



Final report

Study on energy subsidies and other government interventions in the European Union – 2022 edition

Written by Enerdata
August 2022

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PDF

ISBN 978-92-76-58459-9

doi:10.2833/304199

Catalogue number: MJ-04-22-159-EN-N

Luxembourg: Publications Office of the European Union, 2022

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Final report

Study on energy subsidies and other government interventions in the European Union – 2022 edition

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in association with:



Contract details:

European Commission – DG Energy A.4.

Study on energy subsidies and other government interventions in the EU – 2022 edition

Service request: ENER/A4/2022-366

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TERMS USED

<i>Subsidy inventory</i>	Database which contains subsidy amounts for all countries
<i>Commission study 2022</i>	This year study, named "Study on energy subsidies and other government interventions in the EU – edition 2022"
<i>Commission study 2021</i>	Previous edition of the study named "Study on energy subsidies and other government interventions in the EU"
<i>Commission studies</i>	Previous editions of the study (2019, 2020, 2021)
<i>MS Fact-sheet</i>	Synthetical document written about each Member State

ABBREVIATIONS

CAGR	Compound Annual Growth Rate
EC	The European Commission
EU	The European Union
EU27	The 27 members of the European Union
FF	Fossil Fuels
FFS	Fossil Fuel Subsidies
FIT	Feed-in tariffs
FIP	Feed-in premiums
GHG	Greenhouse Gas
HFO	Heavy Fuel Oil
LPG	Liquefied Petroleum Gas
MS / MSs	Member State / Member States within EU27
NECPs	National Energy and Climate Plans
PP	Petroleum Products
RD&D	Research, Development and Demonstration
RES	Renewable Energy Sources
RES-E	Electricity generated from renewable sources

1. Executive summary

Energy subsidy trends in the EU27

This section summarises recent developments in energy subsidies in the EU27. Our conclusions are below.

On the quality and transparency of reporting on energy subsidies:

- Information collected from MS Representatives during the conduct of this study largely improved the quality of data for some MSs. We are of the opinion that this consultation round is a positive contribution to the study.
- A portion of the 2021 and 2022 data is still missing at the date of writing this report¹ (July 2022).

On the energy subsidies trends since 2015:

- The overall amount of energy subsidies in EU27, €159 billion in 2015, has constantly grown (1.8% CAGR) since then reaching **€173 billion** in 2020.
- As of June 2022, we estimate that around €76 billion in subsidies were paid in the EU27 in 2021 and 2022 to address rising energy prices. We expect that this figure will only partially increase the overall amount of subsidies in 2022, as it likely overlaps with existing measures implemented before that year.
- Total **fossil fuel subsidies** paid have remained relatively stable at around €52 billion per year until 2019 before recording a €3 billion fall (-5%) in 2020, which was caused by a €3 billion reduction in subsidies allocated to the transport sector, in the context of COVID-19 pandemic and lockdown measures. Such lower level (€50 billion) seems to be taking shape in the EU27 for 2021 in a context still recovering from the global crisis.
- Structural changes of the European power mix have triggered the emergence of subsidies directed at **industry restructuring** such as aids to close coal/lignite power plants and coal mines. In 2021, they could have represented 6% (€2.2 billion) of the total FFS in the EU27. Germany, as the biggest coal user in Europe, dedicated around 20% (€2.7 billion) of its coal-oriented subsidies in 2020 to coal phase-out measures and schemes to rehabilitate old coal mining sites.
- **Hydrogen**-related subsidies have remained low from 2015 to 2021 (€330 million in 2021) but have significantly increased in 2022, reaching around €900 million. We expect this rise to be confirmed in years to come as EU27 countries' interest in the new technology is growing.
- Support to **renewables** is still on the rise mainly throughout market-based instruments including feed-in premiums, contracts for difference and RES quotas with tradable certificates. Solar still receives the highest financial support, followed by wind and biomass.
- Subsidies to **nuclear** that were stable since 2015 are following an upward trend since 2019 mainly because of revised decommissioning costs in Italy and payment for early closure of power plants in France. Subsidies surged in 2021 as Germany paid €2.4 billion to compensate utilities from the decision to phase-out of nuclear power by 2022.
- On a growing trend between 2015 and 2018 (+9% per year), support to energy efficiency decreased significantly between 2019 and 2020, by 7%, but has rebounded in 2021.

¹ In particular for 2021: Austria, Belgium, Czechia, Ireland, Italy, Luxembourg, Poland, Portugal, Romania, Sweden

Update and analysis of national phase out plans on subsidies

- Only few countries² have translated ambitions to phase out fossil fuel subsidies into laws or clear plans.
- Many MSs have not specified end-dates for fossil fuel subsidies. This makes it hard to monitor the effectiveness of phase out plans.
- Seven MSs³ are responsible for 80% of the total FFS amounts granted in 2020.
- Several measures were taken in favour of fossil fuel use by MSs, in contradiction to the objective of the EU to ensure irreversibility of the transition to climate neutrality.

² In particular: Denmark, Germany, Ireland, Italy, Sweden

³ Namely: France, Germany, Italy, Belgium, Spain, Ireland and Greece

Résumé

Tendances des subventions énergétiques dans l'UE27

Ce chapitre résume l'évolution récente des subventions énergétiques dans l'UE27. Nos conclusions sont présentées ci-dessous.

À propos de la qualité et la transparence des rapports sur les subventions énergétiques :

- Les informations recueillies auprès des représentants des Etats Membres au cours de cette étude ont grandement amélioré la qualité des données de certains Etats. Nous pensons que cette consultation est une contribution positive à la qualité de l'étude.
- Certaines données de 2021 et 2022 sont encore manquantes⁴ au moment de la rédaction de ce rapport (juillet 2022).

A propos des tendances des subventions énergétiques depuis 2015 :

- Le montant global des subventions énergétiques dans l'UE27, de 159 milliards d'euros en 2015, n'a cessé de croître (1,8% par an) depuis cette date pour atteindre **173 milliards d'euros** en 2020.
- A fin juin 2022, nous estimons qu'environ 76 milliards d'euros de subventions ont été versés dans l'UE27 en 2021 et 2022 pour faire face à la **hausse des prix de l'énergie**. Nous pensons que ce chiffre n'augmentera que partiellement le montant global des subventions en 2022, car il recoupe probablement des mesures déjà existantes et mises en œuvre avant cette année-là.
- Le montant total des **subventions versées aux énergies fossiles** est resté relativement stable, à environ 52 milliards d'euros par an jusqu'en 2019, avant d'enregistrer une baisse de 3 milliards d'euros (-5%) en 2020. Cette baisse a été causée par une réduction de 3 milliards d'euros des subventions allouées au secteur des transports, dans le contexte de la pandémie de COVID-19 et des mesures de confinement. Ce bas niveau (50 milliards d'euros) devrait de nouveau être observé pour 2021 dans un contexte où les effets de la crise mondiale persistent.
- Les changements structurels du mix énergétique européen ont favorisé l'émergence de subventions destinées à la **restructuration de l'industrie**, telles que des aides à la fermeture de centrales électriques au charbon/lignite ou de mines de charbon. En 2021, elles pourraient représenter 6% (2,2 milliards d'euros) des subventions totales aux énergies fossiles de l'UE27. En 2020, l'Allemagne, premier consommateur de charbon en Europe, a consacré environ 20% (soit 2,7 milliards d'euros) de ses subventions au charbon à des mesures de sortie progressive du charbon et à des programmes de réhabilitation d'anciens sites d'extraction du charbon.
- Les subventions à l'**hydrogène** sont restées faibles entre 2015 et 2021 (330 millions d'euros en 2021), mais ont considérablement augmenté en 2022, atteignant 900 millions d'euros cette année. Nous nous attendons à ce que cette hausse se confirme dans les années à venir, car l'intérêt des pays de l'UE27 pour cette nouvelle technologie ne cesse de croître.
- Le montant des dépenses aux **énergies renouvelables** continue d'augmenter, principalement par le biais d'instruments de marché, de prix garantis, de contrats avec complément de rémunération et de quotas avec certificats négociables. Le solaire photovoltaïque bénéficie toujours du soutien financier le plus important, suivi de l'éolien et de la biomasse.

⁴ En particulier pour 2021 : Autriche, Belgique, République tchèque, Irlande, Italie, Luxembourg, Pologne, Portugal, Roumanie, Suède.

- Les subventions au **nucléaire** qui étaient stables depuis 2015, suivent une tendance à la hausse depuis 2019 principalement en raison de la révision des coûts de démantèlement en Italie et de paiements pour la fermeture anticipée de centrales en France. Les subventions ont fortement progressé en 2021, l'Allemagne ayant versé 2,4 milliards d'euros pour compenser les producteurs de la décision de sortir du nucléaire en 2022.
- Suivant une tendance à la hausse entre 2015 et 2018 (+9% par an), le soutien à l'efficacité énergétique a sensiblement diminué entre 2019 et 2020 de 7%, avant de rebondir en 2021.

Mise à jour et analyse des plans nationaux de sortie progressive des subventions

- Seuls quelques pays⁵ ont traduit au travers de lois ou de plans leurs ambitions de sortie des subventions aux énergies fossiles.
- De nombreux Etats Membres n'ont pas indiqué de date de fin des subventions aux énergies fossiles. Il est donc difficile de contrôler l'efficacité des plans de sortie.
- Sept Etats Membres⁶ sont responsables de 80% du montant total des subventions aux énergies fossiles versées en 2020.
- Dernièrement, plusieurs mesures ont été prises par les Etats Membres en faveur de l'utilisation des combustibles fossiles. Ces mesures entrent en contradiction avec l'objectif de l'Union Européenne de garantir l'irréversibilité de la transition vers la neutralité climatique.

⁵ En particulier : Danemark, Allemagne, Irlande, Italie, Suède

⁶ A savoir : France, Allemagne, Italie, Belgique, Espagne, Irlande et Grèce.

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2. Introduction

This report documents work completed for the Directorate General for Energy (DG ENER) of the European Commission (EC) on the **Study on energy subsidies and other government interventions in the EU – 2022 edition** (Framework Contract MOVE/ENER/SRD/2020/OP/0008 Lot-2). The work was done by a two-member consortium: **Enerdata**, the project lead, and **Trinomics**. It is the latest in a series of DG ENER studies going back to 2014 documenting energy subsidies and related instruments. Tasks 1-3 of this study involved collecting, documenting, normalising, controlling, and analysing subsidy data from national and EU sources. Task 4 compared fossil fuel subsidies of the inventory with policies and measures implemented or announced by each Member State in connection with the reduction of inefficient fossil fuel subsidies.

The objectives of this study were:

- Tasks 1-3: Energy subsidy trends in the EU27
 - Collect, control, harmonise and analyse energy subsidies data trends in the EU27 from 2015 to 2020, 2021 where possible
- Task 4: Preparing an update and analysis of national phase out plans on subsidies
 - Analyse national fossil fuel subsidy phase out plans
 - Report on the policies either implemented or announced by Member States
- Task 5: Preparation of the study, building on all of these

This report starts with a brief background on energy subsidies in the EU, then launches into documentation of the approaches, findings, and conclusions for each of the above tasks. Annexes include:

- Theoretical framework
- Country data controls and observations
- The subsidies database (separate document, in Excel format)
- Member State Fact-sheets (separate document, in pdf format)

Background

Energy subsidies and government interventions refer to specific initiatives to keep prices for consumers below market levels (e.g. reduced tax rates on road transport fuels) or for producers above market levels (e.g. feed-in tariffs), or to reduce costs for consumers or producers by granting specific benefits. Energy subsidies may be made of direct cash transfers to producers or consumers, as well as indirect support mechanisms (e.g. tax exemptions and tax credits), or even market-based mechanisms providing cross-subsidies between economics actors (e.g. white certificate markets for energy efficiency, electricity capacity mechanisms...).

The most established and detailed categorization of government interventions related to the energy sector has been developed by the European Commission (EC) through the Study on energy costs, taxes, government interventions and their impact on energy investments⁷ using the concept developed by the World Trade Organization through an Agreement on Subsidies and Countervailing Measures (ASCM)⁸.

⁷ Available at : https://ec.europa.eu/energy/studies_main/final_studies/study-energy-costs-taxes-and-impact-government-interventions-investments_en

⁸ Available at : https://www.wto.org/english/tratop_e/scm_e/scm_e.htm

It led to the classification of subsidies and government interventions in four main categories, namely direct transfers, tax expenditures, income or price supports and RD&D budgets.

- **Direct transfers** are direct expenditures by governments to recipients, which could be either consumers or producers. Direct transfers include grants, low-interest or preferential loans.
- **Tax expenditures** are the amount of tax benefits, or preferences, received by taxpayers and forgone by governments. Tax expenditures are relative preferences within a country's tax system that are measured with reference to a benchmark tax treatment set by that country. The amounts of tax expenditures were estimated by governments with reference to a benchmark tax level. Five main different forms have been identified, namely: tax reductions, tax exemptions, tax refunds, tax credits and tax allowances. These instruments may apply to various types of energy-related taxes, such as excise duties, specific electricity taxes, fees financing certain types of technologies (i.e. renewables or cogeneration), carbon taxes, VAT, etc;
- **Income or price supports** encompass various types of economic mechanisms, most of them can be considered as cross-subsidies, i.e. consisting of transferring amounts of money from groups of people / technology / territory to another specific group. Most often, such measures are financed through final consumers' tariffs/prices. Twelve types of interventions have been identified: capacity payments, biofuels blending mandates, renewable energy quotas with tradable certificates, differentiated grid connection charges, energy efficiency obligations, interruptible load schemes, contract for difference, feed-in premiums, feed-in tariffs, consumer price guarantees (cost support), consumer price guarantees (price regulation) and producer price guarantees (price regulation);
- **Research, Development and Demonstration (RD&D) budgets** cover various types of provisions of financial and/or other preferential mechanisms to support innovation.

The use of subsidies is often justified by governments as a way to address market failures, but sometimes the rationale driving the subsidy is outdated. Previous editions of the study highlight how the existence of some subsidies can be explained by the social and economic context of the 20th century, and by inertia of Member State economic policy. For example, the *Commission study 2021* found that of the 420 individual fossil fuel subsidies (FFS) enacted before 2020, 193 (46%) still exist. But the policy context is evolving.

International initiatives to rationalise and phase-out FFS were announced as early as 2009⁹ and have since increased in number and importance. In 2021, G7 leaders raised the ambition to "...phase out new direct government support for international carbon-intensive fossil fuel energy"¹⁰. Then, the Glasgow Climate Pact¹¹ adopted at COP26 in November 2021 called for "...accelerating efforts towards the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies...". While the results of COP26 stopped short of calling for a total phase-out of FFS, there is clearly greater and more focused international attention on this crucial issue.

The European Union (EU) has taken leadership on this issue by forwarding a set of actions and legislative tools to effectively to phase-out FFS. The Regulation on the Governance of the Energy Union and

⁹ G20 Leaders Statement: The Pittsburgh Summit, September 2009, available at:

<https://www.oecd.org/g20/summits/pittsburgh/G20-Pittsburgh-Leaders-Declaration.pdf>

¹⁰ Available at: <https://www.g7uk.org/wp-content/uploads/2021/06/Carbis-Bay-G7-Summit-Communique-PDF-430KB-25-pages-3-1.pdf>

¹¹ Available at: https://unfccc.int/sites/default/files/resource/cma3_auv_2_cover%20decision.pdf, paragraph 36

Climate Action of December 2018¹² enacts the EU's commitment to improve reporting and transparency by requiring MSs to report annually on their progress in phasing out energy subsidies, in particular FFS. And the EU Climate Law of June 2021, which amended the Governance Regulation, requires phasing out all energy subsidies that are incompatible with the objective of climate neutrality in 2050. The text also requires the European Commission to "adopt implementing acts to set out the structure, format, technical details and process (...) [including a] methodology for the reporting on the phasing out of energy subsidies, in particular for fossil fuels"¹³. This new charge should result in more uniform reporting on the phase-out of energy subsidies across MSs, and ease monitoring and benchmarking activities.

The EU Climate Law is complemented by the proposed revision of the Energy Taxation Directive in the Fit for 55 package to align the taxation of energy products with EU energy and climate policies by promoting clean technologies and removing outdated exemptions and reduced rates that currently encourage the use of fossil fuels¹⁴.

The new Guidelines on State aid for climate, environmental protection and energy (CEEAG) of December 2021 also complements the previous legislative package by targeting the end of "subsidies for the most polluting fossil fuels (...) in light of their important negative environmental effects"¹⁵. Although the CEEAG tackles environmentally harmful subsidies, it doesn't forbid financial support where it is in line with European climate objectives. Indeed, the text authorises MSs to provide subsidies to fossil fuels when they accelerate a "shift away from coal, peat and oil shale activities" such as "aid for the closure of power plants using coal, peat or oil shale and of mining operations relating to coal, peat or oil shale extraction"¹⁶.

Under the Taxonomy Regulation, adopted on 4 June 2021¹⁷, the Commission has set up a first delegated act on sustainable activities for climate change adaptation and mitigation objectives, applicable since January 2022. The Taxonomy is the first international classification that defines, lists and organises the environmentally sustainable economic activities into a common language. This provides investors with appropriate definitions of economic activities that can be considered environmentally sustainable and therefore contribute to direct investments towards sustainable projects and activities. It also helps the EU to strengthen its global leadership on energy transition toward sustainable future as the EU Taxonomy could serve as a worldwide standard. The European Commission started, on 1 January 2022, consultations on a draft text of a second Taxonomy Delegated Act to introduce gas or nuclear activities into the EU Taxonomy Regulation. The 6 July 2022, the European Parliament has approved the inclusion of those two activities, under certain conditions, in the EU Taxonomy¹⁸.

¹² Governance of the Energy Union and Climate Action, December 2018, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L:2018:328:FULL&from=EN>

¹³ European Union Climate Law, Article 17, paragraph 4, June 2021, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1119&from=EN>

¹⁴ European Green Deal: Commission proposes transformation of EU economy and society to meet climate ambitions, available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_21_3541

¹⁵ Commission endorses the new Guidelines on State aid for Climate, Environmental protection and Energy, 21 December 2021, available at: https://ec.europa.eu/commission/presscorner/detail/en/IP_21_6982

¹⁶ Approval of the content of a draft for a Communication from the Commission on the Guidelines on State aid for climate, environmental protection and energy 2022, section 4.12.1 Aid for the early closure of profitable coal, peat and oil shale activities, available at: https://ec.europa.eu/competition-policy/system/files/2021-12/CEEAG_Guidelines_with_annexes_I_and_II_0.pdf

¹⁷ EU taxonomy for sustainable activities, available at: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

¹⁸ Taxonomy: MEPs do not object to inclusion of gas and nuclear activities, available at:

Despite the many benefits of ending fossil fuel and other inefficient subsidies, efforts to implement such reforms have long been hampered by a crucial lack of information regarding the amount and type of support measures in place. Although the DG COMP State Aid registry is well designed and effective to follow-up on State aids decided since 2006, former subsidies created and implemented before that date are not inventoried, therefore not monitored. To address this issue, the DG ENER has developed an extensive database (the *Subsidy inventory*) gathering a large set of information on all kinds of energy subsidies and government interventions. After a first approach in 2014, the DG ENER reiterated its effort to better map the existence of energy subsidies by ordering three sequential studies on this topic in 2018, 2020, and 2021. The outcomes of the *Commission study 2021* has been annexed to the *Sixth report on the state of the energy union report (SOEUR)*¹⁹ and it showed that 8 MSs were considering subsidy phase-outs or in the process of developing phase-out plans. While the amount of EU27 FFS have remained steady since 2008 at around €55bn (in EUR₂₀₂₀), the *Commission study 2021* pointed out that trends vary from one country to another with e.g. Sweden and Germany registering FFS drops of €1.0bn and €0.7bn, respectively, over the 2015-2019 period, whereas MSs like France (+€3.2bn) and Belgium (+€0.6bn) paid more in to support fossil fuels. This study builds on the work of these previous studies by adding subsidy data for 2020 and 2021.

<https://www.europarl.europa.eu/news/en/press-room/20220701IPR34365/taxonomy-meps-do-not-object-to-inclusion-of-gas-and-nuclear-activities>

¹⁹ https://ec.europa.eu/energy/topics/energy-strategy/energy-union/sixth-report-state-energy-union_en

3. Energy subsidy trends in the EU27

3.1. Objective

The aim of this study was to collect, control, harmonise and analyse energy subsidies data trends in the EU27 from 2015 to 2020 and, if possible, to 2021. This has been done by updating the current energy subsidies inventory (later called *Subsidy inventory*) inherited from the previous editions of the study along with the EC Study on energy costs, taxes, government interventions and their impact on energy investments of 2020²⁰ (later called as a whole "*Commission studies*").

The objective was also to update the fossil fuel subsidies phase-out plans implemented by each Member State (MS) looking at their state budget for the upcoming years and, if possible, to quantify the ambition of the said plans developed.

In a first step, we discuss on the methodological framework used throughout the study before addressing the various trends observed since 2015.

Overall, the noticeable changes and qualitative observations in the subsidy data collected at country level are available in the 5.2 Annex 2: Country data controls and observations.

3.2. Theoretical framework addressing energy subsidy

Our analysis is based on the methodological framework used in previous *Commission studies*, which is inspired by the Agreement on Subsidies and Countervailing Measures (ASCM) framework stated by the World Trade Organization (WTO)²¹. Accordingly, the subsidy definitions and classifications have remained that of the *Commission study 2021*. To that well established methodological framework, we have added the EU Taxonomy as a new classification. The main axis of analysis, thus of classifications, being the following:

- Category
- Instruments
- Energy sources/carriers
- Purposes
- Source of financing
- Economic sectors
- EU Taxonomy

The methodology is presented in detail under the section 5.1 Annex 1: *Theoretical framework*.

²⁰ « Energy costs, taxes and the impact of government interventions on investments », Trinomics, Enerdata, Cambridge Econometrics, LBST, October 2020. Available at <https://op.europa.eu/en/publication-detail/-/publication/92ae71b0-173a-11eb-b57e-01aa75ed71a1/language-en>

²¹ All documents related to WTO Agreement on Subsidies and Countervailing Measures are available at https://www.wto.org/english/tratop_e/scm_e/scm_e.htm

3.2.1. Data quality

Although many international institutions have repeatedly committed^{22,23,24,25} and called to phase-out fossil fuel subsidies (FFS), reporting specifically on the energy-related subsidies is a new matter for most of the institutions and states. As a result, establishing a reporting on this topic is very challenging and requires many cross-controls. Indeed, as no reporting standard has been imposed yet, each actor (international institutions, states, regions) releases data according to its own understanding. The chapter below describes the hurdles our consortium has encountered to update our inventory. We have identified six main types of barriers in addition to the lack of common rules and scopes of reporting.

3.2.1.1. Accessibility and clarity

The first challenge we have met during this study was to identify the sources of information on energy subsidies. Indeed, in many countries, **the information is spread out between various institutions** and often no consolidated data is available. Although, data on energy/excise tax expenditures are usually well structured, not all the MS -through their Ministry of Finance or Tax administration- are currently publishing a dedicated report on this form of subsidy. When it comes to direct transfers, the data on subsidies is spread all over the institutions -energy efficiency agency, building agency, funding organisations, etc.- providing grants, soft loans or other related subsidies. Like with direct transfers, dispersal of information across the institutions -regulator, competition agency, energy efficiency agency, market operators, etc.- is also true for all the kinds of income or price support. Finally, the **data scattering makes very difficult to ensure the completeness of the amounts gathered**²⁶. At the same time, there is a **risk of double counting**, which required careful introduction of new data into our database.

Another hurdle is the **continuous re-location of the information** due to numerous reorganisations of the websites of the many institutions providing data²⁷. Consequently, we see these never-ending changes as a serious obstacle for the public to follow-up the energy subsidies developments even in their own countries.

Eventually, another major issue is the **interruption of provision of some documents** because they are no longer produced or no longer made public. For instance, we have noticed that several MSs²⁸ have stopped or interrupted issuing their annual tax expenditure reports that used to provide valuable information for our reporting on energy subsidies. Such a problem is quasi-insoluble as our analysis requires information held by the countries' administration.

²² The communiqué mentions the G20 members "To phase-out and rationalise over the medium term inefficient fossil fuel subsidies while providing targeted support for the poorest", G20 Pittsburgh Leaders Declaration, September 2009. Available at: <https://www.oecd.org/g20/summits/pittsburgh/G20-Pittsburgh-Leaders-Declaration.pdf>

²³ The Clean Energy For All Europeans mentions that "this package is also stepping up EU's action in removing inefficient fossil fuel subsidies in line with international commitments under G7 and G20 and in the Paris Agreement. The remaining but still significant public support for oil, coal and other carbon-intensive fuels continues to distort the energy market, creates economic inefficiency and inhibits investment in the clean energy transition and innovation." European Commission, "Clean Energy for all Europeans" package, (COM(2016) 860), November 2016. Available at: <https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-860-F1-EN-MAIN.PDF>

²⁴ The G7 statement of 2016 stipulates the G7 members « remain committed to the elimination of inefficient fossil fuel subsidies and encourage all countries to do so by 2025 ». Available at: <http://www.g8.utoronto.ca/summit/2016shima/ise-shima-declaration-en.html#climate>

²⁵ The G7 statement of June 2021 stipulates the G7 members « we reaffirm our existing commitment to eliminating inefficient fossil fuel subsidies by 2025 ». Available at: <https://www.g7uk.org/wp-content/uploads/2021/06/Carbis-Bay-G7-Summit-Communique-PDF-430KB-25-pages-3-1.pdf>

²⁶ However, we have developed several processes to cope with this issue in order to ensure a good quality and completeness of the data provided. For more information, see section called *Data collect and control process* in the Annexes.

²⁷ This issue has been overcome in most of the case during the study thanks to our network of country experts, however collecting data on energy subsidies is far from being easy for non-experts.

²⁸ For more information, please refer to 5.2 Annex 2: Country data controls and observations.

3.2.1.2. Transparency

Unsurprisingly, a serious obstacle that we have faced was the **lack of the transparency** of the data we have collected. Indeed, in addition to the data scattering issue mentioned above, the format of the **information is rarely presented in a user-friendly manner**: still, most of the documents scanned are provided as pdf, whereas they include quantitative data that would obviously require a spreadsheet-based format. **Data provided in a spreadsheet-based format are still very uncommon**, as well as the presence of subsidies data on government open-data platforms. This is a serious obstacle to compare the data over the years, then to detect new or ended subsidies.

