EUROPEAN COMMISSION
EUROSTAT

Directorate E: Sectoral and regional statistics
Unit E-2: Environmental statistics and accounts; sustainable development

Physical energy flow accounts (PEFA)

Eurostat

London Group on Environmental Accounting

Meeting of 17 to 20 October 2017
Costa Rica

***Abstract**: Physical energy flow accounts (PEFA) record the flows of energy (in terajoules) from the environment to the economy (natural inputs), within the economy (products), and from the economy back to the environment (residuals). Since 2014 Eurostat has been collecting PEFA from European countries on a voluntary basis. In 2017 provision will become mandatory to national statistical institutes of the EU (see Annex VI of Regulation (EU) 691/2011 consolidated version). The methodologically harmonised European PEFA are based on the physical accounting framework outlined in SEEA-CF. At the core of the European PEFA stands a pair of physical supply and use tables.*

This paper will present 'lessons learnt'. It will introduce the comprehensive European annual PEFA questionnaire which consists of seven tables. Eurostat provides an IT-tool ('PEFA-builder') facilitating the compilation of PEFA starting from energy statistics (IEA/Eurostat annual questionnaires) which will be briefly explained.

1 Introduction

The development of SEEA-type energy accounts in the European Statistical System (ESS) began in 2009.[1] It was agreed to start with physical energy flow accounts (PEFA). A comprehensive questionnaire based on a full-fledged scheme of physical supply and use tables was developed by a task force. It was tested in three voluntary annual data collection cycles since 2014. Testing revealed a number of conceptual issues for clarification. Based on Regulation (EU) No 691/2011 - Annex VI the first mandatory data collection has been launched in June 2017.

Eurostat has developed IT tools that facilitate the compilation of PEFA by national statistical offices. The tools process available energy statistics (five IEA/Eurostat annual questionnaires) as far as feasible to populate the PEFA-questionnaire; additional information needs to be added by the PEFA compilers (such as e.g. on road transport, industry detailing, 'autoproducers').

The policy use and the value added of PEFA compared to energy statistics still has to be exploited. After only three voluntary data collection cycles it is too early to evaluate the cost-benefit of PEFA.

The members of the London Group meeting are kindly asked to:

- **be informed of the implementation of energy accounts (=PEFA) in the European Statistical System (see chapter 2);**
- **comment on the rethought of the policy use of PEFA and its value added compared to energy statistics (see section 3.2);**
- **comment on and propose further indicators derivable from PEFA (see section 3.2).**

[1] The ESS is the network of Eurostat and the producers of official statistics in the EU Member States and other European countries associated.

2 Implementing SEEA type energy accounts in Europe

2.1 Priority on flow accounts in physical units

The development and implementation of SEEA-type energy accounts by the European Statistical System (ESS) was triggered by the 2008 revision of the European Strategy on Environmental Accounts (ESEA 2008). This was a strategic work plan to develop environmental accounts in Europe during the period 2008-2013. In 2009 the Eurostat Working Group on Environmental Accounts created a reflection group who developed a discussion paper listing important conceptual and methodological issues for clarification. This paved the way for a series of task force meetings (6-7 May 2010, 7 June 2011, 28 March 2012, 18 February 2014).

The SEEA Central Framework as well as the draft SEEA Energy cover a wide range of 'energy accounts' (flows, stocks, monetary, physical) and obviously priorities had to be set as regards the implementation in Europe. The following main conclusions were agreed at the beginning of the implementation process:

- The main policy use of Energy Accounts is to integrate them with economic data and to feed them into environmentally extended macro-economic models enabling various analyses (e.g. 'energy footprints', decomposition analyses e.g. including air emissions accounts).
- The European Statistical System (ESS) shall first develop methodologies and standards for physical energy flow accounts (PEFA), thereby taking into account potential compatibility aspects towards monetary energy flow accounts.
- All methodological developments shall align as far as possible with and make use of terms and definitions as already developed in international statistical guidelines (such as e.g. International Recommendations for Energy Statistics (IRES), national accounts, SEEA etc.).
- The classification of energy flows (commodities) shall be aligned with international initiatives (IRES and SEEA-E) and make use of the SEEA generic distinction into:
  (i) energy natural inputs,
  (ii) energy products,
  (iii) energy residuals.
- For energy products the existing classification as applied in energy statistics (IEA, Eurostat, IRES) shall be taken into consideration as well as the standard classification for economic products (CPC, CPA) and the product classifications employed in trade statistics (HS/CN).
- The classification of activities shall make use of standard classifications for economic activities (i.e. NACE, the European version of ISIC); with a minimum breakdown level which is the very same breakdown level as employed by Eurostat's monetary input-output tables (NACE rev 1.1: A*60; NACE rev 2: A*64). As regards the use table, in addition to intermediate uses by NACE industries final uses are to be included as well (e.g. final use by households, gross fixed capital formation, stock changes, final use by rest of the world, etc.). Further, it has to be investigated in how far 'bridging items' need to be added comparing to key indicators used in energy statistics (for example, *gross inland energy consumption*).

