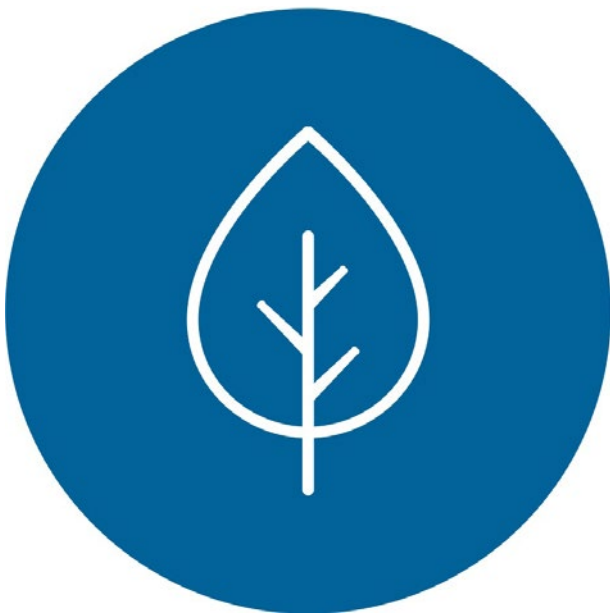


# Fostering the coherence of Environmental-Economic Accounting and extending by Environmental Subsidies and Similar Transfers (ESST) and Potentially Environmentally Damaging Subsidies (PEDS)



## Final Report

Eurostat Project 881564-2019-DE-IFESSTPEDS



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### Abbreviations and acronyms

AEA	Air emission accounts
BLE	Bundesanstalt für Landwirtschaft und Ernährung (German federal office for agriculture and food)
BMF	Bundesministerium der Finanzen (Federal ministry of finance)
CEF	Classification of environmental functions
CEPA	Classification of environmental protection activities
COFOG	Classification of the functions of government
CORDIS	Community research and development information service
CPA	Classification of products by activity
CReMA	Classification of resource management activities
CRS	Creditor reporting system
DAC	Development assistance committee
DEHSt	Deutsche Emissionshandelsstelle (German emission trading authority)
EAFRD	European agricultural fund for rural development
EAGF	European agricultural guarantee fund
EASME	Executive agency for small and medium-sized enterprises
EEG	Erneuerbare-Energie-Gesetz (Renewable energy act)
EGSS	Environmental good and service sector accounts
EMFF	European maritime and fisheries fund
EPEA	Environmental protection expenditure accounts
ERDF	European regional development fund
ESA	European system of accounts
ESI(F)	European structural and investment (funds)
ESST	Environmental subsidies and similar transfers
ETEA	Environmental taxes by economic activity
EU-ETS	European union emission trading system
EW-MFA	Economy-wide material flow accounts
FSO	Federal statistical office
FTS	Financial transparency system
GG	General government
HH	Households
IfW	Institut für Weltwirtschaft (Institute for the world economy)
KfW	Kreditanstalt für Wiederaufbau (Credit institute for reconstruction)
KTF	Klima- und Transformationsfond (Climate and transformation fund)
LIFE	L'instrument financier pour l'environnement (Financial instrument for the environment)

## Abbreviations and acronyms

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NACE	Nomenclature statistique des activités économique dans la Communauté européenne (Statistical classification of economic activities in the european community)
nEHS	nationales Emissionshandelssystem (National emission trading system)
NPISH	Non-profit institutions serving households
NTL	National tax list
ODA	Official development assistance
OECD	Organisation for economic co-operation and development
PEDS	Potentially environmentally damaging subsidies
PEFA	Physical energy flow accounts
ROW	Rest of the world
SEEA-CF	System of environmental-economic accounting – Central framework
SNA	System of national accounts
UBA	Umweltbundesamt (Federal environmental agency)
VAT	Value-added tax

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### Summary

This report details the results and findings of the Eurostat grant project “Fostering the coherence of Environmental-Economic Accounting and extending by Environmental Subsidies and Similar Transfers (ESST) and Potentially Environmentally Damaging Subsidies (PEDS)”, carried out by the Federal Statistical Office of Germany, in which we developed a reporting framework for ESST, examined and developed compilation methods for PEDS, and examined potential overlaps between the monetary and physical environmental-economic accounts with respect to conceptional foundations and computational methods, and developed technical implementation where possible.

### 1 Introduction

Environmental transfers are important economic instruments for achieving environmental policy objectives by incentivising environmentally beneficial behaviour and activities. They are consequently used to promote a wide variety of activities that aim to protect the environment. In light of the increasing importance of climate change and environmental degradation within the current political and economic landscape, it is therefore important to gain a better understanding about the overall size of the financial flows for environmental transfers, their development over time and the beneficiaries. This is also reflected by the proposed amendment of Regulation (EU) No. 691/2011 of the European Parliament and the Council of 6 July 2011 that would establish ESST (Environmental Subsidies and Similar Transfers) as a mandatory module in the European environmental economic accounts.

In the course of this project, we firstly developed a reporting framework for the identification and classification of environmental subsidies and similar transfers (ESST) based on available data for the reference year 2018. During the initial research, it became evident that the identification and classification of ESST paid by the German general government was best achieved through a detailed analysis of budget documents via keyword search and their classification through information from the budget documents as well as legal directives for funding programmes, evaluation and annual reports, framework plans and financial statements. ESST paid by the European Union (EU) to German beneficiaries were identified by analysis of datasets on implemented payments and, where available, information on individual projects and beneficiaries.

Secondly, we developed computation processes for Potentially Environmentally Damaging Subsidies (PEDS). We examined the federal budget as well as other publications and data sources in order to identify budget items which constitute transfers in line with the ESA 2010 (European System of Accounts) and which support potentially environmentally damaging activities. In addition, we identified potentially environmentally damaging tax abatements incentivising potentially environmentally damaging activities.

Lastly, we examined and compared the reporting frameworks and computation processes of ESST and the already established monetary environmental economic accounts

- ETEA (Environmental taxes by economic activity),
- EPEA (Environmental protection expenditure accounts) and
- EGSS (Environmental good and service sector accounts),

in order to identify potential overlaps, common data sources and computation steps. We developed technical implementations based on these findings if the data availability for 2018 was sufficient in order to foster coherence between the modules. We also considered upcoming or ongoing developments or internal revision of computation processes that would likely lead to overlap between modules in the future, e.g. the start of the national emissions trading system in 2021 necessitating the compilation of the corresponding tax revenues for the 2023 ETEA data transmission.

We likewise examined potential overlaps between the monetary environmental economic accounts and the three physical environmental economic accounts:

- EW-MFA (Economy-wide material flow accounts),
- PEFA (Physical energy flow accounts) and
- AEA (Air emission accounts).

## 2 Development of a reporting framework for ESST

### 2.1 Overview

For the development of a reporting framework for ESST, we focused on the identification and classification of transfers paid and received in the year 2018. Firstly, because this is the latest year for which financial results were available when we started the work on the project. Secondly, due to the necessity of labour-intensive budget analysis, additional years have not been analysed.

The reporting framework was developed to fulfil the requirements for the identification and classification of transfers established in the ESST guidelines (Eurostat, 2015) and likely to be required through the upcoming amendment of Regulation (EU) No. 691/2011. These requirements are to classify transfers according to:

- The environmental domain according to CEPA/CRema
- The type of transfer according to ESA 2010
- The institutional sector of the payer<sup>1</sup> according to ESA 2010
- The institutional sector of the recipient according to ESA 2010
- The industry of the recipient for transfers receivable by corporations according to NACE Rev. 2 A\*10

For the federal government and 14 of the 16 German federated states ('Bundesländer'), we carried out a detailed analysis of budget documents and subsidy reports to identify a list of subsidies and similar transfers. These budget items were then combined with financial statistics data to obtain values for actual payments.

For ESST from the two remaining federated states, Hessen and Hamburg, and from local governments, budget analysis is not viable. Here, we relied on aggregate financial results data and applied automated filtering processes. Hessen and Hamburg transitioned from fiscal accounting to double-entry accounting that currently does not allow for a detailed budget analysis to identify environmental transfers. For the local government, this is due to the fact that a detailed budget analysis of all roughly 12000 units in this institutional sector is simply not feasible.

In order to identify financial transactions that fall under the definition of ESST, we identified several data sources that provide information on the transferred amounts as well as information for the classification of the transfers with respects to the environmental domain, the type of transfer, the payer's institutional sector, the recipients' institutional sector, and the recipients' industry NACE Rev. 2 A\*10 division for transfers receivable by corporations.

With regard to ESST from the rest of world, we focused solely on transactions from institutions of the EU through programmes that support environmental activities. We analysed information from databases for these programmes and from additional databases providing more information on individual projects. As a result, our reporting framework covers only transfers by the German general government sector and those by the European Union.

### 2.2 Identification of data sources

#### 2.2.1 Budget documents for federal level and the federated states

Eurostat's ESST guidelines recommend COFOG (Classification of the Functions of Government) data as a starting point for establishing a framework for data collection, at least for environmental protection activities. However, the corresponding German data is of limited use for various reasons. First, it is differentiated by COFOG division and type of transfer, but provides no information about recipients.

<sup>1</sup> Only 'General government' (S.13) and 'Rest of the world' (S.2) are considered as paying sectors for ESST.

Second, COFOG tables for Germany are constructed in a way that doesn't allow for deeper inspection as it is not possible to trace back table cells to specific budget items. At the same time, it is likely that a fraction of household items that fall under COFOG 05.3 (Pollution abatement) might be better classified as resource management activities, CReMA 13 (Management of energy resources) to be specific. Thus, we do not base our analysis on COFOG tables. However, they can be used for cross-checking purposes.

Instead, we opted for budget analysis as the main procedure for identifying ESST. Each year, the federal government and federated states' governments publish detailed information on their budgets in the form of budget plans which also include the respective budgetary laws as well as supplementary budgets. Budget items are listed by ministry and present the planned revenues and expenses.

Additionally, each budget item is assigned codes for two classifications. The first classification is called 'Gruppierungsplan' (grouping/group plan) (Bundesministerium der Finanzen, 2021). The three-digit code indicates a budget item's main group, upper group and group, the latter providing the most detailed information about the type of expense and its recipient. For instance, grouping 892 denotes 'Investment grants for private companies' ('Zuschüsse für Investitionen an private Unternehmen') within the upper group 89 'Investment grants for other sectors ('Zuschüsse für Investitionen an Sonstige Bereiche'), which itself belongs to the main group 8 'Other expenses for investments and investment support measures' ('Sonstige Ausgaben für Investitionen und Investitionsförderungsmaßnahmen').

The second classification is the 'Funktionenplan' (government function plan) (Bundesministerium der Finanzen, 2021). It indicates the purpose or function of an expense. Function 165 for example denotes 'Research and experimental development' ('Forschung und experimentelle Entwicklung') within the upper function 16 'Science, research, development outside of universities' ('Wissenschaft, Forschung, Entwicklung außerhalb der Hochschulen'), which itself lies in the main function 1 'Education, science, research, cultural affairs' ('Bildungswesen, Wissenschaft, Forschung, kulturelle Angelegenheiten'). Both classifications are helpful sources of information, but are not specific enough to facilitate budget analysis solely based on themselves.

Additional information can however potentially be found in explanatory notes that are provided for some budget items, in explanatory notes for thematic groups of budget items ('Titelgruppen') that are budgeted together, or in general explanations for the chapters within the budget documents. Thus, a detailed budget analysis through the use of groupings and government functions as well as explanatory notes in the budget documents was identified as a feasible way to begin the identification of budget items that fall under ESST.

### 2.2.2 Subsidy report

The federal government's ministry of finance publishes a subsidy reports for the federal government biannually. These documents cover transfers as well as tax abatements. The underlying concept of what constitutes a subsidy differs from national accounts. It is based on section 12 of the Act to Promote Economic Stability and Growth ('Gesetz zur Förderung der Stabilität und des Wachstums der Wirtschaft') and comprises direct and indirect transfers and tax abatements granted by the federal government which benefit private companies and industries in order to preserve them, help them adapt to changing market conditions, and to support productivity increases. Compared to national accounts, this conceptualisation is both broader and narrower at the same time, as it encompasses for instance, assistance to private households that reduce the prices of certain goods and services (indirect transfers) and tax abatements, but does not necessarily cover all direct transfer within the general government and to NPISH (Non-profit institutions serving households).

Subsidy reports can therefore serve as a source for cross-checking purposes to ensure that relevant transfers are accounted for in the identification procedure for ESST. For the federal level, we hence analysed the 27th subsidy report of the federal government (Bundesministerium der Finanzen, 2019), which covers the period 2017-2020, for this purpose. For the federated states, the overall availability, periodicity and level

of detail of subsidy reports varies substantially. When available for the reference year in question, they might similarly serve as a tool for cross-reference, but are not a consistent, viable data source for ESST.