3.2.1.3. Consistency

The consistency of the data collected in the reports on subsidies published by MS varied significantly from one country to another. Indeed, very few countries provide the metadata that are required to set up consistent reporting. Indeed, relevant reporting calls for the presence of the following metadata on each measure:

- title,
- objectives,
- description,
- energy carrier / product concerned,
- recipient(s),
- economic sectors,
- legal reference,
- exact scope covered,
- changes in scope,
- data collection methodology,
- explanation on significant variations from one year to year,
- retroactive changes applied to several years in the case of significant changes,
- list of new/ended subsidies,
- start date,
- end date,
- consistency with EU Taxonomy.

Indeed, without the above listed metadata, it is difficult to understand potential changes over the years and analyse trends with accuracy. Especially, very **few reports point out the list of subsidies that have been added** (new ones) **or removed** (subsidies phased-out or purely removed for legislative or technical reasons) of the documents **from year to year**. Such information would though be very useful to perform appropriate follow-up over a period and thus to provide insight on the trends followed by States.

3.2.1.4. Homogeneity and comparability

The homogeneity of the data is also an essential matter to perform consistent analysis. In fact, achieving relevant comparisons across years and across countries requires the use of common methodologies. However, as the UNEP and IISD²⁹ acknowledge, the “benchmarks are currently set on a country-by-country basis”, and **as estimation methods applied by countries differ, the international comparability of existing tax expenditure estimates is limited in the absence of a uniform international framework**. Differences in the amount of subsidies reported can be due to a range of factors such as a higher tax benchmark, a stricter definition of the benchmark system, or a more complete set of tax-expenditure accounts.” Although the UNEP and IISD focus on the issue related to tax expenditures, the same problem applies to many measures. This is the case, for instance, of the

²⁹ Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals, UNEP and IISD, June 2019. Available at <https://www.unep.org/resources/report/measuring-fossil-fuel-subsidies-context-sustainable-development-goals>

various electricity capacity mechanisms implemented lately. Although, the measure is quite recent, no common reporting method has been enforced across the MS. Therefore, the *Subsidy inventory*, which is based on public information, includes amounts of subsidies whose content differs although the measures have the same name.

3.2.1.5. Granularity

The issue of the granularity of the data is also essential to better analyse the evolution of energy subsidy policies and compare countries with each other. Indeed, the granularity of the data reported varies depending on the countries, making comparisons more difficult. For instance, where reporting exists, one single subsidy amount can cover all the technologies consolidated, several technologies grouped together or also only one single technology/carrier/product. This depends on the MS reporting rules. Similar remark also applies to tax expenditure reports. Overall, **the breakdown of the subsidy amounts per energy carriers/products or by beneficiaries is still rare**. However, it is worth mentioning the noticeable and appropriate breakdown of amounts of fossil fuels subsidies by fuel in the French tax expenditure report of 2021. Since then, several subsidies that were previously reported as one entity are now broken down by oil, gas and coal, which improves transparency and allows for a more accurate analysis.

3.2.1.6. Timeliness and punctuality

The publication speed has been an obstacle to this study. While for some countries, data have been collected, controlled, and harmonised for 2021 and subsequent years based on data included in MS budgets, for other countries, several sources of data were not yet published at the time of updating the *Subsidy Inventory*. Indeed, our report was written based on data collected up until 23rd June 2022, therefore some subsidy amounts were still not available for the year 2021. This observation holds true for data provided by many national institutions within the MSs but also for international organisations such as the OECD or DG COMP that have not yet provided data for 2021³⁰. As a result, a portion of the data for the year 2021 couldn't be captured.

To address this issue, we have repeated the approach used in the *Commission study 2021*: missing data for 2021 have been identified, quantified, and estimated to enable the comparison with previous years. In every graph presented in the report, if the subsidy scheme is still ongoing in 2021 and if no data for 2021 is presented in the inventory, it is assumed that the 2021 subsidy amount is equal to that of 2020.³¹ This conservative approach allows for visual comparison across years.

⌘ **To be confirmed** : Amounts under such assumption are indicated with hatching and reported in a separate category named "To be confirmed".

Data under "To be confirmed" category amounted to 24% of the total amount included in the *Subsidy inventory* for year 2021. Where uncertainty is high, comments of trends performed in the following sections are limited to the period 2015-2020. Moreover, we anticipate some data for 2021 to be adjusted retroactively by the responsible national authorities and must therefore be interpreted with caution.

³⁰ At the time we write the report, i.e. 6th July 2022.

³¹ An exception are the two graphs for RES subsidies (

Figure 10 and

Figure 12), where we took into account expected changes in the level of market-based instruments due to the change in electricity wholesale prices.

3.2.2. Data control through consultation round

To improve the robustness of the database and thus our analysis, to better involve MSs in the topic of energy subsidies, and to support the "Commission (...) in implementing (...) [a] more uniform reporting on the phasing out of energy subsidies, in particular for fossil fuels"³², we have introduced a consultative role to MS representatives during the data validation process.

Once we collected and controlled the subsidy data within the consortium, we submitted it to MS representatives to review, comment on, and update the data as needed.

Such a data control process was performed during the previous *Commission studies* with representatives of some countries and generalised to all MSs during this *Commission study 2022*. In general, contacts have brought valuable comments, corrected some minor mistakes, and enriched the inventory.

The country inventory shared with representatives excluded the EU Taxonomy, as agreed with the DG ENER.

The table hereafter gives an overview of the feedback received on a country basis, with the following information:

- *Feedback received* – marks ✓ / ✗ means feedback was received / not received, respectively
- *Information provided* – Complete / Partial / Limited, along with details about information received

³² European Commission, State of the Energy Union 2021 – Contributing to the European Green Deal and the Union's recovery, 26 October 2021. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0950#footnote115>

Table 1: Feedback received at the end of consultation round (as of 29th July)

Country	Feedback received	Information provided
Austria	✓	Full. Data review
Belgium	✓	Full. Comments, data correction, new subsidies
Bulgaria	✓	Full. Data review
Croatia	X	E-mail delivered, but no feedback received
Cyprus	X	E-mail delivery issue
Czechia	✓	Limited feedback. Disagreement expressed with methodology
Denmark	X	Contact not available
Estonia	✓	Full. Comments, data correction, new subsidies
Finland	✓	Full. Comments, data correction, new subsidies
France	✓	Limited feedback. RES data validation only. Lack of time to complete
Germany	X	E-mail delivered, but no reply received
Greece	X	E-mail delivered, but no reply received
Hungary	X	E-mail delivered, but no reply received
Ireland	✓	Full. Comments, data correction, new subsidies
Italy	X	E-mail delivered, but no reply received
Latvia	✓	Full. Comments, data correction, new subsidies
Lithuania	X	E-mail delivered, but no reply received
Luxembourg	X	E-mail delivered, but no reply received
Malta	✓	Full. Comments, data correction
Netherlands	X	E-mail delivery issue
Poland	✓	Full. Comments, data correction
Portugal	X	E-mail delivery issue
Romania	X	E-mail delivered, but no reply received
Slovakia	✓	Full. Comments, data correction, new subsidies
Slovenia	✓	Full. Comments, data correction, new subsidies
Spain	✓	Limited feedback. Unable to verify the information sources
Sweden	✓	Limited feedback. Superficial review

For some reason, 12 MSs were not able to provide us with feedback. Some of them invoked a lack of time, especially large countries such as France (it may be also the case for Italy, however, no confirmation was received). But in general, we were positively surprised that many MSs were able to provide valuable feedback in a short timeframe (10-15 days).

3.3. General considerations

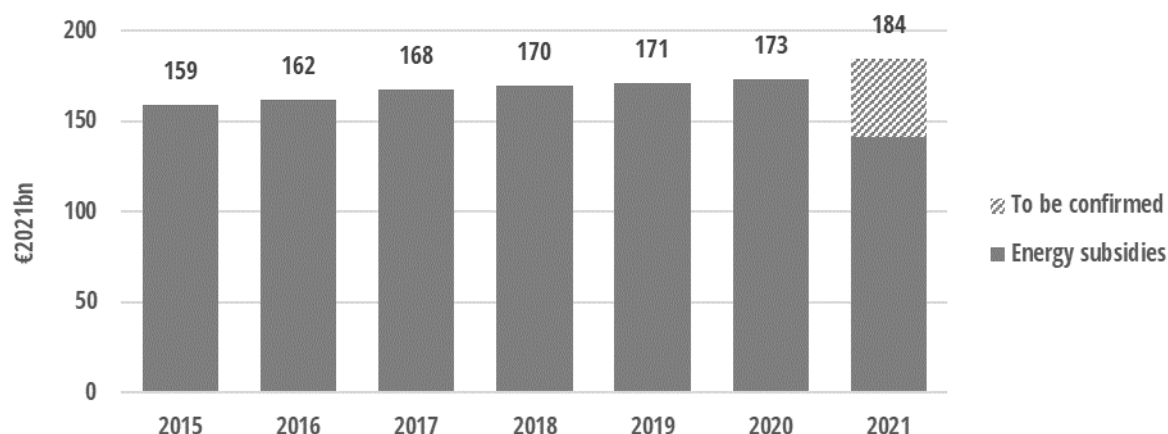
The forthcoming sections of the report analyse energy subsidies trends in the EU27 MS for the period 2015 to 2021. It focuses on the timeframe starting in 2015 in order to investigate progress made since the Paris agreement.

All values (unless otherwise indicated) stated in this report are in euros of 2021 (real values). Most of them are expressed in billion euros and noted €2021bn.

In general, the terms in this report were chosen to be self-explanatory. However, the term “All energies” can be confusing. In this report, “All energies” applies to energy efficiency measures or to energy produced from multi-energy or unknown source.

The updated *Subsidy inventory* includes 1,714 subsidies of which 1,400 are still active in 2021. The total amount of subsidies reaches €173 billion in 2020 (Figure 1).

Figure 1: Overall Energy subsidies in the EU27 (2015-2021; €2021bn)



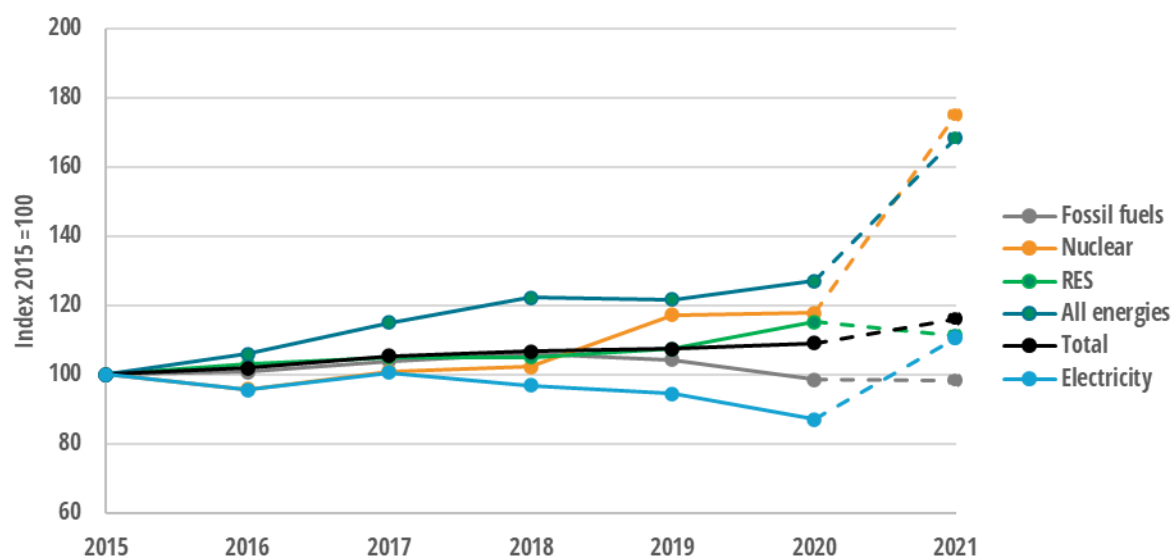
Authors' elaboration based on data from Enerdata, Trinomics and country experts

Sections hereunder are addressing in depth the various trends observed since 2015.

3.4. EU trend of energy subsidies per technology group

Since 2015, the overall energy-related subsidies in the EU27 MS have grown at 1.8% yearly until 2020, representing €14 billion increase on the period. The rise is mainly driven by increasing subsidies for energy efficiency (indicated "All energies" in Figure 2). Eventually, the rising recorded for nuclear in 2019 correspond mostly to exceptional subsidies (more details under the section 3.5.5 Nuclear). Meanwhile, subsidies to electricity have decreased at a moderate pace, while fossil fuel subsidies have remained relatively stable until 2019 before decreasing by 5.5% in 2020.

Figure 2: Energy subsidies trend by source of energy group (2015-20201; indexed with base = 2015)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Subsidy amounts for nuclear are expected to remain stable in 2021, amounts for energy efficiency to sharply increase, amounts for electricity to rebound in a post COVID-19 context.

3.5. Subsidies by energy carrier

3.5.1. Status of the data collected

Data analysed in this section covers the entire 1,714 subsidies identified and collected for the period 2015-2025. Of these, 1,426 are active in 2021.

The total amount of subsidies collected are split into 60% of actual costs (€34 billion, around 400 measures) and 40% of estimated costs (€44 billion, around 200 measures) for 2021. Definition of “actual” and “estimated” amounts is provided in Annex (5.1.5.2). The missing data for year 2021, labelled under “To be confirmed” category³³, represent 24% of the total amount included in the *Subsidy inventory* for year 2021.

3.5.2. Analysis

For 2020 and 2021, the distribution of volumes by fuel and energy carriers observed is in line with that recorded since 2015 with electricity remaining the most supported energy product in the EU27, capturing 68% (€117 billion) of the total subsidies in 2020.

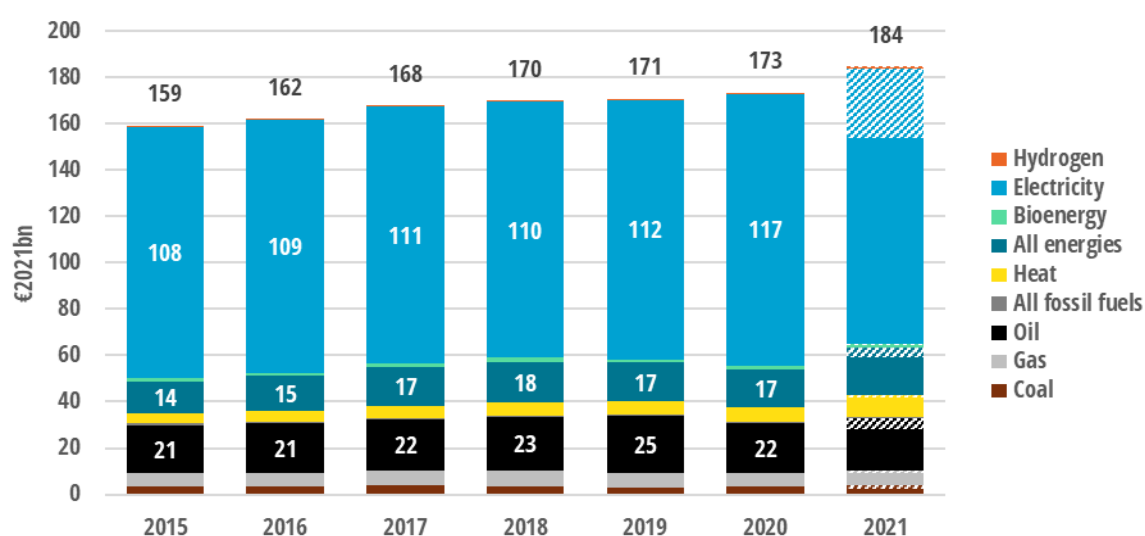
Figure 3 shows that subsidies provided in absolute terms have grown slowly from €159 billion in 2015 to €173 billion in 2020³⁴.

Subsidies directly supporting fossil fuels (Coal, Gas, Oil, All fossil fuels combined) recorded a 3% per year growth from 2015 to 2019 followed by a 9% decrease in 2020, reaching its 2015 level (€31 billion). This most likely reflects COVID-19 related restrictions that slowed down the economy.

³³ See explanation in paragraph 3.2.1.6.

³⁴ Global amounts are around €5bn lower between 2015 and 2020 than in the *Commission Study 2021*. This is due to two major adjustments: a) re-examination of the multi-MSs estimation of the tax expenditures on oil products in air and water transport sectors that reduces the amount by €5bn in 2015 and €3bn in 2020; this affects downwards the total mainly fossil fuel subsidies and specifically that of Czechia, Denmark, Hungary, Romania and Sweden; b) improved data collection on the cost of feed-in tariffs scheme in Spain for renewables and CHP that reduce their total amount by €5bn in 2015 and €3.5bn in 2020. Overall, the €5bn reduction total energy subsidies is by half lower than the cumulated adjustments aforementioned. This means that our enhanced data collection process combined with transparency improvements from MSs have resulted in the addition of ‘new’ identified energy subsidies worth nearly €5bn.

Figure 3: Energy subsidies by main fuels and carriers in the EU27 (2015-2021; €2021bn)

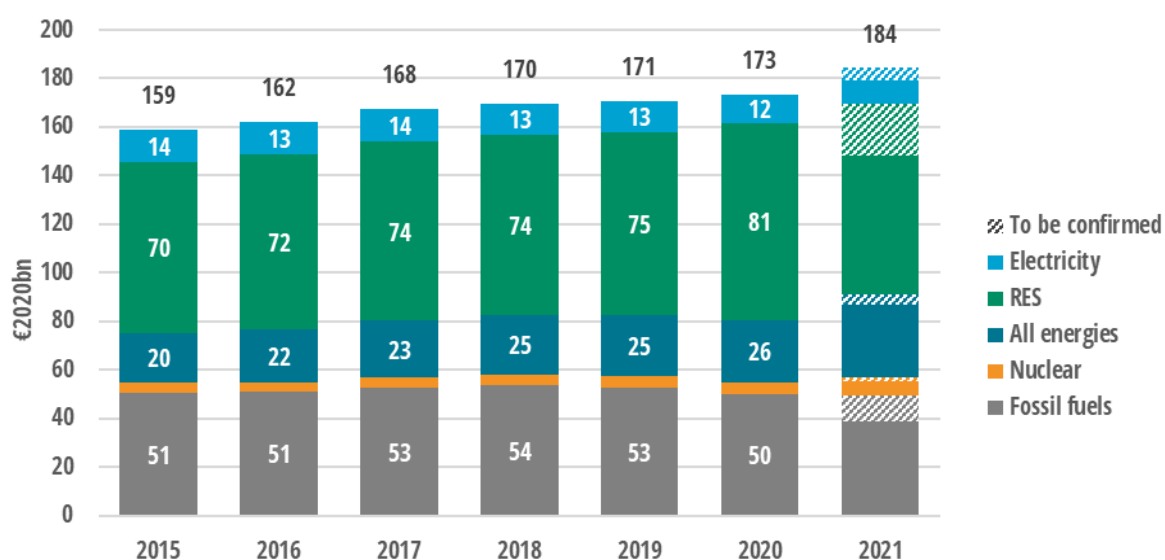


Authors' elaboration based on data from Enerdata, Trinomics and country experts

Figure 4 shows the allocation of the financial support by energy carrier. Note that amounts corresponding to heat and electricity have been re-allocated to their energy source based on the national energy balances³⁵. Evolutions in the subsidy distribution between the main energy carriers are observable. For the first time, and unlike the trend observed in previous *Commission studies*, the Fossil fuels category has clearly decreased (-5%) in 2020. This trend is analysed in depth in the next section.

Support to renewables continue its rising (€81 billion in 2020), while the 'All energies' category is slightly gaining shares, driven by supports to energy efficiency.

Figure 4: Subsidies by main energy carriers in the EU27 (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

³⁵ The remaining amounts corresponding to "All energies" and to "Electricity" correspond to the tax expenditures directed to electricity that could not be re-allocated to specific energy sources.

3.5.3. Fossil fuel subsidies

3.5.3.1. Status of the data collected

The following analysis on FFS includes close to 600 FFS of which nearly 500 are still active in 2021. Since the *Subsidy inventory* conducted in 2021, 28 new FFS have been identified and added while 34 subsidies have ended. These changes are listed in country notes in 5.2 Annex 2: Country data controls and observations.

The total FFS reported for 2020 reached €50 billion and is distributed in 80% of actual costs (€39 billion, around 300 measures) and 20% estimated costs (€10 billion, around 150 measures). Data yet to be confirmed for year 2021 were estimated to equal €10 billion in 2020 (appear as hatched areas in the below graphs).

Fossil fuel subsidies cover financial support to all fossil primary energies and electricity generated by burning fossil fuels. In some cases, multi-energy subsidies are not reflected into the fossil fuel category, but rather into “All energies” category (see section 5.1.8).

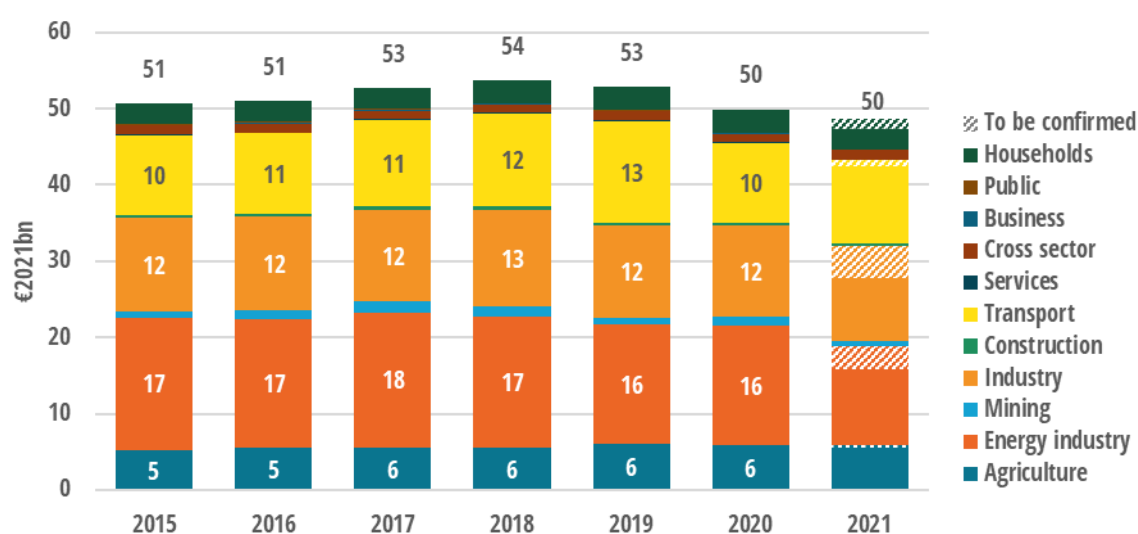
3.5.3.2. Analysis

A 5% decrease (or -€3 billion) has been registered for FFS in 2020 when compared to 2019, and this amount stabilised at around €50 billion in 2021 (Figure 5) during the post COVID economic upturn. It must be noted that this is the first time since 2008 and the beginning of the *Commission studies* that a clear decrease for FFS is observed. It aligns with the trend foreseen in the *Commission study 2021* report which anticipated a €3.6 billion fall in 2020.

The 2020 decrease is exclusively caused by a large decrease (-€3 billion) in subsidies amounts of the transport sector, reflecting lockdown measures. This decrease is driven by the reduction by nearly €4 billion in tax expenditures for FFS (not visible on the figure) in 2020 due to the massive drop of activities in the transport sector, mainly in the aviation sector, while, prior to 2020, subsidies for the transport sector had increase from €10 billion in 2015 to €13 billion in 2019.

FFS assigned to other economic sectors remain stable on the period, except for the energy industry which has a slight downward trend since 2017.

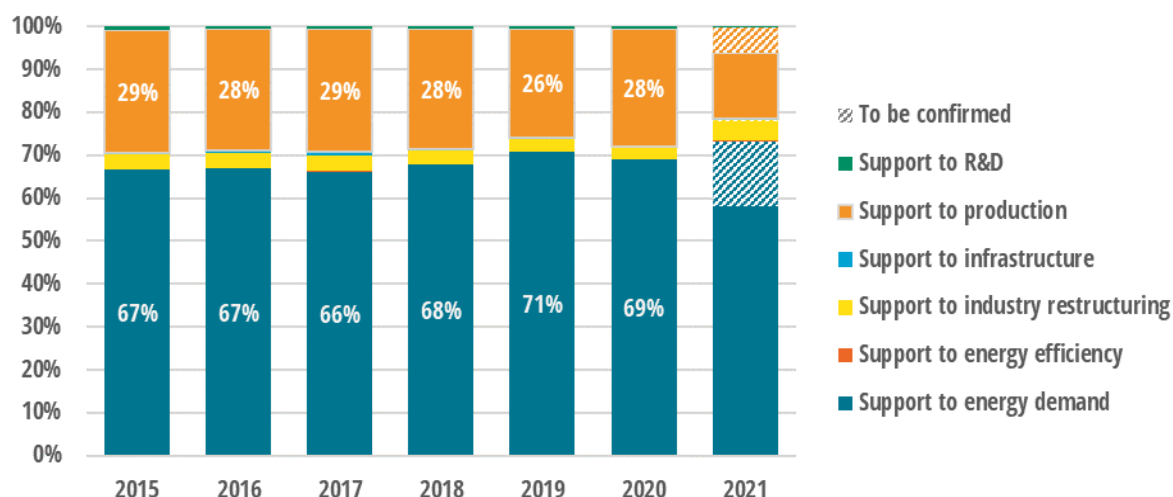
Figure 5: Fossil fuel subsidies in the EU27 by economic sector (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Figure 6 shows that most of the FFS allocated throughout the EU27 countries, since 2015, are in support energy demand (between 67-71%), and this share is expected to reach its highest level in 2021 because of government responses to increasing energy prices (see section 3.6.3). Since 2015, between 25-30% of the FFS subsidies were meant to support electricity production. Subsidies specifically directed to industry restructuring such as aids to close coal/lignite power plants and coal mines represent a small share of the total FFS (3% or €1.4 billion) in 2020 but is expected to grow (6% or €2.2 billion) in 2021.

