Development of the multidimensional statistical framework for the evaluation of the effectiveness of environmental instruments, present state and way forward

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Key issue: framework for the evaluation of the implementation of green fiscal reform in Estonia

Contents

Introduction: Improvement in the framework structure for the evaluation of the effectiveness of environmental instruments for the monitoring of the implementation of green fiscal reform

The document provides an update of the effort to further design the framework that would help to evaluate policies related to the implementation of ecological tax reform at the national level. A multidimensional framework for the evaluation of the effectiveness of environmental instruments has already been discussed at the 23rd meeting of the London Group on Environmental Accounting [1].

[1] - https://seea.un.org/sites/seea.un.org/files/lg23_e35_kaia_oras_01_10_2017.pdf

The framework has five dimensions: two dimensions set by Estonian ecological tax reform[2] on environmental efficiency and the neutrality of environmental taxes on overall taxes impacts, and three aspects suggested by the OECD (Organisation for Economic Co-operation and Development) on the use of revenues, distributional and competitiveness impacts (OECD, 2011 [3]).The suggestions from the London Group and the Estonian experts were received to widen the scope of the framework for fiscal analyses and to integrate relevant accounts for analysing additional aspects.

The equity ("polluter pays principle"), competitiveness and environmental efficiency aspects were analysed further, along with the integration of environmental expenditures and additional environmental instruments regarding natural resources. The suggestions of the experts were analysed and alternative approaches discussed. As an improvement in the structure, two complementary dimensions (the principle of revenue neutrality and competitiveness) were merged under a single "competitiveness" dimension. The dimensions covered are outlined in Table 1 below.

Table 1. Dimensions covered in the multidimensional framework for the evaluation of the effectiveness of environmental taxes/instruments

Dimension/aspect	Basis for the evaluation/ content	Source of dimension	Change
1.Environmental effectiveness	Changes in the absolute values of the tax base	National	No change
2.Principle of revenue neutrality	Shift from labour to environmental taxes	National	Combine 2 and 3 to "Competitiveness"
3.Competitiveness impacts of an overall taxes	Comparison of surplus with environmental taxes paid	OECD	Widening the scope of the equity and competitiveness dimensions: the evaluation of the "polluter pays principle". Analyse the impact of prices.
4.Equity of environmental taxes	Paid taxes versus overall consumption of the tax base	OECD	Develop the statistical infrastructure for tax exemptions or preferential tax rates.
5.Use of revenues	Public sector expenditures on environmental protection versus the receipts of environmental taxes	OECD	Monitoring of the supply and demand side measures considering different target groups
Combined impact with other instruments (investments, prices)	Combined impact of other instruments (investments, changes in technology, other price changes etc.).	OECD	

Background:	In order to create a harmonized environmental and economic data hub which enables analyses relevant to ecological tax reform and supports green fiscal policy, Statistics Estonia has collaborated with researchers to work with the data and the concepts [4,5,6] for several years. The analyses have been published after the environmental taxes account has become available in 2013 [7, 8].

Due to the suggestions of the London Group and Estonian experts to widen the scope of the framework for fiscal analyses and to integrate relevant accounts for analysing additional aspects, further effort

[2] - Environmental tax reform base document. Estonian Ministry of Finance, 2005

[3] - Environmental Taxation A Guide for Policy Makers, OECD, 2011

[4] - "Environmental taxes — economic instruments for environmental protection", Eda Grüner, Kersti Salu, Kaia Oras Tea Nõmmann(Stockholm Environment Institute Tallinn Center, Estonian Institute for Sustainable Development) Statistics Estonia, 3/09, 2009 Quarterly Bulletin of Statistics Estonia", http://www.stat.ee/dokumendid/37734

[5] - Keskkonna majandushoobade raamistik X Eesti ökoloogiakonverents. Framework to Analyze the Impact of Environmental Economic Instruments; Tea Nõmmann, Eda Grüner, Kaia Oras www.stat.ee/dokumendid/37734

[6] - Use of environmental tax statistics for monitoring of environmental tax reform in Estonia, Kaia Oras, Eda Grüner, Kersti Salu, Tea Nõmman, Tallinn, 2009.

[7] Environmental taxes account enables analyzing the taxes macroeconomically, Kaia Oras, Kersti Salu, Statistics Estonia, 3/09, 2013 Quarterly Bulletin of Statistics Estonia", https://www.stat.ee/dokumendid/75152

[8] Environment overview 2016, Quarterly Bulletin of Statistics Estonia, 2/2017, p 37-39, ISSN 1736-7921,

was made to bring in more evidence-based data for modelling of the taxes and ensuring that the "polluter pays principle" and relevant socioeconomic aspects are covered while taxing the negative externalities.

As the framework and tax statistics should add more solid data to the ongoing debates, the aspects related to the burden of environmental taxes are important from the viewpoint of the ministries. Regarding the effects of the taxes on competitiveness, the ability of industries and sectors to cope with the taxes (both for the preliminary analysis and the follow-up analysis) is a desirable aspect of cooperation between various ministries, the Statistical Office and scientific fora. It was noted as desirable from the ministries perspective to link taxes with other environmental and economic costs and surplus in order to see a full picture from the industry perspective. Furthermore, this type of information is also needed for the modelling of the exceptions. The availability of data on a fee or a tax in a structured manner also enables easier analysis of the performance over the entire product chain (product life cycle). Without such an additional picture, the overall impacts could not be observed. While ministries do sometimes perform such analyses themselves, it is tedious. Furthermore, data assembled in accounts provide the ability to see the total amount of taxes and subsidies on industries. This can then be compared with the various charges industries face at any one time to ensure that the load is not too high compared to profits. It would also be desirable to simulate the whole production (or product) chain and identify the optimal tax and fee rates that guide industries to behave in an environmentally sound manner. Exceptions to the taxes should ideally be based on facts. Integrated accounts data would also provide a better opportunity to assess the effectiveness of political promises.