### 2.2.3 Financial statistics data

The federal government as well as some, but not all, governments of the federated states publish machine-readable tables for financial results corresponding to the budgetary plans in text form. However, these tables do not cover – unlike the text documents – special funds such as the federal energy and climate fund ('Energie- und Klimafonds'). For this reason, data files containing financial results for the federal budget and the federated states' budgets, including all special funds, were obtained from the Federal Statistical Office's national accounts division. These files contain information on actual revenues and expenses and can be matched to the individual budget items identified as potential ESST through identifiers for the budget, budget chapters and budget items.

### 2.2.4 OECD data on official development assistance

In order to determine bilateral official development assistance (ODA) with environmental purpose paid by general government, we utilized the Development Assistance Committee (DAC) Creditor Reporting System (CRS) database of the OECD. It contains information about whether a transfer is for an environmental activity and about its principal objective.

For multilateral official development assistance, we relied on data from the Federal Ministry for Economic Cooperation and Development about German contributions to multilateral environmental organisations.

### 2.2.5 Databases on EU funding programmes

We identified the following programmes implemented by the European Union (EU) that, at least partially, provide funding for activities in the fields of environmental protection or resource management:

- Horizon 2020
- European Agricultural Guarantee Fund (EAGF)
- Environment and Climate Action (LIFE)
- European Agricultural Fund for Rural Development (EAFRD)
- European Regional Development Fund (ERDF)
- European Maritime and Fisheries Fund (EMFF)

Table 1 lists the utilised data sources used to obtain detailed information on transfers received by Germany out of these EU programmes. For some programmes, information on the type and usage of payments can also be obtained from national budget documents or national lists of operations. For programmes for which the EU pays out grants directly to the final recipient (namely Horizon 2020 and LIFE), we analysed programme databases as well.

Table 1: Overview of databases on EU programmes

Programme	Database
Horizon 2020	EU Financial Transparency System (FTS)
	Community Research and Development Information Service (CORDIS)
	Energy Efficiency data hub (Powered by EASME )
	Environment and resources data hub (powered by EASME)
EAGF	Federal budget document
	EU Agricultural Funds Recipients database (by BLE )
LIFE	EU FTS
	LIFE programme 2014 – 2020 data hub (powered by EASME)
EARDF	Federal budget document
	EU Agricultural Funds Recipients database (by BLE)
	ESI (European Structural and Investment) funds open data platform
ERDF	Federal budget document
	ESI (European Structural and Investment) funds open data platform
	List of operations (published by federated states)
EMFF	ESI (European Structural and Investment) funds open data platform
	List of operations (published by federates states)
	EMFF data hub (powered by EASME)

## 2.3 ESST from federal government and federated states

### 2.3.1 Keyword search

As explained in section 2.2.1, a detailed analysis of government budget documents was identified as a feasible – albeit very labour-intensive – strategy to identify environmental subsidies and similar transfers in Germany. In order to identify the relevant budget items, an iterative method was chosen. It was applied to budget documents of the federal government and 14 of the 16 federated states. The two remaining, Hessen and Hamburg, use a different budgetary accounting system and are therefore addressed separately in section 2.3.5.

First, a keyword search covering the different environmental domains by CEPA/CRoMA was carried out for the budget documents. Table 2 lists the keywords employed in the search for each CEPA/CRoMA division. The respective divisions for research and development, CEPA 8 and CRoMA 15, were not explicitly included under the assumption that research and development activities are usually listed along with a brief description of their research domain, which would contain keywords where applicable. Matches were found either in the title of budget items, explanatory notes that are provided for some budget items, explanatory notes for the thematic groups of budget items ('Titelgruppe') that are budgeted together, or in general explanations for the chapters within the budget document.

Table 2: Keywords for budget analysis

CEPA/CreMA	Keywords
1	Luft, Ozon, Emission
2	Gewässer, Kanalisation, Abwasser, Kühlwasser
3	Abfall, thermisch, Deponie, Verbrennung
4	Boden, Grundwasser, Oberflächenwasser, Schadstoffe, Erosion, Degradation, Sanierung, Salzw
5	Lärm, Erschütterung, Verkehr
6	Arten, Landschaft, Ansiedlung, Tier, Pflanze, Lebensräumen, Ökosystem, Biodiversität
7	Strahlen, Umweltmedien, radioaktiv
8	-
9	Umweltschutz, Umweltmanagement
10	Wasser
11 + 12	Biodiversität, Vielfalt, Arten, Tier, Fauna, Pflanze, Flora, Jagd, Vegetation, Wald, Forst, forest, Kalamität, Holz, Rodung, Lebensraum, Landschaft, Fisch, Fangtätigkeit, Aquakultur
13	Climate, CO2, Energieeinspar, energieeffizien, energietechnol, energiewende, erneuerbar, solar, sonne, wind, onshore, offshore, Fotovoltaik/Photovoltaik, Wellen, Klimafonds, Klimaschutz, Klima-, klimagerecht, klimafreundlich, Klimawandel, Klimapaket, Klimabericht, Klimaforschung, klimarelevant, Klimarahmen, Treibstoff, Kraftstoff, Treibhaus, Elektromobilität, Elektromotor, Elektrofahrzeug, hybrid, Ladeinfrastruktur, regenerativ
14	Mineral, Metall, Schrott, Abbau,
15	-
16	Umweltmanagement, ISO 14000, ISO 14001, EMAS, berat, Green Economy, Ressourcen

For the budget analysis for the federated states, the list for the keyword search had to be adapted as some of the original keywords were too generic and resulted in up to 20000 matches for certain keywords across all budget documents of the federated states. This was especially the case if a keyword as a sequence of letters is part of other frequently used words. The keyword 'Arten' (species) for example appears in words such as 'Garten' (garden), 'Karten' (maps or cards) or 'erwartenden' (expected) and therefore resulted in many irrelevant matches.

We therefore ran a preliminary text analysis on all budget documents through a script in the statistical programme R that produced a list of all words containing the keywords and the number of occurrences of these words. Words that occurred often and were likely irrelevant, such as those in the example mentioned above were then removed from the list. The resulting list then served as the basis for the keyword search for the federated states, which was still immensely labour-intensive but ultimately feasible within this project and also maintained coherence with the keyword search for the federal government.

### 2.3.2 Initial filtering

As stated in section 2.2.1, budget item codes contain, to a certain extent, information that can be used for the classification of identified transactions. The grouping code can be used to filter out budget items that are revenues or that are expenses that clearly do not constitute current or capital transfers, e.g. personnel expenses. Additionally, some grouping codes denote the recipients' institutional sector or at least narrow down the possible institutional sectors. Based on this information, the initial list of potential ESST items was filtered to contain only items with the grouping codes listed in Table 3.

## Development of a reporting framework for ESST

Table 3: Budget item codes included in initial filtering procedure

Budget item code	Description	Transaction	Recipient
611-613, 616	General (non-earmarked) allocation of funds to general government	Other current	GG
614	General (non-earmarked) allocation of funds to special funds	Other current	GG
617	General (non-earmarked) allocation of funds to inter-municipal special purpose associations	Current transfer	GG, Corporations
621-623, 626	Debt service assistance to general government	Other current	GG
624	Debt service assistance to special funds	Other current	GG
627	Debt service assistance to inter-municipal special purpose associations	Current transfer	GG, Corporations
631-633, 636,	Other (ear-marked) allocation of funds to general government	Other current	GG
634	Other (ear-marked) allocation of funds to special funds	Other current	GG
637	Other (ear-marked) allocation of funds to inter-municipal special purpose associations	Current transfer	GG, Corporations
661	Debt service assistance for public companies	-	Corporations, GG
662	Debt service assistance for private companies	-	Corporations
663	Debt service assistance for other entities on territory	-	-
664	Debt service assistance for public institutions	-	GG, NPISH
666	Debt service assistance for ROW	-	ROW
671	Refunds to entities on territory	-	-
676	Refunds to ROW	-	ROW
681	Pensions, benefits and other allocations of funds to individuals	Other current	HH
682	Grants to public enterprises for current expenses	Subsidies	Corporations, GG
683	Grants to private companies for current expenses	Subsidies	Corporations
684	Grants to social or similar organisations for current expenses	Other current	GG, NPISH
685	Grants to public organisations for current expenses	Other current	GG, NPISH
686	Other grants for current expenses	Current transfer	-
687-689	Grants for current expenses in ROW	Other current	ROW
691-693	Capital transfers to general government (not including investments)	Capital transfers	GG
697	Capital transfers to companies (not including investments)	Capital transfers	Corporations
698	Capital transfers to other entities on territory (not including investments)	Capital transfers	-
699	Capital transfers to ROW (not including investments)	Capital transfers	ROW
881-883, 886	Allocation of funds for investments to general government	Capital transfers	GG
884	Allocation of funds for investments to special funds	Capital transfers	GG
887	Allocation of funds for investments to inter-municipal special purpose associations	Capital transfers	GG, Corporations
891	Investment grants for public enterprises	Capital transfers	GG, Corporations
892	Investment grants for private companies	Capital transfers	Corporations
893	Investment grants for other entities on territory	Capital transfers	-
894	Investment grants for public organisations	Capital transfers	GG, NPISH
896	Investment grants for ROW	Capital transfers	ROW

### 2.3.3 Manual inspection of preliminary list of budget items

The filtered list of potential ESST served as the basis for the final process of deciding which budget items are ultimately to be included in ESST tables. For this purpose, the budget items above a threshold of 1 million EUR were inspected manually in order to find out whether the specific subsidy or similar transfer met at least one of the environmental primary purpose criteria described in the ESST guidelines (Eurostat, 2015). In some cases, the purpose was clearly stated in the explanatory notes of the budget item. In other cases, however, further desktop research was necessary. The utilised resources included legal directives for funding programmes, evaluation and annual reports, framework plans as well as financial statements.



These documents were in several cases also utilised to determine the relevant budget share for subsidies or similar transfers that serve multiple (environmental) purposes. Moreover, whenever more than one environmental domain was identified as relevant or more than one receiving sector was found, we tried to acquire detailed information on how the money was allocated among the CEPA and CReMA divisions. These information sources were also used to classify the budget items by type of transfer, the recipients' institutional sector and its NACE A\*10 industry in case that the allocation was not already evident based on the budget item's grouping code. Not all transfers receivable by corporations could however be allocated to industries, as we found for some budget items no information about the potential beneficiaries' economic activities.

We decided to only manually inspect budget item above the threshold of 1 million EUR because the preliminary list of potential ESST for the federated states contained 2190 budget items and it became evident during the process that a manual inspection of all items was simply not feasible. 698 budget items exceeded the threshold and accounted for 95 percent of the overall amount of all 2190 budget items. The remaining budget items were considered as ESST if their corresponding government function code was any of the following which likely denote environmental activities and were allocated to the type of transfers and institutional sectors based on their grouping code:

- 332 (Protection of the environment and nature) - CEPA 9
- 642 (Renewable energies) – CReMA 13
- 645 (Waste water management) - CEPA 2
- 646 (Waste management) – CEPA 3

### 2.3.4 Special case: KfW

The KfW, a promotional bank in Germany, administers several environmentally related promotional programmes. These include, for example, the granting of loans at favourable rates or with repayment bonuses to private households, enterprises or public institutions for energy-efficient constructions, refurbishments or investments. The bank is owned by the federal government and the federated states. Expenditures for the respective promotional funds were therefore found in the federal budget documents in the course of our keyword search. However, the KfW is listed as a Monetary Financial Institution by the European Central Bank<sup>2</sup>. This implies that it is classified as a financial corporation (S.12) according to ESA 2010, and not as part of general government (S.13). This gives rise to the question of how transfers from the general government to the KfW and from the KfW to the beneficiaries of the programmes should be recorded. Strictly speaking, transfers from the KfW to beneficiaries are not transfers from general government to beneficiaries, but the KfW de facto acts as a facilitator for these environmentally related programmes established by the federal government. We decided therefore to only consider the transfers from the federal government to the KfW that are ear-marked for a specific, environmental KfW programme in the respective budget item as relevant for ESST. These transfers are then considered to go from the general government to the beneficiaries of the respective programme and are allocated accordingly. Other payments from the KfW to beneficiaries not corresponding to these transfers from the federal government to the KfW were not considered to be within the scope of ESST.

### 2.3.5 Special case: Hamburg and Hessen

The majority of the federated states administer their budget according to the same fiscal accounting system used by the federal government, the 'Kameralistik'. Hamburg and Hessen have however switched to double-entry accounting. As a consequence of this accounting method, their budgetary documents provide far less detailed information with respect to individual revenues and expenses. Hessen and Hamburg are however required to provide aggregated figures for individual ministries according to the same grouping and government function classifications mentioned in section 2.2.1, which can be obtained from the financial statistics data detailed in section 2.2.3. Using the list of grouping codes in Table 3, we can obtain estimates of ESST for Hamburg and Hessen based on the following government function codes:

<sup>2</sup> See <https://www.ecb.europa.eu/stats/pdf/money/mfi/mfiflist-2-euro-area.pdf>, p. 10.