2.2 PEFA questionnaire

The task force developed a set of questionnaire tables. It was agreed to implement a fully articulated physical supply and use table (PSUT) scheme with several layers. The first PEFA questionnaire (2014) included 5 tables. Since 2016, the PEFA questionnaire has 7 tables[2] which are briefly described below (see scheme in Figure 1 for lettering of the sub-matrices referred to in the following descriptions). Regulation (EU) No 691/2011 - Annex VI forms the legal base for PEFA. This legal base, adopted in 2014, stipulates that the first mandatory transmission will take place in 2017. However the PEFA questionnaire also collects information which is not in the Regulation, i.e. is not mandatory. Notably, tables B.1, B.2 and D of the PEFA questionnaire are not under legal coverage. The most recent version of the PEFA questionnaire is available on Eurostat's website.

Table A - Physical supply table for energy flows

This table records the supply of energy flows (row-wise) by supplier (column-wise). By definition, natural energy inputs can only be provided (supplied) by the environment (sub-matrix A). Energy products (incl. sale of recycled and reused products) are provided by domestic industries (sub-matrix C) and the rest of the world, i.e. imports (sub-matrix D). Energy residuals result from activities by industries (sub-matrix I) and households (sub-matrix J). Accumulation also supplies energy residuals in form of storage losses, waste and (end-of-life) products incorporating energy (sub-matrix K). Energy residuals in form of waste for energetic uses may also be imported from the rest of the world (sub-matrix L).

Table B - Physical use table for energy flows

This table records the use of energy flows (row-wise) by user (column-wise). It is automatically calculated through the sum of sub-tables B.1 and B.2. Natural energy inputs are used, i.e. extracted, by industries only (sub-matrix B). If households should extract, these flows have to be recorded under the respective industry column typically extracting this type of natural energy input. Energy products are used by industries (sub-matrix E) as intermediate use, households (sub-matrix F) as final consumption, accumulation (sub-matrix G) as net inventory changes, and rest of the world (sub-matrix H) as exports. Energy residuals are used by the environment (sub-matrix Q), i.e. absorption of energy residuals in form of losses and dissipative heat. The accumulation column (sub-matrix O) records the 'storage' of energy amounts incorporated in products for non-energy purposes (e.g. plastic products). Certain industries use energy residuals (sub-matrix N), i.e. waste. In seldom cases, households may also use waste as an energy source. Energy residuals in form of waste for energetic purposes may also be exported to the rest of the world (sub-matrix P).

Table B.1 - Transformation use of energy flows (added in 2016, not under legal coverage)

Table B.1 is a sub-table of Table B and records the transformation use of energy flows (row-wise) by user (column-wise). The concept of 'transformation' derives from energy statistics where it denotes the transformation of primary and secondary energy products into other secondary energy products. Basically energy statistics define transformation through a selection of processes (see e.g. IRES paras. 5.2 – 5.8). PEFA Table B.1 is supposed to record the use of energy products and energy residuals which falls under the transformation concept as defined in energy statistics. Table B.1 records the use of energy products by industries (sub-matrix E.trans) to create other so-called secondary energy products. Further,

[2] At its 2016 meeting, the Working Group on Environmental Accounts agreed to split Table B into B.1 and B.2.

transformation use includes the use of certain energy residuals, namely waste, to produce electricity and heat (sub-matrix N.trans).

The scope of Table B.1 goes beyond the transformation concept as defined in energy statistics as it also includes the use of natural energy inputs (sub-matrix B.trans) which are extracted from nature to create energy products. The transformation from natural energy inputs into energy products is not explicitly recorded/presented in energy statistics. Another specific feature of PEFA Table B.1 is sub-matrix Q.trans which by convention records the uptake of transformation losses by the environment. Like this transformation losses can be separated from other losses in the PEFA framework.

Table B.2 - End use of energy flows (including non-energy use) (added in 2016, not under legal coverage)

Table B.2 is a sub-table of Table B and records the end use of energy flows (row-wise) by user (column-wise). The concept of end use (introduced by SEEA) is similar to the concept of final consumption in energy statistics (see e.g. IRES paras. 5.2 – 5.8). It denotes the 'last' transformation-stage of energy by which humans make use of the energy content and before the energy content becomes unavailable for further anthropogenic use. It notably also includes what is termed non-energy use in energy statistics. This is the case where the energy content of e.g. naphtha is stored in products such as plastics and becomes – temporarily – unavailable for anthropogenic use.