With the view of the comprehensive analyses of the implementation of green fiscal measures, new additional components were suggested. These are discussed below. The way forward in designing a sound statistical framework for monitoring the efficiency of environmental instruments and the implementation of ecological tax reform in Estonia are touched upon. The environmental taxes referred to are located in table 2 and Annex 2 with more details. The relevant reference, national trends and analyses which are the starting point for the following discussions were presented in the form of explained figures and the tables in the annex of a previous document[9] and are not repeated here.

Widening the scope of the equity and competitiveness dimension: the evaluation of the "polluter pays principle"

With the view of the comprehensive monitoring and fiscal analyses of the implementation of ecological tax reform, in addition to environmental taxes other environmental fiscal measures e.g. new components were suggested to be added to already existing dimensions. The suggestion was to pay more emphasis on developing the analytical capacity regarding the „polluter pays" and equity aspects. In particular, the "environmental expenditures of polluters" should be integrated into the analyses in order to cover other expenditures relevant to negative environmental externalities. Environmental taxes in Estonia are defined by Estonian tax law and include the fees and charges imposed on resource use and pollution (presented in Annex 2). At present environmental taxes can be linked to common economic variables like output, intermediate consumption, surplus, etc. in a statistical framework. However, further analyses requires that the environmental expenditure account should be compiled in a comprehensive format with taxes accounts. Thus, the attempt was made to classify the environmental taxes on the same basis as environmental expenditures, e.g. according to the classification of environmental activities (CEPA) and classification of resource management (CREMA) activities. Table 2 below outlines the classification of Estonian taxes to the closest environmental expenditure class according to CEPA and CREMA categories. In addition, the negative externality for each tax is indicated.

[9]- https://seea.un.org/sites/seea.un.org/files/lg23_e35_kaia_oras_01_10_2017.pdf

Table 2. Environmental taxes and tax bases linked to CEPA and CREMA categories

Environmental taxes	Tax category by ESA *	Classification of environment (CEPA) and resource management (CREMA) activities	CEPA/ CREMA **	Negative environmental externality/tax base
POLLUTION TAXES				
Air pollution fee Water pollution fee Waste disposal fee	D.29	Protection of ambient air and climate Wastewater management Waste management	CEPA 1 CEPA 2 CEPA3	Air pollution Water pollution Waste pollution
Packaging excise duty	D.21	Waste management/ Minimization of the intake of fossil resources as raw material	CEPA3/CREMA 13C	Depletion of non-renewable material, waste pollution
RESOURCE TAXES				
Water abstraction fee	D.29	Management of water	CREMA 10	Depletion of water resource
Fees on fishing	D.29	Management of wild flora and fauna	CREMA 12	Depletion of fish stocks
ENERGY TAXES				
Fuel excise duty	D.21	Minimization of the intake of fossil resources as raw material	CREMA 13 B	Depletion of non-renewable energy sources, air pollution, climate change, resource rent
Electricity excise duty	D.21	Heat/Energy saving and management	CREMA 13B	Low resource efficiency
Liquid fuel stockpiling fee	(D.21)	Minimization of the intake of fossil resources as raw material	CREMA 13B	Use of non-renewable energy
Revenue from the sale of emission permits	(D.29)	Protection of ambient air and climate	CEPA 1	GHG emissions
TRANSPORT TAXES				
Car registration fee	D.21	Other resource management activities	CREMA 16	Depletion of non-renewable energy sources, air pollution, climate change, resource rent
Heavy goods vehicle tax	D.29	Other resource management activities	CREMA 16	Use of non-renewable energy, air pollution, climate change, resource rent
Taxes/transactions beyond ESA boundary				
Mineral resource extractic fee	Resource rent	Minimization of the intake of fossil resources as raw material/ Management of minerals	CREMA 13C; CREMA 14	Depletion of non-renewable energy sources and minerals, air pollution, climate change, resource rent
Forest stand cutting charg	Dividend	Management of forest resources	CREMA 11	Depletion of renewable resource

* Taxes on products (D.21); taxes on production (D.29);** - CEPA/CREMA categories are displayed in ANNEX 1

In principle, it is feasible to classify environmental taxes by CEPA and/or CREMA categories. In some cases the taxes refer to several environment or resource management problems and/or activities.

In the analysis of negative environmental externalities and environmental taxes, it was discussed that it is important to include environmental taxes which remain outside of the tax framework e.g. beyond ESA taxes classification/boundary (mineral resource and fossil fuel extraction fee, forest stand cutting charge). These national level environmental charges and fees are appended to table 2 and 3 as these are important for the modelling of the taxes at the national level. These taxes are classified under other transactions (resource rent, dividends) in the ESA.

In order to observe the impact of changes in taxes on microeconomic level, the current expenditure components include environmental taxes along with other environmental expenditures in the table 3. below. However several of the taxes fall outside of the environmental protection expenditure account (EPEA) boundary and are part of the resource management expenditure account (REMEA). As REMEA is still under development, important data concerning resource management is, at present, missing for further analysis. EPEA comprises expenditures that prevent, reduce or eliminate environmental pressures (classified by CEPA) and excludes activities that make more efficient use of natural resources (resource management; classified by CREMA).

In Table 3 below the environmental expenditures and investments are set alongside with environmental taxes, if feasible, following the same structure of the taxes and CEPA and CREMA classifications as outlined in the Table 2. The structure of the tables is identical but the columns are rearranged.