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- 332 (Protection of the environment and nature) - CEPA 9
- 642 (Renewable energies) - CReMA 13
- 645 (Waste water management) - CEPA 2
- 646 (Waste management) - CEPA 3

We have, however, no information about the methods used to map internal data from the ministries to the groupings and government functions and hence the reliability of these conversions. The estimated ESST are therefore likely to contain transfers with partially different purposes than their assumed ones based on the government function code. On the other hand, other environmental transfers are likely to not be captured at all, because they would have been aggregated according to another government function. Additionally, the allocation to the institutional sector of the recipients is based on the groupings and requires therefore broad assumptions for the ambiguous cases. The results for Hessen and Hamburg should therefore be considered as only rough estimates.

We are in contact with the respective finance ministries to obtain more precise data and develop a reporting framework for these two federated states in preparation of the upcoming amendment of Regulation (EU) No 691/2011. This is however not a straightforward task, as it appears, for example, to necessitate the involvement of other ministries in Hessen. We suspect that this might be the case because individual ministries could be responsible for the conversion of their internal data to the groupings and government functions. Furthermore, Hessen has updated its budgetary regulations taking effect in the fiscal year 2023. As a consequence, we were unfortunately unable to develop a reporting framework for these two federated states in the course of this project and hence used the simplified estimation as detailed above. The results are shown in Table 4.

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Table 4: Hessen and Hamburg: ESST

Function	CEPA/CReMA	Transaction	Recipient	EUR million	
Waste water management	2	Subsidies	Corporations	0.37	
			NPISH	0.1	
		Other current	GG	2.77	
			HH	0.02	
Waste management	3	Subsidies	Corporations	0.02	
			NPISH	0	
		Other current	GG	0	
			HH	0	
Protection of the environment and nature	9	Subsidies	Corporations	1.33	
			NPISH	0.82	
			Other current	GG	2.99
				HH	2.38
		Capital transfers	NPISH	1.31	
			GG	39.92	
			Corporations	29.49	
			HH	1.31	
Management of energy resources	13	Subsidies	Corporations	0.9	
			NPISH	0.28	
			Other current	GG	0.79
				HH	0.32
		Capital transfers	NPISH	0.03	
			GG	5.71	
			Corporations	1.96	
			HH	0.03	

### 2.3.6 Official development assistance

We identified environmental bilateral ODA by the federal government using information about the principal objectives of the supported projects from the Development Assistance Committee (DAC) Creditor Reporting System (CRS) database of the OECD. The principles objectives relevant for ESST are 'Environment', 'Desertification', 'Climate mitigation' and 'Biodiversity'. For a more precise allocation of transfers to CEPA/CReMA, we ran a keyword search for the 'project purpose' variable. For unmatched projects, we repeated the keyword search using the 'long\_description' variable. Still unmatched projects were manually allocated.

In order to avoid double counting, we identified items in the final list of ESST-relevant budget items that covered ODA. Through information from the budget items' explanatory notes and further desk research, we calculated for each of these budget items an 'ODA share' that was then removed from the respective amount.

### 2.3.7 Consolidation

Consolidation, the removal of transfers occurring between units belonging to the same aggregated sector, is generally not recommended for the compilation of ESST (Eurostat, 2015). We think, however, that consolidation is justifiable under specific circumstances.

We observed during the budget analysis for the federated states that certain governmental tasks pertaining to the environment are administrated and organised differently across the federated states. A certain task, for example the management of state-owned forests, is in some cases organised within the structures of the responsible ministry. The corresponding expenses for environmental purposes would then appear in the ministry's budget as "regular" expenses for personnel, equipment etc. within the ministry and are thus out of scope of ESST. In other cases, the same task is outsourced to another entity that is nonetheless fully under the control of the state government. In this case, the formed entity has its own budget, but is still financed and controlled by the state government to such an extent that it is still considered part of general government according to ESA 2010. The same expenses are now however recorded in the state government's budget not as "regular" expenses within the ministry, but as allocation of funds or investment grants to the outsourced entity and are therefore within the scope of ESST.

We therefore think that transfers from an entity in general government to another entity which is controlled or financed by the paying entity to such an extent that it is considered part of general government according to ESA 2010<sup>3</sup>, should be consolidated within ESST. This consolidation was hence implemented in our computation of ESST for the reference year 2018.

### 2.4 ESST from local government

The subsector 'Local government' (S.1313) in Germany includes all individual municipalities, municipal associations and districts. A detailed budget analysis for these roughly 12000 units is infeasible. We have therefore decided to utilise highly aggregated statistics on local governments' financial results (Statistisches Bundesamt, 2020) in a similar way to the analysis of the financial results for the federated states Hamburg and Hessen. One difference is that the statistic structures budget lines not by the government function plan ('Funktionenplan'), but by 'products' ('Produktgruppen'<sup>4</sup>), which serve a similar purpose, i.e. differentiating government activities along policy fields. The statistic allows for a limited disaggregation along dimensions relevant for the ESST tables. The so-called 'product number' gives insight into government functions, similar to the COFOG classification. Unfortunately, the most detailed 3-digit codes are still somewhat generic, so that only a limited number of codes qualify as relevant:

- 537 (waste management) - CEPA 3
- 538 (waste water management) - CEPA 2
- 554 (nature conservation and landscape management) - CEPA 6
- 561 (environmental protection measures) - CEPA 9

In addition, the variable names in the statistic follow the 'Gruppierungsplan' and contain information on the type of transfer and the recipient's institutional sector. We included the following columns from the statistics on local governments' financial results:

- 25: 'Zuweisungen und sonstige Zuschüsse für laufende Zwecke, allgemeine Zuwendungen und Umlagen an öffentlichen Bereich'<sup>5</sup>
- 26: 'Zuweisungen und sonstige Zuschüsse für laufende Zwecke, allgemeine Zuwendungen und Umlagen an andere Bereiche'<sup>6</sup>
- 41: 'Zuweisung und Zuschüsse für Investitionen an öffentlichen Bereich'<sup>7</sup>
- 42: 'Zuweisung und Zuschüsse für Investitionen an andere Bereiche'<sup>8</sup>

3 The section for financial statistics within the Federal Statistical Office of Germany maintains a list of these extra-budgetary units in accordance with the respective principles in ESA 2010.

4 For their coding, see Statistisches Bundesamt (2020), table 'Produktrahmen'.

5 This is a sum total for government function codes 710-714, 821-824, 831-833; see Statistisches Bundesamt (2020), table "Gruppierungsübersicht".

6 This is a sum total for government function codes 715-718; see Statistisches Bundesamt (2020), table "Gruppierungsübersicht".

7 This is a sum total for government function codes 980-984, 997; see Statistisches Bundesamt (2020), table "Gruppierungsübersicht".

8 This is a sum total for government function codes 985-988; see Statistisches Bundesamt (2020), table "Gruppierungsübersicht".

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We considered as ‘current transfers’ matches from columns 25 and 26, and as capital transfers matches from columns 41 and 42. This allocation follows the assumption that recipients other than the public sector are corporations (while a fraction may benefit NPISH). The filtered table cells cover EUR 1151 million of ESST paid by municipalities. Table 5 presents details.

Table 5: Local government: ESST

Function	CEPA/CReMA	Transaction	Recipient	EUR million
Waste water management	2	Capital transfers	GG	46.11
			Corporations	19.94
		Other current	GG	606.73
			Corporations	74.22
Waste management	3	Capital transfers	GG	1.47
			Corporations	17.29
		Other current	GG	111.44
			Corporations	219.75
Nature conservation and landscape management	6	Capital transfers	GG	1.93
			Corporations	2.98
		Other current	GG	4.28
			Corporations	20.48
Environmental protection measures	9	Capital transfers	GG	0.37
			Corporations	2.57
		Other current	GG	1.19
			Corporations	20.07

The analysis of Germany’s local governments’ environmental subsidies and similar transfers is therefore a rather ‘mechanical’ exercise in that it relies on a rigorous filtering of aggregated financial results. A detailed analysis of local government budgets is not feasible, but future work will concentrate on gathering additional aggregate information on local governments’ environmental subsidies.

## 2.5 ESST from the rest of the world

Foreign ESST to domestic recipient could theoretically come from various paying entities in the rest of the world. We however focused our attention on those from the EU funding programmes listed in section 2.2.5. These EU transfers most likely comprise the vast majority of ESST from the rest of the world as we are not aware of any international or foreign entities that substantially finance environmental activities in Germany. Identifying the amounts of ESST-related payments from the EU programmes and breaking them down by CEPA/CReMA classes, the recipients’ institutional sector and type of transfer was for some programmes labour-intensive and the accuracy due to the quality and availability of data varies between the programmes.

### 2.5.1 Horizon2020

For the computation of ESST from Horizon 2020, data on granted amounts from the EU Financial Transparency System (FTS) was combined with project data from the Community Research and Development Information Service (CORDIS) and information from the EASME environment and resource data hub via the Horizon2020 project ID. Thematically irrelevant projects were filtered out by information on the action type in the FTS database. We then ran a CEPA/CReMA keyword search on the projects’ descriptions and main objectives and the remaining unmatched projects were manually assigned. As all project in Horizon 2020 are research projects, they were allocated to either CEPA 8 or CReMA 15, depending on whether they address environmental or resource management issues. The beneficiaries’ institutional sectors were determined based on information in the FTS database. Based on this classification the transfers were then classified as either subsidy (D.3) or other current transfer (D.7).

### 2.5.2 LIFE

LIFE (L'Instrument Financier pour l'Environnement) is like Horizon 2020 a programme by the EU Commission. The data sources and compilation process were largely the same. Data from the ETS database was combined through a fuzzy matching algorithm with information from the LIFE project database as no consistent identifier is available in the two data sets. The allocation to CEPA/CREMA was carried out via keyword search and manual inspection of the project descriptions and main objectives.

### 2.5.3 EAGF

Within the European Agricultural Guarantee Fund (EAGF), only the green direct payments for sustainable farming methods were identified as qualifying transfers for ESST. We obtained aggregated data from the German Federal Office for Agriculture and Food (BLE) and classified the total amount under CEPA 4 according to the recommendation in the ESST guidelines. Under the assumption that the vast majority of beneficiaries are agricultural market producers, we decided to classify the green direct payments as subsidies (D.3) to corporations (S.11) as the corresponding institutional sector.

### 2.5.4 EMFF

Our main data source on implemented payments from the European Maritime and Fisheries Fund (EMFF) as well as from the European Regional Development Fund (ERDF) and the European Agricultural Fund for Rural Development is the ESI (European Structural and Investment) funds open data platform. It provides data on implemented payments aggregated by thematic objectives and by additional thematic classifications for ERDF and EAFRD. In the absence of such more detailed information for the EMFF, the broad thematic objectives were used to attribute payments to CEPA/CREMA. The thematic objective 'Low-Carbon Economy' was allocated to CEPA 1, the thematic objective 'Environment Protection & Resource Efficiency' to CEPA 6. These allocations were determined through an analysis of the lists of EMFF operations that suggested that CREMA 13 for 'Low-Carbon Economy' and any CREMA class for 'Environment Protection & Resource Efficiency' are not applicable for the EMFF operations in Germany. The information from the EMFF lists of operations was also used to allocate the beneficiaries of payments falling under the aforementioned thematic objectives to institutional sectors via keyword search, and to classify the type of transfer.

### 2.5.5 ERDF

The German lists of operations for the ERDF were used to determine share for institutional sector of beneficiaries of the aggregated ERDF payments analogously to the EMFF. The data on payments from the ESI funds open data platform however contains additional information on the various intervention fields of the ERDF. This information enabled a more precise classification of implemented payments by CEPA/CREMA. By combining information for the ERDF intervention field with the allocation of the beneficiaries' institutional sectors, the shares for the types of transfers could also be more accurately estimated.

### 2.5.6 EAFRD

The data on implemented payments for the EAFRD provides information for two classifications that can be used to classify payments by CEPA/CREMA. Firstly, the EAFRD-specific priorities and their subcategories called 'focus areas' (FA), of which the following are relevant for ESST:

- Priority 4: Restoring, Preserving and Enhancing Ecosystems
- Priority 5: Resource-efficient, Climate-resilient Economy
- FA 5A: Increasing efficiency in water use by agriculture
- FA 5B: Increasing efficiency in energy use in agriculture and food processing
- FA 5C: Facilitating the supply and use of renewable sources of energy
- FA 5D: Reducing greenhouse gas and ammonia emissions from agriculture
- FA 5E: Fostering carbon conservation and sequestration in agriculture and forestry

Secondly, the EAFRD measures, of which the following are relevant for ESST by themselves:

- 08: Investments in forest areas development and improvement of the viability of forests
- 10: Agri-environment-climate
- 11: Organic farming
- 12: Natura 2000 and Water Framework Directive payments
- 13: Payments to areas facing natural or other specific constraints
- 15: Forest environmental and climate services and forest conservation

In addition, the measures

- 04: Investments in physical assets and
- 07: Basic services and village renewal in rural areas

provide additional information for the allocation of payments with respect to the type of transfer and the beneficiaries' institutional sectors. The combinations of priority/focus area and measures for the aggregated implemented payments from the ESI funds open data platform served as the basis for allocation or the calculation of shares for the allocation to CEPA/CRReMA, type of transfer and institutional sector. There is however no available data on individual projects as compared to the lists of operations for the EMFF and ERDF.