Figure 6: Fossil fuel subsidies in the EU27 by purpose (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

On the country-scale, around half of the FFS reported in 2020 were delivered by Germany and France (€14 billion and €11 billion respectively), followed by Italy (€5 billion), Belgium (€4 billion), and Spain (€3 billion) (Figure 7).

FFS in Germany were historically stable at €15 billion until 2018 but has been adopting a declining tendency since due to: reductions in tax exemptions for transport (due to lower air traffic, from 2020), tax reductions on gas to be used as a fuel or for power generation, as well as reductions in aids to subsidies the use of coal. On the other hand, subsidies aimed at accompanying the shut-down of coal-fired power plants and the rehabilitation of the old coal-mining sites are increasing in the country (€2.7 billion in 2020, compared to €1.2 billion in 2019). The subsidy for the selling of German coal to the electricity grid and steel industry as well as decommissioning costs was originally decreasing until 2020 (as historically mainly used to subsidies the use of coal), when it reached a strong peak in 2020 (€1.9 billion). The peak can be explained by one-time payments meant to manage contaminated sites³⁶. Since that year, this subsidy has been only used for decommissioning and decontamination of coal sites. Starting in 2020, Germany launched a tender mechanism for the phase-out of hard coal (around €330m subsidised in 2020 and the equivalent in 2021), as well as compensation payments for the decommissioning of coal plants (around €180 million per year expected until 2038).

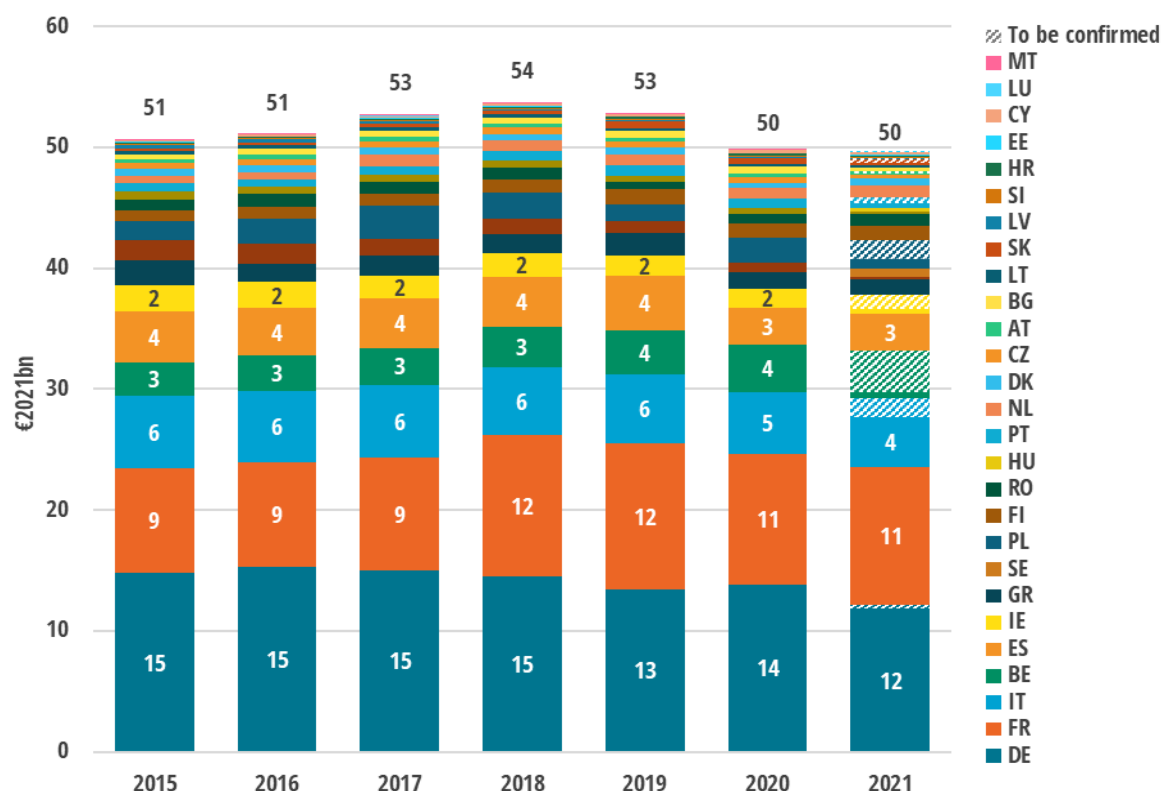
After a noticeable increase in FFS in 2018 (due to growing tax reduction on off-road gasoil and exemption of excise duties on petroleum products for its overseas departments and territories), France's subsidies plateaued until the 2020 COVID-19 crisis.

Fossil fuels subsidies in Belgium in 2019 have increased driven by growing tax expenditures for diesel in road transport and industry.

³⁶ 28. Subventionsbericht des Bundes 2019 – 2022, Bundesministerium der Finanzen (2021)

For some countries, amount reported for FFS is uncertain due to poor data quality or lack of transparency. I was the case for example in Poland in the few past years, although some improvement were noticed recently (further details available in 5.2 Annex 2: Country data controls and observations).

Figure 7: Fossil fuel subsidies in the EU27 by country (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

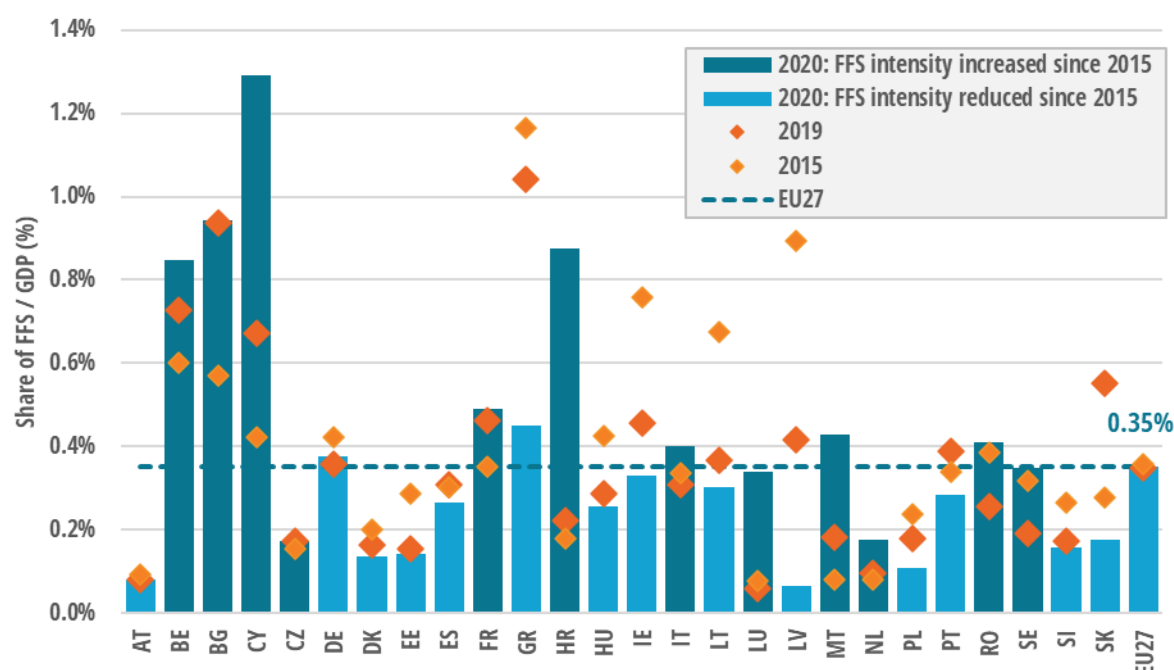
The importance that each Member State gives to supporting fossil fuels can be assessed by analysing the subsidy amounts in relation to its GDP, also called the *FFS intensity* (such intensity does not include subsidies aimed at transitioning out of coal). Figure 8 presents the evolution of the *FFS intensity* at three specific years: 2015 (light orange diamonds), 2019 (dark orange diamonds) and 2020 (blue bars). The 2019 value shows the subsidies levels' tendency before the impact of the COVID-19 pandemic. The gap between the top of the bars and the light orange diamonds represents the FFS intensity variation between 2015 and 2020. At the end, light blue bars depict a reduction of the FFS intensity for the country, while dark blue bars depict an increase of the FFS intensity.

On average, FFS represented 0.35% of the total EU27 GDP in 2020 (the share remained quite stable since 2015). However, the trend followed by MS over 2015-2020 varied as shown in Figure 8.

Namely, the countries which have increased their FFS intensity in 2020 compared to 2015 are: Cyprus, Belgium, Bulgaria, Croatia, France, Italy, Sweden, Romania, Luxembourg, and Malta. On the other hand, the countries which reduced the most their FFS intensity since 2015 are Greece, Ireland, Hungary, Latvia, and Lithuania.

High variations in FFS intensities were registered between 2019 and 2020 as EU27 countries' GDPs were affected in 2020 (notably Southern countries which's tourism-linked share of GDP dropped with the global pandemic).

Figure 8: Fossil fuel subsidies as share of GDP (2015, 2019 and 2020; %)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Figure 9 shows the MSs' amounts of FFS by technologies in 2020 as well as their share in their respective GDP. According to the figure, 11 countries had a higher *FFS intensity* than the EU average (0.34% in 2020, similar to 2019's average) and 16 have a lower one. Among the large countries, France (0.42%) and Germany (0.38%) displayed a slightly higher FFS intensity than the EU average, while Italy (0.27%) and Spain (0.23%) stand slightly below that landmark.

Oil and Petroleum Products (PP) were the most supported fossil fuels in 2020 and represented around half (€23 billion) of the EU27 FFS total. Figure 9 displays each MS' FFS breakdown by type of energy. The other strongly supported energies are gas (19% of the EU27 total amount of FFS in 2020) and coal (18%).

As mentioned earlier, Germany is the EU27 country who spends the most on FFS: most of the country's FFS are assigned to coal (47%), and gas (40%), mainly through the support to electricity production having high shares of fossil fuels. The country provides large support to coal power generation and more directly by subsidising the coal industry and miners. Regarding gas, the country supports the sector mainly via energy tax reductions and exemptions.

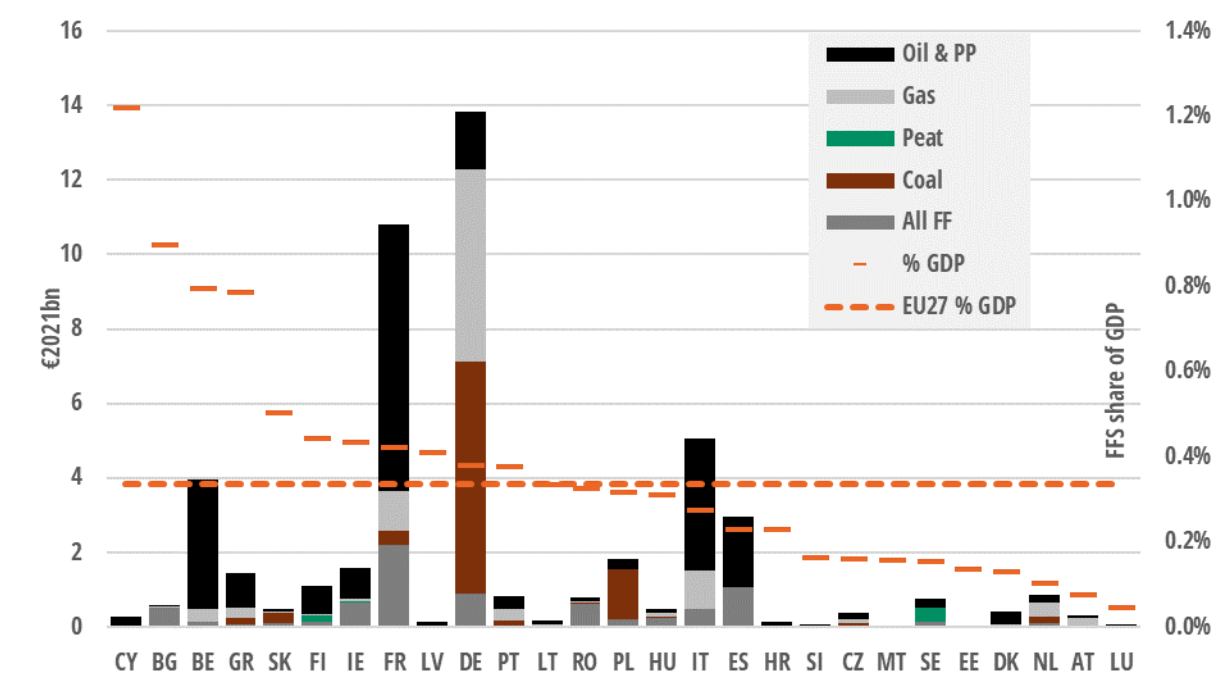
France is the second largest FFS contributor in the EU27; the country committed €7.2 billion to oil and PP in 2020, which represented 65% of the country's FFS contributions, and around 30% of the total oil and PP subsidies in the EU27. Oil and PP subsidies aim to support energy demand in the country for all economic sectors: transport, agriculture, households, industry, construction, etc. and mainly under the form of excise taxes.

Italy subsidised the third largest amount overall in 2020 (€5 billion), and the second most in the amount of oil and PP subsidies delivered (€3.6 billion). The main supports were tax exemptions for diesel, kerosene, and petroleum products to support activities such as freight and passenger transport, agriculture and fisheries.

In 2020, Belgium allocated €4 billion to FFS of which more than 85% for oil and PP (€3.5 billion). The subsidies were dedicated to excise tax exemptions, reduced excise duty and tax refunds for kerosene, gasoil, LPG and HFO for the transport and industry sectors.

Spain spent €3 billion in FFS in 2020 of which 30% for oil and PP through remuneration based on capacity and on generation for CHP power plants, and 40% as excise taxes on hydrocarbon and excise tax exemptions for the transport, agriculture and industrial sector.

Figure 9: Share of FFS by technology by Member State vs GDP (2021€bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Textbox 3-1: Diesel vs gasoline tax difference

In almost every country of the EU27, gasoline has a higher taxation rate than diesel. In 2019, only Belgium had the same tax rate for both products. Elsewhere, the level of tax difference varied between €3/l and €30/l with a European average around €11/l. This difference decreased in the EU27 between 2015 and 2019 (-1% per year).

In line with the previous *Commission studies*, the excise tax difference favouring diesel over gasoline is not included in the *subsidy inventory* that comes along the study³⁷. Indeed, we define tax expenditure as the exemption, exclusion, or deduction from the base of a tax for a given product. Therefore, the excise tax difference between diesel and gasoline has not been considered as tax expenditure, therefore not included in the *Subsidy inventory*, nor in the global analysis.

We have estimated the favourable tax treatment for diesel to reach €12.8 billion³⁸ for the EU27 in 2019, with five countries accounting for 77% of that amount: Germany (€4.3 billion), France (€1.7 billion), Italy (€1.3 billion), Spain (€1.3 billion) and Netherlands (€1 billion). In 2019, this amount rose compared to 2018 (+1%) but have been globally decreasing since 2015 (-2% per year). This downward trend should continue in the years to come as some countries have decided to close the taxation gap between gasoline and diesel for environmental and public health purposes (i.e. diesel has a higher impact on air pollution). It is the case in France and Belgium where the tax difference between diesel and gasoline dropped by €6.7/l and €19/l, respectively, between 2015 and 2019. This tendency could also be accelerated by the EU's legislation such as the proposed revision of the Energy Taxation Directive (ETD)³⁹.

3.5.4. Renewable energy sources

3.5.4.1. Status of the data collected

Our inventory comprises almost 450 RES subsidies, of which 90% are actual data provided by the responsible authorities, indicating that these data are closely monitored and result in good data quality and reliable analysis. The remaining values were estimated to obtain more specific values, e.g., by breaking down the electricity mix by energy source or to obtain values that were not provided by the authorities, e.g., values of certificate systems. For FiT/FiP and RES quotas, missing data for 2021 due to later publication dates have been estimated based on the percentage changes from MS where data for

³⁷ Although this tax difference could be seen as a form of tax expenditure as the level of taxation differs between the two fuels that are mainly consumed for the same purpose, i.e. road transport, we define tax expenditure as the exemption, reduction or refunds from the base of a tax for a given product (by opposition to different tax level for a given energy use, which would impose to compare the level of taxation to all the energy product for this given use, e.g. taxation of electricity, gas, gasoline, diesel, LPP for the energy use in road transport). Moreover, currently, most of the MS do not consider the excise tax difference between diesel and gasoline as tax expenditure. We have identified only Denmark, Italy and Sweden reporting such measures in their national tax expenditure reports.

³⁸ To estimate this amount we have collected, from the TAXUD CIRCABC database, the excise tax rates for gasoline and diesel in each country (effective rate at 1st January of each year) and calculate the tax difference between both, in euros. Then, we got energy consumption estimations from the Odyssee database. We only considered diesel consumed by personal private vehicles, as freight transport that benefit from reduced tax rate was already covered by the main subsidy inventory. Finally, we multiplied the excise tax differences with diesel consumption. As consumption data for 2020 were yet available in Odyssee database, we use that of 2019.

³⁹ "Revision of the Energy Taxation Directive (ETD): Questions and Answers", European Commission (2021), available at: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3662, (last access : 24/06/2022).

2021 have already been published. In this case, only Sweden has provided complete data for the estimation of certificate values.

Uncertain data for year 2021 represent 21% of the RES subsidies amount included in the *Subsidy inventory* for year 2021.

3.5.4.2. Approach about negative amounts related to certain RES subsidies

In some countries the subsidies for electricity from renewables in 2021 compared to 2020 have been reported with lower or even negative values by official sources. Negative values were observed for example in Ireland under the Renewable Energy Support Scheme (RESS). Consequently, total amounts of renewable energy production support for solar and onshore wind were negative in 2021.

In other countries (e.g. Germany, 2021-2022) support for renewable electricity has decreased significantly. At EU level, subsidies for FiT / FiP are likely to decrease in 2021 (Figure 10). Since the second half of 2021, energy prices have been rising⁴⁰, which leads to situations where wholesale prices have exceeded the level of some FiT/FiP contracts concluded with project owners, that in turn create situations where suppliers owe money back to regulators instead of receiving money (contract for difference).

Negative amounts can be of interest to assess efficiency of a mechanism, or useful to assess the competitiveness of RES for example. But this is not the goal of this study, so we rather made the choice to integrate negative amounts as zero, considering that negative amount cannot be considered as a benefit for the consumer or the producer and thus, as a subsidy in line with the definition for the study.

3.5.4.3. Analysis

Our results show that subsidies for RES increased by €6 billion in 2020 compared to 2019 (+7.5%). This is explained by the fall of wholesale electricity prices at the beginning of the pandemic, which led to higher feed-in premiums than in 2019, and can be seen as extra costs in MSs budgets. In Germany, the costs for feed-in premiums of the EEG increased by approximately €3 billion compared to 2019, which explains already a large part of the increase.

Among the 13 identified subsidy instruments (Table 6), feed-in tariffs and feed-in premiums remain the largest support schemes by volume for RES technologies in 2020 (Figure 10). They represent 79% of total RES subsidies, i.e. €63 billion in 2020.

As renewable energies are mainly supported through market-based instruments (e.g., feed-in premiums and RES quotas with tradable certificates), the level of support is influenced by the market environment, i.e., supply interruptions or a decline in demand influence the subsidy amount. Given the market disruptions caused by the COVID-19 pandemic, we expect data for 2021 to be adjusted retroactively by the responsible national authorities and must therefore be interpreted with caution.

Considering the recent electricity wholesale price increase, especially after mid-2021, we assume that the actual support through FiT/FiP must have decreased significantly. However, due to the delay of data validation by national authorities 2021 data are often projections done in 2020 by the responsible authorities. For instance, Germany's latest report dated October 2021⁴¹ uses calculations from 2020⁴² to estimate 2021 spending, while projections for 2022 might be more representative as those estimations

⁴⁰ "The average German wholesale electricity price on the EPEX Spot Day-ahead market of €85.31/MWh from January to November 2021 was more than twice as high as in 2020 (€29.26/MWh)", Bundesnetzagentur 2021.

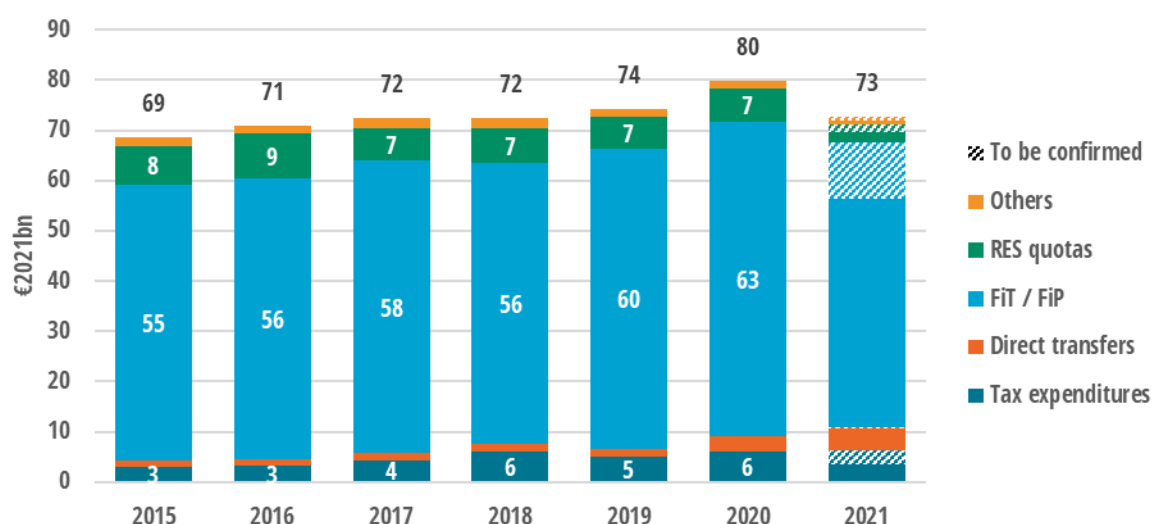
⁴¹ „EEG in Zahlen: Vergütungen, Differenzkosten und EEG-Umlage 2000 bis 2022“, Bundesministerium für Wirtschaft und Klimaschutz (2022), www.erneuerbare-energien.de/EE/Redaktion/DE/Downloads/eeg-in-zahlen-xls.html (last accessed: 13.06.2022).

⁴² EEG in Zahlen: Vergütungen, Differenzkosten und EEG-Umlage 2000 bis 2021, Bundesministerium für Wirtschaft und Klimaschutz (2021),

were done in October 2021. Those projections for 2022 show a strong decrease of expenditures for FiT/FiP.

RES quotas with tradable certificates represent the second highest share (9%) in RES subsidies. We notice that Poland and Italy are gradually phasing-out their RES quota scheme and replacing it with feed-in premiums or contracts for difference.

Figure 10: Renewable energy subsidies by financial instrument (2015-2021; €2021bn)



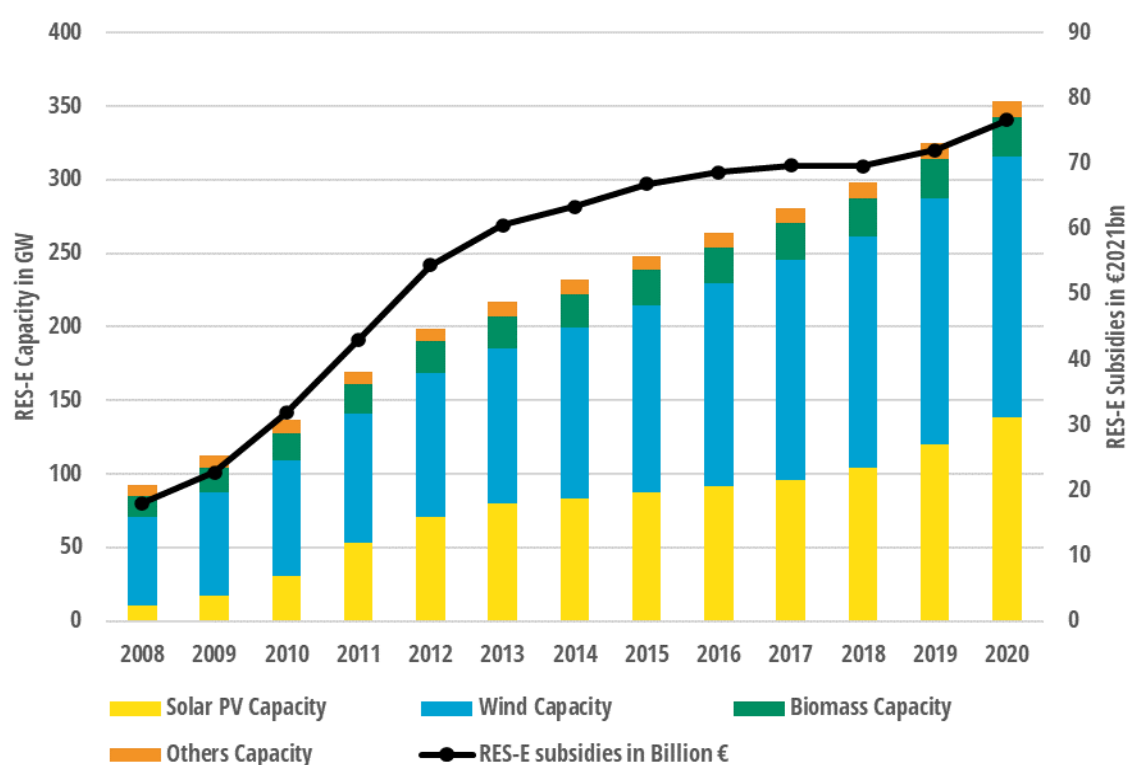
Authors' elaboration based on data from Enerdata, Trinomics and country experts

Figure 11 shows the evolution of RES-E capacity⁴³ and RES-E subsidies in the period from 2008 to 2020. The graph shows that during the first period (2008-2015), RES subsidies rose sharply (at a CAGR⁴⁴ of 20% per year), while the renewable power capacity (except hydro) increased at slightly slower rate (CAGR of 15% per year). The trend has taken the opposite path in the second period from 2015 to 2020 with power capacity growing at a faster pace (CAGR of 7% per year) than subsidies (CAGR of 2% per year). This could be due to various reasons, such as reduction in production costs, higher capacity factors of newly installed plants or higher wholesale market prices, which justifies lower financial support or even subsidy-free RES projects. However, the annual percentage increase in the power capacity has also more than halved, which is contradictory considering only the strong cost reductions of recent years. The slower annual growth rate could be linked to the reduced financial support per GW and that new RES projects are more difficult to implement, e.g., due to the more difficult accessibility of new wind power plants or opposition to them. This could justify higher expenditures for RES subsidies in order to accelerate the energy transition and meet the set climate goals.