Table 3. Environmental taxes paid, environmental current expenditures and investments related to the respective negative environmental externalities, thousand Euros, 2015

Negative environmental externality/ tax base	CEPA/ CREMA	Environmental/ resource management current expenditures			Environ-mental/ resource management investments
		Total	--- of which: environmental taxes paid	Environ-mental taxes paid	
			POLLUTION TAXES		
Air pollution and climate Water pollution Waste pollution	CEPA 1 CEPA 2 CEPA3	17 672 91 105 273 761	**Air pollution fee** **Water pollution fee** **Waste disposal fee**	**12 406** **5 001** **26 344**	102 198 62 181 28 569
Resource management, packaging waste	CEPA3/ CREMA 13C	*2 614*	**Packaging excise duty**	**1 168**	*158(!)*
			RESOURCE TAXES		
Use of non-renewable water resource	CREMA 10	*53 636*	**Water abstraction fee**	**12 686**	*42 439*
Pressure on fish stocks	CREMA 12/CEPA 6	*602*	**Fees on fishing**	**1 820**	*115(!)*
			ENERGY TAXES		
Use of non-renewable fossil energy source, air pollution, climate change	CREMA 13 C	N.A.	**Fuel excise duty**	**444 303**	N.A.
Resource management, use of energy	CREMA 13B	N.A.	**Electricity excise duty**	**34 021**	N.A.
Use of non-renewable energy	CREMA 13 C	N.A.	**Liquid fuel stockpiling fee**	**5 460**	N.A.
Climate change mitigation	CEPA 1	N.A.	**Revenue from the sale of emission permits**	**7 447**	N.A.
			TRANSPORT TAXES		
Use of non-renewable energy, air pollution, climate change	CREMA 16	N.A.	**Car registration fee**	**7 086**	N.A.
Use of non-renewable energy, air pollution, climate change	CREMA 16	N.A.	**Heavy goods vehicle tax**	**5 072**	N.A.
			Taxes/transactions beyond ESA taxes boundary		
Use of non-renewable energy, air pollution, climate	CREMA 13C; CREMA 14	N.A.	**Mineral resource extraction fee**		N.A.
	CREMA	N.A.	**Forest stand cutting charge dividend**		N.A.

(!) – Inconsistent figures - In the case of resource management product taxes, the tax payers are often dispersed and the relevant resource management investments and current expenditures are not consistently separable in enterprise data or in the accounts.

Statistics for the larger environmental externalities (air pollution, water pollution and waste disposal, physical quantities) is available in comprehensive format for the pollution taxes (air pollution fee, water pollution fee and waste disposal fee) and respective expenditures. This is also due to the fact that these taxes are "taxes on production." Respective expenditure are routinely collected from enterprises (estimated by the enterprises themselves) and registers using surveys. Environmental investments and current expenditures were considered relevant as the investments were made to cleaner technologies and current expenditures were made for pollution management. Expenditures and investments are available for all institutional sectors separately including the general government and enterprise sector. It is also possible to compile the financing of the expenditures. Further analyses of environmental expenditures is also feasible for the "rest of the world" category based on financing tables in EPEA and REMEA.

For several of the other taxes (packaging excise duty, water abstraction fee), the expenditure dimension exists, but was difficult to identify. For most of the other levied environmental taxes easily identifiable counterparts in EPEA do not exist. By content, most of these taxes refer to resource management and are product taxes. On one hand, the resource management account has not yet been compiled in Estonia. On the other hand expenditures to fight respective negative externalities of resource use (depletion) are difficult to separate and quantify theoretically as well. In the case of resource management, the investments and expenditures were in certain cases estimated on the basis of available EGSS production of respective CREMA categories (marked with !) based on robust figures available in national accounts.

In addition, the tax dimension itself may not show up in EPEA under environmental protection transfers because it is mandatory only to report transfers that are not already captured under expenditures or investments. According to the EPEA handbook EP transfers without a counterpart are small – typically less than 1% of total environmental protection expenditure. For simplicity, EPEA does not take into account both sides (payers of taxes and receivers of transfers that are financed from paid taxes) at the same time. This means that a full analysis of who pays whom across the resident institutional sectors is not required (by regulation) and it is possible to add 'earmarked taxes' paid by corporations and households to the government as a supplementary information in the voluntary part. These „earmarked taxes" are used to finance subsidies on EP services or investments.

The ecological nature and detailed enterprise level nature of environmental issues poses a challenge for evaluating the effects of the measures using the accounts. For an exhaustive analysis, negative externalities and financial flows should be linked at the detailed level. The expenditures made for a specific environmental purpose should be allocated to the same externality. However, at present, such a detailed analysis is not routinely available in the accounts. In the EPEA account, it is not mandatory to establish the dimension of economic activities by NACE (except ancillary activity) but it is, in principal, available in the underlying datasets.

The tax rates depend on the specific polluting activity, as some of the activities are more harmful for the environment or more intensively utilizing natural resources than others. In these areas of activities, it is necessary to assess the balance between the added value for economic and social sphere by business activities and associated environmental use. The level of detail of the environmental issues/problems and the environmental assessments set certain limitations (local issues, seasonal variations, spatial adaptation). However the monitoring of the fiscal measures for several of the bigger environmental issues (like climate gases emissions) are still quite relevant to perform.

Discussion and way forward

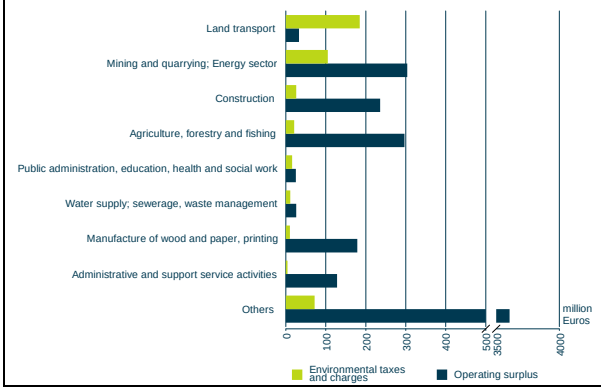
The widening of the scope of the equity and competitiveness dimension in environmental fiscal reform monitoring in order to include the evaluation of the "polluter pays principle" has required the integration of additional datasets and partially this has been a successful effort. Widening of the framework enables to take into account other costs of environment protection.However, the "polluter pays" aspect is difficult to grasp from a resource management perspective.