End use as recorded in PEFA Table B.2 includes energy and non-energy use of energy products by industries (sub-matrix E.end), households (sub-matrix F.end), accumulation (sub-matrix G.emd), and rest of the world (sub-matrix H.end). Notably, it includes the 'non-transformative' uses of energy products in the so-called energy sector which support the transformation activities. End use further includes the use of energy residuals by industries (sub-matrix N.end), accumulation (sub-matrix O.end), and the environment (sub-matrix Q.end). In seldom cases also households may use waste as an energy source. Sub-matrix Q.end records the uptake of end use losses by the environment.

Table C - Physical use table of emission-relevant use of energy flows (related to fuel combustion)

This table records the emission-relevant use of energy flows (row-wise) by user (column-wise). Notably, it includes only fuel combustion related use of energy flows. It relates to emissions resulting from use of energy products for combustion in production and consumption activities of industries and households (sub-matrices E.er and F.er). There are a few cases where the use of natural energy inputs may be emission-relevant also (B.er), namely the flaring of natural gas. The use of energy residuals may be emission-relevant (N.er), namely in the case of using waste for energy recovery.

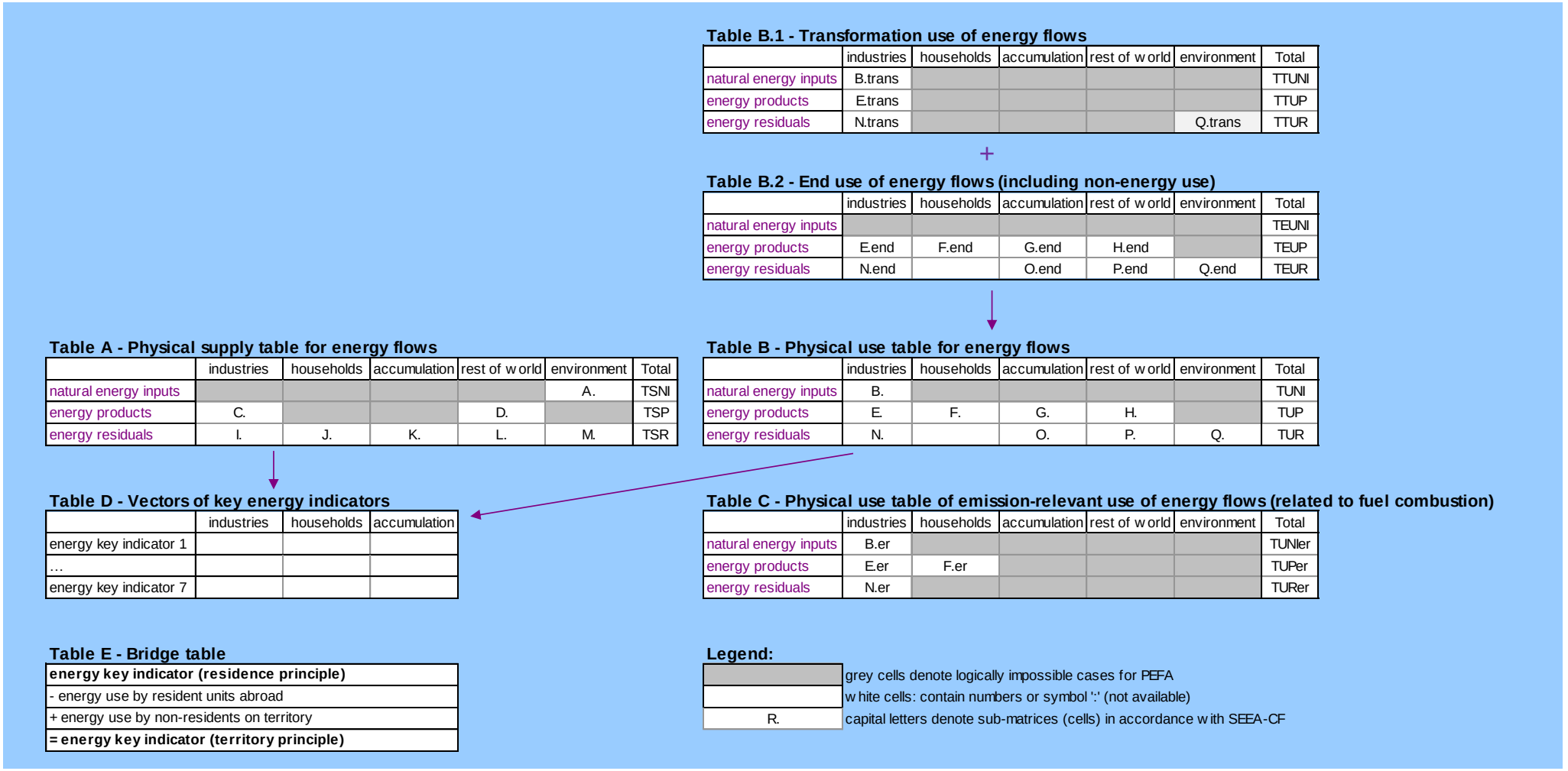
Table D - Vectors of key energy indicators (not under legal coverage)

This table contains vectors of key energy indicators in a breakdown by production, consumption and accumulation. It is automatically calculated from tables A and B. See also section 3.2 further below for a discussion of PEFA indicators.