### 2.6 Eurostat reporting tables for 2018

Table 6, Table 7 and Table 8 present results for subsidies, other current transfers and capital transfers following the format of Eurostat's ESST submission tables for the reference year 2018. Overall, we identified ESST from the general government amounting to EUR 10908 million, of which EUR 5364 million was allocated to CRReMA and EUR 5544 million to CEPA. This value for CEPA, compared to the amount of EUR 4609 million covered by the COFOG tables, confirms in our view the inadequacy of COFOG data for the compilation of ESST for Germany. Firstly, it seems likely that the COFOG data includes transactions that would be classified as CEPA although they should be classified as CRReMA (see section 2.2.1). Secondly, the methodological guidance for COFOG states that all foreign aid, including for environmental protection, are to be reported under COFOG 01.2 (foreign economic aid) (Eurostat, 2019). ESST from the German general government to the rest of the world are therefore not readily identifiable and classifiable from COFOG data.

ESST from Rest of the World amounted to EUR 2497 million. Regarding the different subsectors of the general government, the majority of ESST are paid by the federal government (EUR 8215 million). The federated states accounted for EUR 1542 million of ESST and the local government for EUR 1151 million.

Regarding the CEPA/CRReMA aggregations, we followed the Eurostat reporting tables for 2018. During the computation process, we classified the ESST in more detail in light of the recent development with respect to the new 'Classification of Environmental Functions' (CEF) and updates to the CEPA/CRReMA explanatory notes (Eurostat, 2020). This should allow for a relatively straightforward transition from CEPA/CRReMA to the CEF in case that this change is going to be implemented for the reporting of ESST in the future. The CEPA/CRReMA divisions we used are as follows:

- CEPA 1 – Protection of ambient air and climate
- CEPA 2 – Wastewater management
- CEPA 3 – Waste management
- CEPA 4 – Protection and remediation of soil and water
- CEPA 5 – Noise and vibration abatement
- CEPA 6 (including CRReMA 12) – Protection of biodiversity and landscapes
- CEPA 7 – Protection against particle radiation
- CEPA 8 – Research and Development
- CEPA 9 – Other environmental protection activities

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- CReMA 10 – Management of water
- CReMA 11a – Sustainable management of forest areas
- CReMA 11b – Minimisation of the intake of timber resources
- CReMA 13a – Production of energy from renewable sources
- CReMA 13b – Heat/energy saving and management
- CReMA 13c – Minimisation of the intake of fossil energy resources as raw materials
- CReMA 14 – Management of minerals
- CReMA 15 – Research and development activities for resource management
- CReMA 16 – Other resource management activities.

Table 6: Eurostat tables, sheet '1.1.1. Subsidies'

in million EUR	CEPA/CREMA									
	2	3	6	1 + 4 + 5 + 7	8 + 9	10	11 + 12	13	14	15 + 16
From ROW	0.6	6.7	300.3	1 778.2	23.9	0	9	49.7	0	92.8
From General Government	93.3	237.3	141.7	376.3	115.6	23.7	78.7	346.4	3.2	386.8
To ROW	1.3	0.2	2.1	0.1	6.9	0.4	0.6	28.2	0	0.1
To General Government	9.7	0.3	0.9	5.6	30	0	17.5	0	0	28.5
To Corporations	82.3	236.5	138.2	368.3	78.7	23.3	60.5	318.3	0	358.1
To HH	0	0	0	0	0	0	0	0	0	0
To NPISH	0	0.3	0.4	2.4	0	0	0.1	0	0	0

Table 7: Eurostat tables, sheet '1.1.2 Other current'

in million EUR	CEPA/CREMA									
	2	3	6	1 + 4 + 5 + 7	8 + 9	10	11 + 12	13	14	15 + 16
From ROW	0	0.2	38.6	26.4	8	3.3	0	6.2	0	26.8
From General Government	1 199.6	139.5	763.6	319.1	1 183.2	47.1	71.3	2 809.3	7.7	719.3
To ROW	584.8	26	662.1	92.5	1 044.9	12.1	62.5	2 509.1	2.1	50.9
To General Government	613.2	112.8	31.9	160.1	52.5	34.4	3.4	131.2	5.6	634.6
To Corporations	0	0	0	0	0	0	0	0	0	0
To HH	1.1	0.1	5.4	25.2	6.9	0	2.7	160.4	0	0.6
To NPISH	0.6	0.7	64.2	41.4	78.9	0.6	2.6	8.6	0	33.2

Table 8: Eurostat tables, sheet 1.2. 'Capital transfers'

in million EUR	CEPA/CREMA									
	2	3	6	1 + 4 + 5 + 7	8 + 9	10	11 + 12	13	14	15 + 16
From ROW	0	0	21.2	27.4	0	0	0	65.1	0	12.4
From General Government	186	24.3	61.7	588.8	113.3	23.3	22.6	800.1	2	22.7
To ROW	0	0	16.4	0	0	0	0	16.4	0	0
To General Government	142.1	2.8	20.2	177.1	50.5	21.5	5.6	84.1	0	3.8
To Corporations	43.7	21.4	13.7	358.4	45.5	1.8	16.9	90	2	11.4
To HH	0.1	0	0	50	2.6	0	0	594.2	0	1.3
To NPISH	0.1	0.2	11.4	3.2	14.7	0	0.1	15.5	0	6.3



### 2.7 Pending work

#### 2.7.1 Time of recording

ESA 2010 specifies different times of recording for the types of transfers relevant for ESST. Capital transfers are to be recorded when a payment is due or when ownership of an asset is transferred or a liability is cancelled by the creditor (ESA 2010, §4.162, §4.166). Some types of relevant 'other current transfers' are to be recorded when they are made, while other types are to be recorded at the time "the regulations in force stipulate the transfers are to be made" in the case of obligatory transfers (ESA 2010, §4.119, §4.123, §4.127). Subsidies are to be recorded when "the transaction or the event (production, sale, import, etc.) which gives rise to the subsidy occurs" (ESA 2010, §4.39).

The implicit assumption in our reporting framework that the time of recording for the transfers identified as ESST in a given year would fall into the same year for all those transfers is therefore likely not accurate. This is especially the case for subsidies which are at times only transferred completely upon or after completion of a project which could lead to misallocations of subsidies. For capital and other currents transfers, the implicit assumption however appears to be more reasonable. Especially for the types of other current transfers that are to be recorded when they are made. The overall magnitude of this issue is however unknown and might warrant further investigation which was however beyond the scope of this project.

#### 2.7.2 Tax abatements

While tax abatements do not initiate financial flows and thus are out of scope of national accounts, they are used to incentivise environmentally friendly activities in a similar fashion to environmental subsidies. Statistically, they are hard to measure objectively, for it is often unclear against what basis the abatement is granted. For instance, in Germany, electric vehicles that are registered for the first time will be exempted from the payment of motor vehicle taxes for ten years. Due to the complexity of the German vehicle tax scheme, where, among others, carbon dioxide emissions of a vehicle, type of engine, cubic capacity and the date of registration are considered when calculating the tax rate, it is very difficult to measure the extent of the tax abatement for the exemptions of electric cars. Similar difficulties will arise for other environmental taxes as well. Different usages, materials and impacts are often taxed differently, making it very difficult to calculate the respective tax abatement. This makes them rather a financial or political concept than an objective, statistically measurable one.

Nevertheless, leaving tax abatements totally out of the analysis would paint an incomplete picture of environmentally friendly policies. This is in particular important when it comes to abatements on taxes that are not covered by the ETEA, for example income taxes or the value-added tax (VAT). In Germany, for instance, the federal government's climate protection programme 2030 is accompanied by the 'Gesetz zur Umsetzung des Klimaschutzprogramms 2030 im Steuerrecht'<sup>9</sup>. This act establishes, among other things, lower income taxes and value-added taxes on certain climate friendly activities. Those tax abatements will not be reflected in the ETEA accounting. However, as long as tax abatements refer to taxes covered within the accounting for environmental related taxes, their impacts show at least there as reduced tax payments. In such cases, a separate accounting for them within ESST seems unnecessary. In light of the upcoming amendment of Regulation (EU) No. 691/2011, we also decided to focus our efforts on the development of a reporting framework for explicit environmental transfers in order to be able to fulfil the mandatory parts of the future ESST data transmissions.

#### 2.7.3 Specific levies that fall outside the scope of the ESST guidelines

Under the German Renewable Energy Act (Erneuerbare-Energien-Gesetz EEG 2017), electricity consumers pay a mandatory price mark-up. Electricity transmission grid operators then disburse funds to producers of (mainly) electricity from renewable energy sources. The redistributed sums, shown in Table 9, are substantial.

9 'Implementation of the climate protection programme 2030 in tax law act'.

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Table 9: Revenues and expenses under the 'Erneuerbare-Energien-Gesetz'

Year	Revenue (EUR million)	Expenses (EUR million)
2015	22 025	24 248
2016	22 738	24 346
2017	24 593	25 952
2018	24 196	25 591

However, these redistributed funds are regarded as a component of the electricity good's market price by Germany's National Accounts. The amounts paid resemble taxes in that they are compulsory transactions mandated by national government, and payers do not receive direct benefits as a result. However, government does not receive these payments. Similarly, the amounts paid out to producers resemble subsidies in that they raise producers' compensation per unit of output. However, they are not paid by a government body, and hence do not qualify as a subsidy.

Similar arguments can be made in favour of considering further payments made to producers of combined heat and power under the 'Kraft-Wärme-Kopplungsgesetz' (combined heat and power act) for the inclusion under an ESST reporting framework. In addition to that, payments are made to producers of offshore wind farms if their power connection to the main land is interrupted or established later than contractually agreed upon, financed by a surcharge on the electricity price as well. In this case, producers' compensation does not involve a marginal unit of output, but it could be argued that the scheme lowers enterprises' risks by means of a policy intervention.

The inclusion of these remuneration schemes would naturally be mirrored by the inclusion of their financing under an extended beyond-national-accounts reporting framework of environmental taxes.

### 3 Development of a reporting framework on PEDS

#### 3.1 Conceptual design for Potentially Environmentally Damaging Subsidies (PEDS)

As far as we are aware, there are no internationally agreed upon definitions of neither potentially environmentally damaging subsidies (PEDS) nor subsidies in general. The definitions used in reports and publications vary considerably between institutions both domestically within Germany and internationally<sup>10</sup>.

But even though there exist no agreed upon definition of PEDS, the acronym in itself appears to have been already established as a de facto term<sup>11</sup>. This is somewhat of an issue due to the ambiguity of the word 'subsidy' within the term PEDS.

Within the framework of the System of National Accounts (United Nations, 2008) and its European equivalent ESA 2010, subsidies (D.3) are "current unrequited payments which general government or the institutions of the European Union make to resident producers" (European Commission, 2013). As a type of transfer, they are differentiated from Social contribution and benefits (D.6), Other current transfers (D.7) and Capital transfers (D.9). Following the SNA/ESA framework in its definition of subsidies would result in a definition of PEDS that only includes transfers that fall under 'Subsidies (D.3)' in the ESA 2010 classification.

The System of Environmental-Economic Accounting Central Framework (SEEA CF) is the relevant framework and compilation guide for all environmental-economic accounts. It is based on the SNA in its accounting approach, concepts, definitions and classifications. SEEA CF establishes no explicit definition of potentially environmentally damaging subsidies, but describes them as 'subsidies and similar transfers which support activities that are considered environmentally damaging'. Although being based on the SNA 2008, the SEEA CF's implied concept of subsidies in this case therefore deviates from it by including similar transfers. But by describing PEDS thusly, the SEEA CF remains internally consistent, as the definition of Environmental subsidies and similar transfers (ESST), the de facto counterpart to PEDS, includes Social contributions and benefits (D.6), Other current transfers (D.7) and Capital transfers (D.9) under the term 'similar transfers'. We thought this to be the most appropriate approach and accordingly consider the term PEDS to encompass both potentially environmentally damaging subsidies and similar transfers. We consider a subsidy or similar transfer potentially environmentally damaging if it supports an activity that has a (proven and specific) immediate negative effect on the environment.

Tax abatements do not involve any kind of financial transactions and are therefore not recorded in the national accounts as a transfer. As a consequence, we do not consider tax abatements as PEDS according to our definition. However, ignoring them altogether and focusing solely on ESA transfers would only paint a largely incomplete picture of support measures provided to environmentally damaging activities. Tax abatements are frequently used as support measures and often considered as subsidies or listed as memorandum items in reports and publications<sup>12</sup>. While we do not include tax abatements in our list of PEDS, we have decided to list complementarily those that fall under our notion of 'potentially environmentally damaging'. We further differentiate two categories of tax abatements. First, tax abatements for taxes under the ETEA framework and second, tax abatements for taxes not covered by ETEA.

Lastly, there could be other, implicit support measures for potentially environmentally damaging activities, e.g. selective exemptions from standards or regulation to extensions of loans by the government<sup>13</sup>. Just as tax abatements, they are not registered in the national accounts as transfers. Therefore, we opted to not include these support measures in our list of PEDS, but listed relevant implicit support measures as memorandum items in section 3.7.

10 For an overview, see (UBA, 2016, p. 9).

11 e.g. in SEEA CF (United Nations, 2012) or ESST guidelines (Eurostat, 2015).