⁴³ Electricity production capacities for renewables and wastes, Eurostat (2022),

⁴⁴ Compound Annual Growth Rate

Figure 11: Evolution of RES-E subsidies and RES-E power production capacity (2008-2020)



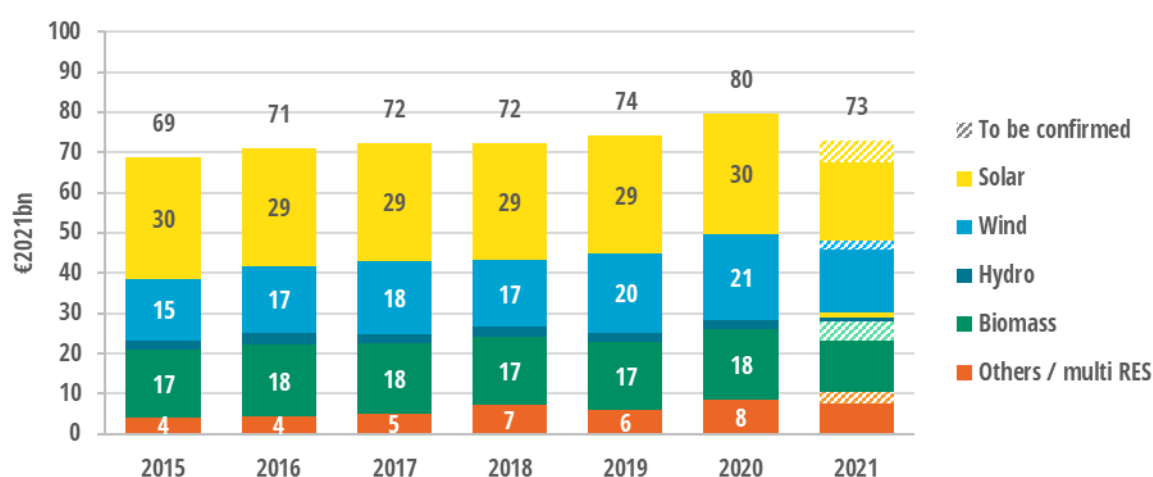
Authors' elaboration based on data from Enerdata, Trinomics, country experts and Eurostat

Figure 12 shows that solar energy technology (€30 billion) receives the highest share of subsidies of all renewables in 2020 followed by wind (€21 billion) and biomass (€18 billion). Hydro (€2 billion), which is mostly a mature and already broadly deployed technology, receives little financial support. Solar and wind are mostly supported by feed-in tariffs or feed-in premiums. Even though solar accounts for a significantly lower share in energy production than wind in 2020 (392 TWh electricity from wind and 147 TWh electricity and heat from solar⁴⁵), it receives higher financial support.

Figure 12 also highlights that, even considering the uncertainties, a drop in amounts for 2021 (around 8%) can be expected. This expectation is reinforced by the amount already published in some countries. Together, Germany and Spain – two MS that already published actual RES data for 2021 – have reported, for instance, a €2.4 billion drop in feed-in tariffs for 2021 compared to 2020 (-7%).

⁴⁵ Eurostat, 2022

Figure 12: RES subsidies by technology (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

The approach by technology and by country (Figure 13) shows a very heterogeneous situation across countries that partly relates to weather conditions in the EU. In most of the cases, countries have opted for technologies with the higher local potential such as solar in highly solar irradiation countries like Cyprus, Greece, Italy, Malta, Spain, or biomass in forested countries like Austria, Estonia, Finland, Latvia, Sweden. The three countries with the highest population (Germany, France, Italy) present quite balanced spending across technologies reflecting both their large and various territories, and their ambition to promote a mix of solutions.

Portugal and Croatia, two countries with a high solar irradiation, do not invest much in solar. For Croatia, this could be due to insufficient legal framework and a low priority in the previous national energy strategy, which led to insufficient support schemes⁴⁶. Recently the country introduced a new €783 million support scheme for electricity produced by RES, including solar⁴⁷, which meet the objectives of the country's latest Integrated Energy and Climate Plan⁴⁸. Portugal plans, according to its National Energy and Climate Plan⁴⁹, to increase its solar PV capacity, which is currently at a low level. In 2019, the first solar PV auction was held and resulted in the lowest prices in Europe, indicating that solar could be a cost-effective technology for Portugal's future.

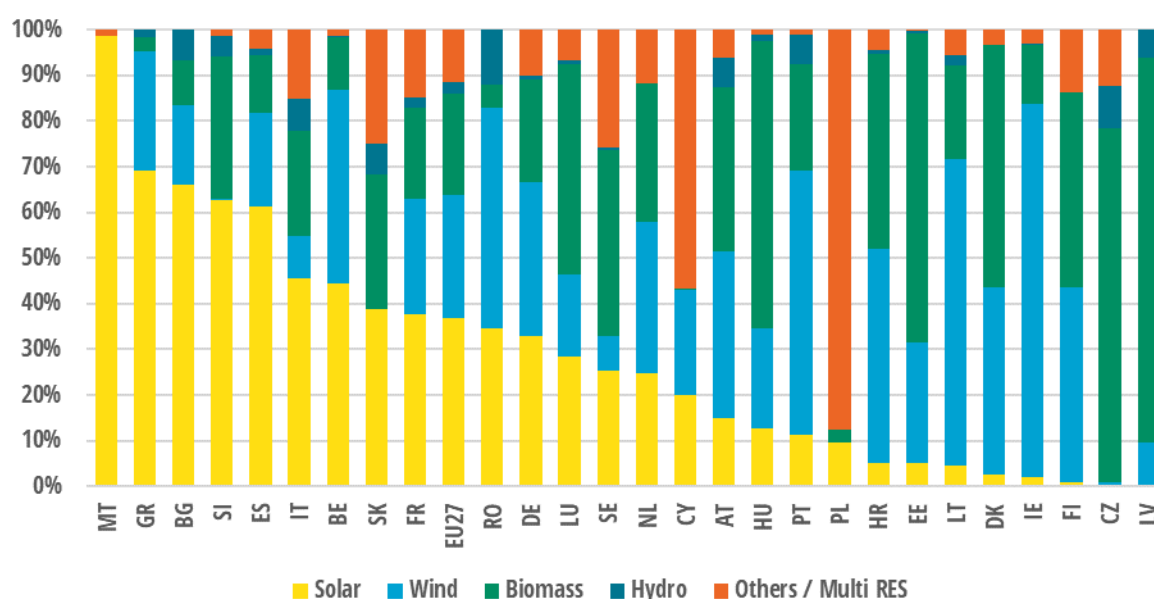
⁴⁶ "R., PEET: The Political Economy of Energy Transition in Southeast Europe – Barriers and Obstacles", Gallop, P., Gray, E., Nikolovska, E., Mustață, A., Petcu (2021)

⁴⁷ "State aid: Commission approves €783 million Croatian scheme to support production of electricity from renewable energy sources", European Commission, (2021)

⁴⁸ "First Draft of the Integrated Energy and Climate Plan for the Period from 2021 to 2030", Republic of Croatia – Ministry of Environment and Energy

⁴⁹ Portugal: National Energy and Climate Plan 2021-2030 (NECP 2030) (2019)

Figure 13: Share of RES subsidies by technology by Member State (2020; €2021bn)

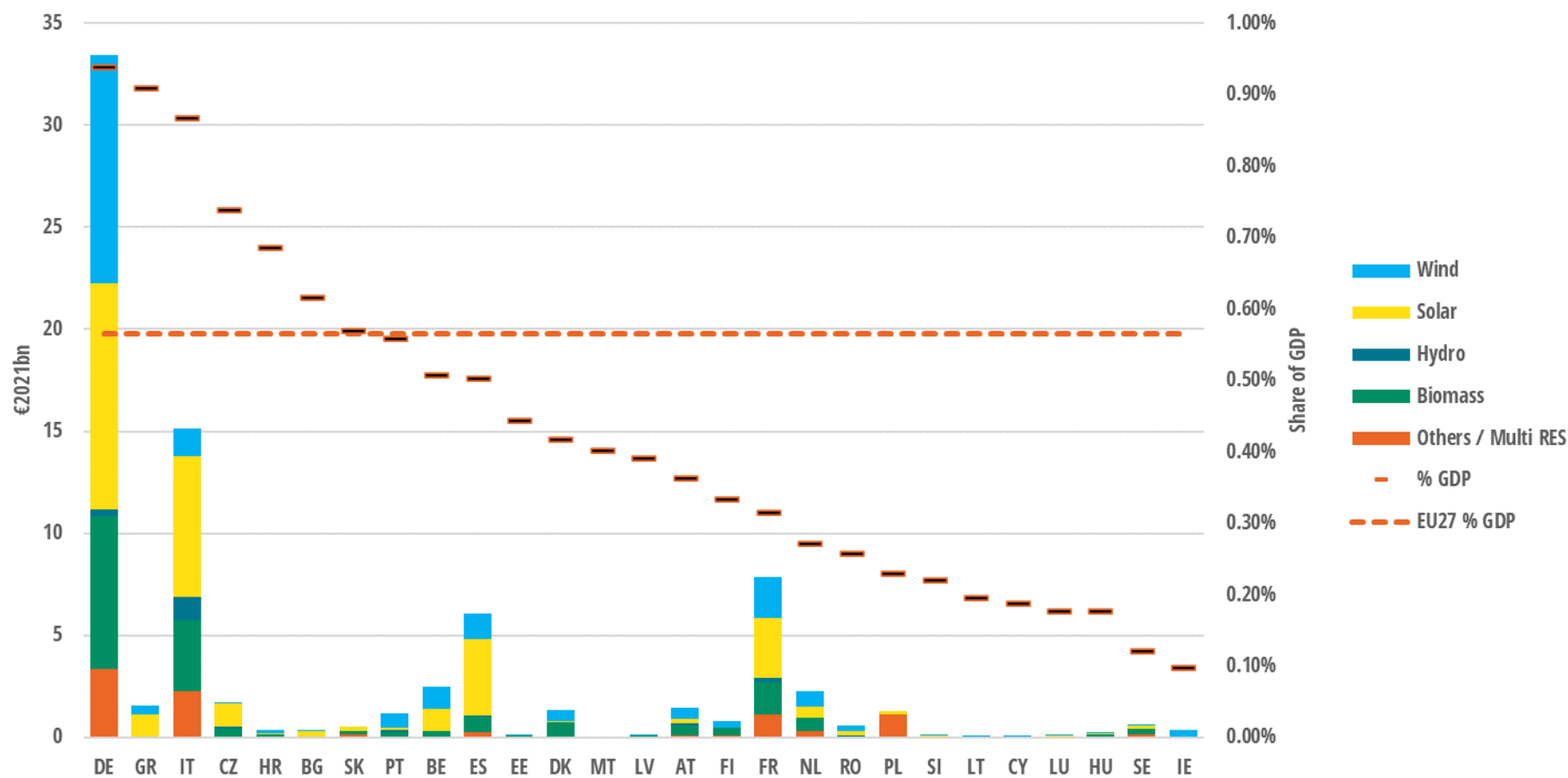


Authors' elaboration based on data from Enerdata, Trinomics and country experts

Figure 14 compares the volume of RES subsidies by technology and by MS with MSs GDP in 2020. This indicator measures the level of investment dedicated by each country to support the development of renewables. In 2020, RES subsidies represented 0.57% of total EU27 GDP, similarly as in 2015.

Germany leads the ranking in absolute (€33.5 billion) and relative (0.94% of GDP) terms. Then Greece and Italy follow in relative terms. France's share of 0.32% (€7.8 billion) is significantly lower than the EU average. The EU average share of RES subsidies on the GDP is 0.57%, while the median is 0.39%. Ten countries spend less than half the EU-average on RES subsidies, including the Netherlands, Sweden and Poland. However, it must be noted here that higher renewable subsidies per GDP numbers can also reflect higher legacy costs of earlier subsidy schemes and therefore should not strictly interpreted as an indicator of renewable energy penetration.

Figure 14: RES subsidies by technology by Member State vs Share of GDP (2020; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Textbox 3-2: Hydrogen

According to the *Subsidy inventory* developed for this study, we were able to observe an emergence of hydrogen-related subsidies which were very small prior to 2015 and have been increasing drastically from 2021 (around €900 million in 2022, compared to €200 million in 2015). 19 countries implement subsidies dedicated to hydrogen (all types) since 2015. In addition, as renewable hydrogen technology is still in a maturation phase, and the announcements made to allow its take-off are very recent, few data were recovered. It is expected more data to be available in the coming years. An important step for further subsidisation of renewable hydrogen has taken by the European Commission's approval under EU State aid rules of 'Hy2Tech' as an Important Project of Common European Interest⁵⁰. This IPCEI was jointly prepared by 15 Member States (Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Netherlands, Poland, Portugal, Slovakia and Spain). The approval allows these Member States to provide up to €5.4 billion in public funding.

Despite its current small share in the global hydrogen production (<1% in 2020), renewable hydrogen is key to the EU's overall decarbonisation strategy. Well aware about that, the European Commission unveiled in June 2022 its plan to launch a European Electrolyser Partnership to build a strong industrial electrolyser manufacturing base in Europe. Renewable hydrogen represents an opportunity to increase energy security as well as to reduce national emissions from hard-to-abate sectors. But without government support, the integration of hydrogen into the energy systems will not be realised at the pace required to meet climate ambitions.

A hydrogen strategy⁵¹ published by the European Commission in 2020 sets renewable hydrogen as the European top priority, while low-carbon hydrogen⁵² is considered as a temporary solution over the medium term. By 2030, the EU aims to install 40 GW of renewable hydrogen electrolyzers by 2030. The target was enforced by the target under the RepowerEU plan to produce 10 million ton of renewable hydrogen within Europe in 2030. Cumulative investments in renewable hydrogen in Europe could be up to €180-470 billion by 2050, and in the range of €3-18 billion for low-carbon fossil-based hydrogen. Hydrogen will be expected to be used in hard-to-decarbonise sectors: the heavy industry and mobility sector. The renewable hydrogen targets as proposed by the European Commission for these sectors under the revision of the Renewable Energy Directive are currently being discussed in Council and the European Parliament. They should incentive the use of renewable hydrogen in the industry and mobility sector.

On top of this EU-level objective, various European countries have announced their own hydrogen strategies. Germany's, France's, Portugal's, the Netherlands', and Spain's electrolyser capacity targets already account for over 50% of the EU's targeted 40 GW capacity.

With renewable hydrogen technology still considered as immature, most of the subsidies to be deployed will support research and development, pilot projects and the first utility-scale projects.

Several projects are currently planned, the largest being the HyDeal España (Spain) which will include 7.4 GW electrolyzers and 9.5 GW solar power plants expected for commissioning by 2025. Hydrogen is expected to be used in different domains as for example in the heavy industry or mobility (e.g. Germany commissioned its first hydrogen-powered train in 2018, or the French Airbus eyes the commercialisation of a hydrogen powered plane after 2035).

⁵⁰ *Important Projects of Common European Interest* programme: a European mechanism aimed at promoting innovation in strategic and promising industrial fields through transnational European projects.

⁵¹ "A hydrogen strategy for a climate-neutral Europe", the European Commission (2020)

⁵² Green hydrogen is produced by using zero-carbon electricity while blue hydrogen is produced by using carbon-emitting reforming process, with carbon capture and storage.

3.5.5. Nuclear

3.5.5.1. Status of the data collected

As already documented in the *Subsidy inventory 2021*, identified subsidies as nuclear are much smaller than those for fossil fuels and renewables. Indeed, the *Subsidy inventory 2022* encompasses 41 subsidies, of which 31 are actual amounts and 10 are estimates. For 19 MSs, the subsidies that target RD&D were estimated based on 2020 amounts, as data were not yet available for 2021. Also, a few subsidies labelled under direct transfers were not yet available.

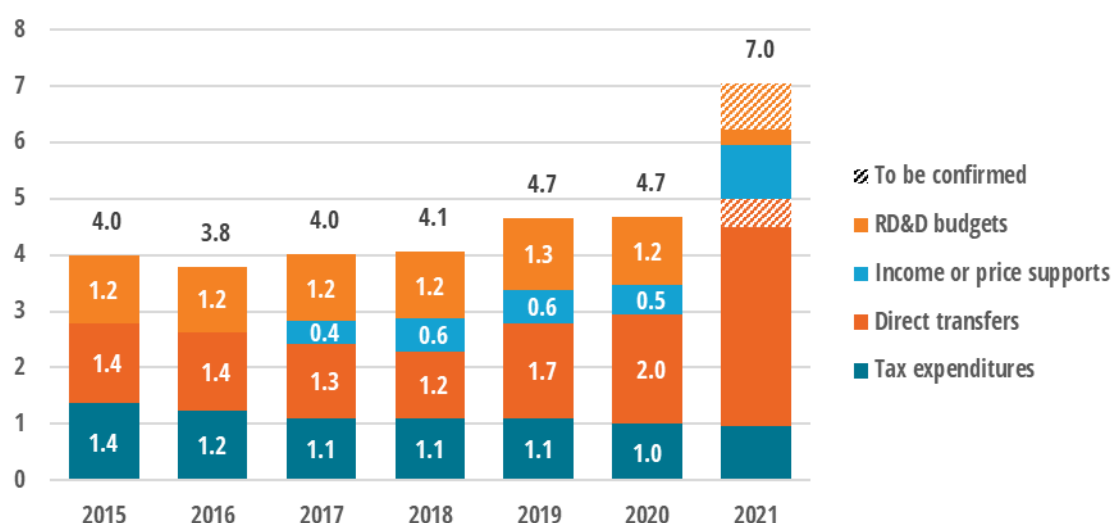
3.5.5.2. Analysis

Most of the subsidies to nuclear energy are distributed by Germany and France as they accounted for more than 78% of the total amount of subsidies for nuclear in the EU27 between 2015 and 2020. Italy is third with around 13% of the total on the same period, although the country has no nuclear power plant running since 1990. Consequently, the level of subsidies can vary greatly depending on measures taken by those three countries.

Subsidies to nuclear increased from €3.8 billion in 2016 to €4.7 billion in 2020 (see Figure 15). This increase is due to several factors. In the *Commission study 2022*, the amount attributed to the capacity market mechanism in France was broken down by energy. As a consequence, we now estimate that the amount of subsidy attributed to nuclear through the capacity market mechanism in France varied around €0.4 and €0.6 billion between 2017 and 2020. This amount is expected to increase in 2021, as the cost of the energy market is supposed to rise, as so the share of nuclear.

Also, the upward trend is pulled by the cost of nuclear plant decommissioning: in Italy, where decommissioning costs were revaluated, estimated costs increased from around €100 million in 2018 to €400 million in 2020 (amount for 2021 to be published in September 2022); and in France, where the Government paid €380 million, in 2020 mainly, in compensation to EDF for the early closure of the Fessenheim plant. The Government will still have to pay a variable compensation, the level of which is still uncertain. Germany has also agreed, after a long court case, to pay a compensation to achieve its nuclear phase-out agenda by 2022 (see textbox below). A compensation of €2.4 billion was paid in November 2021, which substantially impacted the total amount of subsidy to nuclear in Europe (Figure 15).

Figure 15: Energy subsidies to nuclear power in the EU27 (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

In 2020, subsidies to nuclear are distributed between tax expenditures that are mainly supporting energy demand; RD&D budgets; direct transfers, that support infrastructure or industry restructuring and income or price supports that correspond to France capacity market mechanism⁵³.

Textbox 3-3 Earlier closures of nuclear power plants

In France and in Germany, the implementation of national legislation that includes limited or complete end of the use of power from nuclear energy has led to substantial subsidies to utilities operating nuclear power plants for early closures of their assets.

In 2015, France decided to cap nuclear energy production capacity and diversify its power generation mix. The public utility EDF was forced to close its Fessenheim plant; the damage linked to the cap was covered by a compensatory protocol between the State and the operator. The protocol provides for several mechanisms for adjusting the amount of compensation: the fixed part, amounting to €370 million, was paid in full in December 2020; the amount of the variable part, determined by parameters set in the protocol, is to be paid later as the compensation for the shortfall of the selling of electricity by EDF will also depend on future electricity market price⁵⁴.

In Germany, the accelerated nuclear phase-out was enacted in 2011 following the Fukushima Daichi plant meltdown in Japan. As of end 2011, 8 nuclear power plants were closed, with the remaining 9 due to close by the end of 2022 at the latest. The 4 utilities operating nuclear power plants (EnBW, Eon, RWE and Vattenfall) sued the German federal government, claiming for a compensation for the early closure of their plants. An agreement was reached in autumn 2020, granting a €2.4 billion compensation to the utilities for lost electricity volumes and stranded investments as followed: €1.4 billion is to be paid to Vattenfall (32% of its 2020 preliminary EBITDA), €0.9 billion to RWE AG (27% of 2020 preliminary EBITDA), €0.1 billion to EnBW and €0.04 billion to E.ON. The amounts granted to Vattenfall and RWE relate mostly to lost electricity volumes, whereas amounts for EnBW and E.ON are for stranded investments.

⁵³ This distribution must be considered with caution as the nuclear sector remains highly opaque. Therefore, a proportion of the subsidies declared as directed towards R&D could in fact support infrastructure or industry restructuring.

⁵⁴ State Aid SA.61116, available at: https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=3_SA_61116

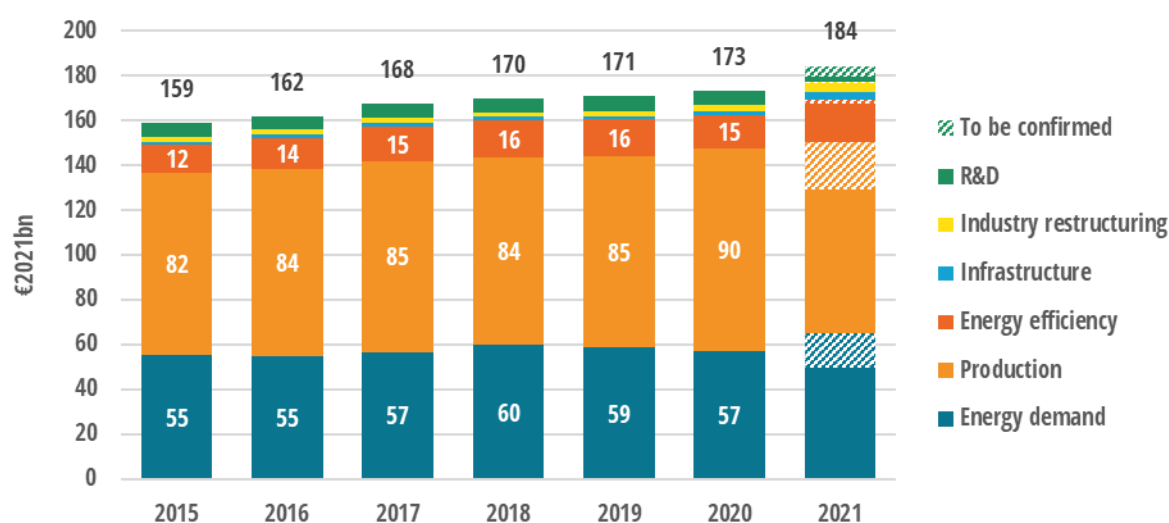
3.6. Subsidies by purpose

Data analysed in this section includes the total 1,680 subsidies collected.

While the total amounts for 2020 appear to be a continuation of a trend already observed in previous years, it hides differences observable when looking at the distribution of subsidies by purpose (Figure 16). On one hand, subsidies for energy production rose from €85 billion to €90 billion (+6% in comparison to 2019); on the other hand, subsidies for energy demand decreased from €59 billion to €57 billion (-3%). This decrease is elaborated in section *Energy demand* hereafter.

Subsidies for energy efficiency remains at a lower level (€15 billion or 9%) as a share of total subsidies. However, the year 2021 already recorded a significant increase and could be one driver in the increase of total subsidies. This increase is elaborated in section *Energy efficiency* hereafter.

Figure 16: Energy subsidies by purpose (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

3.6.1. Energy efficiency

Data analysed in this section includes 300 subsidies collected of which nearly 200 still active in 2021.

3.6.1.1. Status of the data collected

Energy efficiency subsidies cover supports aimed at reducing energy consumption. By convention, we have established that this kind of subsidy targets all types of energies, including renewables, fossil fuels, electricity, and heat, whatever their origin. Around two thirds of the identified measures among MSs are multi-energy subsidies classified under the "All energies" category. Due to the cross-energy and cross-sector nature of energy efficiency subsidies, the subsidy amounts collected correspond to a broad type of measures that are often consolidated under a single subsidy instrument, i.e. an 'energy fund' covers various actions while they are all reported under one single instrument (e.g. *Grant*).