Now, after linking the taxes to CEPA classes the amount of environmental charges on industries can be assessed in the light of all other environmental costs: environmental current expenditures, environmental investments, other taxes and excise taxes.

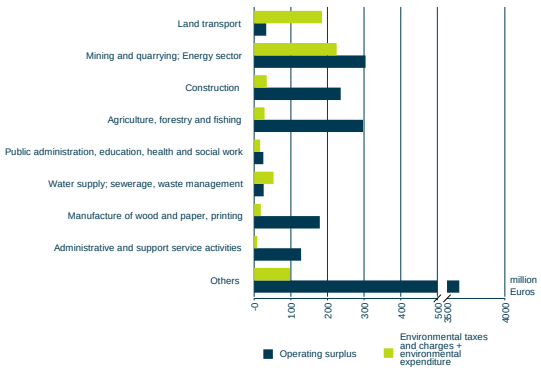
We have asked the question: what is the impact of environmental taxes on equity and sectoral competitiveness? If we compare just the environmental taxes with the operating surplus, then it is seen that land transport is the biggest payer of environmental taxes and mining and energy sector which also has high environmental impact pays less. Mining and energy sector also has 4 times higher surplus compared to the environmental charges they pay. If we add other environmental costs (environmental investments and expenditures) to the analysis then the largest payer for environmental protection among the sectors would become the mining and energy sector. This is illustrated on graph 1 below.

Graph 1. Comparison of the burden of environmental costs of various sectors: on the left environmental taxes versus surplus; on the right environmental costs versus surplus, 2015

Environmental taxes and charges and operating surplus by economic activity

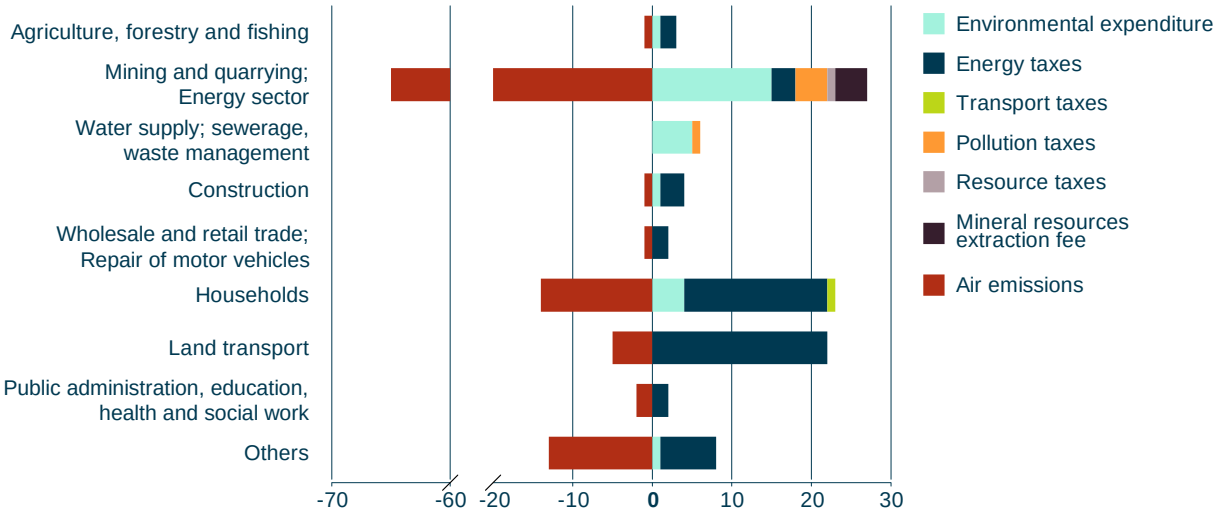


Environmental taxes, charges and other environmental costs and operating surplus by economic activity



On the graph below (Graph 2) we consider environmental effectiveness and equity. Total air emissions (as a proxy for environmental pollution) are displayed on the left. On the right side the distribution of environmental costs (environmental taxes plus environmental investments and expenditures) among selected main activities is displayed. Adding other environmental costs makes the environmental efforts of the sectors more visible.

Graph 2. Environmental costs (right) by economic activities compared with total air emissions (as proxy) on the left, 2015



Could a well-thought out model of the environmental fiscal instruments be created for the purposes of evaluating the impact of the environmental taxes and other environmental instruments (and costs) on competitiveness? The table template for collecting the data into one framework was designed and is displayed in Annex 3, table 1. This contains information from EPEA and other economic variables from standard national accounts. The data structure of part A, monetary environmental variables, follows the EPEA expenditure table. It includes the basic transactions. The consumption of environmental products (intermediate consumption and final consumption) including also environmental extra cost reflect how much sectors are paying for the environment. Next, environmental gross fixed capital formation and acquisition less disposals of non-produced non-financial assets for the production of EP services show how much enterprises have invested in order to lessen the negative environmental impacts of their activities. Also presented are the paid environmental taxes and the transfers that are received to support environmental expenditures. This set up allows for the calculation of the total environmental expenditures by summing up the consumption, investments and taxes paid and subtracting from this sum the transfers received. Furthermore, adding other economic variables like surplus, output, export etc (part B “Basic economic variables”) from other data sources (external to EPEA) enables the analysis of the impact of environmental expenditures and taxes to sector competitiveness. Part C would cover “Basic environmental variables” and part D “Basic social variables”.