12 e.g. the Subsidy Report by the Federal Ministry of Finance, the Subsidy Report by the Federal Environmental Agency (UBA) or the Subsidy Report by the Kiel Institute for the World Economy (IfW).

13 One might even consider the insufficient internalisation of environmental externalities as an implicit subsidy, though this is rarely the case in the economic literature, reports and publications. The SNA is likewise wary of the accounting of externalities (see SNA 2008, §3.94).

In summary, we only take ESA 2010 transfers, i.e. subsidies and similar transfers as PEDS into account. However, relevant tax abatement and other, implicit support measures are also compiled to provide a comprehensive overview of support measures to potentially environmentally damaging activities.

### 3.2 Identification of data sources

#### 3.2.1 Overview

We have identified two types of main data sources that can be used to compile PEDS in Germany. Our primary data sources are the federal budget documents that we screened and analysed systematically. In addition, we utilized information from three subsidy reports that are published regularly by public agencies and a research institute as secondary data sources. Namely, these are the 27th Subsidy Report by the Federal Ministry of Finance (Bundesministerium der Finanzen, 2019), the report on environmentally harmful subsidies by the Federal Environmental Agency (UBA, 2016) and the Subsidy Report by the Kiel Institute for the World Economy (Laaser & Rosenschon, 2020). All reports differ in their definition of what should be considered a subsidy. Moreover, it is often not possible to fully retrace every step taken in their methodologies of how to identify and calculate subsidies. Therefore, we used these reports mainly as inspiration and to complement our primary data source.

#### 3.2.2 Main data source: Budget documents

In order to identify PEDS transactions, we analysed federal budget documents. Each year, the federal government and federated states' governments publish detailed information on its budget in the form of budget plans which also include the respective budgetary laws as well as supplementary budgets. Budget items are listed by ministry and presented the planned revenues and expenses.

Using the information provided by the grouping and government function codes (see section 3.2.2), we firstly screened the federal budget for budget items whose three-digit grouping code can be matched to either subsidies (D.3), other current (D.7) or capital transfers (D.9) in the ESA classification of distributive transactions (see Table 3). Secondly, we used the government function code to filter out further budget items whose function codes suggests that an expense is likely not a transfer for an activity that has an immediate negative effect on the environment, e.g. defence (upper function 03) or public security and order (upper function 06).

Similar to the work on ESST, the federal structure of Germany made rigorous budget analysis very time-consuming. We therefore focused only on the identification of PEDS on the federal level. However, it is possible that there are also PEDS on the level of the federated states. But as some federated states have transitioned from cameralistic to double-entry budgeting in recent years (see section 2.3.5), a detailed analysis of budget documents based on grouping and function codes is no longer a viable method to identify PEDS in these federated states (Laaser & Rosenschon, 2020). Hence, there is currently no consistent method for identifying PEDS that could be applied uniformly to all budgets on the level of the federated states as there are no government function that denote potentially environmentally damaging activities that could facilitate a simplified compilation for Hamburg and Hessen akin to the one for ESST. The IfW for example no longer provides a detailed documentation of financial assistance provided by the federated states in its subsidy report as a result (Laaser & Rosenschon, 2020). Thus, while it is in principle possible to identify PEDS for the majority of the federated states given enough time and resources, it is yet unclear if PEDS can be identified consistently and regularly for those who transitioned to double budgeting.

For the level of local governments, a detailed budget analysis for all approximately 12000 units of this subsector for PEDS is as unfeasible as it is for ESST. Moreover, it is also not possible to identify PEDS within the highly aggregated statistics on local governments' financial results that were used for the estimation of ESST by local governments (see section 2.4).

### 3.2.3 Secondary data sources: Subsidy Reports

The different subsidy reports differ in their definitions, periodicity and computation methods. The subsidy report by the Federal Ministry of Finance is published biennially. The latest report was published in 2019 and covers the years 2017 to 2020 (see section 2.2.2). Another report, by the Federal Environmental Agency, is released irregularly, with the latest version published in 2016. It only covers subsidies that have a potentially negative effect on the environment and applies a broader definition. It includes direct budgetary transfers and tax abatements as well as transfers without direct budgetary impact such as guarantees, concessions, state provision or procurement of goods, services and rights at non-market prices. Tax abatements are defined differently in the two reports: while the subsidy report by the BMF only considers special fiscal exceptions to taxes that lead to reduced revenue for the public sector (revenue foregone method), the UBA additionally reports on tax exemptions or tax rates that are regarded as too low, given the purpose or justification of the tax.

In its Kiel Subsidy Report, the IfW regularly assesses the level of subsidies in Germany. Its underlying notion of a subsidy is based on welfare economics theory and considers direct budgetary transfers and tax concessions that distort the allocation of resources as subsidies (Laaser & Rosenschon, 2020). Thus, in contrast to the Federal Ministry of Finance's subsidy report, the IfW includes additional flows of financial assistance and tax allowances as subsidies. First, the IfW also takes financial transfer to parastatal beneficiaries into account that offer private goods, e.g. statutory health insurance, hospitals, museums, theatres. Second, the IfW includes direct budgetary transfers that are left out in the Federal Ministry of Finance's subsidy report with what the IfW considers insufficient justifications. Examples are transfers to activities falling under a very broad notion of government tasks that are not classified as a subsidy by the ministry or transfers that are already captured in other governmental reports (Laaser & Rosenschon, 2020). Third, it includes most tax concessions listed in Annex 3 of the Federal Ministry of Finance's subsidy report. In Annex 3, the report lists tax concessions that it doesn't consider to be subsidies as memorandum items. Lastly, the IfW also reports the foregone revenue through the provision of free CO<sub>2</sub> emission certificates.

The IfW compiles its list of direct budgetary transfers by screening through federal budget documents by grouping codes as well, but does not additionally screen by function codes. Tax concessions are compiled from Annexes 2 and 3 of the Federal Ministry of Finance's subsidy report.

### 3.3 Identification of PEDS in Germany

As outlined previously, we analyse federal budget documents for the identification of PEDS transactions. The included grouping codes in the first step of the screening process were those also used for the computation of ESST.

Table 10 lists the function codes included in the second step of the filtering process. The remaining list of budget items then contained those that could constitute potential subsidies according to their grouping and function. Among these budget items we selected by means of individual inspection those that are subsidies according to our definition and potentially environmentally damaging.

Table 10: Functions included for PEDS identification

Function	Description	Function codes
023	Economic cooperation and development	023
036	Defence research and development	036
16	Science, research, development outside of universities	162, 163, 164, 165, 167
195	Preservation and maintenance of historical monuments	195
411	Promotion of housing construction	411
412	Housing construction subsidies/ Capital formation	412
419	Other housing	419
423	Urban development	423
52	Agriculture and food	521, 522, 523
53	Forestry and hunting, fishery	531, 532
62	Water management, flood and coastal protection	623, 624, 625
63	Mining, manufacturing and construction	631, 632, 634, 635, 638
64	Energy and water supply, waste disposal	641, 642, 643, 644, 645, 646, 647, 649
65	Commerce and tourism	651, 652
66	Finance and insurance	661, 669
68	Other in the sector industry and services	680
69	Regional development measures	691, 692
73	Waterways and ports, promotion of shipping	731, 732
74	Railways and public transport	741, 742
75	Aviation	750
77	Communications	771, 772
79	Other transportation	790

### 3.4 PEDS in Germany

#### 3.4.1 Overview

The following section describes the potentially environmentally damaging subsidies based on the research conducted. Transfers with actual payments that are in accordance with the European System of Accounts (ESA) are presented in section 3.4.2. Section 3.4.3 contains several transfers whose classification as PEDS remains inconclusive as of now, for example because they support several activities that are only partially 'potentially environmentally damaging'. As abatements of taxes are not part of our PEDS definition, they will be listed separately in section 3.5. A complete list of PEDS, potential PEDS and tax abatements can be found in Table 15.

#### 3.4.2 Transfers in line with ESA

##### 3.4.2.1 Hard coal subsidies

ESA code: D.3

Beneficiary: Corporations

NACE code(s): B05

Until recently, the production of hard coal has been subsidised on a large scale in Germany. The state aid included guaranteed demand, mining-royalty concessions, reduced pension contributions for miners and debt relief schemes. Since the last coal mine in Germany was closed in December 2018, the coal-mining federated states and German government have mainly provided adjustment assistance in form of early-retirement funds for coal miners and decommissioning support payments.

Even though from 2019 onwards, the subsidies no longer support ongoing environmentally damaging activities, it can be argued that the ongoing payments are within the scope of PEDS or at least constitute a borderline case. The phasing out of subsidies for ongoing coal mining activities was the result of an

agreement between the federal government, the governments of Nordrhein-Westfalen and Saarland, the mining union 'IG BCE'<sup>14</sup> and the mining corporation 'RAG AG' in 2007, and the resulting 'law on hard coal financing' ('Steinkohlefinanzierungsgesetz'). This law codified the continuation of subsidies for ongoing mining operations until 2018, including the allocated amounts per year, and the continuation of adjustment assistance in form of early-retirement funds for coal miners and decommissioning support payments beyond 2018.

The substantial amounts of these subsidies (see Table 11) even after 2018 and the knowledge of mining operators in 2007 of these future subsidies likely influenced the profitability and thus the scope and duration of mining operations after the passing of the law. Which in turn would imply that the subsidies after 2018 at least partially directly relate to the scope mining of operations and implicitly supported their continuation after 2007.

The inclusion of these subsidies in PEDS would however raise the question under which reference years then to report these subsidies as they are to be recorded when "the transaction or the event (production, sale, import, etc.) which gives rise to the subsidy occurs" (ESA 2010, §4.39). As subsidies for the phasing out of environmentally damaging activities might occur more often in the future, methodological guidance for the reporting of these boundary cases would therefore be helpful.

Table 11: Payments for hard coal subsidies

	2017	2018	2019	2020
Volume (EUR million)	1 050	967	884	1 924

### 3.4.2.2 Electricity price compensation

ESA code: D.3

Beneficiary: Corporations

NACE code(s): A0891, C14, C17, C20, C24

The German government partially compensates the electricity costs for certain economic sectors and sub-sectors with high energy usage production processes. The aim is to prevent so called carbon leakage, where rising electricity prices due to the EU-ETS allowances lead to companies transferring to countries with lower environmental standards. Table 12 shows which industries requested an electricity price compensation in 2019. In total, 546 million euros of aid were distributed. (German Emissions Trading Authority (DEHSt) at the German Environment Agency, 2021)

It should be noted that the measure supports businesses irrespective of whether the electricity used comes from renewable sources or fossil fuel. Consequently, it can be assumed that a share of the transfers should not be considered as harmful to the environment.

Table 12: Distribution of state aid for electricity price compensation in 2019

Industry	NACE	2019 (EUR million)
Chemical industry	C20, A0891	218
Iron and steel	C24	131
Paper	C17	102
Non-ferrous metals	C24	95
Clothing	C14	0.2
Total		546

Source: German Emissions Trading Authority (DEHSt) at the German Environment Agency, 2021.

14 IG Bergbau, Chemie, Energie.

### 3.4.3 Other, potential PEDS

#### 3.4.3.1 Promotion of home ownership

Several programmes promote home ownership of private households in Germany. These include support for home-loan savings through premiums under the ‘Home Ownership Savings Premium Act’ (‘Wohnungsbauprämienengesetz’), support for urban development or a home ownership-related child benefit (‘Baukindergeld’), which supports the purchase or construction of owner-occupied homes of families with children financially. Even though most benefits apply also for the purchase of existing houses or owner-occupied flats, the programmes are considered to give incentives to the construction of new (single-family) houses leading to urban sprawl, soil sealing and increasing traffic. Therefore, the support measures can have negative effects on climate, water, soil, air and biodiversity.

#### 3.4.3.2 Support programmes for agriculture, forestry, fisheries and rural development

There are arguments to consider support measures which benefit the sectors agriculture, forestry and fisheries as potentially environmentally damaging. This is the case whenever support programmes provide incentives to increase production outputs or intensities and thereby putting pressure on the environment. However, it is very difficult to determine the share of a transfer that is environmentally harmful since agricultural programmes often also support environmentally friendly activities. In Germany, for example, the joint task ‘Improvement of agricultural structures and coastal protection’ is carried out with federal, federated states and local authority funding. For 2020, the federal share alone is budgeted to be as high as 774,340 million euros.

Similarly, EU programmes supporting agriculture or fisheries<sup>15</sup> can partially be considered as PEDS. Moreover, funds provided by the EARDF are, through the joint task ‘Improvement of regional economic structures’, partially allocated to the development of commercial and industrial areas. Funding provided for these activities could also be considered potentially environmentally damaging, as the development of commercial and industrial areas increases soil sealing and fragmentation of landscapes (UBA, 2016).