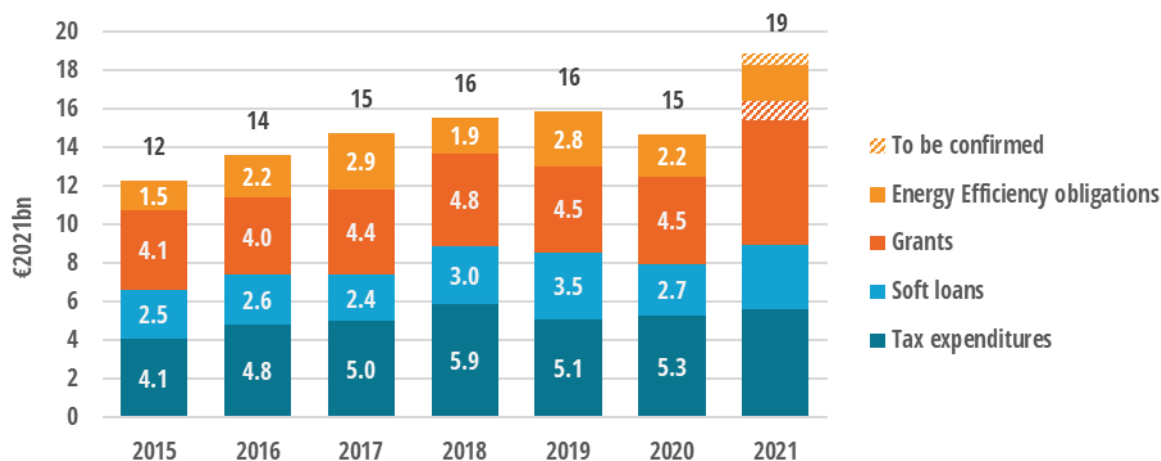
Data yet to be confirmed for year 2021 were estimated to equal €1.6 billion in 2020, is divided in 3 instruments – grants (60% of the €1.6 billion), energy efficiency obligation (37%) and soft loan (3%) – represents approximately 8% of total energy efficiency subsidies.

3.6.1.2. Analysis

As shows Figure 17, the year 2020 appears to be a clear deviation from the growing trend observed in previous years. Before 2020 the energy efficiency subsidies have increased steadily (+9% per year from 2015 to 2018). Between 2018 and 2019 amounts have almost stagnated while they have decreased

significantly between 2019 and 2020 by as much as 7%, probably as a consequence of the low economic activity due to the Covid pandemic. They were expected to rebound with almost 23% increase between 2020 and 2021.

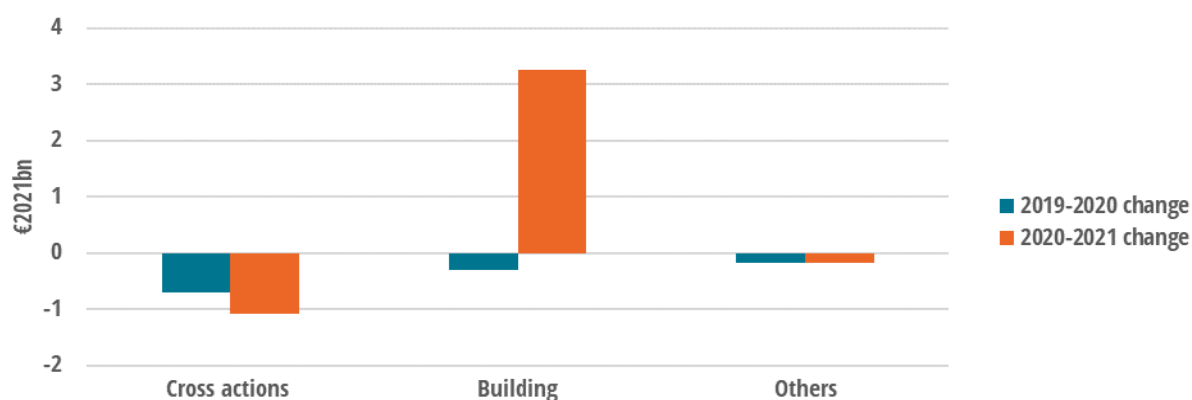
Figure 17: Energy subsidies for support to energy efficiency by instrument (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Overall support for energy efficiency declined in 2020 in comparison to 2019 and increased in 2021 in comparison to 2020. In Figure 18, subsidies are broken down into 3 subsector categories namely 'Buildings', 'Others' (including Communication, Equipment, Lighting and Renewables), 'Cross actions' (subsidies not attributable to single subsector).

Figure 18: Changes of energy efficiency subsidies per subsector between 2019 and 2020 (€2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Between 2019 and 2020 all categories saw a decline in energy efficiency subsidies, most probably due to reduced economic activity because of COVID-19 measures and lockdowns. At the start of 2021 many governments implemented recovery plans that included amongst others spending on energy efficiency. It is also assumed the impact of the EU Recovery and Resilience Facility will only be perceivable later, as a fraction came already in 2021. The increase in support for energy efficiency between 2020 and 2021 are entirely driven by the building sector.

3.6.2. Energy demand

Data analysed in this section includes 577 subsidies collected of which nearly 520 still active in 2021.

3.6.2.1. Status of data collected

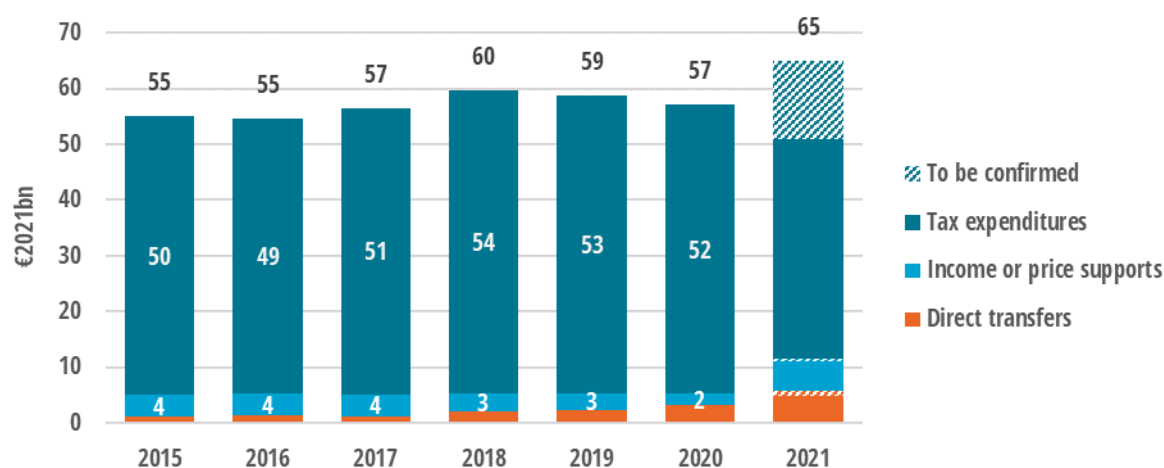
Subsidies for energy demand cover supports aiming at incentivising energy consumption in various economic sectors. This can be through mechanisms like tax reductions or refunds and address a wide range of economic sectors and agents from support in energy intensive industries to low-income households. This kind of subsidy targets all types of energy including renewables, fossil fuels, electricity, and heat, whatever their origin.

As of July 2022, data yet to be confirmed for the concerned subsidies worth €15.5 billion in 2020, which represents approximately 24% of total energy demand subsidies. The reason is a delay in MS tax expenditure reports which are not all publicly available yet.

3.6.2.2. Analysis

Figure 19 shows subsidies for the support of energy demand broken down per instrument. During the period 2015 to 2019, overall spending is stable at around €57 billion a year. The year 2020 shows a decrease of 3%. While for 2021 it is estimated that support will exceed pre-2020 levels. Higher total support for energy demand would not be surprising in the context of energy price rises and increased policy support measures that have been put in place by governments since the end of 2021.

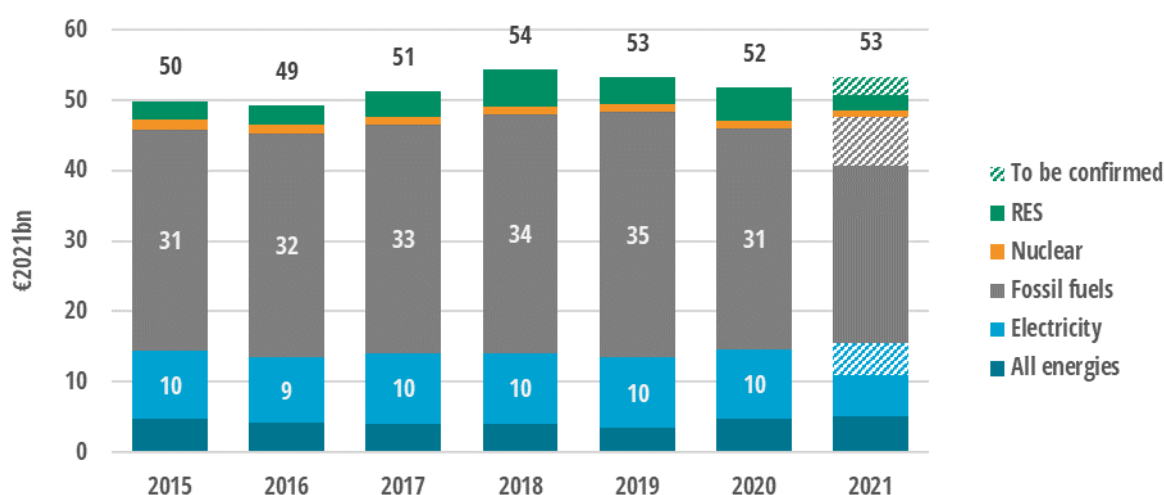
Figure 19 Energy subsidies for support to energy demand by instrument (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Tax expenditures represent by far the biggest share of total subsidies for energy demand (90%). Over the period 2015 – 2019 this has remained stable at around €50 billion a year. In Figure 20 the tax expenditures are broken down per technology group. The lion's share of the tax expenditures goes to fossil fuels. Fossil fuel support represents around 60% of total tax expenditures.

Figure 20 Tax expenditures for support to energy demand per technology group (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

3.6.3. Rising energy prices related policies

Since the second half of 2021, the EU and worldwide markets have registered sharp energy prices hikes. This is to some extent explained by a context of strong economic recovery following the COVID-19 pandemic. In addition to this economic context, several additional factors have caused these energy prices increases and their persistence within time, including: unprecedented wholesale gas prices increase in 2021, the tightness of the global LNG markets, owing to less new liquefaction projects coming online and increasing demand for gas, the low availability of the French nuclear fleet and the shutdown of some nuclear units in Europe, a long and cold 2020 winter followed with a hot 2021 summer which resulted in an increase in energy demand for heating and cooling, etc., as well as increases in geopolitical tensions (including the Russian invasion of Ukraine in February 2022).

Starting in September 2021, EU ministers of energy and transport agreed on the need to tackle rising energy prices to reduce the economic burden on households and companies which were still struggling to recover from the effects of the pandemic. The European Commission in October 2021 published a communication on energy prices, proposing short-term and mid-term measures with a tool-box Member States endorsed and introduced measures mostly in line with the tool-box proposals.

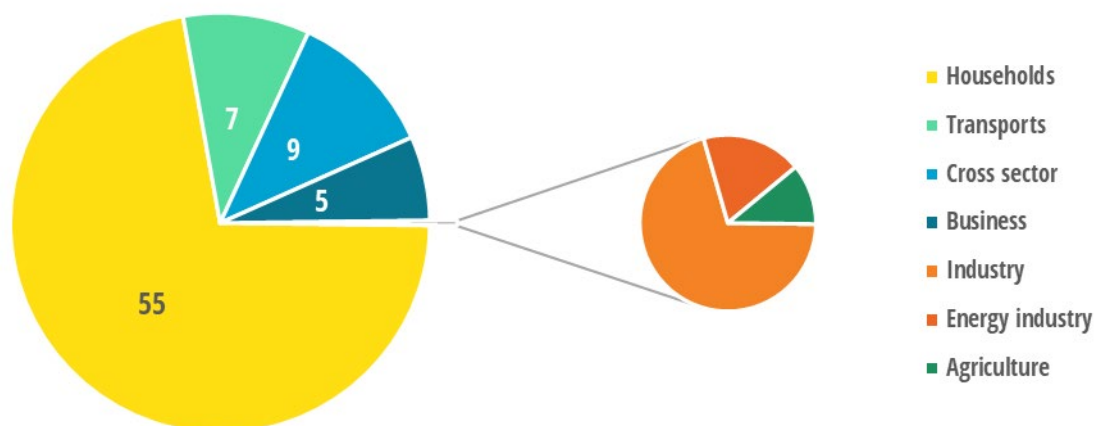
As of June 2022, the countries which have dedicated the most funds to tackle energy price rising issues over 2021-2022 are: Germany (€23 billion only in 2022), the Netherlands (€6 billion), and Italy (€4 billion). Six countries initiated their measures in 2021, namely: Italy, France, Czechia, Malta, Bulgaria, and Spain. The countries which spent the most in 2021 were Italy (€2.9 billion) and France (€1.4 billion).

Overall, we estimate that around €76 billion in subsidies should be distributed in EU27 in 2021-2022 to address rising energy prices. As the objective of these measures is to limit the impact of price rising for consumers, a massive share of the amount (98%) subsidises energy demand. Subsidies have been distributed mainly towards households (€54.7 billion, 73%) and transport (€7.4 billion, 10%). Business and industries also benefited from these kinds of measures receiving €5.1 billion (7%). €8.7 billion could not be attributed to a specific sector (Figure 21).

Today, it is too early to know precisely how each MS will integrate these amounts into its own budget and if it will be considered as new expenses or integrated into existing ones. However, the €76 billion mentioned cannot be considered as pure additional subsidies as we assume that a significant share of these amounts likely overlaps with existing measures implemented before 2022. Also, the question of the distribution of these amounts into 2021, 2022 and 2023 represent another uncertainty that will only

vanish over time. For these reasons, we cannot foresee a potential sharp increase in energy subsidies for 2022.

Figure 21: Subsidies to address rising energy price by economic sectors (€2021bn)

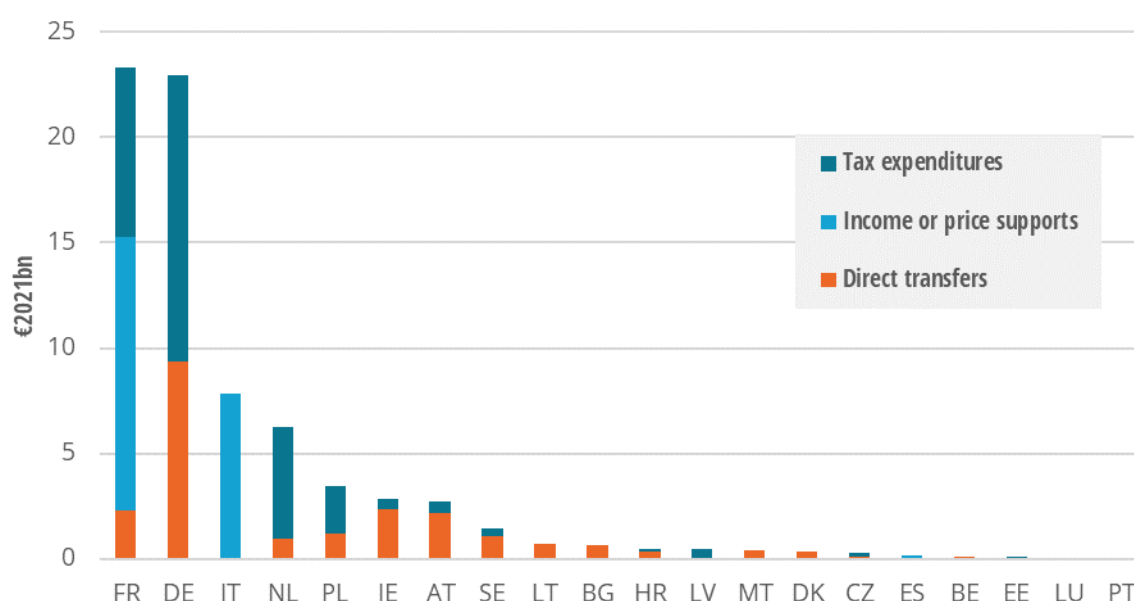


Authors' elaboration based on data from Enerdata, Trinomics and country experts

Around 45% of the total amount of subsidies (i.e. €31 billion) were allocated through tax expenditures, 29% (i.e. €22 billion) under direct transfers, and the remaining 26% (€21 billion) through income or price support measures.

Figure 22 shows a non-exhaustive picture of the subsidies allocated by the countries since September 2021; as the topic is currently on top of the government concerns, new measures are regularly announced, not always clearly quantified. Through its €23 billion, Germany spent around 60% on tax expenditures, and 40% on direct transfers to fight increasing energy prices. Italy for its share, spent €7.8 billion in 2021 and 2022 only on income or price support mechanisms. The Netherlands spent around 85% of its subsidies linked to rising energy prices through tax expenditures, and the remaining via direct transfers.

Figure 22 : Subsidies to address energy price rising by countries and type of instrument in 2021 and 2022 (€2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

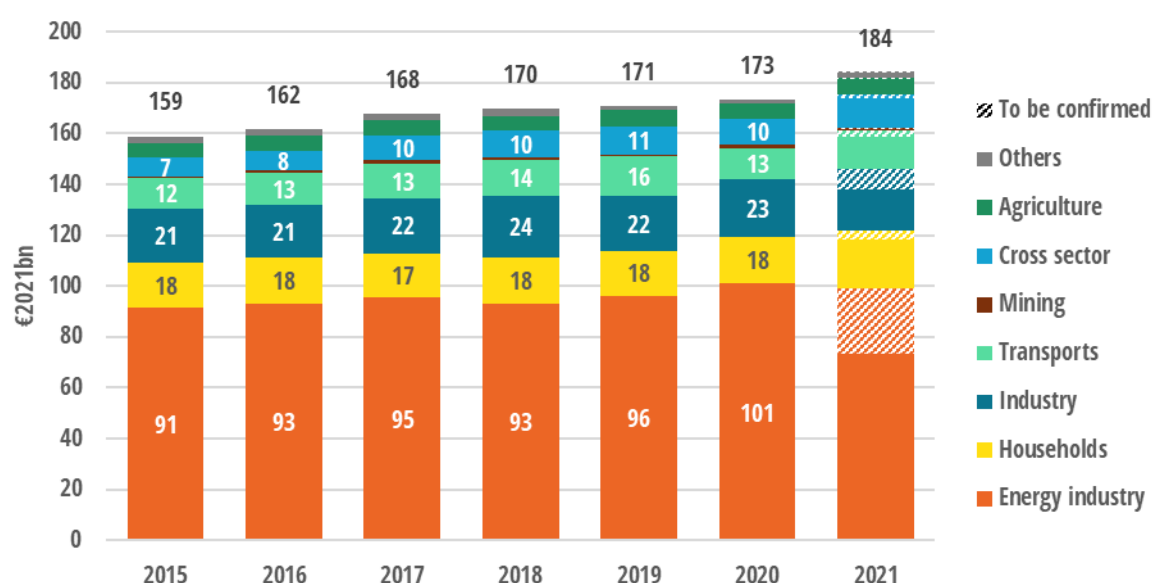
3.7. Subsidies by economic sector

Energy industry is by far the most subsidised economic sector, with €101 billion in 2020 representing around 58% of the identified subsidies in 2020 (See Figure 23), of which €69 billion of FiT/FiP and RES obligations⁵⁵ (not visible on figure). The second and third largest sector are the industry (€23 billion, 13%, excl. mining and construction sectors) and Households (€18 billion, 11%)⁵⁶. Preliminary data for 2021 show a similar distribution as the year before with a possible decrease in the energy industry sector that still have to be confirmed. Subsidies towards households should also be rising following measures taken by Governments to limit the effects of energy price rising.

⁵⁵ FiT, FiP and RES obligations are included by convention in the energy industry, while such payments benefit not only to companies involved in this economic sector

⁵⁶ Business, Construction, Public and Services sectors have been regrouped under the denomination "Others" as their individual amount for 2020 is less than €1 billion.

Figure 23: Energy subsidies by economic sector in the EU27 (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

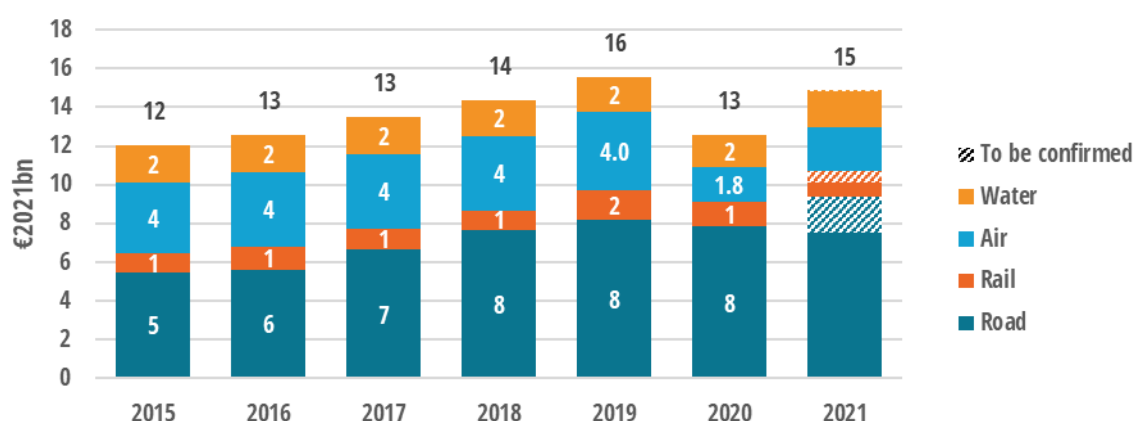
3.7.1. Transport

Subsidies to the transport sector have increased between 2015 and 2019 (+7% per year, on average or around €1 billion per year), exceeding €16 billion in 2019. This amount includes €13 billion from the Fossil fuels techno group (Figure 5) and the remaining €3 billion from other techno groups (electricity, nuclear, RES, All energies) all together. This growth was mainly driven by the increase in subsidies to road transport (+11% per year between 2015 and 2019) which accounted for 53% of the identified subsidies in 2019 (up from 46% in 2015) (see Figure 24).

Due to the COVID-19 pandemic, subsidies to transport dropped by 19% in 2020, i.e. by around €3 billion. This decrease is explained by the effects of measures taken to fight COVID-19 that restricted drastically the circulation of people and goods. Subsidies to domestic air transport (excluding international intra-EU air transport) have been the most impacted from €4.0 billion in 2019 to €1.8 billion in 2020 (-55%).

For year 2021, we estimate that subsidies to the transport sector are bouncing back at around €15 billion (+18% or €2.3 billion compared to 2020) but are still below 2019 levels (-5% compared to 2019). Road transport subsector could strengthen its weight with a likely share of 63% of the subsidies in the transport sector, domestic air traffic (excluding international intra-EU air traffic) would account for 15% (through the tax exemption on kerosene), 12% for domestic navigation (through the tax exemption on fuels used in domestic maritime transport, excluding fishing activities), and 9% for rail transport.

Figure 24: Energy subsidies by transport mode (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Domestic air and water (navigation) transport tax expenditures were estimated by the core team of the project using a unified method and external sources. Methodology used is detailed in Annex 1.

Textbox 3-4: Electric mobility

In *Commission Study 2022*, we covered subsidies to recharging infrastructure. Those subsidies have increase from €90m in 2015 to €370m in 2020 with Germany leading the way (€255 million), followed by Italy (€90 million), Sweden (€8 million), Finland (€7 million), Denmark (€5 million), Czechia (€4 million). Preliminary data for 2021 and 2022 shows important increase with Germany likely to exceed €1,000 million. Some subsidies have been carried through recovery programmes (e.g. in France with €60 million announced for 2022) or as consequence of energy price rising (e.g. in Croatia with €60 million announced for 2022).

During data collection, we also came across numerous measures or support towards cleaner or electric vehicle that are not qualified as energy subsidies. We have collected and gathered these measures together in a separate database. On the 38 support measures we identified since 2015, 18 were directed specifically towards electric vehicles. The 20 others are supporting either low emission thermic vehicles, hybrid electric vehicles or low emissions vehicles in general including electric ones. Note that this separate inventory is not exhaustive and does not include all measures in place at MS level. Like for infrastructure, the amount of support in this domain have been increasing since 2015 reaching around 1,700 million in 2020, more than €3,500 million in 2021 and more that €5,000 million have already been announced for 2022. It is also Germany that is leading the way with €880 million in 2020 followed by Netherlands (€640 million), Sweden (€480 million), Romania (€60 million), and Lithuania (€40 million).

The type of instrument and the sectors targeted varies but a vast majority of measures can be considered as direct transfers (28 measures) and are directed towards households: the typical instrument being a grant for the purchase of a clean vehicle. On the other hand, we also identified mechanisms aiming businesses and public authorities even though this kind of help can sometimes be included into bigger schemes financing energy efficiency. Finally, some countries also use tax expenditures (e.g. in Germany, where first-time registered all-electric vehicles are excluded from taxes) or easier access to credit (e.g. in France, where households or legal entities can access a soft loan to buy a low emission vehicle).

Textbox 3-5: Support for commuters

Commuter benefits are a widely used measure throughout the EU27 MS to support workers by compensating them for their travel expenses between home and work. Typically, commuter benefits are

applied in a form of tax benefits, such as allowances for travel costs or tax-free reimbursements. Within the scope of this study, they are not considered as energy subsidies, and are therefore excluded from the inventory because they are not directly supporting the consumption of any energy product.

However, those instruments often support living further away from work, which increases energy demand and GHG emissions. Nevertheless, the design of commuter benefits can support energy demand to a greater or lesser extent and well-designed support for commuters can improve the modal split towards more sustainable transportation and thus reduce the demand for fossil fuels.

Although these instruments were not specifically targeted in our study, we have often found such measures in several MS tax expenditure reports.

In Germany, the commuter travel allowance (Entfernungspauschale) is deducted from the annual income equivalent to a tax credit. Total costs are estimated to be €6 billion (2018) according to the Umweltbundesamt⁵⁷.

In France, a similar measure exists (Frais de Transport)⁵⁸ but it only fully applies when living within 40 km from the place of work. When using public transport to commute, the employer is obliged to reimburse 50% of the transportation costs. Additionally, a “sustainable mobility” allowance, which can be applied to car sharing, cycling and rental of electric vehicles, came into force in 2020.

In Spain⁵⁹ and the Netherlands⁶⁰, there is a tax-free mileage reimbursement of €0.19/km, which is paid by the employer on a voluntary basis.

With the recent energy price increase and expensive fuel prices in Europe, commuter benefits have become a popular instrument to relieve households from high fuel prices. Austria, for example, has increased the commuter allowance (“Pendlerpauschale”) by a factor of four, regardless of the fuel used.

3.8. Subsidies by category

The Table 2 below, which summarises the distribution of energy subsidies in 2020, highlights that the bulk of the financial aid is paid through income/price supports (49%) and tax expenditures (36%). They are mainly captured by renewables (47%) and fossil fuels (29%).