The disaggregations would include the NACE breakdown, CEPA category and institutional sectors (specialised corporations, corporations that have environmental expenditures as ancillary activity, households, general government and the rest of the world). The not relevant and not available breakdowns are marked with grey.

In Annex 3, table 2 the additional section outlines the description of some indicators for measuring the impact of the green fiscal measures on various dimensions e.g. for competitiveness, revenue neutrality, environmental efficiency, etc. by linking the variables of environmental cost with the variables of economic, social and environmental performance. The comparison of environmental expenditures with physical emissions in order to see if the “polluter pays” principle applies would be feasible as well. The variables of the relevant dimensions listed, still need to be tested.

It is also important that all of the environmental resource charges (like the resource rent), which are not presently considered as taxes in national accounts, should be included in statistical environmental fiscal analyses.

Statistical confidentiality and the ecological nature of environmental externalities will remain a shortcoming for the carrying out of the analyses of the impacts of some environmental taxes on environmental effectiveness.

Conclusions

The suggestion to widen the scope of the analysis from taxes to other fiscal measures is feasible to a certain extent.

Environmental taxes were allocated to the relevant CEPA and CREMA categories and feasible figures were identified. In addition, a second approach was taken to design a wider template for collecting data into one framework from national accounts, environmental expenditure and taxes accounts.

One challenge is the difficulty of defining and measuring resource management expenditures. A significant obstacle at present is the weak definition of resource management expenditures. At the national level, the obstacle for the analyses related to environmental and economic accounts is the non-coherence of taxes definition in Estonian environmental taxes policy and Estonian national accounts.

Influence of taxes on prices

Environmental taxes and resource rents (mineral resource extraction fee) influence the cost of the production, the prices of the products and hence also the competitiveness. So as to cover the relevant aspects, the effects of the direct and indirect taxes on producer prices is (or needs to be) analysed by those who develop the taxes. When imposing taxes and fees, the whole chain of relevant products or activities should be considered. Potential effects of the tax or charge on the entire chain should be analysed to ensure that the initial goal of environmental protection is supported. For example, companies may look for cheaper alternatives (e.g. illegal dumping etc.) if they are no longer ready to pay a higher cost.

The fuel excise duty is the biggest among environmental taxes and it is an important input factor to most production activities. If fuel taxes increase the fuel price, prices of other goods also increase immediately. Rather than encourage a switch to an environmentally friendly alternative, it might encourage the purchasing of fuel from neighbouring countries where fuel prices are lower because either the fuel excise has not been applied or the rate is considerably lower. Such analyses should complement also the analyses of risks to the reduction of the government revenues.

The indirect taxes (fuel and electricity excise duty) influence the cost of the input factors and the expenses of these goods could be separated in statistics. Fule and electricity excise duties could increase the price of the production of energy intensive products. The influence of energy taxes on competitiveness has been debated in Estonia as rather high energy taxes are keeping the energy intensive industry away from Estonia. By reducing the electricity excise duty rate in 2018[10], the Estonian Government tried to improve the competitiveness of energy-intensive Estonian companies. As similar concessions were implemented for large consumers in neighbouring countries, this was also performed in Estonia in order to provide a new impetus to the expansion plans of existing companies as well as attract new investments to the country.

The more widely specific goods which enterprises produce are globally traded, the more sensitive the producers of this good are to the effects of tax changes. For example, in the context of the dramatic

[10] - Electricity excise duty rate of energy-intensive industrial companies will be reduced 90 percent from the current €4.47 to €0.50 per megawatt-hour starting from 01.01.2019

drop of the market price of oil and due to the influence of taxes on competitiveness, the Estonian Government has reduced the oil shale resource extraction charge with the aim to alleviate the burden on the shale oil industry and linked this to global oil prices. [11]. The relevant socio-economic impacts were discussed as main arguments for this action[12]. It is also important that all of the environmental resource charges (like the resource rent in this case) which are not presently considered to be taxes in national accounts are included in the statistical environmental fiscal analyses.

In combination with other relevant information, the taxes account allows for the monitoring of the structure and the proportion of the taxes in the intermediate costs and hence enables the modelling of the influence of the taxes on producer prices. The impact of tax changes can be related to the changes in the surplus of enterprises that pay the taxes.

Conclusion:

It was discussed that taxes and resource rents elevate producer and consumer prices and further discussion is needed about whether the prices of the goods (transport fuels, shale oil), which are relevant for the environmental taxes should be explicitly monitored as well. The statistics related to the component of the environmental taxes on the prices of important goods (from producers and users perspective) could be an observable part of price statistics. Also, it was discussed that from the decision makers perspective the whole chain of relevant products or activities should be considered and analysed (while imposing taxes and fees).

Equity of environmental taxes, integrating of environmental harmful subsidies and transfers

Several producer groups or activities are eligible for tax exemptions. From a policy perspective (measuring of the efficiency of the green fiscal reform), the tax exemptions or preferential tax rates (e.g. negative environmental subsidies should be comprised) should be counted as well since this is an important aspect of the equity of environmental taxes. So, for the purposes of the „polluter pays" aspect and fiscal analyses, potentially environmentally damaging subsidies need to be identified and assembled in analyses. However, according to UN SEEA manual, only taxes and subsidies which are recorded as actual transactions taking place between institutional units (according to UN SEEA, para 4.129) are to be accounted. Following standard national accounts principles, there are no transactions recorded in relation to these exemptions. As a solution, the separate satellite account beyond ESA boundaries could serve the purpose of the integrated fiscal analyses (integrating these subsidies).

The concept of environmentally harmful subsidies applies both to the subsidies classified as environmentally harmful (for example the support for fossil use industries) and also to environmental tax exemptions. UN SEEA, paragraph 4.147 also explains that the definition of environmental subsidies and similar transfers focuses on the intention of the government rather than on the environmental impact arising from the use of the resources provided. Although the OECD, IEA and IMF have provided the estimates for environmentally harmful subsidies, the topic is still not fully analysed at the national level and methods for doing so have not been clarified. Further analysis in this regard is necessary.