Table E - Bridge table

This table shows the reconciliation or 'bridge' from the key energy indicator derived from PEFA (residence principle) towards the energy statistics key indicator (territory principle). Note: this table reports for the entire national economy (no column-wise breakdown).

Figure 1: Set of tables in PEFA questionnaire 2017



Remarks on the classification of rows in PEFA Tables A, B, and C

The classification of rows, i.e. definition of groupings of physical flows[3], in the physical supply and use tables (PEFA Tables A, B, and C), is provided in Annex 1. It distinguishes 31 items. This classification deserves some further explanations. Several challenges had to be met.

According to the SEEA three generic types of physical flows need to be distinguished in physical supply and use tables: (i) natural inputs, (ii) products, and (iii) residuals. One pre-requisite when developing PEFA was to employ as far as possible existing classifications. For (i) and (iii) no classifications existed. For (ii) several classifications exist, inter alia CPA[4] and SIEC[5]. A PEFA classification of (ii) would ideally be compatible to both. However, a two-sided compatibility is only feasible on a detailed level of ca. 70 energy commodity classes as employed in the IEA/Eurostat annual questionnaires (AQ). Each of the energy commodities in the AQ can be linked to a CPA-2-digit division and to a SIEC code. The PEFA-Builder (see section 2.4) actually works at this detailed level.

However, when drafting and negotiating the legal base for PEFA, countries did not accept the deep detail of ca. 70 energy commodities and a compromise was worked out which distinguishes 20 groups of energy products (ii). Obviously, these 20 are an aggregation of the more detailed ca. 70 energy commodities as employed in the AQ. Unfortunately the two-fold compatibility towards CPA and SIEC could not be fully maintained for these 20 groupings.

The development of classifications for natural energy inputs (i) and energy residuals (iii) was less constrained. A compromise of seven classes of natural energy inputs was agreed, whereby the distinction between renewable and non-renewable played a major role. Four classes of energy residual were agreed. Notably waste was assigned to this physical flow-type. Again, the PEFA-Builder operates more detailed classification levels for (i) and (iii).

Remarks on the classification of columns in PEFA Tables A, B, C and D

The columns distinguish production activities (further broken down by NACE rev.2 A*64), three household activities, and one column each for accumulation (changes in inventories and produced assets), the rest of the world, and the environment.

2.3 PEFA guidelines

A draft PEFA manual was published with the occasion of the first voluntary data collection in May 2014. It was designed to provide methodological guidance for compiling the 2014 PEFA questionnaire.

Since 2014, the PEFA questionnaire has changed slightly and a number of methodological and conceptual issues were identified and discussed in the Eurostat Working Group meetings in 2015, 2016 and 2017. Certain methodological and conceptual issue were changed; others have been specified more clearly and in more detail.

[3] The SEEA-term physical flow denotes the flow of material or energy from process A to process B; whereby process can be transformation and accumulation. In energy statistics the term energy flow denotes rather a process and not the flow of energy between two processes!

[4] Statistical classification of products by activity (CPA)

[5] Standard International Energy Product Classification (see chapter 3 in IRES)

The respective WG documents – discussed at the meetings in 2015, 2016 and 2017 – provide further insights (see Annex 1). These conceptual and methodological changes have been summarised in a document called 'PEFA guidelines for data collection 2017'.

The draft 2014 PEFA Manual and the 2017 PEFA guidelines are available on Eurostat's website. Eurostat intends to publish a revised version of the PEFA Manual in the next months.

In the course of implementing PEFA, a number of conceptual and methodological issues (going beyond what had been specified in SEEA-CF and SEEA-Energy) could be clarified and further specified; examples are:

- specifying recording conventions for nuclear energy;
- specifying recording conventions for biomass based energy flows;
- specifying recording conventions for biofuels versus conventional fossil fuels;
- specifying emission-relevant energy use;
- etc.

2.4 PEFA IT tools

In order to support countries in compiling PEFA, Eurostat developed several IT tools. The so-called PEFA tools include the following modules: *Definition Builder*, *Definition Builder for table C*, *PEFA NACE Breakdown*, and the *PEFA Builder*. The PEFA tools were developed as Excel workbooks.

The PEFA-tools process already existing energy statistics. Point of departure are flatfiles exported from the five Annual Questionnaires on energy statistics (AQ), jointly operated by the International Energy Agency (IEA) and Eurostat (abbreviated AQ in the following). These 5 AQs are based on the so-called Energy Statistics Regulation[6] and mandatorily available in all EU Member States.