Table 2: Subsidy amounts distribution by category and instrument (2020, %)

⁵⁷ „Umweltschädliche Subventionen in Deutschland – Aktualisierte Ausgabe 2021“, page 63., Burger, A. and Bretschneider, W. (2021)

⁵⁸ “Frais de transport”, Ministry of Taxes, <https://www.impots.gouv.fr/particulier/frais-de-transport> (last access: 20.06.2022)

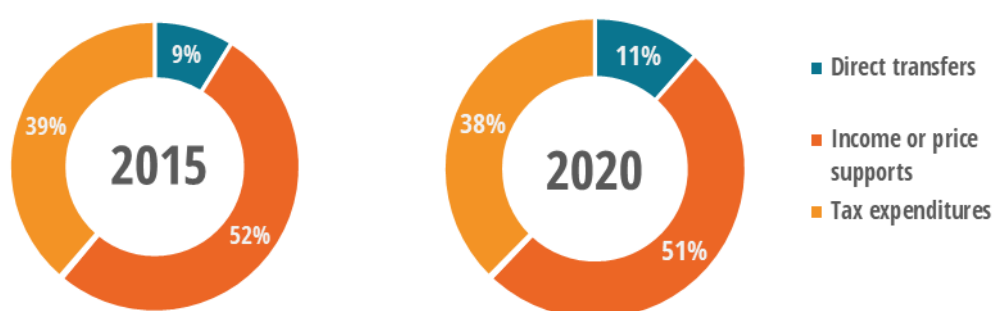
⁵⁹ “Mileage Reimbursement in Spain – A Guide for Overseas Employers”, ShieldGeo (2019). <https://shieldgeo.com/mileage-reimbursement-in-spain/> (last access: 20.06.2022)

⁶⁰ “Wat is de maximale reiskostenvergoeding die ik van mijn werkgever kan ontvangen?”, Rijksoverheid (2022). <https://www.rijksoverheid.nl/onderwerpen/inkomstenbelasting/vraag-en-antwoord/wat-is-de-maximale-kilometervergoeding-die-ik-van-mijn-werkgever-kan-ontvangen> (last accessed: 20.06.2022)

Subsidy category	All energies	Electricity	Fossil fuels	Nuclear	RES	Total
Direct transfers	5%	0%	3%	1%	2%	11%
Tax expenditures	6%	6%	20%	1%	4%	36%
Income or price supports	1%	1%	6%	0%	41%	49%
RD&D budgets	2%	0%	0%	1%	1%	4%
Total	15%	7%	29%	3%	47%	100%

Over the period 2015-2020, the overall distribution of subsidies by category and instrument remained stable. The only minor evolution detected affects direct transfers that record a constant increase capturing 9% share of the total amounts in 2015 and reaching up to 11% in 2020 (Figure 25).

Figure 25: Share of subsidy amounts paid, comparison of 2015 and 2020 (%)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

3.8.1. Tax expenditures

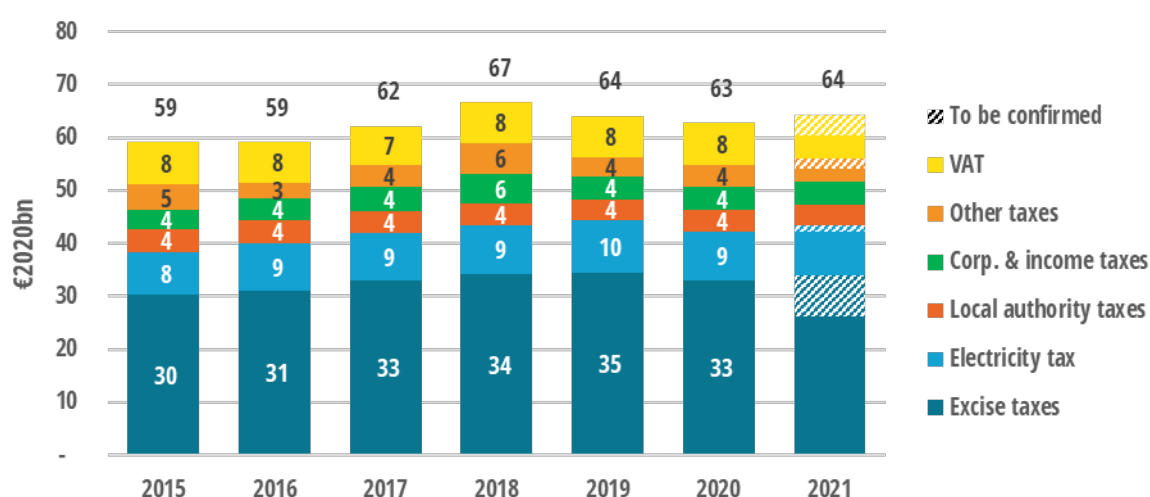
After the income/price mechanisms – mostly dedicated to RES support –, tax expenditure is the second largest tool used to subsidise energy. The amounts of tax expenditures in EU27 increased from 2015 to 2018 (€65 billion) and have decreased since then, reaching €62 billion in 2020 (Figure 26). Based on available data at the date of this report, we anticipate total tax expenditures in 2021 to be about €2 billion euros above 2020 level.

Of the €63 billion of tax expenditures in 2020, €33 billion were revenue waivers from excise taxes (including energy taxes and carbon taxes) mostly on petroleum products, and €9 billion from tax on electricity totalling close to €42 billion of revenue foregone. This type of revenue foregone increased by 6% (+€2.4 billion) between 2015 and 2020, which is mainly explained by the growing gap between increasing standard rates and reduced rates that were kept stable.

Exemptions on VAT represent the second largest source of tax revenue expenses with €8 billion in 2020, i.e. 12% of the total. Corporate and incomes tax expenditures were almost exclusively directed towards energy efficiency measures.

Figure 26 underlines that the distribution of revenue foregone by type of tax has remained quite steady over the period.

Figure 26: Tax expenditure in the EU27 by type of tax (2015-2020; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Textbox 3-6: VAT

Prior to the COVID19 pandemic, exemptions on Value-Added Tax (VAT) for energy represented 12% of the total tax revenues expenses with €7.9 billion (2019); this share has increased to 13% in 2020 (€8 billion). In 2021, 12 countries of the EU27 have been using VAT exemptions to subsidise energy. The countries using the most VAT as tax revenues expenses are Italy (€3.8 billion in 2020), and France (€1.7 billion in 2020).

The record-price hikes which began in 2021 and intensified in 2022 with the Russian invasion of Ukraine have put significant pressure on the purchasing power of consumers. Consequently, in April 2022, the EU amended its VAT Directive allowing EU MSs to use reduced VAT rate below 5% (on a limited ranges of supplies) for the first time. Previously, MSs were free to set their standard VAT rate provided it was 15% or above (such a limit was designed to prevent distortions in the EU single market by actors seeking to gain advantage by shifting consumption to other EU states).

15 countries in the Eurozone have or are about to introduce temporary cuts on their VAT rates on energy since beginning 2022 (Table 3).

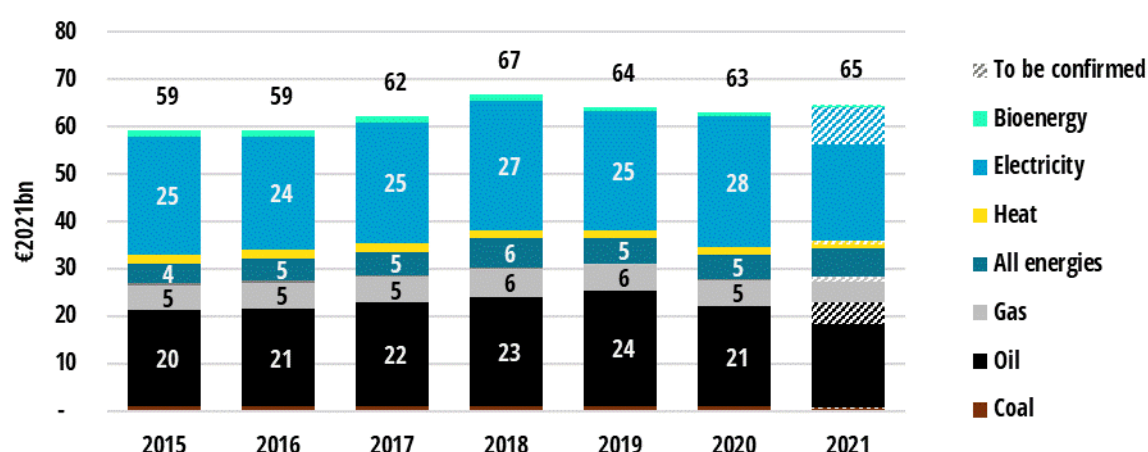
In addition, by 2030, the application of VAT rates or exemptions on fossil fuels and other goods harmful to the environment will have to be phased-out (*EC Council Directives, 2021*).

Table 3: Temporary energy VAT changes in the EU27 since beginning 2022 (as of end June 2022)

	VAT on gas and electricity	VAT on transport fuels
AT	-	-
BE	↘ 6% VAT (from 21%)	-
BG	↘ 0% VAT (from 20%)	-
CY	↘ 5-9% VAT (from 19%)	↘ 5% VAT
CZ	VAT modification might be applied in the short term	
DE	-	-
DK	-	-
EE	↘ 9% VAT (from 20%)	↘ 5% VAT (from 9%)
ES	↘ 10% VAT (from 21%)	
FR	-	-
GR	-	-
HR	↘ 13% VAT (from 25%)	-
HU	-	-
IE	↘ 9% VAT (from 13.5%)	-
IT	↘ 5% VAT (from 10-22%)	-
LT	-	-
LU	-	-
LV	Discussion to ↘ from 21% to 5% VAT	
MT	-	-
NL	↘ 9% VAT (from 21%)	
PL	↘ 0% VAT (gas)	↘ 8% VAT (from 23%)
PT	↘ 0% VAT (gas) ; ↘ 5% VAT (elec)	↘ 13% VAT (from 23%)
RO	↘ 5% VAT (from 19%)	↘ 5% VAT
SE	-	-
SI	↘ 5% VAT	
SK	-	-

In 2020, tax expenditures directly benefitted to both petroleum products and electricity (€21 billion and €28 billion, respectively), followed by natural gas and 'All energies' at €5 billion each (Figure 27). Tax revenues forgone on petroleum products increased by 15% between 2015 and 2019 (+€4 billion) and decreased by 11% in 2020 (-€3.3 billion). Over the 2015-2020 period, tax revenues on electricity have fluctuated at a stable level around €25 billion.

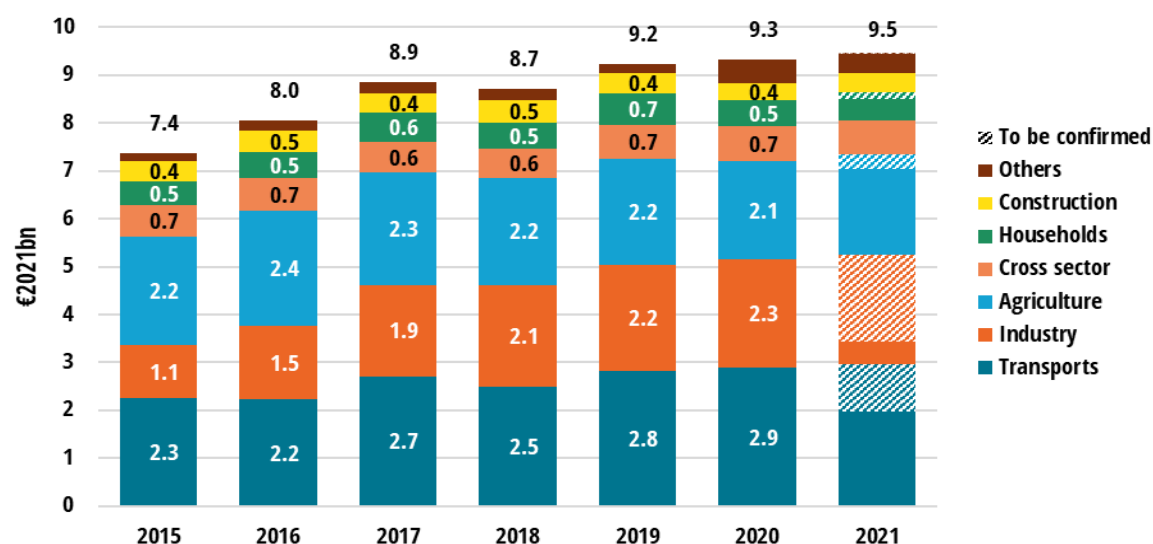
Figure 27: Tax expenditures in the EU27 by energy sources and carriers (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

Marked gasoil (also called coloured gasoil), which is used for off-road uses in agriculture, construction, industry, rail transport, public administration and for heating purposes in residential and services, benefited from €9.3 billion of subsidies in 2020, up by €2 billion since 2015. Figure 28 underlines that the transport (€2.9 billion in 2020, +€0.6 billion since 2015) and industry (€2.3 billion in 2020, +€1.2 billion) sectors benefit from most the tax revenues forgone on marked gasoil in absolute value. It can be observed the strong annual growth on the period (+15% per year) for industry sector. Meantime, subsidy to agriculture (including fishing activities) is the only economic sector to be on a downing trend (-1.8% per year).

Figure 28: Tax expenditures on marked gasoil by economic sector in the EU27 (2015-2021; €2021bn)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

3.9. Subsidies grouped using the EU Taxonomy

All subsidies have been sorted by four categories established for this study and listed hereafter, according to the methodology described in Annexes (section 5.1.2).

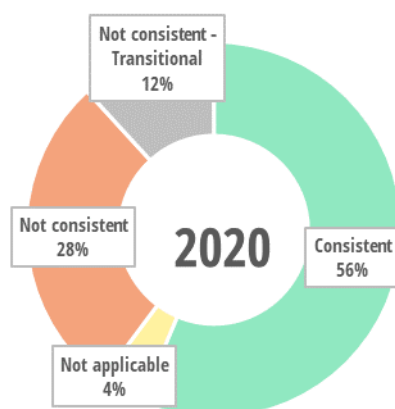
1. Consistent: subsidies benefitting activities known as "taxonomy-eligible economic activities", such as renewables, energy efficiency or infrastructure enabling low-carbon road transport and public transport.

2. Not consistent – Transitional: subsidies benefitting activities not eligible under the EU Taxonomy delegated acts, but which could hypothetically be part of the EU Taxonomy under specific criteria, or which can support the energy transition such as decommissioning of fossil fuels assets.
3. Not consistent: all subsidies supporting directly or indirectly the production or consumption of solid or liquid fossil fuels (see 5.1.2 EU Taxonomy classification).
4. Not applicable: subsidies that cannot be classified under previous categories such as market mechanisms (e.g., load-shedding, capacity market, security reserves) or support to the closure of nuclear power plants.

Figure 29 hereunder shows the share of each category from the total subsidies amounts in 2020 (€173 billion), including the complete database (all technology groups together).

Subsidies under “Consistent” category represent the majority, with 56% (or €98 billion) of overall amount in 2020, while subsidies under “Not consistent” category covers half of it with 28% (or €49 billion). Subsidies under “Not consistent - Transitional” category weight for 12% (or €20 billion) and the remaining “Not applicable” category only 4% (or €7 billion).

Figure 29: EU Taxonomy consistency assessment (2020; %)



Authors' elaboration based on data from Enerdata, Trinomics and country experts

3.10. Other financial supports

3.10.1. Support through freely allocated allowances in the EU ETS

Why are free allowances not considered as a subsidy?

The free allocation of emission allowances is supposed to reduce the burden of companies participating in the EU ETS in order to avoid the loss of international competitiveness and carbon leakage. In the current phase of the EU ETS allowances are auctioned and generate government revenue. Therefore, freely allocated allowances would impact the governmental budget and hence would be included in our database under normal circumstances. As agreed with the client, freely allocated allowances will continue to be treated separately.

Overview:

The EU launched the world's first international emissions trading system (ETS) in 2005. In its first phase (2005-2007) almost all allowances were given to businesses for free. Under the second period (2008-2012) the proportion of free allocation was slightly reduced to around 90%⁶¹. Since the beginning of the third period (2013-2020), the EU ETS auctioning has become the default allocation method and the power generation sector is obliged to buy all its allowances and no longer receives free allowances, except for eight countries that have made use of a derogation under Article 10c of the EU ETS Directive. This rule continues in the 4th phase (2021-2030), but only Bulgaria, Hungary and Romania decided to apply Article 10c of the EU ETS Directive in phase 4.⁶²

In 2021, the Commission proposed the Carbon Border Adjustment Mechanism (CBAM) regulation which supports the phase out of free allowances without risking that companies move their production abroad. It should be implemented as a transitional phase by the 1st January 2023, according to the European Parliament.⁶³ The CBAM ensures that EU importers pay the same carbon price as producers within the EU. The CBAM will gradually be implemented in sectors with high risk of carbon leakage, among others in electricity generation. Until 2032 free allowances should be completely phased out according to the European Parliament decision from June 2022⁶⁴, which is yet to be enforced. Furthermore, in 2021 National implementation Measures (NIMs), which provide information on production activity, transfers of heat and gases, electricity production and emissions replaced the previous benchmark to determine the level of free allocation⁶⁵.

Norway, Iceland and Liechtenstein are also participating in the EU ETS and since 2020, the EU ETS is linked with the Swiss ETS. These non-EU27 countries are not considered under the following graphs and calculations. However, their activities are also impacting the market price.

Results

In phase 3, allocation of certificates by auctioning became the standard allocation mechanism and the number of freely allocated allowances decreased gradually since then. In 2021, 560 MtCO₂ were freely allocated, a 12% decrease from 2020 and a decrease of 42% from 2013, the beginning of the 3rd phase.

The market price remained at a low price of €5/tCO₂ for 5 more years after the beginning of the 3rd phase until it started to increase in 2018. It is unlikely that the price increase was driven only by the demand side. Instead, it seems more likely that the price was mainly triggered by regulatory changes, such as the revision of the EU ETS Directive (2018) and the beginning of the 4th phase of the EU ETS in 2021.

Even though the demand decreased sharply in 2020 and 2021 during the COVID-19 pandemic the market price did not collapse, which could be thanks to the Market Stability Reserve (MSR), which was

⁶¹ "Development of EU ETS (2005-2020)", European Commission (2022), https://ec.europa.eu/clima/policies/ets/pre2013_en (last access: 20.05.2022)

⁶² "Free allocation for the modernisation of the energy sector, European Commission (2022) https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/free-allocation-modernisation-energy-sector_en (last access: 23.05.2022)

⁶³ "CBAM: Parliament pushes for higher ambition in new carbon leakage instrument", European Parliament (2022)

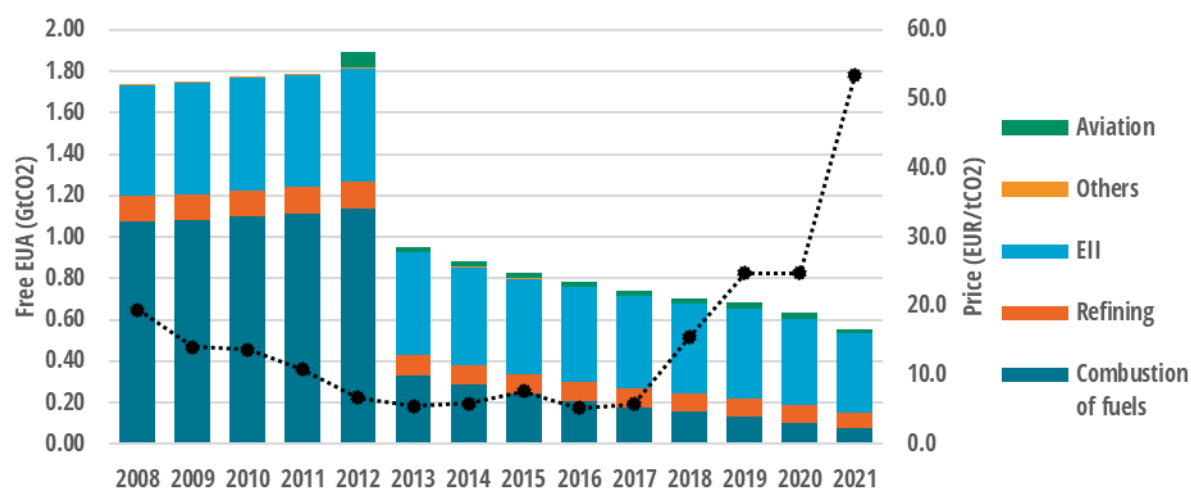
⁶⁴ "Climate change: Parliament pushes for faster EU action and energy independence", European Parliament (2022)

⁶⁵ COMMISSION DECISION (EU) 2021/355 of 25 February 2021 concerning national implementation measures for the transitional free allocation of greenhouse gas emission allowances in accordance with Article 11(3) of Directive 2003/87/EC of the European Parliament and of the Council (2021)

implemented in 2019. In this regard, it may be interesting to perform deep analysis about the utilisation of the MSR in 2020 and 2021.⁶⁶

Compared to the *Commission study 2021* report free aviation emission allowances have risen in the year 2012 retroactively by 20.8 MtCO₂, because aviation ETS accounts were moved from British national authorities to EU based authorities (mainly Germany, France and Spain) after Brexit.⁶⁷ It should be noted that historical allocations and emissions associated with these accounts moved to the respective countries as well.

Figure 30: Free EUA and average annual EAU price in the EU ETS (2008-2021)



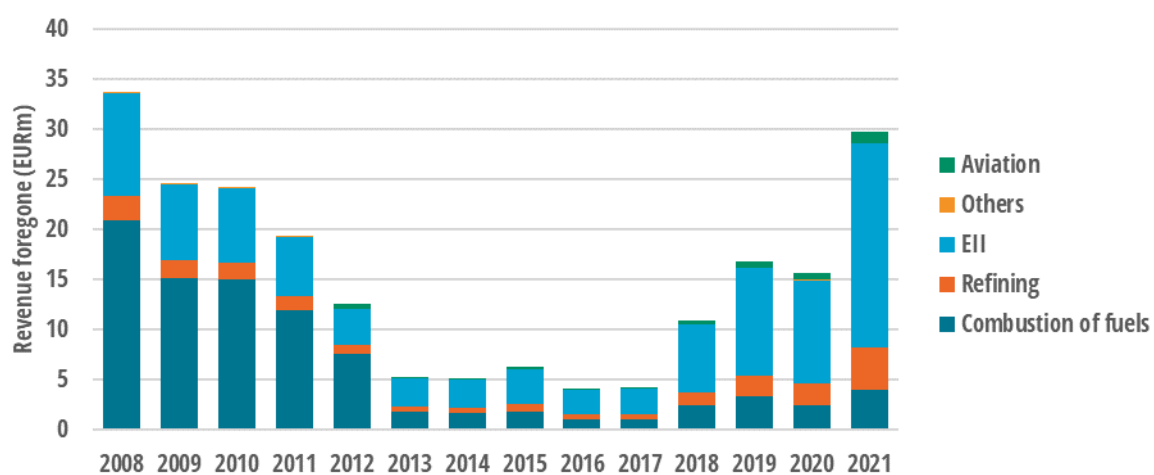
Authors' elaboration based on data from the EEA and ICAP

Figure 31 shows the development of the revenue foregone over the years. The sharp increase of the market price from 2018 onwards overcompensated the reduction in freely allocated allowances and thus leads to higher foregone revenue.

⁶⁶ "2022 State of the EU ETS Report", Marcu, A. et al. (2022), <https://ercst.org/state-of-the-eu-ets-report-2022/> (last access: 25.05.2022)

⁶⁷ "Frequently Asked Questions - The impact of Brexit on the EU Emissions Trading System for aviation", European Commission (2021), https://ec.europa.eu/clima/system/files/2021-09/policy_transport_aviation_faq_aviation_brexit_en.pdf (last access: 25.05.2022)

Figure 31: Revenue foregone from free EUA allocations in the EU ETS (2008-2021)



Authors' elaboration based on data from the EEA and ICAP

3.11. Conclusions

On the quality and transparency of reporting on energy subsidies:

- Information collected from MS Representatives during the conduct of this study largely improved the quality of data for some MSs. We are of the opinion that this consultation round is a positive contribution to the study. We expect that our solicitation will contribute to improve MSs' ongoing work on their national reporting of fossil fuel subsidies toward the publication of the upcoming draft NECPs.

On the energy subsidies trends since 2015:

- The overall amount of energy subsidies in EU27, €159 billion in 2015, has constantly grown (1.8% CAGR) since then reaching **€173 billion** in 2020.
- As of June 2022, we estimate that around €76 billion in subsidies were paid in the EU27 in 2021 and 2022 to address rising energy prices. We expect that this figure will only partially increase the overall amount of subsidies in 2022, as it likely overlaps with existing measures implemented before that year.
- Total **fossil fuel subsidies** paid have remained relatively stable at around €52 billion per year until 2019 before recording a €3 billion fall (-5%) in 2020, which was caused by a €3 billion reduction in subsidies allocated to the transport sector, in the context of COVID-19 pandemic and lockdown measures. In 2021, we expect the FFS to remain near its level of 2020, i.e., €50 billion.
- The implementation of policy to tackle climate change by the EU over the last two decades has resulted in structural changes to the European power mix that, in turn, have triggered the emergence of subsidies directed at **industry restructuring** such as aid to close coal/lignite power plants and coal mines. In 2021, these could represent 6% (€2.2 billion) of the total FFS in the EU27. Germany, as the biggest coal user in Europe, dedicated around 20% (€2.7 billion) of its coal-oriented subsidies in 2020 to coal phase-out measures and schemes to rehabilitate old coal mining sites.
- **Hydrogen**-related subsidies have remained low from 2015 to 2021 (€330 million in 2021) but have significantly increased in 2022, reaching around €900 million. We expect this rise to be confirmed in years to come as EU27 countries' interest in the new technology is growing.
- Support to **renewables** was still slightly on the rise until 2020 mainly throughout market-based instruments including feed-in tariffs/premiums, contracts for difference and RES quotas. We expect a substantial drop in 2021 due to high wholesale prices, which reduced the gap with feed-in tariff/premium levels. Solar still receives the highest financial support, followed by wind and biomass.
- Subsidies to **nuclear** that were stable since 2015 are following an upward trend since 2019 mainly because of revised decommissioning costs in Italy and payment for early closure of power plants in France. Subsidies surged in 2021 as Germany paid €2.4 billion to compensate utilities from the decision to phase-out of nuclear power by 2022.
- On a growing trend between 2015 and 2018 (+9% per year), support to **energy efficiency** decreased significantly between 2019 and 2020, by 7%, but has rebounded in 2021.