[11]- economic sustainability of estonian shale oil industry until 2030 , Kalev Kallemets, Oil Shale, 2016, Vol. 33, No. 3, pp. 272–289
ISSN 0208-189X, doi: 10.3176/oil.2016.3.06, © 2016 Estonian Academy Publishers

[12]- „Estonian oil shale mining and oil production: macroeconomic impacts study", by Ernst & Young. http://www.energiatalgud.ee/img_auth.php/6/64/EY._Estonian_oil_shale_mining_and_oil_production_macroeconomic_impacts_study.pdf

Conclusion:

The concepts of the environmental harmful subsidies should be clarified and developed. From a policy perspective, there is interest in tax exemptions or preferential tax rates. However, for other types of environmentally harmful subsidies the interest is still moderate.

Monitoring of the supply and demand side measures considering different target groups.

This year, in order to bring together different aspects of the same phenomena, analysis on how to reduce the use of fossil fuels, supply and demand side measures have been brought together into one framework in the project "Scaling up existing climate solutions".[13] Over the last several years, demand-side measures have been designed and implemented in Estonia and the long term effects on these measures have been modelled. In addition, supply side measures are implemented to complement the demand-side measures as well. There has been an emphasis on the distinguishing between supply and demand side measures as these instruments focus on different target groups. Setting the restrictive and supportive supply and demand-based measures as well as their respective financial flows in a common format[14,15] would enable to analyse and communicate the aspects of the "setting and use of the tax revenues" of the monitoring framework for the green fiscal reforms. Based on tax statistics, the restrictive demand side measures dominate over restrictive supply side measures in Estonia (see table 4). For the supportive measures, the statistics should be found either in environmental expenditure account or from the account of environmental subsidies. Complete analyses hence require both the availability of an environmental expenditure account and a resource management account.

Table 4. Examples of the supply and demand side fiscal measures regarding the measures of phasing out the use of fossil fuels, thousand Euros, 2015

	RESTRICTIVE		**SUPPORTIVE**	
SUPPLY	Mineral resource extraction charge	14 083	Renewable energy subsidy	76 000
	Pollution taxes	44 920	CHP (combined heat and power)	5 600
DEMAND	Fuel excise duty	444 303	Resource efficiency support measures	
	Electricity excise duty	34 021	for - heating systems	3 227
			- street lightning	14 240

From a communication perspective it is important to display and analyse the supply and demand based measures in a common format especially from a user (general public) perspective to communicate to those who may be interested in how the taxes are used.

[13] SEI Initiative on Fossil Fuels and Climate Change: Michael Lazarus and Georgia Piggot, SEI USA - Fossil Fuels Production Reduction Process Management: Missing Piece inClimate Policy Puzzle; https://www.sei.org/wp-content/uploads/2018/04/managing-the-decline-of-fossil-fuel-production-a-missing-piece-of-the-climate-policy-puzzle.-piggott-lazarus.pdf

[14] Restrictive supply-side fiscal measures refer for policies that are intended to cut off the supply of the undesired products. These measures include quotas, supply taxes, and subsidy reductions. In addition, the resource rent on fossil fuels and minerals also could be classified here. Restrictive demand-side measures in contrary refer for policies that intend to reduce the demand for. E.g. carbon prices and excise duties on fuel use.Supportive supply-side measures refer for policies that support the supply of alternatives, like renewable energy or organic goods subsidies.

	RESTRICTIVE	SUPPORTIVE
SUPPLY	Policies that cut of the supply, including declining quotas, supply taxes, and subsidy reductions	Policies that support the supply of environmentally friendly alternatives, like renewable energy subsidies and mandates
DEMAND	Policies that restrict demand for environmentally harmful goods, for example carbon prices	Subsidies for purchase of energy-efficient goods

[15] Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies, Authors, Fergus GreenEmail authorRichard Denniss, 2018; https://link.springer.com/article/10.1007/s10584-018-2162-x

General summary, discussion and suggestions

The document provides an update of the efforts to improve the framework that would help to evaluate the policies related to the implementation of green fiscal instruments. In order to carry out relevant analyses (equity of the taxes, competitiveness, polluter pays), the environmental taxes account has to be compiled in a comprehensive format with environmental and economic accounts. In order to widen and improve the equity and competitiveness analyses, in addition to already established analyses of environmental taxes versus economic costs, other environmentally related costs (environmental expenditures and investments) needed to be integrated as well. The combined burden of environmental taxes and other environmental expenses could be further evaluated.

Adding environmental costs like environmental investments and expenditures to environmental taxes when analysing the implememtation of green fiscal reform will provide a different kind of insight into the environmental burden of different sectors. This kind of analysis also makes the environmental efforts of the sectors more visible.

Estonian environmental taxes were classified to closest environmental/resource management expenditure class according to CEPA and CREMA categories. In addition, the negative externality for each tax was indicated on a broad scale. The draft framework for collecting relevant variables from accounts was designed. In addition, the equity dimension was further debated in order to integrate environmentally harmful subsidies. Furthermore, from the point of interest of decision makers, the impact of prices on taxes and vice versa was analysed. In order to develop further the dimension "how revenues are used", the supply-demand side restrictive-supportive approach for evaluating the actions taken from government fiscal side was applied.

Problems identified (summarized):

The summarized proposals, main problems and decisions are outlined in the table 4 below.