In brief, the *PEFA-builder* imports data from the annual energy questionnaires and, after a series of calculations and data transformations, assigns the processed values to the respective table in the PEFA framework. The resulting physical supply and use tables represent approximately PEFA tables A, B.1, B.2 and C but are actually more detailed in the classification of rows and columns. An additional module on transport has been developed for undertaking auxiliary calculations, allowing to make the necessary resident adjustment and to obtain the bridging items necessary for table E.

Another module evolved into a separate tool: *PEFA NACE Breakdown*. In here, additional data is asked to the user, in order to improve the level of industry detailing (in NACE rev.2 classification).

Given the complexity of the mapping between the 5 AQs and the PEFA questionnaire, two additional tools were developed, which help to assign the source figures to the correct cells in the PEFA questionnaire: *Definition Builder* and *Definition Builder for table C*.

The PEFA tools (a zip.file including the *PEFA-Builder* and other files) are available on Eurostat's website.

The PEFA tools are complex and can be used only by statistical experts who have a good knowledge of energy statistics and energy accounts. Significant additional information –

[6] Regulation (EC) No 1099/2008

going beyond what is implicit to the 5 AQs – needs to be provided (e.g. on so-called 'autoproducers' of electricity and heat, or the differentiated use of transport fuels by industries and households).

The development of the PEFA tools has been complex and costly. However, Eurostat considers it as an important investment as it significantly contributes to the comparability of PEFA results across countries and time. In addition, Eurostat may use it in the future for data validation and gap-filling.

2.5 Data collection, validation and publication

Since 2014, Eurostat has undertaken three voluntary data collection cycles, in order to support countries in preparing for the legal transmissions. From the Eurostat side, preparatory work was mainly for testing the PEFA questionnaires and tools. About half of the ESS countries participated. The tests revealed many valuable observations and suggestions that resulted in improvements of the PEFA questionnaire and tools. PEFA results have been published since 2015, however it was not feasible to estimate PEFA for the aggregated EU yet.

In 2017 the first mandatory data collection cycle has been launched. Milestones of the data collection cycles since 2014 are presented in .

3 Conclusions – preliminary 'lessons learnt' from implementing PEFA in Europe

In the following the authors present some preliminary 'lessons learnt' from the implementation of PEFA in Europe.

3.1 Implementation took more time and resources as expected, PEFA production is going to mature towards routine

The implementation of PEFA in the European Statistical System (ESS) started in 2009. It took 8 years until the first mandatory data collection was launched. The implementation took longer than one might have expected – notably monetary energy accounts still need to be developed. Significant resources were necessary in both Eurostat and the European NSIs. More than 1 million EUR were invested in capacity building at NSI-level (via so-called grant agreements).

Compiling PEFA seems heavier than other physical environmental accounts such as economy-wide material flow accounts or air emission accounts. The full-fledged PSUT accounting framework (double entry book keeping) combined with the entropy law (energy cannot be destroyed; it only changes forms) is intellectually certainly more challenging. Many energy flows are recorded several times in the PSUT framework. PEFA compilers require sufficient training until a reasonable knowledge level is archived.

A number of conceptual and methodological issues – going beyond the guidelines provided in SEEA-CF and SEEA-Energy – came up during implementation phase (see Working Group papers). Those issues had to be analysed, discussed, and recording conventions had to be agreed.

The development of the PEFA-tools has been a challenging and costly task too while at the same time it is not clear how many NSI are or will use these IT tools. Technical solutions for implementing certain requirements in EXCEL had to be found. Mapping the items of the 5 AQ to the PSUT framework is an intellectual challenge. A separate tool was developed which facilitates this mapping (so-called DefinitionBuilder). This tool will make it easier to adapt to future revisions of the 5AQs.

It is expected that most ESS countries will report in 2017. Based on past experiences, it is assumed that quality will improve gradually over the years. It will certainly take further years until PEFA will become a routine production process with high quality data. Next steps at the side of Eurostat are:

- estimate PEFA for the aggregated EU;
- calculate 'energy footprints' (tool is already available);
- integrate PEFA with air emissions accounts and monetary SUTs (e.g. structural decomposition analyses);
- start implementing monetary energy accounts (e.g. supply and use of energy products as classified in PEFA, i.e. 20 products), if wanted.

3.2 Sharpening the policy use and value added of PEFA

PEFA data and derived indicators have not been applied much, so far. Once PEFA are available (in particular for the aggregated EU) Eurostat intents to encourage and promote its application. The potentials of PEFA need to be pointed out more prominently. Illustrative examples may serve as a powerful means to do so.

Currently, energy and climate policy making can widely be informed by energy statistics

Currently, international energy statistics – implemented already since the 1980s – widely inform policy making. Virtually all policy targets in the domains of energy and climate are based on indicators derived from energy statistics. What is the value added of PEFA in this context?