4. National phase out plans on subsidies

4.1. Objective

This chapter aims at providing a consolidated overview on the measures implemented or announced by each Member State that contribute to the reduction of FFS. One goal is to provide a clear and up-to-date version of policies announced ahead of the forthcoming new version of the draft NECPs due to mid-2023.

The intention is to provide DG ENER with detailed material at the country level, but also to compare each of the MS's contributions and to highlight any potential trends at a EU27 level.

To achieve these objectives, we created a MS Fact-sheet for each country. The MS Fact-sheets contain plans previously identified in *Commission study 2021* updated with latest policies implemented or announced by each government, collected from our team of country experts, or from other sources (e.g. Climate transparency⁶⁸).

All MS Fact-sheets can be consulted in Annex 3, section 5.3, and gathered the following information:

- Situation about fossil fuels related policies announced or implemented by the government
- List of subsidies identified in the *Subsidy inventory* that support fossil fuels use in the MS
- Situation about subsidies to the nuclear industry
- Total amount of FFS
- FFS amounts with end-date already planned
- FFS amounts with end-date yet to be planned

In the sections hereunder, we analyse the information collected in the MS Fact-sheets and draw the main conclusions.

4.2. Analysis and outlook on Member States' plans

Our analysis covers the information about fossil fuel technologies, with focus on short-term and mid-term measures (from now until 2030).

For this task, we faced difficulties in capturing the same level of information from one MS to another due to different levels of accessibility, transparency, consistency, homogeneity, granularity, and timeliness of published information. Another issue is the high level of uncertainty regarding the effective implementation of policies announced, due to the inherent constant evolution of policies, year after year, by MS governments. We encountered many cases where the starting date of policies were postponed or cancelled, for example the reduction of the tax expenditure for off-road gasoil in France. Part of our analysis is based on theoretical end-date for each subsidy that was collected and recorded in the *Subsidy inventory*. The distribution of subsidy amounts between the group "end-date already planned" and the group "end-date yet to be planned" are to be interpreted as the reflect of data we have been able to access to.

In the two following sections, we make use of information reported in the MS Fact-sheets to assess the effort made by MSs to phase out FFS. Firstly, we analyse the amounts of FFS; secondly, we scrutinise the policies and actions addressing FFS that have been announced and implemented by the MSs.

⁶⁸ The Climate Transparency Report 2021 and country profiles, available at: <https://www.climate-transparency.org/g20-climate-performance/g20report2021>

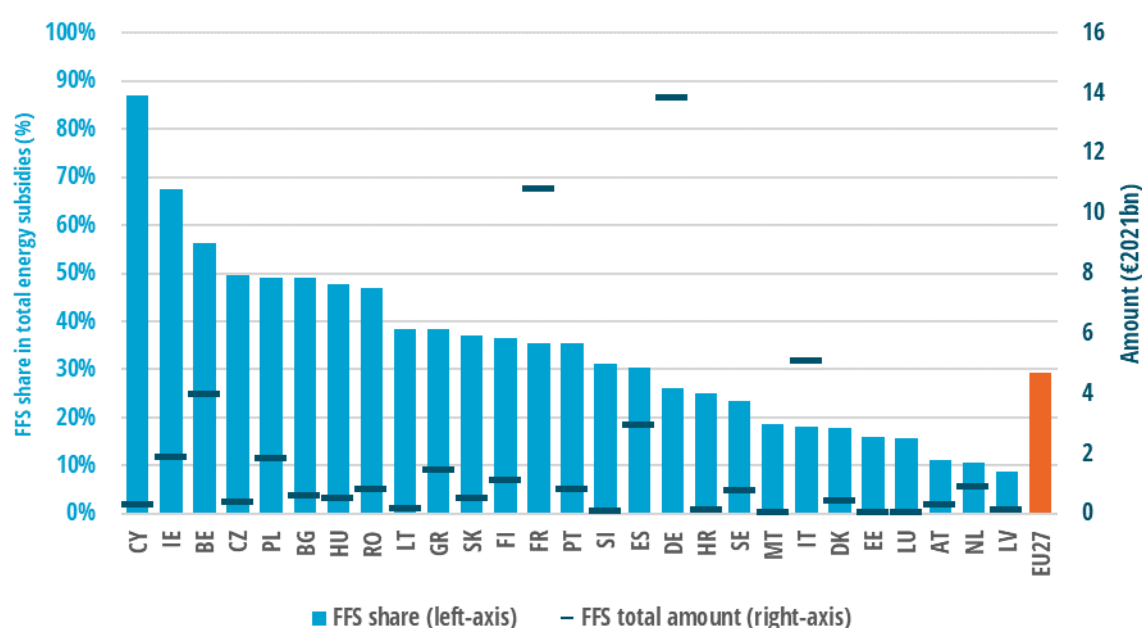
4.2.1. Amounts

In the *Subsidy inventory*, FFS represented almost €50 billion in 2020 in the EU27. For more than 80% of this amount (€41 billion), the end-date is either unknown, unplanned, or planned after year 2030. At best, this 80% share reflects an overall lack of transparency and accessibility of end-dates scheduled by MSs. At worst, it reflects the gap between FFS phase out objective (zero-euro by 2030) and effective MS commitments. In reality, we believe it partly reflects both these reasons; below we provide an assessment of the remaining effort to be made in the EU27.

More than 80% of the €41 billion are paid by 7 MSs, namely – in decreasing order of amount inventoried – France, Germany, Italy, Belgium, Spain, Ireland and Greece. Among these MSs are the 4 biggest economies of EU27. But Belgium, Ireland and Greece are also included, which combine significant FFS amounts along with a high FFS share in their total energy subsidy amounts (56%, 67%, 38%, respectively) as shown in Figure 32.

Despite its high GDP, Poland is absent from the 7 MSs listed previously because it is the sole MS where FFS amounts with end-date planned are bigger than amounts with no end-date planned. It can be explained by a high FFS share (49%) in the total energy subsidies of the MS, way above the EU27 average (29%) (Figure 32).

Figure 32: FFS amounts (€2021bn) and FFS as a share of total energy subsidy (%) in 2020



Authors' elaboration based on data from Enerdata, Trinomics and country experts

As of June 2022, there is high proportion of FFS with unknown end-dated, unplanned, or planned after year 2030. Indeed, this is not a common practice by governments to provide the end date of measures implemented as part of the tax expenditure reports, finance law or national budget. The start-date of each measure is often mentioned, not the end date. This seriously hinders our analysis. As a result, among the MSs mentioned above, it has not been possible to identify significant share of FFS amounts with end-dates before 2030, except for Germany and Poland. This situation does not allow us to assess whether or not EU27 can be on track with phasing out FFS and with zero-euro target in 2030. To that end, it appears crucial that the MSs can commit to clear end-dates for ongoing FFS but also improve transparency and accessibility of such information. The upcoming draft NECPs to be released mid-2023 should bring more transparency on this issue.

The situation by country is detailed within each MS Fact-sheet, bringing complementary information to the global picture. This work is available in Annex 3, section 5.3.

4.2.2. MSs plans

Table 4 is based on the individual MS Fact-sheets to provide an overview of plans and actions decided by each MS individually and to allow the comparison with other MSs. Where deemed necessary other sources (e.g. NECPs) have been consulted as well for completion⁶⁹. In each column, we indicate a criteria (policy or action) which can accelerate FFS phase-out. Then, we sort the contribution of each MS according to the following categories:

- Positive contribution (in green), and
- Negative contribution, or not clear or explicit (in grey).

The description and evaluation of the criteria used must be interpreted as follows:

Intentions / Ambitions: Ambition in this case is understood as either a clear goal to phase out from fossil fuels. Or the ambition to have 100% renewable electricity by a certain year. The latter implicitly presumes the phase out of fossil fuels as a source. Both are seen as a positive contribution. If no clear mentioning of an ambition or a vague "committed to" with no further details, than evaluated as not positive.

Ambitions written in laws / plans: Where the MS Fact-sheet mention the elaboration or implementation of plans or laws it is evaluated as a positive contribution

Clear end date (coal fired-power plants, fossil fuels for heating, fossil fuels in transport, end all FFS): If a mention of clear end date is found (in MS Fact-sheet, or NECP reports) it is evaluated as a positive contribution.

Plan for restart / extend FF power plants: To face increasing concern about energy supply security due to war in Ukraine, some countries plan to revive FF power plants. In such case, then it is evaluated as a negative contribution but a temporarily acceptable measure, in line with the RePower EU Plan⁷⁰.

⁶⁹ https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps_en#final-necps

⁷⁰ REPowerEU: affordable, secure and sustainable energy for Europe, 18 May 2022

Table 4: Consolidated overview of identified actions and plans per country to phase-out fossil fuels

Member State	Intentions/ ambitions ¹	Ambitions written in Laws / Plans	Clear end date coal-fired power plants ²	Clear end date fossil fuels for heating	Clear end date fossil fuels in transport	Clear end date for all FFS	Avoid doing plan restarting / extending fossil fuels-fired power plants ³
Austria							
Belgium							
Bulgaria							
Croatia							
Cyprus			N/A				
Czechia							
Denmark							
Estonia							
Finland							
France							
Germany							
Greece							
Hungary							
Ireland							
Italy							
Latvia			N/A				
Lithuania			N/A				
Luxembourg			N/A				
Malta			N/A				
Netherlands							
Poland							
Portugal							
Romania							
Slovakia							
Slovenia							
Spain							
Sweden							

Notes

1) From latest communication or NECP reports (2020)

2) Initial intentions until 2022

3) In a context of high uncertainty on gas / russian boycott in 2022

Contribution to FF phase out

Positive contribution
Negative contribution or not clear or explicit

To complement on the overview of plans, the following observation can be highlighted.

Many countries have defined ambitions related to the phasing out of fossil fuels, especially in the power sector. Some, such as Austria, have set the target of 100% renewable electricity in 2030. However, beyond the power sector, the translation of ambitions into law or plans is not yet so common. Only a handful of countries have implemented laws or clear plans to support their ambitions. For example, Belgium “will draw up by 2021 an action plan to gradually phase out subsidies for fossil fuels, taking into account among others, the need to guarantee the country’s security of energy supply⁷¹”, as stated the Government in December 2019. But until now, the said action plan has not yet been implemented. Similar observations applies to numerous MS that have yet to transform their announcement into effective plans.

As of June 2022, several EU27 governments are still contemplating on whether to shut-down coal fired power plants or not, to compensate for reduced deliveries of Russian natural gas. For instant, the Dutch Government has decided in June 2022 that the 35% production cap of the remaining coal fired plants will be lifted to compensate for reduced natural gas supplies from Russia. Austria has agreed to convert a gas fired plant so that it can produce electricity from coal, while in the years before the plant has been converted from coal to gas⁷². Other countries such as France, Germany, Italy or Romania have announced plans to restart mothballed fossil fuels-fired power plants to ensure security of supply. Such measures may enter into contradiction with one EU Climate Law objective to ensure that the transition to climate neutrality is irreversible.

4.2.3. Conclusions

In general, many countries show ambitions to move away from fossil fuels. Though only a few countries have translated ambitions into laws or clear plans. If a significant number of countries have set clear dates to exit FFS in the electricity production, it is less common for transportation and heating.

Putting a term on FFS appears a difficult operation for governments, and end-dates for ongoing FFS are often unknown or not published by authorities. Clear commitments and reporting enhanced with more transparency from all MSs on end-dates subsidies would facilitate the monitoring of the progress made. To achieve zero-euro target in 2030, these commitments shall be set in priority by the 7 MSs (aforementioned) responsible for 80% of the total amount granted to FFS.

Recent measures favourable to fossil fuel-fired power plants operation were taken to secure energy supply for the upcoming winter. It underlines how difficult it can be for each MS to stick to its commitments while supporting the economic growth and maintaining EU27 citizens’ purchasing power in the context of the current geopolitical landscape.

⁷¹ <https://climat.be/actualites/2021/inventaire-federal-des-subsventions-aux-energies-fossiles>

⁷² <https://www.reuters.com/business/energy/austria-revives-coal-fired-power-option-russia-cuts-gas-supply-2022-06-19/>

5. Annexes :

Annex 1: Theoretical framework

Annex 2: Country data controls and observations

Annex 3: Member State Fact-sheets

5.1. Annex 1: Theoretical framework

5.1.1. Classifications

To be consistent with previous *Commission studies*, we have kept the subsidy definitions and classifications which are based on the Agreement on Subsidies and Countervailing Measures (ASCM) framework stated by the World Trade Organization (WTO)⁷³. The said ASCM classifies the subsidies in four main categories (see Textbox below).

Textbox 5-1: Definition of a subsidy within the Agreement on Subsidies and Countervailing Measures (ASCM) of the World Trade Organization (WTO)

Article 1: Definition of a Subsidy

1.1 For the purpose of this Agreement, a subsidy shall be deemed to exist if:

(a)(1) **there is a financial contribution by a government or any public body** within the territory of a Member (referred to in this Agreement as "government"), i.e. where:

(i) a government practice involves a **direct transfer of funds** (e.g. grants, loans, and equity infusion), potential direct transfers of funds or liabilities (e.g. loan guarantees);

(ii) **government revenue** that is otherwise due is **foregone or not collected** (e.g. fiscal incentives such as tax credits);

(iii) a government provides goods or services other than general infrastructure, or purchases goods;

(iv) a government makes payments to a funding mechanism, or entrusts or directs a private body to carry out one or more of the type of functions illustrated in (i) to (iii) above which would normally be vested in the government and the practice, in no real sense, differs from practices normally followed by governments;

or

(a)(2) there is any form of **income or price support** in the sense of Article XVI of GATT 1994;

and

(b) a benefit is thereby conferred.

The WTO typology is commonly used by several international institutions such the OECD, the IRENA and NGOs such as IISD as shows Table 5 which summarises the adaptation by these organisations to the WTO framework.

⁷³ All documents related to WTO Agreement on Subsidies and Countervailing Measures are available at https://www.wto.org/english/docs_e/legal_e/24-scm_01_e.htm

Table 5: Table Energy subsidy classifications by major international institutions (classification updated from *Commission study 2021*)

WTO ⁷⁴ (1994)	DG ENER (2020)	IRENA (2020)	UNEP - IISD - OECD (2019)	OECD (2013)
Agreement on Subsidies and Countervailing Measures	Study on energy costs, taxes, government interventions and their impact on energy investments	Energy subsidies, Evolution in the Global Energy Transformation to 2050	Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals	Inventory of Estimate Budgetary Support and Tax Expenditures for Fossil Fuels
A government practise involves a direct transfer of funds, potential direct transfers of funds or liabilities.	Direct transfers	Direct financial transfer	Direct transfer of government funds Transfer of risk to government (Indirect)	Direct transfer of funds Transfer of risk to government (Indirect)
Government revenue that is otherwise due is foregone or not collected	Tax expenditures	Preferential tax treatment	Tax expenditures, government revenue foregone	Tax revenue and other government revenue foregone
Government provides goods or services other than general infrastructure, or purchases goods	Under-pricing of goods/services	Energy-related services provided by government at less than full cost	Under-pricing of other goods and services	NA
There is any form of income or price support	Income or price supports	Regulation of the energy sector	Induced transfers (price support)	Induced transfers

⁷⁴ The WTO proposes a fifth type of subsidy called « Government makes payment to a funding mechanism, or entrusts or directs a private body to carry out the function(s) which would normally be vested in the government and the practise doesn't differ from practises normally followed by governments » that is excluded from the table because no other study cover this type of subsidy.

In line with previous *Commission studies*, we renewed the defined set of classifications covering the typology of subsidies by category and instruments (Table 6), energy sources/carriers (Table 7), purpose (Table 8), source of financing (Table 9) and economic sectors (Table 10).

Subsidy instruments inventoried in Table 6 can be considered as the “positive list”, i.e. the list of instruments covered by our study.

Table 6: Classification of subsidy category and instruments

Subsidy category	Subsidy instrument
Direct transfers	Soft loans
	Grants
	Others
Tax expenditures	Tax reduction
	Tax exemption
	Tax refund
	Tax credits
	Tax allowance
	Others
Under-pricing of goods/services	Under-pricing of government-owned resources or land
	Under-pricing of government-owned infrastructure
	Under-pricing of other government-provided goods or services
Income or price supports	Capacity payments (electricity capacity mechanisms)
	Biofuels blending mandate
	RES quotas with tradable certificates
	Differentiated grid connection charges
	Energy efficiency obligations
	Interruptible load schemes
	Contract for Difference (CfD)
	Feed-in premiums
	Feed-in tariffs
	Consumer price guarantees (cost support)
	Consumer price guarantees (price regulation)
	Producer price guarantees (price regulation)
	Others
RD&D	RD&D

Table 7: Classification of energy sources/carriers

Main energy sources	Main fuels and carriers	Products and carriers
All energies	All energies	All energies
Heat	Heat	Heat
Electricity	Electricity	Electricity
Nuclear	Nuclear	Nuclear
Fossil fuels	FF-All / several	FF-All fossil fuels
	FF-All / several	FF-Several fossil fuels
	FF-Coal / Lignite	FF-Coal / Lignite
	FF-Natural Gas	FF-Natural gas
		FF-Mine gas
		FF-Shale gas
	FF-Oil	FF-Crude oil & NGL
		FF-Oil & Gas
		FF-Petroleum products
		FF-PP-Gasoil
		FF-PP-Blended gasoil
		FF-PP-Gasoline
		FF-PP-Leaded Gasoline
		FF-PP-Unleaded Gasoline
		FF-PP-Blended gasoline
		FF-PP-LPG
		FF-PP-Kerosene
		FF-PP-Fossil-based marine fuels
		FF-PP-Heavy fuel oil (HFO)
	FF-Peat	FF-Peat
	Hydrogen	FF-All fossil fuels
		RES-Biogas
Bioenergy	RES-Biomass	RES-Biogas
		RES-Biomass & biogas
		RES-Biomass (solid)
		RES-Biomass MSW
		RES-Liquid biofuels
		RES-Liquid biofuels-Biodiesel
		RES-Liquid biofuels-Bioethanol
RES	RES-All / several / others	RES-All
	RES-All / several / others	RES-Several
	RES-Geothermal	RES-Geothermal
	RES-Heat	RES-Heat
	RES-Hydro	RES-Hydro
	RES-Marine energy	RES-Marine energy
	RES-Solar	RES-Solar
	RES-Wind	RES-Wind
		RES-Wind offshore
		RES-Wind onshore

Table 8: Classification of subsidy purpose

Subsidy by purpose
Support to energy demand
Support to energy efficiency
Support to industry restructuring
Support to infrastructure
Support to production
Support to R&D

Table 9: Classification of source of financing

Source of financing
Government / Public bodies
Final customers
Operators

Table 10: Classification of economic sectors

Economic sectors	Sub-sectors
Energy industry	Energy sector
	-ENER-Fossil fuel extraction
	-ENER-Energy crops
	-ENER-Conversion
	-ENER-Conversion-Refining
	-ENER-Conversion-LNG
	-ENER-Conversion-CHP
	-ENER-Conversion-Electricity production
	-ENER-Conversion-Heating & Cooling
	-ENER-Conversion-Liquid biofuels
	-ENER-Conversion-Biogas production
	-ENER-Conversion-Hydrogen production
	-ENER-Infrastructure
	-ENER-Infra-Transmission
	-ENER-Infra-Distribution
	-ENER-Infra-T&D
	-ENER-Infra-Storage
	-ENER-Assets decommissioning
	-ENER-Waste management
	-ENER-Retail
Agriculture	Agriculture
	-AGRI-Crop, animal production, hunting
	-AGRI-Forestry and logging
	-AGRI-Fishing and aquaculture
Construction	Construction
Mining	Mining
Industry	Industry
	-INDU-Energy-intensive industry
	-INDU-Non energy intensive-industry
Transports	Transport
	-TRANS-Air transport
	-TRANS-Rail transport
	-TRANS-Road transport
	-TRANS-Water transport

Economic sectors	Sub-sectors
	-TRANS-Public transport
Services (tertiary sector)	Services (tertiary sector)
Business	Business
Households	Households
	-HH-Low income
Public	Public
Cross sector	Cross sectors

5.1.2. EU Taxonomy classification

In the context of the energy transition aiming at reaching climate neutrality in the EU, we have intended to clarify the contribution of energy subsidies to the ongoing energy transition promoted by the EU by introducing to our inventory and analysis of a new classification adapted from the Taxonomy Climate Delegated Act⁷⁵ ("EU Taxonomy"). This task doesn't have the ambition to provide any form of instruction or legal force to work but rather to bring food for thought for future policy developments to institutions and organisations that would make a link between the EU Taxonomy and the energy subsidies currently ongoing or under development. The work below represents the opinion of the authors, in no way those of the European Commission. In addition, at the time of writing this report, it is important to keep in mind that the Complementary Climate Delegated Act⁷⁶, addressing nuclear and gas energy activities, has already been proposed by the European Commission, and the adoption process by the co-legislators, the Parliament and the Council, has not been finished, and as the Delegated act did not yet enter into force, therefore it has currently no legislative force. As a result, nuclear and gas energy activities were considered under a "not consistent - Transitional" status in our analysis.

The work attempts to create a relationship, systematic when possible, between two types of classification systems that use some common concepts and others that are more distant. Indeed, the reasoning of the EU Taxonomy is based on *economic activities* with binary conclusion (included vs not included), while our initial mission on the energy subsidies was to identify and describe the various types of energy subsidies using a *multi-criteria framework*. Indeed, we came to the conclusion that a full straightforward match was impossible between both systems. Therefore, we have designed a framework using the EU Taxonomy as a base while creating two new categories to reflect the transitional or not applicable aspects of several subsidies. As a result, we suggest assessing the consistency (or the "potential compliance") of subsidies with the "Climate mitigation" section of EU Taxonomy Climate Delegated Act⁷⁷ by sorting them into the following four categories.

For the purposes of categorisation, the 'do no significant harm criteria' to the other five environmental objectives was not used as it would require an assessment relying on environmental criteria not compatible with the preferred approach by economic activities.

1st category: Consistent

The "Consistent" category includes energy subsidies targeting beneficiary areas broadly compatible with the activities listed in the current "Climate mitigation" section of EU Taxonomy Climate Delegated Act. This subset of activities is known as "taxonomy-eligible economic activities": economic activities that are described in the Commission's delegated acts, but are not assessed for their compliance with the relevant technical screening criteria.

As the architecture of the EU Taxonomy is based on the output of economic activities, therefore a supply-side approach, we have been able to build a quite straightforward link to the *Subsidy inventory* using the criteria "subsidy purpose" (see section 3.6). The link is particularly easy with the three following groups:

⁷⁵ Commission Delegated Regulation 2021/2139

⁷⁶ Document C(2022)631, available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM%3AC%282022%29631&qid=1647359214328

⁷⁷ Commission Delegated Regulation 2021/2139

- “Support to energy production”,
- “Support to energy efficiency”,
- “Support to energy infrastructure”

In addition of being classified in the three categories above, each subsidy must also match both the economic activities in Table 11 below and the energy sources/carriers:

- Renewables: to be in line with technologies mentioned in the EU Taxonomy,
- “all energies” as most of the energy efficiency subsidies are classified this way in the *Subsidy inventory*,
- Electricity: in this case, we suppose that all the energy subsidies directed to the energy carrier “electricity”, whatever the technologies/energy sources used for its production, is consistent to the EU Taxonomy in the sense it contributes to the clean energy transition promoted by the EU,
- Heat: same as for electricity above

In addition, this “simplified” classification, we have also added the subsidies classified as:

- “Support for energy demand” when it targets renewable energy technologies as we supposed that favouring the consumption of renewable energy indirectly supports the economic activities that produce these technologies,
- RD&D for renewable energy technologies, hydrogen and “all energies” indistinctly.

Table 11 summarises the approach we have developed to match the EU Taxonomy and the *Subsidy inventory* to address the subsidies considered as “consistent”.

In 2020, “Consistent” subsidies totalled €94 billion; i.e., 55% of the overall amounts.

Table 11: Energy subsidies match with a restrictive list of economic activities included in the EU Taxonomy Delegated Act.