## 3.5 Tax abatements

### 3.5.1 Overview

The following subsections give an overview over tax abatements in Germany that could be considered as potentially environmentally damaging. We derive our definition of tax abatements from the subsidy report by the ministry of finance, where they are referred to as tax benefits. Here, “tax benefits [...] are defined as special tax exceptions that lead to a reduction in public revenue. [...] A special tax arrangement is regarded as a subsidy if it directly or indirectly benefits specific sectors or subsectors of the economy. Tax benefits also include special tax arrangements that directly benefit business and industry over the general public” (Bundesministerium der Finanzen, 2019)

Following this definition, only those tax abatements stated implicitly as reliefs or exemptions in the respective law are considered. Consequently, as soon as different taxation schemes or variations in tax rates for different products are part of the regular legislation, they will not be considered as tax abatement. Nevertheless, the argument can be made that the government can hide tax abatements through tax arrangements. We therefore report on some special tax schemes within this report and list them as memorandum items when they are mentioned as a tax abatement in one of the consulted subsidy reports. This involves, for example, the lower value-added taxation rate for the majority of food items in Germany (see subsection 3.5.3.2).

15 e.g. European Agricultural Fund for Rural Development (EARDF) and European Maritime and Fisheries Fund (EMFF).



### 3.5.2 Tax abatements covered by ETEA

This section covers abatements of taxes that are part of the Eurostat data collection on environmental taxes by economic activity (ETEA). We will discuss other potentially environmentally damaging tax schemes in section 3.5.3.

According to the official policy guidelines agreed by the Federal Cabinet in 2015, existing tax benefits should be replaced with financial assistances or other measures that place smaller burden on public finances. However, currently, the German system of taxes knows many exemptions and abatements. They are referred to as tax benefits in the official subsidy report by the BMF (Bundesministerium der Finanzen, 2019).

#### 3.5.2.1 Energy tax

ESA code: D.214

Beneficiary: Corporations

NACE code(s): A, B, C, D, E, F, H (details in Table 13)

In Germany, the 'energy tax' is charged on the use of oil products, natural gas, coal and coke products. Tax rates differ according to whether the product is used as a transport fuel or for heating and processing purposes.

There are a number of exemptions and reliefs from the energy tax in Germany. Exemptions involve the taxation of fuels used in inland waterway transportation, aviation fuel and kerosene used in commercial aviation as well as for energy products that energy producers use up in their own production processes ('own use privilege'). Energy tax reliefs include tax reductions for diesel used in agricultural and forestry, for specific processes and procedures in manufacturing, for some businesses in the sectors of manufacturing, agriculture and forestry as well as for manufacturing in special cases (so called 'Spitzenausgleich'). Table 13 gives an overview about the estimated volume of the energy tax exemptions and reliefs in the year 2019 according to the subsidy report by BMF as well as the NACE classes that benefit from the respective tax abatements.

Table 13: Energy tax exemptions and reliefs

	NACE	2019 (EUR million)
<b>Exemptions for</b>		
Inland waterway transportation	H503, H504	141
Commercial aviation	H511, H512	584
Own use privilege		159
<b>Tax reliefs for</b>		
Agricultural and forestry businesses	A01, A02	450
Specific processes and procedures	C23, C25, C26, E382	483
Selected businesses	A, C, D, E, F	153
Special cases	C, D, E, F	342
<b>Total</b>		<b>2 312</b>

Source: Own calculations based on Federal Ministry of Finance, 2019.

In Germany, there are different energy tax rates charged for the use of unleaded petrol (654.50 EUR per 1,000 litres) and diesel (470.40 EUR per 1,000 litres). As described in section 3.5, different tax rates that result from the tax scheme without forming an exception would in general not be considered tax abatements. However, according to the German Environment Agency, the lower tax rate on diesel can be seen as an environmentally damaging tax relief amounting to estimated 7,353 million euros in 2012. We do not follow this argumentation.

### 3.5.2.2 Electricity tax

ESA code: D.214

Beneficiary: Corporations

NACE code(s): A, C, D, E, F (details in Table 14)

The electricity tax is payable on electric current when electricity is withdrawn from the supply grid. Tax reliefs exist for specific processes and procedures in manufacturing, selected businesses and in special cases in manufacturing ('Spitzenausgleich') as presented in Table 14. Similar to the argument made regarding the electricity price compensation in subsection 3.4.2.2, it would be inaccurate to consider electricity tax abatements as entirely environmentally damaging. According to the German Working Group on Renewable Energy Statistics<sup>16</sup>, the share of electricity from renewable energy sources in gross electricity consumption was already 45 % in 2020 in Germany and is targeted to reach 65 % by 2030. (Bundesministerium für Wirtschaft und Energie, 2021)

Table 14: Electricity tax reliefs

Type of tax relief	NACE	2019 (EUR million)
Specific processes and procedures	C23, C25, C26, E382	810
Selected businesses	A, C, D, E, F	1 000
Special cases in manufacturing	C, D, E, F	1 540
<b>Total</b>		<b>3 350</b>

Source: Own calculations based on Federal Ministry of Finance, 2019.

### 3.5.2.3 CO2 emissions allowances

ESA code: D.29

Beneficiary: Corporations

NACE code(s): B, C, D, H

Germany is part of the European Emissions Trading System (EU-ETS). Some of the allowances are partly allocated free of charge for parts of industrial and heat production or for products where a high risk of 'carbon leakage'<sup>17</sup> is assumed. The part of industrial and heat production that receive free allocations are expected to decrease from 80 percent in 2013 to 30 percent in 2020 according to the German Emissions Trading Authority (DEHSt) (German Emissions Trading Authority (DEHSt) at the German Environment Agency, 2014).

The Federal Statistical Office of Germany estimated foregone tax revenue from emission permits handed out for free by the German national government for their contribution to the publication "Monitoring greenhouse gas transfers – focusing on transfers related to fossil fuel for monitoring Agenda 2030 and SEEA" published by Statistics Sweden (SCB, 2020). In 2018, the estimated revenue foregone amounted to 2,218 million euros.

<sup>16</sup> Working on behalf of the Federal Ministry for Economic Affairs and Energy.

<sup>17</sup> Carbon leakage refers to a shift in production processes and thus greenhouse gas emissions to non-European countries due to the costs of European emissions trading. The products subject to this risk are specified by the European Commission in the Carbon Leakage List.

### 3.5.2.4 Vehicle tax

ESA code: D.29

Beneficiary: Corporations

NACE code(s): A

In Germany, vehicles used in agriculture and forestry are exempted from the vehicle tax. The revenue foregone is estimated to amount 475 million euros in 2019.

### 3.5.3 Tax abatements not covered by ETEA

This section covers tax abatements on taxes that are not part of the environmental taxes by economic activity (ETEA) but can still be considered as potentially environmentally damaging.

#### 3.5.3.1 Income tax

Commuting allowance

ESA code: D.51

Beneficiary: Households

NACE code(s): -

According to the German income tax law travel costs for commuting to work are deductible as income-related expenses. The commuting allowance (or distance allowance) takes each full kilometre between home and place of work at a lump sum of 30 cents into account. From 1 January 2021, the lump sum will further increase to 35 cents per kilometre for kilometres above 20 kilometres of the one-way journey. Although the commuting allowance can be deducted regardless of the type of transport (e.g. car, public transport or even walking), it is argued that the allowance sets incentives to move further away from the place of work, which will then increase the usage of environmentally damaging ways of transport, such as private cars. The revenue foregone resulting from the commuting allowance is estimated by the Institute for the World Economy (IfW) at 5,100 million euros per year (Laaser & Rosenschon, 2020).

#### Lump sum taxation for company cars

ESA code: D.51

Beneficiary: Households

NACE code(s): -

There are arguments that company car benefits in Germany have several negative social outcomes. These include a tax privilege to drivers who use their company cars privately. To account for the private use of company cars, each month 1 % of the list price of the company car is taxed on top of the user's income. This rate is considered to be too low and therefore sets incentives to use the car more frequently and in general supports the fossil-fuel based automotive industry. The reduced income taxation is estimated to range between 3,300 and 5,500 million euros per year. (Metzler, Humpe, & Gössling, 2019)

#### 3.5.3.2 Value added tax

##### Value added tax relief for international flights

ESA code: D.211

Beneficiaries: Households, corporations

NACE code(s): -

While the value added tax on domestic flights is 19 % in Germany, there is no taxation of commercial international flights. According to the German Environment Agency (UBA), this exemptions favours air

traffic compared to other transport means. The UBA estimates this indirect subsidy to be as high as 4,763 million euros in 2012. (UBA, 2016)

### **Reduced value added tax rate for animal products**

ESA code: D.211

Beneficiaries: Households, corporations

NACE code(s): -

The regular rate of value added tax (VAT) in Germany is 19 %. For certain products such as selected foods, animal feed, print products or public transport a reduced tax rate of 7 % applies. The German Environment Agency (UBA) argues that the reduced tax rate supports products that have environmentally harmful effects, like meat and dairy products (UBA, 2016). According to an expert report from 2016, an increase of the VAT for animal and dairy products would result in an increase in tax revenues between 5,500 to 6,300 million euros per year (Wissenschaftlicher Beirat Agrarpolitik, Ernährung und gesundheitlicher Verbraucherschutz und Wissenschaftlicher Beirat Waldpolitik beim BMEL, 2016). However, the varying tax rates are part of the taxation scheme and are in a strict sense no abatements.

### **3.6 List of PEDS, other potential PEDS and tax abatements**

Table 15 on the following pages summarizes all PEDS, other potential PEDS and tax abatements described in sections 3.4 and 3.5. The column 'NACE / HH' shows whether the beneficiaries are corporations and/or private households and in which NACE class the corporations can be classified whenever this information is available.

The respective amounts per support measure are largely sourced from publications by ministries or other government agencies. The calculation methodology behind these figures is not always fully traceable or reproducible for us and not necessarily compatible with the SNA 2008 framework. An example would be the question whether payments or tax abatements are recorded for the year the subsidised activity took place or for the year in which the payment or tax abatement was received and accounted. As a result, the tax abatements listed in Table 15 are not compatible with ETEA for example. Regarding the distribution by NACE, it should be noted that exact shares are only available for parts of the items listed and are mostly drawn from further secondary sources, which we cannot fully verify and control. The table should however provide an adequate overview over the extent of support measures given to the potentially environmentally damaging activities.

## Development of a reporting framework on PEDS

Table 15: List of PEDS, potential PEDS and tax abatements

Title	2012	2016	2018	2019	ESA	NACE / HH	PEDS according to section 3.1?	Source <sup>18</sup>
	EUR million							
Assistance to the coal industry			967	940	D.3	B05 / -	Yes	
Electricity price compensation			202	546	D.3	C14, C17, C20, C24 / -	Yes	
Energy tax exemption for waterway transport		180	141	141	D.214	H503, H504 / -	No	
Energy tax exemption for aviation		570	584	584	D.214	H511, H512 / -	No	
Energy tax relief for agricultural and forestry businesses		450	467	450	D.214	A01, A02 / -	No	BMF
Energy tax relief for specific processes and procedures		553	483	483	D.214	C23, C25, C26, E382 / -	No	
Energy tax relief for businesses		157	154	153	D.214	A, C, D, E, F / -	No	
Energy tax relief in special cases		172	159	159	D.214	C, D, E, F / -	No	
Energy tax exemption for own use		350	342	342	D.214	C, D, E, F / -	No	
Energy tax relief for diesel (versus petrol)	7 353				D.214	Not available / yes	No	UBA
Electricity tax relief for specific processes and procedures		836	807	810	D.214	C23, C25, C26, E382 / -	No	
Electricity tax relief for businesses		1 052	990	1 000	D.214	A, C, D, E, F / -	No	BMF
Electricity tax relief in special cases		1 617	1 550	1 540	D.214	C, D, E, F / -	No	
Free issued CO2 emissions certificates		835	2 218		D.29	B, C, D, H / -	No	FSO
Vehicle tax exemption for tractors and special purpose vehicles		260	470	475	D.29	A / -	No	BMF
Commuting allowance			5 100	5 100	D.51	Not applicable / yes	No	IfW
Lump sum taxation for company cars				3 300 – 5 500	D.51	Not applicable / yes	No	UBA
Value added tax relief for international flights	4 763				D.211	Not available / yes	No	UBA
Reduced value added tax rate for animal products				4 300 – 5 000	D.211	Not applicable / yes	No	WBA
Home ownership-related child benefit			11	570		Not applicable / yes	No	BMF

18 BMF: (Bundesministerium der Finanzen, 2019),  
 UBA: (UBA, 2016),  
 IfW: (Laaser & Rosenschon, 2020),  
 WBA: (Wissenschaftlicher Beirat Agrarpolitik, Ernährung und gesundheitlicher Verbraucherschutz und Wissenschaftlicher Beirat Waldpolitik beim BMEL, 2016),  
 FSO (Federal Statistical Office of Germany): Own calculations based on data by German Emissions Trading Authority (DEHSt).

### 3.7 Implicit support measures out of scope of PEDS

As already mentioned in section 2.7.3, there are several state-imposed components of the electricity price in Germany that are not taxes and thus do not go into the government's budget. Most importantly, the EEG surcharge (under the Renewable Energy Sources Act) is used to provide funding for electricity from wind, solar and biomass. It amounted to 24,196 million euros in 2018 and accounted for 21 % of the final electricity price paid by consumers. Another surcharge, the combined heat and power (CHP) surcharge, is used to pay premiums to combined heat and power (CHP) plant operators as well as to promote the use of heating and cooling networks and accumulators.