Theoretically, the potential of PEFA lies in the integration with macro-economic accounts (e.g. monetary supply and use tables) and other environmental accounts (e.g. air emissions accounts, environmental taxes).

The PEFA questionnaire offers various parts/elements that could potentially be used for such integrated analyses.

There are the basic physical supply and use tables as such (i.e. PEFA Tables A and B). Unfortunately they cannot be 'mapped' one-to-one with the monetary supply and use tables because of different row-classifications. The monetary SUT employs CPA whereas PEFA uses its own specific classification of energy products (see **Error! Reference source not found.**). Therefore, a straight mapping – e.g. to determine unit prices – is not feasible.

However Tables A and B could be added as external extensions to a monetary input-output model to analyse impacts of changes in the final use. Changes in the final use have consequences on the supply and use of natural energy inputs and energy products.

Structural decomposition analyses are another potential integration of PEFA and monetary accounts (see paragraphs further below).

PEFA can also be related to air emissions accounts (AEA). PEFA Table C 'emission relevant use' can be employed to compile AEA. Table C shows the emission relevant use of some 20 energy products. These could be multiplied with fuel specific emission coefficients, or at least be used to derive a distribution key to assign emissions to individual production activities (NACE industries) and private households.

Tables A and B (and to a certain extend Table C) are means to coherently derive certain aggregated vectors which then can be integrated and analysed with other accounting data. Table D includes some possible vectors. Those indicators (vectors) represent one main value added of PEFA (see further below). Estimating 'energy footprints' is one obvious applications of PEFA where the *net domestic energy use* (indicator 6 in PEFA Table E) is added to a monetary input-output model.

The value added of PEFA – further discussion needed on the potential of PEFA indicators

Table D of the PEFA questionnaire provides seven indicators; those are not exhaustive. Schenau (2013) presents a systematic overview of a wide range of indicators/aggregates derivable from PEFA. Schenau (2013) distinguishes (1) indicators for the total economy, (2) indicators for individual industries and households, and (3) indicators for individual energy commodities. Indicators for the whole economy (1) and for individual energy commodities (3) are also provided by energy statistics, although not for the residence principle. Indicators for individual industries (2) seem to form actually the main value added of PEFA.

Further, Schenau (2013) distinguishes indicators (a) directly derived from PEFA Tables, (b) derived by combining aggregates, and (c) combining physical and monetary data (= ratios).

The most interesting PEFA indicator (vector) is obviously *net domestic energy use*. It shows the end use of energy by resident production activities (NACE industries) and private households. End use means that the respective energy is not available any longer for anthropogenic use in the respective accounting period. The net domestic energy use at economy-wide level (sum over all production activities and private households) is the key PEFA energy indicator and the residence-principle correspondent to the energy statistics' key indicator *gross inland energy consumption* (called *primary energy supply* by IEA).

Potentially, there are more relevant indicators suited to inform policy making. Further discussions are needed which PEFA indicators (vectors) could offer added value beyond existing indicators derivable from energy statistics.

Structural decomposition analysis – an example for integrated environmental-economic application

Structural decomposition analyses may form another valuable application of PEFA data (vectors). One simple application would add the net *domestic energy use* vector (= PEFA Table D – indicator 6) to a monetary input-output model in order to analyse the drivers of the development of 'energy footprints'.

More sophisticated designs of structural decomposition analyses would integrate PEFA, AEA and monetary input-output tables in order to investigate and quantify the drivers of changes in 'emission footprints'.

4 References and further readings

4.1 Guidelines and other references

System of Environmental-Economic Accounting 2012: Central Framework - final, official publication 2014 (SEEA2012-CF): https://unstats.un.org/unsd/envaccounting/seearev/

System of Environmental-Economic Accounting for Energy (SEEA-Energy): draft version tabled as background document at the 11th meeting of the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) on 22 - 24 June 2016. See also http://unstats.un.org/unsd/envaccounting/energy.asp.

System of Environmental-Economic Accounting 2012: Applications and Extensions - white cover publication 2014 (SEEA2012-AE): https://unstats.un.org/unsd/envaccounting/seearev/

System of National Accounts 2008 (SNA2008): http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf see also http://unstats.un.org/unsd/nationalaccount/sna.asp

European System of Accounts (ESA2010): final version see also http://ec.europa.eu/eurostat/web/esa-2010/overview

Eurostat Manual for Supply, Use and Input-Output Tables. see also http://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/overview

Eurostat (2014): Physical energy flow accounts (PEFA) – Manual 2014 (draft), Luxembourg

International Recommendations for Energy Statistics (IRES): White cover version adopted by the United Nations Statistical Commission at its 42nd session on 22 to 25 February 2011. Including the Standard International Energy Product Classification (SIEC)

Energy Statistics Compilers Manual (ESCM): see also http://unstats.un.org/unsd/energy/ESCM.htm