Table 4. Summarized suggestions, main problems and decisions

Suggestion	Problems	Decisions
Integrate the environmental costs before doing analyses of equity and competitiveness aspects of environmental fiscal reform	- the missing piece of the puzzle - the resource management expenditure account - the resource management expenditures/ costs are difficult to define and measure - weak integration of national level environmental financial instruments with national accounts and environmental accounts due to different definitions	- Integrate the available expenditure and investment data - Create the table template to collect the figures and calculate the relevant efficiencies if feasible - add the missing fiscal instruments (fees, charges, resource rent, dividends) into an analysis
Analyse the impact of prices	Impact of prices has been considered relevant but would need additional insights	Future development
Integrate environmentally harmful subsidies	Has been considered relevant but would need additional insights	Future development
To apply the supply-demand side restrictive-supportive approach for evaluating action taken from government fiscal perspective	No widespread format for evaluating environmental fiscal measures and support schemes	Use the presented structure for the communication

One of the current limitations seems to be that resource management expenditure accounts are missing and difficult to compile as at the international level the concept of resource management expenditures is not fully elaborated yet, and at the national level the account has also not been compiled. Only the production and value added of resource management related goods have been calculated.

Another aspect is the weak integration of national level environmental financial instruments with national accounts and environmental accounts due to non-harmonized definitions. The scope of environmental taxes account is too narrow regarding the national environmental taxes definition: some important fees and charges fall outside of the taxes scope due to definitions in national accounts.

In order to create the model for the evaluation of the impact of environmental taxes and other environmental instruments (and costs) on competitiveness, the availability of figures and coherence of the detailed dimensions was not fully examined and needs extra effort.

There is a policy interest that while imposing taxes and fees, the whole chain of relevant products or activities is important to consider but the routine standards for these kind of impact analyses are not readily available in statistics.

Way forward

In the light of the environmental costs that enterprises pay (environmental current expenditures, environmental investments, other taxes and excise taxes) it is necessary to further analyse whether environmental charges pose a high burden on industries' operating costs.

A well-thought out model of environmental fiscal instruments could be created for the purposes of the evaluation of the impact of environmental taxes and other environmental instruments (and costs) on competitiveness. The draft table of the transactions and other figures for calculation of the dimensions of the green fiscal reforms has been created. Tax exemptions, preferential tax rates and other environmentally harmful subsidies of interest should be added to the analyses in the future. Variables to be included still need to be further tested and discussed. Are there other Statistical Offices interested to try out the presented framework? The preliminary table and indicators are displayed in Annex 3. Hopefully the development of the environmental and resource management account could provide the basis for the bridging of the different dimensions of the green fiscal reform mainly via the system of national accounts.

From the communication perspective it is important to display and analyse the supply and demand based supportive and restrictive measures in a common format especially considering the user perspective. The development of the statistics of the prices of important production goods influenced by environmental taxes needs further investigation.

Questions to the London Group

1. Is the draft table template of the transactions and other variables for the evaluation of the efficiency of green fiscal reform relevant (Annex 3. "Available variables, breakdowns and feasible indicators for the evaluation of the effectiveness of the green fiscal reform")? All comment on possible inconsistencies are highly appreciated.
2. Is the supply and demand side supportive and restrictive measures a suitable framework for users while analysing how the tax revenues have been used?
3. As variables still need to be further tested and discussed, are there other Statistical Offices or institutes interested to try out the draft framework? Who would like to cooperate with us?
4. Is there a need for specific LG research theme dealing with the monitoring issues of green fiscal reforms?

Please send the suggestions to: kaia.oras@stat.ee; tea.nommann@sei.org

Annex 1 Classification of environmental protection and resource management activities

CEPA

1. Protection of ambient air and climate
2. Wastewater management
3. Waste management
4. Protection and remediation of soil, groundwater and surface water
5. Noise and vibration abatement
6. Protection of biodiversity and landscapes
7. Protection against radiation
8. Environmental research and development
9. Other environmental protection activities

CREMA

10. Management of water
11. Management of forest resources

11A. Management of forest areas

11B. Minimization of the intake of forest resources

12. Management of wild flora and fauna
13. Management of energy resources

13A. Production of energy from renewable sources

13B. Heat/Energy saving and management

13C. Minimization of the intake of fossil resources as raw material

14. Management of minerals
15. Research and development for resource management
16. Other resource management activities

Annex 2 Estonian environmental taxes and charges

Name of the instrument	Tax /not a tax	STO	Economic function	Environmental
Package excise	Tax according to national tax law	D2122C	Taxes on products	Pollution
Package excise (domestic)	Tax according to national tax law	D214A	Taxes on products	Pollution
Pollution fee	Environmental charge, not a tax	D29F	Taxes on production	Pollution
Fuel excise	Tax according to national tax law	D2122C	Taxes on products	Energy
Electricity excise	Tax according to national tax law	D2122C	Taxes on products	Energy
Liquid fuel stockpiling fee	Tax according to national tax law	D2122C	Taxes on products	Energy
Revenue from the sale of emission permits	Environmental charge, not a tax	D29F	Taxes on production	Energy
Motor vehicle excise	Tax according to national tax law	D2122C	Taxes on products	Transport
Car registration fee	Tax according to national tax law	D214D	Taxes on products	Transport
Heavy Goods Vehicle Tax	Tax according to national tax law	D29B	Taxes on production	Transport
Tax on motor vehicle	Tax according to national tax law	D29H	Taxes on production	Transport
Tax on motor vehicle	Tax according to national tax law	D59F	Other current taxes	Transport
Boat tax	Tax according to national tax law	D59F	Other current taxes	Transport
Water abstraction fee	Environmental charge, not a tax	D29H	Taxes on production	Resource
Fee on fishing	Environmental charge, not a tax	D29H	Taxes on production	Resource
Mineral (including fossil) resource extraction fee	Environmental charge, not a tax	-	-	-
Forest stand cutting charge	Environmental charge, not a tax	-	-	-
Hunting fee	Environmental charge, not a tax	-	-	-

D2122C - Excise duties
D214A - Excise duties and consumption taxes
D214D - Car registration taxes
D29B - Taxes on the use of fixed assets
D29F - Taxes on pollution
D29H - Other taxes on production n.e.c.
D59F - Other current taxes n.e.c.