It can be argued that these surcharges have the characteristics of a tax as they are compulsory transactions mandated by the national government, while payers do not receive direct benefits due to the payment. However, the payments are not allocated to the national budget and therefore neither fall under the definition of taxes nor under the definition of subsidies or similar transfers. Consequently, EEG surcharge reliefs in form of special equalisation schemes for electricity-intensive enterprises and rail operators as well as an exemption for enterprises which generate and use their own electricity ('Eigenstromprivileg'), and payments to producers of combined heat and power financed by the CHP surcharge are not listed as PEDS. Nonetheless, it can be argued that these exemptions provide incentives for potentially environmentally damaging behaviour set by national legislature.

The inclusion of these remuneration schemes could be mirrored by the inclusion of their financing under an extended beyond-national-accounts reporting framework of environmental taxes.

### 4 Towards an integrated compilation of Germany's environmental-economic accounts

#### 4.1 Monetary environmental-economic accounts

##### 4.1.1 EPEA and ESST

Within the ESST framework, environmental subsidies and similar transfers are defined in reference to the SEEA-CF as current and capital transfers “intended to support activities that protect the environment or reduce the use and extraction of national resources” (SEEA-CF 2012, §4.138). Environmental protection transfers in the EPEA framework are defined by the EPEA handbook as “all current or capital transfers intended to support environmental protection activities and actions” (Eurostat, 2017)<sup>19</sup>. Thus, within the boundaries of environmental protection activities, ESST and EPEA share the same definition of relevant transfers with the exception that transfers falling under ‘social contribution and benefits’ (D.6) are included in ESST, but considered out of scope for EPEA. This is, however, a rather theoretical difference as it is unlikely that an environmental protection transfer would fall under ‘social contributions and benefits’ (Eurostat, 2015). In practice, when jointly compiling transfers for ESST and EPEA, this difference can also be easily addressed by classifying the transfers in question not under ‘total other current transfers’ (D.6, D.7), but separately as either ‘social contribution and benefits’ (D.6) or ‘other current benefits’ (D.7) in case a transfer should indeed fall under the former category. These two categories can then be combined when compiling ESST and ‘social contributions and benefits’ (D.6) can be excluded when compiling environmental protection transfers for EPEA.

Another difference between ESST and EPEA with more implications for the compilation of environmental protection transfers concerns consolidation. While the ESST guidelines recommend to not consolidate the data for ESST<sup>20</sup>, transfers are to be consolidated in EPEA for general government and NPISH which, additionally, are also grouped together in EPEA as opposed to being individual categories in ESST. However, these differences can be addressed in a joint compilation of transfers for EPEA and ESST. ESST are classified by both the institutional sectors of the payer, either general government (S.13) or the rest of the world (S.2), and the beneficiary, either general government (S.13), corporations (S.11/S.12), households (S.14), NPISH (S.15) or the rest of the world (S.2). It is thus possible to identify the environmental protection transfers that would be subject to the consolidation principle in EPEA. i.e. transfers that are paid by the general government and received by either the general government or NPISH. These transfers can then be excluded from the computation of the transfers in EPEA.

With respect to transfers from the rest of the world, the reporting requirements for the institutional sector of the beneficiary differ between EPEA and ESST. For ESST, only the respective totals of subsidies, other current transfers and capital transfers across all institutional sectors have to be reported. For EPEA, it is necessary that the transfers are classified according to the institutional sector of the beneficiaries in order to compute the required characteristics for environmental protection transfers, e.g. ‘D3\_D7\_D92\_D99\_REC\_GG’, ‘D3\_D7\_D92\_D99\_REC\_CORP’, ‘D3\_D7\_D92\_D99\_REC\_HH’. It is however useful for ESST to classify environmental transfers according to the institutional sector of the beneficiary as well, since this has potential implication for other classifications, e.g. the type of transfer. For example, according to ESA 2010 §4.122b), current transfers directly from institutions of the European Union to market producers are to be classified as subsidies. Thus, when the beneficiary of such a direct current transfer from the EU is a corporation, it is by definition (ESA 2010 §2.45 and §2.55) a market producer and the current transfer is consequently a subsidy (D.3).

It is thus possible to address the aforementioned differences between EPEA and ESST in a joint compilation of environmental transfers within ESST that would also facilitate the compilation of a subset of these transfers in line with the scope, consolidation rules and classification requirements of EPEA. This

19 While the EPEA framework as a whole is based on the SEEA-CF, we have found no direct reference to SEEA-CF §4.138 in the definition of environmental protection transfers in the EPEA handbook.

20 As mentioned in section 2.3.7, we decided to consolidate ESST under certain circumstances.

requires the following explicit steps in our compilation of environmental transfers that exceed the current reporting requirements for ESST:

- Differentiation between 'social contributions and benefits' (D.6) and 'other current transfers' (D.7) when classifying transfers by type of transfer.
- Classification of the institutional sector of the beneficiary for transfers paid by the rest of the world.

All other requirements for EPEA are met automatically in our compilation process of transfers for ESST and we already included the allocation to the recipients' institutional sector for transfers from the rest of the world and will also incorporate the differentiation between 'social contributions and benefits' (D.6) and 'other current transfers' (D.7).

### 4.1.2 EPEA and EGSS

The computation of EGSS for Germany is not carried out by our section for Monetary Environmental-Economic Accounts, but the section for Environmental-Economic Statistics within the Federal Statistical Office of Germany. The principal data source for EGSS is the German survey on EGSS, coordinated by the section for Environmental-Economic Statistics and carried out by the 14 statistical offices of the federated states.

Under certain conditions, EGSS data on output, exports and employment derived from the survey on EGSS can theoretically serve as a direct, external data source for EPEA. Currently, the EGSS data is however not sufficiently detailed enough to meet these conditions.

While the EGSS survey collects data on output and exports for market activities, it does neither for non-market activities nor ancillary activities nor activities for own-use. Furthermore, the EGSS data from the survey on EGSS is not differentiated by type of environmental product, so that output and exports of environmental specific services and employment related to their production cannot be distinguished from output, exports and employment for other specific and cleaner products. It is therefore not possible to obtain the necessary information for the EPEA characteristics for output, exports and employment for the production of environmental protection services from the EGSS data stemming from the EGSS survey.

The raw data from the survey on EGSS, from which the EGSS is computed, is however more detailed. The survey uses a list of environmental measures and activities which are mapped to the environmental domains in CEPA/CRema. The respondent can report figures for output and exports for each item on the list, which are then aggregated for each CEPA/CRema division. The item on the list are therefore intended to delineate activities and measures within an environmental domain by their technical nature and do not distinguish the type of environmental product, i.e. environmental protection services from other environmental protection products. As an example, item 3245: 'constructional sound insulation measures for buildings' contains both the manufacturing of goods like insulation materials and sound-insulating windows as well as their installation during construction and other services like maintenance and planning. Additionally, the information is also not sufficiently detailed enough to distinguish between characteristic and non-characteristic activities, only the former being within the scope of EPEA. Thus, the raw data of the survey on EGSS is also currently not suited as a source for the computation of EPEA.

Revisions to the list of environmental measures and activities will, however, likely change the suitability of EGSS data as input for EPEA. Beginning with the 2020 survey on EGSS, R&D on environmental protection is included in the list of environmental measures and activities in separate items for each CEPA/CRema division. As specific environmental protection services, these R&D activities fall under the scope of EPEA and the data on market output and exports in EGSS could therefore be used as a direct source for EPEA. This would however require additional effort to map or attribute the EGSS figures to institutional sectors to comply with the EPEA reporting requirements.



While being the main source for the computation of EGSS, the survey on EGSS does not cover all production of environmental goods and services. Notably, data for CPA product groups 37 (Sewerage services; sewage sludge), 38 (Waste collection, treatment and disposal services; materials recovery services) and 39 (Remediation services and other waste management services) is estimated using other data sources such as national accounts. These CPA products groups consists of environmental services that fall under CEPA 2 in the case of CPA 37, CEPA 3 for CPA 38 excluding CPA 38.3<sup>21</sup> and CEPA 4 for CPA 39, and thus are relevant for EPEA as well. Specialist producers of these environmental protections services in Germany are found in the corresponding industries NACE 37 (Sewerage), NACE 38 (Waste collection, treatment and disposal activities; materials recovery) and NACE 39 (Remediation activities and other waste management services), while industries NACE 35 (Electricity, Gas, Steam and Air Conditioning supply) and NACE 36 (Water collection, treatment and supply) have secondary output of these services. Thus, for the production of the CPA product groups 37, 38.1+38.2, 38.3 and 39 by industries NACE 35, 36, 37, 38 and 39, an integrated estimation for EPEA and EGSS is feasible.

While this integrated estimation of EPEA and EGSS for these CPA product groups ensures coherence in the estimation of variables between the two modules, it does not ensure coherence in the reporting of EPEA and EGSS. Currently, the respective transmission deadlines are t+24 for EPEA and t+22 for EGSS. Some of the required data for the reference year might only become available in the time between the two deadlines. In that case, the computation of EGSS would have to use estimates based on previous years, while the actual data for the reference year would be used for EPEA. These discrepancies are likely to disappear with the revision of data in subsequent years. But they could theoretically persist if data sources such as supply and use tables are revised and already available for the revision of one of the two modules, but not for the revision of the other.

Regarding the technical implementation for this joint computation, we have decided to implement it for the reference year 2018 in R instead of Excel. Currently, the computation of all mandatory and voluntary EPEA characteristics for specialist and secondary producers of environmental protection market services in industries NACE D and NACE E is based on nine different data sources. The current implementation in Excel is based on links to the Excel files for these data sources for the reference year, which have to be manually updated when the estimation has to be done for a new reference year or has to be revised based on new available, revised versions of the data sources. Additionally, if a data source is not yet available for the reference year, the estimation based on the previous year's values has to be linked manually as well. The effort required for this implementation would further increase if it would have to be repeated for the EGSS reporting and subsequent revision of EGSS data as well. Especially, as the differing availability of the data sources for the EGSS transmission deadline would require other variable to be estimated on the previous year's values as well and the links in the Excel files would have to be updated accordingly.

The implementation in R has several advantages in that regard. First, for a given data source we are able to combine all version for a given reference years and across multiple references years into a single panel dataset by reference year and NACE and to only select the most recent data for a given variable in each reference year.

Second, by transforming all data sources into the same structure, we can combine them into a single panel data sets from which all required characteristics can be calculated. This greatly reduces the complexity compared to current implementation with a multitude of links across multiple excel files.

Third, this single panel data set allows the computation to be carried out irrespective of which data sources are already available for the reference year at a given time. This can be achieved in R by including conditionality commands in the script. This means that if the data source for a certain variable is already available for the reference year it will be used for the computation. If it is not yet available, the values of the variable for the reference year will be estimated based on the previous year's values and other information already available for the reference year.

21 CPA 38.3 (Materials recovery) falls under CReMA 14.

Fourth, the panel data set also allows us to carry out the computation across multiple years at once, which is particularly useful for the required transmission of revised figures of previous years along with the figures for the current reference year.

Lastly, the automated computation in R, once programmed, is less labour-intensive. The computations hence can be carried out much closer to the transmission deadlines, allowing for the inclusion of data sources that become available only shortly before.

Table 16 depicts the structure of the output dataset from the R implementation. It can be thought of as a panel dataset of production accounts that combines the production accounts for the CPA product groups 37, 38.1+38.2, 38.3 and 39 by specialist and secondary producers in NACE 35, 36, 37, 38 and 39 across multiple, consecutive years. From this dataset, the required values for EPEA and EGSS variables can be directly obtained for all required years. Furthermore, production accounts for individual years can also be easily obtained.

# Towards an integrated compilation of Germany's environmental-economic accounts

Table 16: Conceptual output table for EPEA/EGSS for NACE 35-39

NACE	Producer	Year	CEPA 2 variables	CEPA 3 variables	CEPA 4 variables	CRema 14 variables
35	Corp: secondary	2017	. . . . .	. . . . .	. . . . .	. . . . .
35	Corp: secondary	2018	. . . . .	. . . . .	. . . . .	. . . . .
35	Corp: secondary	2019	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
37	GG/NPISH	2017	. . . . .	. . . . .	. . . . .	. . . . .
37	GG/NPISH	2018	. . . . .	. . . . .	. . . . .	. . . . .
37	GG/NPISH	2019	. . . . .	. . . . .	. . . . .	. . . . .
37	Corp: specialist	2017	. . . . .	. . . . .	. . . . .	. . . . .
37	Corp: specialist	2018	. . . . .	. . . . .	. . . . .	. . . . .
37	Corp: specialist	2019	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
38	GG/NPISH	2017	. . . . .	. . . . .	. . . . .	. . . . .
38	GG/NPISH	2018	. . . . .	. . . . .	. . . . .	. . . . .
38	GG/NPISH	2019	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
.	.	.	. . . . .	. . . . .	. . . . .	. . . . .
39	Corp: specialist	2017	. . . . .	. . . . .	. . . . .	. . . . .
39	Corp: specialist	2018	. . . . .	. . . . .	. . . . .	. . . . .
39	Corp: specialist	2019	. . . . .	. . . . .	. . . . .	. . . . .
39	Corp: secondary	2017	. . . . .	. . . . .	. . . . .	. . . . .
39	Corp: secondary	2018	. . . . .	. . . . .	. . . . .	. . . . .
39	Corp: secondary	2019	. . . . .	. . . . .	. . . . .	. . . . .