OECD/IEA/Eurostat (2005): Energy Statistics Manual. IEA, Paris. http://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/NRG-2004

IEA/Eurostat/UNECE: Annual Energy Questionnaires & reporting instructions

Eurostat (2017): PEFA guidelines for data collection 2017, Luxembourg

Schenau, S. (2013): Compilation of physical energy flow accounts (PEFA) for the Netherlands. Final report under Grant Agreement no. 50904.2011.005-2011.299, Den Haag (CBS)

United Nations, European Union, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, World Bank (2014): System of Environmental-Economic Accounting – Central Framework (SEEA – CF). New York

4.2 Working Group documents

Eurostat (2011): Energy Accounts: Progress and work planned (ENV/ACC/WG/06 (2011)). Working Group on Environmental Accounts, meeting of 28 and 29 March 2011

Eurostat (2012): Physical Energy Flow Accounts (ENV/ACC/WG/06 (2012)). Working Group on Environmental Accounts, meeting of 26 and 27 March 2012

Eurostat (2013): Energy Accounts: Progress and work planned (ENV/ACC/WG/05 (2013)). Working Group on Environmental Accounts, meeting of 19 and 20 March 2013

Eurostat (2014): Physical Energy Flow Accounts (PEFA) (ENV/ACC/WG/05(2014)). Working Group on Environmental Accounts, meeting of 19 and 20 February 2014

Eurostat (2015): Physical Energy Flow Accounts (PEFA) (ENV/ACC/WG/05(2015)). Working Group on Environmental Accounts, meeting of 9 and 10 March 2015

Eurostat (2016): Physical energy flow accounts (PEFA): clarification of technical and methodological issues (ENV/ACC/WG/1.3(2016)). Working Group on Environmental Accounts, meeting of 13 and 14 April 2016

Eurostat (2016): Physical energy flow accounts (PEFA): data production and dissemination (ENV/ACC/WG/1.1(2016)). Working Group on Environmental Accounts, meeting of 13 and 14 April 2016

4.3 London Group documents

21st Meeting of the London Group on Environmental Accounting 2-4 November, The Hague, Netherlands

LG/21/2	Energy and emissions handbooks: lessons learned
LG/21/2	Energy- and Air Emission Accounts in Sweden
LG/21/2	Energy accounts from international databases
LG/21/2	Employment in renewable energy activities

19th Meeting of the London Group on Environmental Accounting 12 - 14 November 2013, London, UK

LG/19/2	Consumption based Accounting and Energy and Climate Policy - Presentation (John Barrett, University of Leeds, Keynote Address)
LG/19/12	State of debate note on the energy account (Kristine Kolhus and others)
LG/19/12	Energy Accounting: Session Outline
LG/19/12	Draft proposed core tables for energy (Alessandra Alfieri and Sokol Vako, UNSD)
LG/19/12	Draft proposed core tables for energy - Presentation (Alessandra Alfieri and Sokol Vako, UNSD)
LG/19/12	Indicators from the physical energy flow accounts (PEFA) - Presentation (Sjoerd Schenau, Statistics Netherlands)
LG/19/12	The Energy Statistics Compilers Manual - with focus on energy accounts - Presentation (Kristine Kolshus, Statistics Norway)
LG/19/12	Energy Flow Accounts of Germany: Application (Helmut Mayer, DESTATIS, Presentation)
LG/19/12	Physical Energy Flow Accounts - Training Materials (Helmut Mayer, DESTATIS, Presentation)

18th Meeting of the London Group on Environmental Accounting 2 - 4 October 2012, Ottawa, Canada

LG/18/20	Draft of SEEA-Energy (UNSD)
LG/18/23	Drafting process of the Energy Statistics Compilers Manual (ESCM) prior to, during

and after the 7th Oslo Group meeting - some guidelines (Oslo Group)

LG/18/p20	The System of Environmental-Economic Accounting for Energy (SEEA-Energy) (Alessandra Alfieri)
LG/18/p21	Overview of the Canadian Energy Flow Account (Cindy Lecavalier)
LG/18/p22	Energy Accounts in the European Statistical System (ESS) - state of the art (Anton Steurer)
LG/18/p23	Energy Statistics Compilers Manual (ESCM) (Julie Hass)

17th Meeting of the London Group on Environmental Accounting 12 - 15 September 2011, Stockholm, Sweden

LG/17/bk10.2 Process and outline for the Energy Statistics Compilers Manual

15th Meeting of the London Group on Environmental Accounting 30 November - 4 December 2009, Wiesbaden, Germany

LG/15/1 Issue paper on classification of physical flows (UNSD)

14th Meeting of the London Group on Environmental Accounting 27-30 April 2009, Canberra, Australia

