specific target groups, e.g. enterprises in relevant economic sectors. One of possible reasons is the fact that the Plan is not recognized by various stakeholders' groups as a "funding stream", which lowers the interest into it. It should be noted, that most of the experts belonging to both public administration and academia, do not recognize civil society organisations (CSOs) as relevant target group, which should be also involved into planning and implementation of the Plan-related policy measures.

***Recommendations:***

- Enhance the process of raising public awareness and knowledge about the SET Plan among different target groups and general public, including relevant CSOs, through incorporating explicit links to SET Plan and its priorities and targets in all related climate and energy strategic documents and initiatives on EU level, as well as encourage the national policy-makers to do the same for national and regional/local ones. These could be not only documents and initiatives, directly related to climate and energy policy but also more general ones, related to innovation policy, e.g. national Smart Specialisation Strategies[29] and Regional Innovation Strategies (RIS3 in lagging regions)[30], or cross-country initiatives and funding programmes, e.g. the EU Strategy for Danube Region, Interreg Europe, etc.

Even though technology-driven aspects of specific national policies usually attract less attention from stakeholders, most of the respective policies include technology-related issues as a substantial part of them. As demonstrated with the example of two policy areas – low-carbon mobility and heating and cooling, the major governance bottlenecks regarding technical issues of the energy transition policies are similar to the constraints met by these policies due to economic (market and financial) constraints. In the case of low-carbon mobility (and electrification of car-sharing services as a particular example), such a bottleneck is the lack of long-term political commitment and insufficient policy coordination, as well as the "stop-and-go" approach in the design and implementation of the respective national policies. In the case of heating and cooling policies, the technical aspects, highlighted by the stakeholders, are much more, but major governance bottlenecks are seen also in the lack of or inefficient coordination and harmonisation of national policies across various sectors and policy areas (e.g. construction sector, energy, production of electrical devices, etc.), as well as affordability and poverty issues that are seen vital for the shift towards more sustainable H&C.

[29] http://s3platform.jrc.ec.europa.eu/

[30] Ibid.



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***Recommendations:***

- Further and deeper harmonization of national policies across sectors and policy areas is highly needed
- Diversification and decentralization of RES is deemed fundamental and governments must pay higher attention not only to electricity generation but also to other sectors and services (heating, use of alternative fuels), which has to go hand in hand with the development of new materials and community-based services.
- Incentives and drivers for shift in individual behaviors regarding H&C are largely missing. The value of community-based solutions should be promoted as they offer sustainable multiplier effect.
- EU and Member States should secure long-term political, financial and social commitments and synergy across the various policy areas:
    - Overcoming the EU-centered design of energy policies;
    - Overcoming the "stop-and-go" approach in national policies;
    - Overcoming the discrepancy between the top-down approach of the general policy-making and the bottom-up characteristic of the energy transition, seen as intrinsic and vital for its success.
- Particularly in H&C, ensure affordability of energy transition policies to be in the focus of decision-making, avoiding that the energy transition is seen as increasing social inequalities.
- Ensure better support to low-carbon R&D and technological development in universities as well as to tech companies.



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