EU Taxonomy - Climate mitigation			Energy subsidies - Support to energy...			
Sector	Activity		production	efficiency	infrastructures	Others
Manufacturing	3.1	Manufacture of renewable energy technologies		X	X	
	3.2	Manufacture of equipment for the production and use of hydrogen		X	X	
	3.3	Manufacture of low carbon technologies for transport		X	X	
	3.4	Manufacture of batteries		X	X	
	3.5	Manufacture of energy efficiency equipment for buildings		X	X	
	3.6	Manufacture of other low carbon technologies		X	X	
Energy	4.1	Electricity generation using solar photovoltaic technology	X			
	4.2	Electricity generation using concentrated solar power (CSP) technology	X			
	4.3	Electricity generation from wind power	X			
	4.4	Electricity generation from ocean energy technologies	X			
	4.5	Electricity generation from hydropower	X			
	4.6	Electricity generation from geothermal energy	X			
	4.7	Electricity generation from renewable non-fossil gaseous and liquid fuels	X			
	4.8	Electricity generation from bioenergy	X			
	4.9	Transmission and distribution of electricity	X		X	
	4.1	Storage of electricity	X		X	
	4.11	Storage of thermal energy	X		X	
	4.12	Storage of hydrogen	X		X	
	4.13	Manufacture of biogas and biofuels for use in transport and of bioliquids	X			
	4.14	Transmission and distribution networks for renewable and low-carbon gases	X	X	X	
	4.15	District heating/cooling distribution	X		X	
	4.16	Installation and operation of electric heat pumps	X			
	4.17	Cogeneration of heat/cool and power from solar energy	X			
	4.18	Cogeneration of heat/cool and power from geothermal energy	X			
	4.19	Cogeneration of heat/cool and power from renewable non-fossil gaseous and liquid fuels	X			
	4.2	Cogeneration of heat/cool and power from bioenergy	X			
	4.21	Production of heat/cool from solar thermal heating	X			
	4.22	Production of heat/cool from geothermal energy	X			
	4.23	Production of heat/cool from renewable non-fossil gaseous and liquid fuels	X			
	4.24	Production of heat/cool from bioenergy	X			
	4.25	Production of heat/cool using waste heat	X			
Water supply, sewerage, waste management and remediation	5.6	Anaerobic digestion of sewage sludge	X			
	5.7	Anaerobic digestion of bio-waste	X			
	5.1	Landfill gas capture and utilisation	X			
	5.11	Transport of CO2		X		
	5.12	Underground permanent geological storage of CO2				

EU Taxonomy - Climate mitigation			Energy subsidies - Support to energy...			
Sector	Activity		production	efficiency	infrastructures	Others
Transport	6.15	Infrastructure enabling low-carbon road transport and public transport			X	
Construction and real estate	7.2	Renovation of existing buildings		X		
	7.3	Installation, maintenance and repair of energy efficiency equipment		X		
	7.4	Installation, maintenance and repair of charging stations for electric vehicles in buildings (and parking spaces attached to buildings)		X		
	7.5	Installation, maintenance and repair of instruments and devices for measuring, regulation and controlling energy performance of buildings		X		
	7.6	Installation, maintenance and repair of renewable energy technologies		X		
Information and communication	8.2	Data-driven solutions for GHG emissions reductions				X
Professional, scientific and technical activities	9.1	Close to market research, development and innovation				X
	9.2	Research, development and innovation for direct air capture of CO2				X
	9.3	Professional services related to energy performance of buildings		X		

2nd category: Not consistent – Transitional

Under the “Not consistent – Transitional” category, we have gathered subsidies benefitting activities not eligible under the EU Taxonomy Climate Delegated Act (without looking specifically into the technical screening criteria), but which support activities that could hypothetically be part of the EU Taxonomy under specific criteria (such as electricity, heat/cool, combined heat and power generation from natural gas or energy production from nuclear), or which can support the energy transition (such as decommissioning of fossil fuels assets). This category contains the following activities (non-exhaustive list):

- Support to energy production:
 - Efficient district heating/cooling distribution burning “all energies”, i.e. when no information available on the energy sources input in the assets to produce energy
 - Production of electricity, heat or combined heat and power when no information available on the energy sources input in the assets to produce energy
 - Electricity production from nuclear: we assume that nuclear power generation currently subsidised complies with requirement mentioned in the Complementary Climate Delegated Act, i.e., presenting a life-cycle GHG emissions <100 g CO₂e/kWh
 - Electricity production from gas provided that it complies with requirement mentioned in the Complementary Climate Delegated Act (no occurrence in the updated *Subsidy inventory*, cf. further explanation in the 3rd category section below)
- Support to energy efficiency:
 - Investment in efficient district heating/cooling distribution burning “all energies”, i.e., energy subsidies for which we are not able to distinguish which energy produces energy
- Support to energy infrastructure:
 - the activity replaces an existing high emitting heating/cooling activity using solid or liquid fossil fuel
 - Support for decommissioning of polluting plants (lignite, coal, ...)
- Support to energy demand:
 - Consumption of electricity, heat or combined and power when no information available on the energy sources input in the assets to produce energy. In this case, we suppose that electricity and heat are carriers contributing to the energy transition, i.e., the support to electricity or heat consumption is a way to reduce that of fossil fuels, thus contributing to mitigate CO₂ emissions
 - Consumption of electricity when it is produced from nuclear
- RD&D subsidies for nuclear

In 2020, “Not consistent – Transitional” subsidies totalled €20 billion i.e., 12% of the overall amounts.

3rd category: Not consistent

Subsidies that cannot be classified under the two first categories are scrutinised here. Under the “Not consistent” category we have included subsidies supporting directly or indirectly (through heat or electricity) the production or consumption of fossil fuels. It regroups the subsidies which combine two criteria: a) not compatible with the activities listed in the current EU Taxonomy (without looking

specifically into the technical screening criteria) and b) not *Transitional* as understood in the 2nd category description. This 3rd category contains the following activities (non-exhaustive list):

- Support to energy production:
 - Direct or indirect energy production from solid or liquid fossil fuels. It includes the vast majority of electricity production from gas because we consider current power generation produced from existing gas-fired assets do not comply with requirement mentioned in the Complementary Climate Delegated Act⁷⁸
 - Heat production from gas: idem as for Electricity production from gas
 - Combined heat and power: idem as Electricity production from gas
- Support to energy demand
 - Compensation for the indirect costs of EU ETS
 - Direct or indirect energy consumption of solid or liquid fossil fuels

In 2020, "Not consistent" subsidies totalled €48 billion; i.e., 28% of the overall amounts.

4th category: Not applicable

"Not applicable" category, includes subsidies that cannot be classified under the three first categories. It regroups the remaining part of subsidies not compatible with the activities listed in the current EU taxonomy without looking specifically into the technical screening criteria. This category contains the following activities (non-exhaustive list):

- Support to energy production
 - Market mechanisms such as load-shedding, capacity market, security reserves
- Support to energy demand
 - when no information available on the energy sources input in the assets to produce energy
 - when subsidies are directed to low-income households as we considered that these citizens have no economic option to switch to cleaner technologies, therefore it is considered outside the EU Taxonomy approach.
- Support to energy efficiency
 - Subsidies that do not address economic activities listed in Table 11, of which we identified energy subsidies actions such as information and communication, energy efficiency obligation schemes, consultancy, trainings...
- Support to industry restructuring
 - Subsidies supporting the closure of nuclear power plants

⁷⁸ The criteria as stated in the Complementary Climate Delegated Act are:

- Direct GHG emissions <270g CO₂e/kWh, or annual direct GHG emissions <550kg CO₂e/kW over 20 years
- The activity must also meet **cumulative conditions**:
 - It replaces a facility using solid or liquid fossil fuels
 - **No renewables alternatives** available
 - **Maximum capacity of 15% more** of the replaced one
 - It ensures **switch to renewable** or low-carbon gases (30% as of 2026, 55% as of 2030; 100% as of 2035)
 - In MS where the project uses coal for power generation, it **has committed to a coal phase-out**

In 2020, “Not applicable” subsidies totalled €7 billion; i.e., 4% of the overall amounts.

5.1.3. Negative list: data not collected

To be consistent with *Commission studies*, these subsidy types that are not covered are listed below:

- Transport is restricted to fuel tax reductions/exemptions and domestic transport. The study also does not cover:
 - Extra-EU27 international transport
 - Intra-EU27 international aviation
 - International waterborne transport
 - Reductions/exemptions of distance-based road charges;
 - Reductions/exemptions or non-existence of potential urban road pricing schemes;
 - Reductions/exemptions of infrastructure charges, including rail, ports, airports.
- Support to nuclear plants decommissioning through:
 - The European Bank for Reconstruction and Development (EBRD), though the International Decommissioning Support Fund (IDSF) in Kozloduy (Bulgaria), Bohunice V1 (Slovakia) and Ignalina (Lithuania)
 - The Central Project Management Agency (CPMA) in Ignalina (Lithuania)
 - The Slovak Innovation and Energy Agency (SIEA) in Bohunice V1 (Slovakia)
- Financial support related to cost of integration of intermittent RES;
- Government ownership (of all or a significant part) in energy companies;
- Government equity infusions in private firms.

5.1.4. Negative list: data collected apart from main inventory

For clarity matter, it is reminded that the following supporting schemes and measure are not considered as energy subsidy according to definition above (Textbox, section 5.1.1) and therefore excluded from the *Subsidy inventory*. Nevertheless, we have collected and gathered these measures together in a separate database (*DG_ENER_extra-data_2022.xls*) and commented them in separate textboxes all along this report.

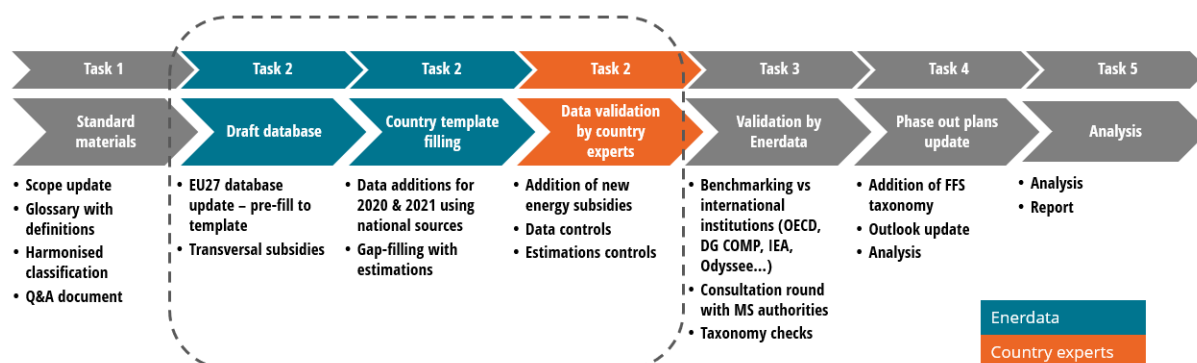
- Diesel vs gasoline tax difference ([Textbox 3-1](#))
- Support to electric mobility, ‘clean’ vehicle ([Textbox 3-4](#))
- Support to commuter ([Textbox 3-5](#))

5.1.5. Data collect and control process

5.1.5.1. Data collection process

The data collection process was performed in the three steps highlighted below.

Figure 33: Data collection process



5.1.5.2. Data hierarchy

The subsidy data are made of two main types of information:

Actual data gather the amounts directly taken from official documents. They can be either amounts effectively paid (in previous years) or budget amounts assessed by official institutions.

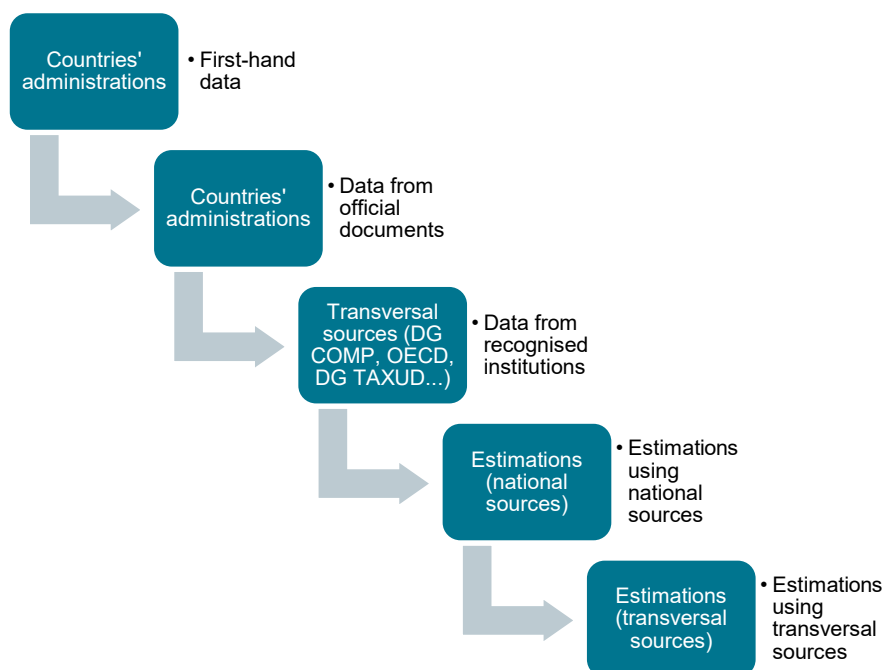
Estimated data are subsidy amounts that have been estimated by either the core team or the country experts. Such estimations are cross-controlled within the consortium and are based on information (energy consumption, tax rates...) taken from official -national or international- institutions.

All along the data collection process, we have used a default data hierarchy that organises and qualifies the data as follows:

1. Data taken from official documents (from ministries, government agencies, energy regulators, statistical offices, Court of Auditors...) are preferred over estimations:
 - Where we have already established direct contact with key employees in Ministries of Finance, we asked them to provide again first-hand information. If they deliver the required information, they are used as the preferred data.
 - Amounts collected in official documents (from ministries, government agencies, energy regulators, statistical offices, Court of Auditors...) from national sources have been preferred over amounts from transversal sources;
 - When official documents were not available, data from transversal sources (OECD, DG COMP State Aid Cases database, MURE....) have been retained.
2. When official data were not available, the core team performed estimations that have later been controlled by country experts:
 - Estimations use national statistics (for energy data) and national data from fiscal/custom/ministry administration;
 - When national data are not available for estimations, we use transversal sources (i.e. Eurostat for energy data, CIRCABC and TAXUD data for fiscal data).

The data hierarchy we suggest deploying during for this study is summarised below in Figure 34.

Figure 34: Data hierarchy chart



5.1.5.3. Data collection principles

The data collection exercise for each task followed principles built on international best practices⁷⁹ comprising:

- Relevance
 - Developed data templates according to task needs and following the scope defined in the inception phase with the DG ENER;
 - Address data gaps of previous *Commission studies*;
 - Focus completion of any gaps left after data collection according to the feedback from DG ENER on the most important issues (if applicable).
- Traceability
 - Include the raw data sources and a link or reference to the source;
 - Indicate the methodology used in estimations;
 - Use a colour code system to reflect the updates made in comparison to versions from previous *Commission studies*.
- Simplicity & functionality
 - Do not duplicate data – where this is needed, link the cells to ensure that changes are reflected;
 - Where calculations are made, this should be done linking the used cells;
 - Consolidate and simplify the databases in the end of each task;
 - Build upon tools from previous *Commission studies*.

⁷⁹ United Nations (2018) International Recommendations for Energy Statistics (IRES)

- Coherence and comparability
 - Use defined concepts for data collection across countries;
 - Where possible, use the same source for as many items as available;
 - Cover as large period as possible, with attention to the most recent year available;
 - If a data series is updated using a different source, validate that the data for previous years is aligned with the previous source and – if it is – update the whole data series (if applicable).
- Accessibility and clarity
 - Present the data and metadata for each task in a coherent and clear format, improving on best practices from previous projects;
 - Provide databases, reports and supporting documentation in formats agreed with DG ENER in the shared document management and storage system;
 - Use common database structures across tasks when possible;
 - Indicate the confidentiality level for each dataset and resulting analysis.

5.1.6. Data validation through comparison against other institutions studies

Given the nature of the data collected, which is not well structured nor well transparent across countries, a key issue was to find means to control quality and to ensure the comparability of the data across countries ultimately leading to consistent and relevant analysis. To achieve good data quality, we have implemented several controls by benchmarking our data with that of existing external databases.

Our initial plan was to compare our data against the sources listed below however, as of mid-June 2022 not all of them are updated. Consequently, we were able to collect data from transversal sources depending on their availability. Please note that emojis used hereafter represent the status of the data availability:

- 🟡 **DG Competition State Aid Cases:** amounts provided cover years until 2020. Consequently, subsidy amounts for 2021 have not been verified. We have faced unavailability of the data and alerted Commission IT support on April-1. This issue was fixed by DG Competition on May-5.
- 🟡 **OECD fossil fuels inventory:** Amounts provided by the OECD are covering a period ending in 2020. As a result, subsidy amounts for 2021 have not been verified. Five MSs, namely Bulgaria, Croatia, Cyprus, Malta and Romania are not covered.
- 🟢 The **State of the EU ETS Report** has been released by the ERCST in April 2022. It covers amounts to the “Compensation for the indirect costs of EU ETS” for the years 2019 and 2020. Subsidy amounts for 2021 have not been verified.
- 🛑 **Odyssee-MURE** database alignment with the inventory has been continued on a country basis. Next update of Odyssee-MURE database for energy efficiency measures is planned for 2023. Therefore, energy efficiency data from EUROSTAT have been used instead of data from Odyssee-MURE.
- 🟡 The **CEER Status Review of Renewable Support Schemes in Europe**, issued in June 2021, covering 2018 and 2019, is available. New report covering 2019-2020 is expected in June 2022. Subsidy amounts for 2021 have not been verified.

- 😊 **DG TAXUD Excise Duty on Energy:** excise duties are published every semester for many energy products (including petroleum products, natural gas, coal and electricity) for several uses. It has been utilised for estimation purposes.
- 😊 **ACER-CEER Market Monitoring Report (MMR) 2020** provides the annual cost of capacity mechanisms by MSs in 2019 and 2020.
- 😊 The IEA has released a new update of its **energy technology RD&D budget database** in May 2022 encompassing actual data until 2020 and estimates for some EU MS for 2021.
- 😊 The **IEA Policies database** provide numbers of energy related policies, of which some cover market-based instruments that are identified as subsidies by the *Commission study 2021*. This database is used for MSs not covered by the OECD.
- 😊 The **Fossil Fuel Subsidy Tracker** provides estimates from three international databases.

5.1.7. Data check through consultation round of MS Attachés

For this study, we gave to MSs' Representatives a chance to crosscheck information collected for their respective country. After being controlled by country experts and validated, country files were shared with contacts named by DG ENER or, alternatively, with energy Attachés contacts (also provided by DG ENER). During a period of 15 days comments and modifications received in return were collected and used to adjust and strengthen country files.

The vast majority of Representatives have provided valuable feedback as summarised in the table above (3.2.2). In general, it has confirmed or brought only few changes to the amounts delivered by our consortium. Nonetheless, far from being useless, we are rather convinced these feedbacks have contributed to significantly improve completeness of each of the country files, providing new details and sources that were not identified so far.

11 Representatives have returned no feedback at all or were unable to complete the review due. Invoked reasons comprise the following:

- Lack of time
- Disagreement with methodology

In our opinion, the consultation round met its goal by strengthening the new *Subsidy inventory* and improving the overall quality of the *Commission study 2022*.

5.1.8. Subsidy amount allocations

In line with the methodology used in previous *Commission studies*, when relevant and feasible, we have allocated the subsidy amounts related to multi-sectors and multi-energy subsidies based on MS' energy balances. Subsidy amounts have been allocated according to the two following approaches:

5.1.8.1. Multi-energy subsidy

Amounts reported for multi-energy subsidies were allocated according to their respective shares in the energy mix. For instance, a subsidy amount covering, as a whole, feed-in tariffs for electricity production from CHP burning fossil fuels was apportioned to each fossil fuel depending on their respective shares within the power generation mix.

5.1.8.2. Multi-sector subsidy

Similarly, multi-sector subsidies were allocated to each sector depending on their contribution to the said measure based on energy records in the national energy balance. For instance, a tax reduction on

marked diesel (off-road consumption), reported as a whole, was broken down between the various consuming sectors (agriculture, construction, industry...) of off-road diesel according to their individual shares in the total consumption.

5.1.9. Transversal energy subsidies sources

Several types of energy subsidies were incorporated for all the MS using a unique source of information to ensure homogeneous treatment across country.

5.1.9.1. Subsidies homogenously estimated for all the MS

To cope with the heterogeneous reporting methods across MS for air and maritime transport tax expenditures and, in line with previous *Commission studies*, we estimated domestic air and maritime (excluding international) transport subsidies using the following formulas:

Tax expenditure on fuel consumption in air transport

Air transport tax expenditure = kerosene consumption for domestic aviation (1,000 litres) x countries' standard excise tax rate for kerosene (in €/1,000 litres)

Tax expenditure on fuel consumption in maritime transport

Water transport tax expenditure = gasoline, diesel and fuel oil consumption for domestic navigation (in toe) x countries' standard excise tax rates for gasoline, diesel and fuel oil (in €/toe)

Energy consumption data are taken from Eurostat⁸⁰ and excise tax rates are extracted from TAXUD semester reporting on Excise duties on energy⁸¹. Energy consumption amounts for year 2021 were estimated as Eurostat doesn't yet provide annual data for this year and because monthly data were deemed not appropriate due to quality issues.

Regarding **air transport**, we have chosen to estimate the energy consumption for year 2021 using the annual variation of air flights between 2020 and 2021, based on data from Eurocontrol⁸², taking as assumption a perfect correlation between the number of flights and the energy consumption. As Finland and Hungary were not included in the Eurocontrol dataset, we have used the average variation of the other 25 MS for these two countries. The excise tax rates were updated for the year 2021 using TAXUD data.

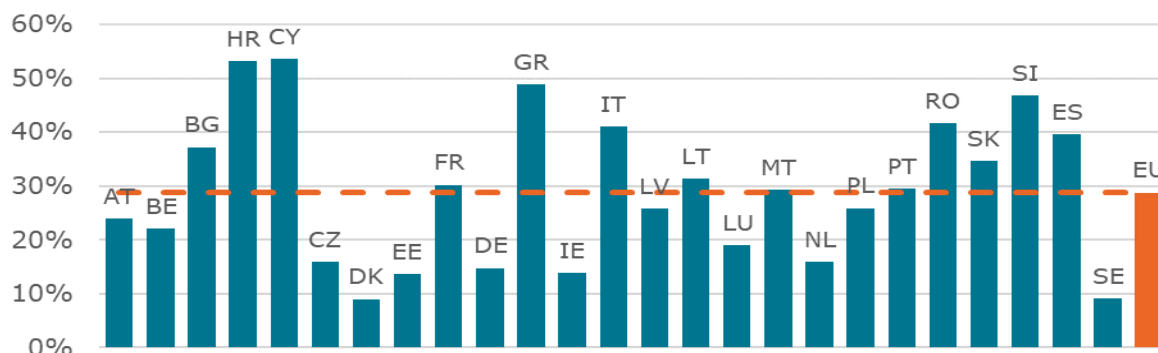
As Figure 35 shows, number of flights strongly rebounded between 2020 and 2021 in all MSs with variation comprised between +9% and +54%, while the EU average stood at +29%.

⁸⁰ Available at <https://ec.europa.eu/eurostat/data/database>

⁸¹ Available at https://ec.europa.eu/taxation_customs/business/excise-duties-alcohol-tobacco-energy/excise-duties-energy_en

⁸² Data are available at <https://ansperformance.eu/data/>

Figure 35: Variation of flights between 2020 and 2021 in the EU



Enerdata from Eurocontrol

Regarding **maritime transport**, we have based our calculation on the domestic navigation data from Eurostat⁸³. Between 2020 and 2021, we have estimated roughly the energy consumption using the annual variation of “Goods transport by inland waterways”, assuming a perfect correlation between the variation of tonnes transported and the energy consumption. Only 11 MS reported data in 2021, therefore, we have used the average variation of these 11 countries (-4.6%) and applied it to the other 14 MS. The excise tax rates were updated for the year 2021 using TAXUD data.

The current inventory also comprises a subsidy corresponding to the tax expenditure on oil products for **fishing** purposes. This subsidy was estimated as the multiplication of the energy products supplied for use as fuel for fishing purpose with the excise tax rates used for navigation in the calculation above. The variation of the energy consumption for fishing purpose between 2020 and 2021 was aligned with that of the maritime transport sector.

Tax expenditure on fuel consumption for fishing

Fishing tax expenditure = gasoline, diesel and fuel oil consumption for fishing (in toe) x countries' standard excise tax rates for gasoline, diesel and fuel oil (in €/toe)

5.1.10. Other financial supports

Methodology

The value of freely allocated allowances is determined by two factors: The certificate market price and the allocated quantity of free allowances. The European Environmental Agency regularly publishes an EU ETS database⁸⁴ where the number of freely allocated allowances is indicated. The allowances were

⁸³ Eurostat, Goods transport by inland waterways [TTR00007], available at <https://ec.europa.eu/eurostat/databrowser/view/ttr00007/default/table?lang=en>

⁸⁴ EEA (2022), European Union Emissions Trading System (EU ETS) data from EUTL, available at: <https://www.eea.europa.eu/data-and-maps/data/european-union-emissions-trading-scheme-17> (last access 20.05.2022)

allocated to the following sectors: Aviation (code 10 Aviation), Power plants (code 20 Combustion of fuels), Refineries (code 21 Refining of mineral oil), Energy-intensive industries (codes 22 to 44) and others (codes 45, 46 and 99). To estimate the foregone value of freely allocated allowances per year the difference of annual freely allocated allowances and corrections in the aviation sector of each year has been multiplied by the corresponding annual average market price of certificates. Prices have been taken from EEA⁸⁵ and ICAP⁸⁶.

The corrections are due to the "Stop the clock" decision in 2012, when freely allocated allowances were returned by aviation companies because of the retroactive suspension of emission trading in international aviation.

$$\begin{aligned} \text{Annual foregone revenue in €} &= \text{Annual average market price (€/tCO}_2\text{)} \\ &\times \sum_c \text{Freely allocated allowances}_c(\text{tCO}_2) - \text{Corrections to freely allocated allowances}_c(\text{tCO}_2) \\ c &= \text{EU27 country} \end{aligned}$$

Textbox 5-2: Allocation of free Allowances from the European Union Emission Trading System (EU ETS)

In consistence with the Commission Study, the allocation of free allowances from the EU ETS are not considered as an energy subsidy but they are monetized using the methodology outlined below:

EUA ETS support in € = $\sum \text{tCO}_2$ of free allowances per year x EUA average annual prices in €/tCO₂.

The corresponding amounts will be allocated to the five following economic sectors:

- Aviation (code 10 Aviation);
- Power plants (code 20 Combustion of fuels);
- Refineries (code 21 Refining of mineral oil);
- Energy-intensive industries (codes 22 to 44);
- Others (codes 45, 46 and 99).

Data EUA ETS volumes and average annual prices will be taken on the European Environment Agency (EEA).

5.1.11. Subsidies incorporated directly from external sources

In consistence with the previous *Commission Study*, the estimated amounts of total public energy research, development and demonstration (RD&D) budgets of the 19 MS covered by the IEA were incorporated directly into the *Subsidy inventory*, with treatment.

⁸⁵ EEA The EU Emissions Trading System in 2021: trends and projections, <https://www.eea.europa.eu/publications/the-eu-emissions-trading-system-2>

⁸⁶ ICAP (2022), ICAP Allowance Price Explorer, available at: <https://icapcarbonaction.com/en/ets-prices> (last access: 20.05.2022)

5.2. Annex 2: Country data controls and observations

Please refer to file delivered as separate document.

5.3. Annex 3: Member State Fact-sheets

Please refer to file delivered as separate document.

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