14th London Group Meeting: SEEA classifications of energy resources (Ole Gravgård, Statistics Denmark):
http://unstats.un.org/unsd/envaccounting/londongroup/meeting14/LG14_8a.pdf
14th London Group Meeting: Renewable energy resources in the SEEA (Maarten van Rossum, Mark de Haan and Sjoerd Schenau, Statistics Netherlands):
http://unstats.un.org/unsd/envaccounting/londongroup/meeting14/LG14_7a.pdf

13th Meeting of the London Group on Environmental Accounting 29 September - 3 October 2008, Brussels, Belgium

LG/13/8	A Suggestion for SEEA Standard Tables on Energy (Ole Gravgard, Statistics Denmark)
LG/13/9	A suggestion for SEEA energy bridge tables - The link between energy statistics, energy balances and energy accounts (Ole Gravgard, Statistics Denmark)
LG/13/10	A suggestion for SEEA classifications of energy resources (Ole Gravgard, Statistics Denmark)
LG/13/12	Definition of primary and secondary energy (Sara Øvergaard, Statistics Norway)
LG/13/13	Renewable vs. non-renewable energy sources, forms and technologies (A.Gritsevskyi, IAEA)

Annex 1: Classification of rows in PEFA supply and use tables

N00	**NATURAL ENERGY INPUTS**
N01	Fossil non-renewable natural energy inputs
N02	Nuclear non-renewable natural energy inputs
N03	Hydro based renewable natural energy inputs
N04	Wind based renewable natural energy inputs
N05	Solar based renewable natural energy inputs
N06	Biomass based renewable natural energy inputs
N07	Other renewable natural energy inputs
P00	**ENERGY PRODUCTS**
P08	Hard coal
P09	Brown coal and peat
P10	Derived gases (= manufactured gases excl. biogas)
P11	Secondary coal products (coke, coal tar, patent fuel, BKB and peat products)
P12	Crude oil, NGL, and other hydrocarbons (excl. bio)
P13	Natural gas (without bio)
P14	Motor spirit (without bio)
P15	Kerosenes and jet fuels (without bio)
P16	Naphtha
P17	Transport diesel (without bio)
P18	Heating and other gasoil (without bio)
P19	Residual fuel oil
P20	Refinery gas, ethane and LPG
P21	Other petroleum products incl. additives/oxygenates and refinery feedstocks
P22	Nuclear fuel
P23	Wood, wood waste and other solid biomass, charcoal
P24	Liquid biofuels
P25	Biogas
P26	Electrical energy
P27	Heat
R00	**ENERGY RESIDUALS**
R28	Renewable waste
R29	Non-renewable waste
R30	Energy losses all kinds of (during extraction, distribution, storage and transformation, and dissipative heat from end use)
R31	Energy incorporated in products for non-energy use

Annex 2: Milestones of PEFA data collections since 2014

2014 cycle (testing):

- The 2014 PEFA questionnaire (first voluntary data collection cycle) was launched 16 May 2014 with a reporting deadline 15 December 2014. PEFA Manual (draft) was disseminated as well in May 2014.
- PEFA builder (version 1.0) was made available on 5 September 2014.
- Seven countries replied. Data was evaluated (ping-pong) during the 3rd quarter 2014 and 1st quarter 2015. Eurostat provided extensive feedback to each country in form of a small report. Data were not published on Eurostat's online database.
- A first PEFA checking tool with automated procedures was developed and improved in the course of December 2014 until April 2015.

2015 cycle (testing):

- Already by end of 2014, work started on PEFA-Builder (version 2.x).
- April 2015: small survey to find out who is in charge of compiling PEFA at national level? 23 countries replied. Only one country reported that an administrative body different from the National Statistical Institute (NSI) will be in charge of PEFA. In 22 countries the NSIs will be in charge of PEFA: In 19 NSIs it will be the unit/team in charge of environmental accounts. In 3 NSIs a unit different from the unit in charge of physical environmental accounts, e.g. energy statistics, will deal with PEFA.
- May 2015: ESTP training with a focus on how to use the PEFA-Builder
- The 2015 PEFA questionnaire (second voluntary data collection cycle) was launched on 17 July 2015 with a reporting deadline of 15 November 2015. This time, the PEFA tools (incl. PEFA Builder v. 2.5) were launched together with the questionnaire.
- 10 countries replied. Data validation stretched until March 2016. Data was published on Eurostat online database.

2016 cycle (testing):

- May 2016: ESTP training with a focus on how to use the PEFA-Builder
- The 2016 PEFA questionnaire (third voluntary data collection cycle) was launched on 29 June 2016 with a reporting deadline of 15 October 2016. The PEFA-tools were launched together with the PEFA questionnaire.
- 13 countries replied. Data validation started in October 2016. Data has been published on Eurostat online database.

2017 cycle (mandatory):

- The 2017 PEFA questionnaire (first mandatory data collection cycle) was launched on 01 June 2017 with a reporting deadline of 30 September 2017.
- The PEFA tools were made available be the end of June 2017.