Estonian mineral resource extraction charges, hunting and forestry fees also presented in Annex 2 are not included in EU-wide classification on environmental charges and environment-related taxes. In addition, since natural resource and pollution charges[16] are not defined as taxes according to Estonian Tax Act[17], they are not considered a part of the country's overall tax burden. Caution should therefore be taken if tax increases are to be recommended (e.g. by the EU or OECD).

[16] MoE / Ministry of Environment (2005). Environmental Charges Act. Passed 07.12.2005, RT I 2005, 67, 512. Entry into force 01.01.2006. (In English) https://www.riigiteataja.ee/en/eli/514072016005/consolide

[17] Taxation Act. Passed 20.02.2002, published RT I, 25.10.2016, 13.; https://www.riigiteataja.ee/en/eli/531102016007/consolide

Annex 3. Available variables, breakdowns and feasible indicators for the evaluation of the effectiveness of the green fiscal reform

Annex 3. Table 1. Environmental, economic and social variables by relevant breakdowns (grey: not relevant)

Part A. Monetary environmental variables:

Variable/ ESA transaction	NACE, 2-digit level	CEPA/ CREMA	Corporations (S.11)	RoW (S.2)	House-holds (S.14)	General Governm ent(S.13)
Consumption of EP products (P.2, P.3)				X		
Environmental investments, GFCF (P.51g_NP[18])				X	X	
Earmarked taxes received (D.2)			X	X	X	
Environmental taxes received (D.2)			X	X	X	
Total taxes received (D.2)			X	X	X	
Environmental taxes paid (D.2)						
Transfers received and paid (D.3,D.7, D.9)						
Total environmental expenditure (P.2+P.3+P.51g_NP+D.2-D.3-D.7-D.9)						

Part B. Basic economic variables:

Variable ESA transaction	NACE, 2-digit	CEPA/CR EMA	Corporations (S.11)	RoW (S.2)	House-holds (S.14)	General Governm ent (S.13)
Total surplus (B.2g B.3g)		X		X	X	X
Total taxes paid (D.2)	X	X				
Output (P.1)		X				
Export (P.6)		X				
Total expenditures (P.2;P.3) + taxes (D2)		X		X		
Revenue		X		X	X	
Value added B.1g		X		X	X	

Part C. Environmental variables:

Variable	NACE, 2-digit	CEPA/CR EMA	Corporat ions (S.11)	RoW (S.2) (välisma ailm)	House-holds (S.14)	General Govern ment (S.13)
Emissions, physical units, indexes						

Part D. Social variables:

Variable ESA transaction	NACE, 2-digit	CEPA/C REMA	Corpora tions (S.11)	RoW (S.2)	House-holds (S.14)	General Governme nt (S.13)
Employment		X		X	X	
Social contributions (D.1)		X		X		

[18] NP – acquisition less disposals of non-produced non-financial assets for the production of EP services

Annex 3, table 2. Indicators for the evaluation of the effectiveness of the green fiscal reform

Dimension	Aspect	**Indicators**	**Comment/description**
Sectorial insight (by NACE and CEPA):			
Competitiveness: revenue neutrality	Is there a zero impact on total tax burden?	The share of the environmental taxes and the share of social contributions in total expenditures, sectorial view + time series 2008-2016	Environmental taxes paid (D.2)/ Output(P1) –(surplus B.2g + mixed income B.3g) Social contributions (D.1)/)/ Output(P1) –(surplus B.2g + mixed income B.3g)
Competitiveness	Environmental burden from environmental taxes and other environmental expenditures compared to sectors revenue	Environmental expenditure (environmental taxes plus other environmental expenditures) / value added; sectorial view + time series Environmental expenditure (environmental taxes plus other environmental expenditures) / surplus; sectorial view + time series	Total environmental expenditure (P.2+P.3+P.51g_NP+D.2-D.3-D.7-D.9) / Value added (B.1g) _____ Total environmental expenditure (P.2+P.3+P.51g_NP+D.2-D.3-D.7-D.9) / Total surplus (B.2g B.3g)
Equity	„Polluters pay principle“, who is carrying the burden of environmental taxes?	Sectors relative shares of paid taxes in comparison with the sectors relative shares in respective tax base (consumption, emissions etc.) Indicators: tax base in physical quantities, tax in monetary values, % shares, index	Environmental taxes paid (D.2)/ tax base in physical quantities
Equity	„Polluters pay principle“, who is carrying the burden of environmental taxes?	Sectors relative shares on environmental expenditures in comparison with the sectors relative shares in respective tax base (consumption, emissions etc.) Indicators: environmental expenditures in monetary values tax base in physical quantities , % shares, index	Total environmental expenditure (P.2+P.3+P.51g_NP+D.2-D.3-D.7-D.9)/)/ tax base in physical quantities
Environmental effectiveness	Have the loads of the emissions or resource use decreased?	Changes in the absolute values of tax base e g environmental pressures or resource use (indicators: changes of waste landfill, emissions, relevant driving forces, resource use, etc.) Tons of resource or	Changes in the absolute values of the tax base in physical quantities

		emissions, sectorial view + time series	
Environmental effectiveness	Have the loads of the emissions or resource use per unit of economic output decreased?	Changes in the productivity, e g emissions or resource use per unit of value added. Tons of resource or emissions/per value added; sectorial view +time series	Emissions or resource use (tax base) in physical quantities/ value added (B.1g)
Government level:			
How are the tax revenues used	How have the environmental tax revenues been used?	Share of general government expenditures on environmental protection in the receipts from environmental taxes	Final consumption (P.3) + investments (P.51g_NP)/receipts from environmental taxes (D.2)