Within the joint computation, market output (P.11) can be computed uniformly for specialist producers and secondary producers using data from the supply tables. Similarly, figures for employment and exports (P.6) can be derived uniformly as well using data from cost structure surveys and use tables respectively following the methods proposed in the EGSS practical guide (Eurostat, 2016).

Gross value added (GVA) is defined as a balancing item in the production account, i.e. “the difference between output and intermediate consumption” (ESA 2010, §9.06c). For specialist producers of the waste and wastewater services, i.e. the CPA product groups 37, 38.1+38.2, 38.3 and 39, the production accounts can be filled sufficiently to obtain GVA as the result of this identity in the environmental production account. For NACE 35 and 36 as secondary producers of waste and wastewater services, the data situation is however too insufficient to precisely compute the intermediate consumption for their market production of these services. Thus, GVA of NACE 35 and 36 associated with the production of waste and wastewater services has to be estimated following the methods proposed in the EGSS practical guide, i.e. based on the ratios between gross value added and output from national accounts applied to their respective output of these environmental protection services.

Going forward, we will continue to further develop and revise the integrated computation of EPEA and EGSS for CPA product groups 37, 38 and 39 in R for future data transmission by our section. And we will coordinate with the section for Environmental-Economic Statistics responsible for EGSS reporting to ensure coherence between the two modules on this matter and to keep track of upcoming changes in the EGSS compilation, such as the inclusion of R&D for environmental protection into the survey on EGSS, that would lead to EGSS being a suitable data source for certain EPEA variables. Additionally, we will also assess if and to what extent it will be feasible to implement other parts of the EPEA computation in R instead of Excel.

### 4.1.3 EPEA and ETEA

A potential link between EPEA and ETEA are environmental taxes whose revenue are used for the financing of environmental protection measures and hence would fall under earmarked taxes in EPEA, captured by the voluntary characteristics TAX\_EM\_PAY\_CORP and TAX\_EM\_PAY\_HH. The only environmental tax in ETEA for which this is currently the case in Germany are the auction revenues from the EU-ETS. These are earmarked for the federal climate and transformation fund KTF (Klima- und Transformationsgesetz - KTFG, 2010). Additionally, the law establishing the KTF authorises the allocation of its expenditure to several purposes including the promotion of investment in CO<sub>2</sub>-neutral mobility<sup>22</sup>. The programmes within the KTF serving this specific purpose mainly focus on electromobility, e.g. by providing subsidies and similar transfers for the purchase of electric vehicles or the installation of charging stations and other essential infrastructure for recharging electric road vehicles. These products and activities fall under CEPA 1 (and thus have an environmental protection purpose. The German auction revenues of the EU-ETS would therefore constitute an earmarked tax in accordance with the SEEA CF (§ 4.89) and the SNA 2008 and can be recorded as such in EPEA.

But as the expenditure of the KTF is only partially allocated to environmental protection purposes, the EU-ETS auction revenues can only be partially considered as an earmarked tax for EPEA. Because the KTF is also relevant for ESST, it is possible to estimate the share of ESST transferred by the KTF that are classified under CEPA, i.e. for environmental protection purposes. This share then could be used to estimate the share of the EU-ETS auction revenues relevant for EPEA as an earmarked tax for environmental protection.

In compiling the ESST in 2018 for working package 2, we identified ESST paid by the KTF for environmental protection purposes (CEPA 1) amounting to EUR 166 million, equivalent to 6.6 percent of the KTF's total expenditure in 2018 of EUR 2529 million. In ETEA, EU-ETS auction revenues for 2018 amounted to EUR 1505 million, of which 6.6 percent are equal to EUR 99 million.

22 The law establishing the KTF is the Klima- und Transformationsfondsgesetz (KTFG).

However, while it is possible to calculate an estimate for the EPEA characteristic TAX\_EM\_PAY\_CORP in this way with ESST and ETEA serving as inputs, the amount of 99 million € for 2018 should be considered a preliminary estimate. Firstly, because the compilation of EU-ETS auction revenues for EPEA is currently being revised. Secondly, the classification of identified ESST from the KTF to CEPA/CRoMA was not done on the level of the individual transfers, but on the level of the different programmes of the KTF and the corresponding budget items. With potentially more detailed information on individual transfers, we hope to be able to more precisely calculate the share of transfers from the KTF intended for environmental protection purposes in the future.

## 4.2 Physical and monetary environmental-economic accounts

### 4.2.1 Overview

Regarding the monetary environmental-economics accounts the focus for potential and existing overlaps with the physical environmental-economics accounts lies predominantly on ETEA. Regulation (EU) No 691/2011 defines an environmental tax as “a tax whose tax base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment, and which is identified in ESA as a tax”. Two of the tax bases covered by ETEA, energy and the greenhouse gases carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O) and perfluorocarbons (PFC) covered by the EU-ETS (European Union emission trading system) have a direct link to the physical environmental-economic accounts PEFA (Physical Energy Flow Accounts) and AEA (Air Emission Accounts). The former containing data for energy usage. The latter containing data for the volume of air emissions of the greenhouse gases covered by the EU-ETS.

### 4.2.2 Energy taxes in ETEA and PEFA

The current estimation process for energy taxes for ETEA is a mixed approach. Firstly, the overall tax revenues for the German energy tax (excluding electricity) and the electricity tax are sourced from the National Tax List (NTL) and used as benchmarks to ensure coherence between the NTL and the estimates for ETEA. Secondly, using data on the tax base, the use of energy by industries and households from PEFA, as well as information on tax rates and tax exemptions, the tax revenue per industry and for households is estimated. Thirdly, based on these estimates, the benchmark values from the NTL and national accounts data, the final allocation of the tax revenue is then carried out by the division for national accounts within the Federal Statistical Office. Lastly, taxes paid by non-residents are estimated and the data on tax revenue by industry and households is adjusted accordingly.

There are however significant deviations between the initial estimates based on the energy use data from PEFA and the final allocation of tax revenue done by the division for national accounts. Unfortunately, we are currently not privy to the allocation method use by the division for national accounts within the Federal Statistical Office. The figures for energy taxes in ETEA are likely consistent with the national accounts. But they cannot be considered consistent with PEFA as the deviations vary substantially across industries and energy products, even though data from PEFA serves as an input in the computation process. We are therefore considering a revision of the computation process for energy taxes still based on data on energy use from PEFA, but maintaining coherence between PEFA and ETEA in the process.

### 4.2.3 Revenues of the EU-ETS in ETEA and AEA

The EU-ETS in Germany is administrated by the German Emissions Trading Authority (DEHSt), which provides data on the auction revenues, the free emission allowances allocated per installation and the emissions per installation, the latter being the tax base of the EU-ETS. Moreover, the DEHSt data provides additional information to map the operators of individual installations to industries by NACE Rev. 2 A\*64 breakdown. As AEA report emissions of CO<sub>2</sub>, N<sub>2</sub>O and PFC by the same industry breakdown, data from the EU-ETS could be potentially used in the compilation process of PEFA.

Many of the activities covered by the EU-ETS, fall only under the EU-ETS if the installation exceeds a certain capacity threshold. Likewise, exemptions for certain type of flights are still in effect for aviation<sup>23</sup>. Additionally, the fact that some activities under the EU-ETS and NACE Rev. 2 A\*64 industries can be distinctly matched, does not imply that one of those activities is carried out exclusively by the respective industry. Thus, even for EU-ETS activities without a capacity threshold for installations that also distinctly match an industry<sup>24</sup>, it is unlikely that the emissions under the EU-ETS fully capture all emissions of that industry. Especially as industries are likely to cause emissions through secondary and ancillary activities as well. Figures for emissions captured by the EU-ETS should therefore in theory not exceed the corresponding emissions in AEA for the same industry and can therefore potentially serve as a lower limit for the estimation of emissions in AEA.

#### 4.2.4 Revenues of the national emissions trading system in ETEA and PEFA

In order to complement the EU-ETS, Germany introduced a national Emissions Trading System (nEHS) starting in 2021, covering CO<sub>2</sub> emissions from the combustion of fuels for heating and transport. As the resulting auction revenues of the nEHS constitute an environmental tax, they have to be reported in ETEA under 'other CO<sub>2</sub> taxes' in the upcoming 2023 ETEA data collection.

Within the framework for ETEA, the tax payer of an environmental tax is not the unit paying the tax, but the unit using the tax base or carrying out the activity that is taxed (Eurostat, 2013). Which for revenues from emission trading systems would be the unit emitting the greenhouse gases. For the EU-ETS, it is the operator of an installation or airplane who is also the unit required to surrender the necessary emission allowances. The allocation of tax revenue from the EU-ETS to a NACE Rev. 2 A\*64 industries for ETEA is therefore straightforward as the operator's NACE code is obtainable from the German Statistical Business Register.

For the nEHS however, the unit required to surrender emission allowances is the distributor of the fuels whose combustion by the end user is causing the emissions. The tax payer in the sense of ETEA is therefore not the distributor but the end user who is unknown. This difference is of significance for the allocation of the tax revenue from the nEHS to industries, households and non-residents which, as a result, has to be based on additional information.

We are currently in the process of developing a reporting framework for the tax revenue of the nEHS as an 'other CO<sub>2</sub> tax' in ETEA for the 2023 data collection. A potential data source that we are considering for the allocation of the tax revenues is PEFA. More specifically, Table C of the PEFA questionnaire – 'Physical use table of emission-relevant use of energy flows (related to fuel combustion)' that allocates the use of energy products for combustion to either industries broken down by NACE Rev. 2 A\*64 industries, households or non-residents. But it is as of yet unclear, if it is ultimately suitable as an input for the estimation and whether we will use it as such.

23 See: Regulation (EU) 2017/2392 of the European Parliament and of the Council of 13 December 2017.

24 For example, the activities 'refining of mineral oil' and 'production of coke' have no capacity threshold and distinctly match with NACE 19 (Manufacture of coke and refined petroleum products).

### 5 Conclusion and outlook

In this project, we developed a reporting framework for ESST in preparation for the upcoming amendment of Regulation (EU) No. 691/2011 and in light of the increasing importance of environmental and climate change topics for the political, societal and economical discourses.

By testing the reporting framework for the reference year 2018, it has become evident that a comprehensive, reliable and valid compilation of ESST for a large, federal country like Germany is immensely time-consuming. We will therefore refine the reporting framework to ensure the timely compilation of ESST on an annual basis with the available personnel capacity in our section.

This will potentially entail the switch from the keyword search approach, which was the most time-consuming part of the project, to an automated process for the identification of potential ESST. The results and findings of the keyword search might prove very helpful in that regard as a means to test such an automated process. This might also enable us to manually inspect more budget items and thereby lowering the corresponding threshold, and to allocate more time to desk research, and procurements and analysis of additional information and data sources for the classification of ESST to further improve the accuracy of the data. Additionally, we will likely allocate more time to the classification of ESST on the federal level as it accounts for roughly three quarters of the ESST by the general government in 2018.

Given the limited time available for work on a reporting framework for PEDS, there is the potential to further improve the developed concept and the compilation of PEDS for Germany. It would be particularly helpful to have a clear and internationally agreed upon definition, preferably as part of the SEEA Central Framework. This also applies for a methodology with regard to tax abatements. We therefore welcome the recent efforts by Eurostat and within the MESA (Monetary environmental statistics and accounts) working group to establish a common methodological and practical approach with respect to implicit transfers such as tax abatements as well as other support measures for PEDS.

As mentioned in section 3.6, the amounts for each respective PEDS and tax abatement presented in this report are largely sourced from publications by ministries or other government agencies or were identified in an analysis of the federal budget. They were therefore not computed as part of a reporting framework in accordance with SNA 2008 in contrast to the developed framework for ESST. Developing such a reporting framework, including the procurement of data and computational methods, as well as compiling and reporting the data on a regular basis, would require a substantial amount of time and resources, especially for explicit transfers.

The reporting framework and computation processes for ESST were developed in such a way to facilitate the compilation of transfer for both ESST and EPEA. We also developed in R a technical implementation of an automated, joint estimation process of EPEA and EGSS with respect to the production of waste and wastewater services by the industries NACE D (Electricity, gas, steam and air conditioning supply) and NACE E (Water supply; sewerage; waste management and remediations activities). Based on the viability of this implementation in R, we will examine if and what other parts of the EPEA computation could be moved from Excel to R as well.

For other identified overlaps between environmental-economic accounts modules, we decided to not yet implement the findings in our current production systems as these overlaps were identified for either upcoming or potential internal revisions of and extension to the established computation processes for the environmental-economic accounts. We will however take them into account for these future tasks.

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