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Climate Change Public Budget Tagging

Connections across Financial and Environmental Classification Systems

Institutions for
Development Sector

Fiscal Management Division

DISCUSSION
PAPER Nº
IDB-DP-844

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ABSTRACT*

Identifying and evaluating climate expenditures in the public sector, known as budget tagging, has generated increasing attention from multiple stakeholders, not only to assess the government's climate change policy, but also to monitor fiscal risks associated with increasing and unpredictable climate change impacts. This paper explores the issues raised by climate change budget tagging in the context of a broader discussion on the connections with fiscal and environmental statistical classification systems. It argues that, for climate change budget tagging efforts to be successful, the definitions and classifications of climate change expenditures must be consistent with statistical standards currently in use, such as the Government Finance Statistics Framework and the System of National Accounts.

JEL Codes: H, H50, H60, E01, C80, O54, Q54

Keywords: public economics, public finance, national government expenditures, national budget, public sector accounting, data collection, climate change

* The authors thank the Technical Group for their extensive comments on Principle 4, Green Budget Tagging, of the Coalition of Finance Ministers for Climate Action. They especially thank Adrian Fozzard (World Bank), Myriam Linister (OECD), Mauro Migotto (OECD) and Nicole Sherie (OECD) for their written comments.

TABLE OF CONTENTS

FIGURES AND TABLES

ACRONYMS

CEA	Classification of Environmental Activities
CEPA	Classification of Environmental Protection Activities
CPEIR	Climate Public Expenditures and Institutional Review
CREMA	Classification of Resource Management Activities
COFOG	Classification of the Functions of Government
EPEA	Environmental Protection Expenditure Accounts
FDES	Framework for the Development of Environmental Statistics
ISIC	International Standard Industrial Classification
MFSM	Monetary and Financial Statistics Manual
OECD	Organisation of Economic Co-operation and Development
SEEA	System of Environmental-Economic Accounting
SNA	System of National Accounts

INTRODUCTION

Climate change expenditures in the public sector can broadly be defined as the spending aimed at funding climate change policy responses such as mitigation, adaptation, and management of climate-related disasters and risks. Identifying and evaluating climate expenditures in the public sector, or budget tagging, has generated increasing attention from multiple stakeholders, not only to assess the government's climate change policy, but also to monitor fiscal risks associated with increasing and unpredictable climate change impacts. Budget tagging is essential to better prioritize future public expenditures on climate change policy responses.

Climate change budget tagging is the practice of identifying, measuring, and monitoring climate-relevant activities and expenditures. It can be considered as a subset of broader statistical tagging/coding activities that classify statistical data units in standard classification systems. At present there are no internationally agreed upon tagging methodologies to identify climate-change related expenditures in public sector budgets (World Bank, 2020).

Nevertheless, there are some recognized approaches, such as the OECD Rio Markers methodology (OECD, 2006), the European Union climate action taxonomy (EU, 2020), and the Climate Public Expenditures and Institutional Review (CPEIR) methodology (UNDP, 2015). Also, some governments have adopted their own methodologies and classification systems (see World Bank [2020] for a review).

While these proposals are an important and necessary effort, they were not envisioned as an attempt to meet the criteria of a methodology based on a statistical standard that is associated principally with standardization. Also, since for the most part budget tagging is not part of the

habitual tasks of national statistical offices, ministries of finance, or central banks, it tends to be expensive to implement and has generally only been carried out once or as a pilot exercise, with little analytical application or influence on policymaking.

Finally, and more significantly, current budget tagging exercises are not connected to known or accepted international statistical standards or classification systems.[1] This is a major problem in the development of any tagging methodology, but it is especially relevant in the case of climate change policy. The lack of methodological coherence makes it difficult to draw from multiple data sources and to connect data across policy domains, a key issue when analyzing climate change phenomena.

The objective of climate change budget tagging is fundamentally analytical. Consequently, the possibility of connecting climate change budget variables across different expenditure categories, as well as environmental information systems and accounts, is crucial. For this reason, any tagging methodology will be strengthened to the extent that the classification system developed can be connected to other agreed statistical frameworks, standards, and classification systems, especially public sector financial accounts—the principal guiding framework for organizing public sector financial statistics—and the System of Environmental-Economic Accounting (SEEA), the international statistical standard that connects environmental and economic variables.

In an effort to contribute to a common international methodology for classifying climate expenditures, this document explores the connections between international statistical classification systems and climate change budget classification and tagging, and identifies the potential challenges of linking systems for a common and comparable methodology. The principal argument is that a linked or coherent classification system is relevant not only for comparability, but also to support analytical efforts given the wide range of data systems associated with climate change policy analysis.[2] Further, this report concludes that a cogent methodology should deal with at least three main issues: (i) policy sensibility, (ii) statistical boundaries, and (iii) analytical capacity.

1 Except for the EU taxonomy, which was made consistent with the Classification of Environmental Protection Activities (CEPA); however, this taxonomy is not systematically integrated into accounting frameworks such as the System of Environmental and Economic Accounting (SEEA) or the public sector statistical framework.

2 The Inter-American Development Bank is developing a series of initiatives to support countries in Latin America and the Caribbean to optimize policy responses to climate change and their associated fiscal risks. These initiatives include developing and implementing methodologies and instruments to identify and evaluate climate change expenditures, such as climate budget tagging.

1. SYSTEMATIC ASSESSMENT OF CLIMATE CHANGE POLICY RESPONSES

Broadly there are three types of policy responses to climate change: mitigation, adaptation, and management of climate-related disasters and risks[3] (Edenhofer, Pichs-Madruga, Sokona, et al., 2014; Field, Barros, Mastrandrea, et al., 2014). While the first type of response requires a global approach and may involve complex inter-jurisdictional policy instruments,[4] the second and the third are policy responses to local climate change impacts that, nonetheless, if not dealt with, may have potential global effects.[5]

All policy responses imply choices and therefore involve economic costs. Further, they may require accounting for international financial flows and investments associated with green financing,[6] as other countries and international organizations

3 Management is associated with the range of policies or actions that deal with catastrophic loss after major or extreme climate events. Though these policies are closely associated with adaptation, the distinction is made because typically adaptation policies are ex-ante decisions, while management policies refer to ex-post actions associated with unexpected loss, such as the effects of fires, floods, or hurricanes.

4 Management of climate-related disasters and risks include linked emissions trading systems that regulate trade in carbon emissions permits across jurisdictions, such as the European Union Emissions Trading System or the Western Climate Initiative that trades permits between California and Quebec.

5 For example, biodiversity loss in one locality may have cascading effects around the world or climate change impacts may displace populations and increase migration flows.

6 Green financing refers to private or public financial flows for climate or environmental projects.

provide lending or aid for climate change policy support.

Policy instruments are tools through which governments implement policy actions. They involve either direct government expenditures (e.g., funding a specific project or program to provide government services or invest in capital formation) or instruments that purport to change the behavior of economic agents, such as regulations (e.g., environmental standards), market incentives (e.g., taxes), and education campaigns. One scholar labelled them "carrots, sticks, and sermons" (Bemelmans-Videc, Rist, and Vedung, 1998).

In practice, climate change policy responses are implemented through a mix of policy instruments. For example, climate change can be mitigated by funding the construction of a new renewable energy plant or by implementing a carbon tax. The policy response to climate change is mitigation, while the policy instrument is either government expenditure or a tax. Budget tagging essentially involves mapping policy instruments, in this case climate expenditures, to specific policy responses, such as mitigation and adaptation.

Both climate expenditures (including some subsidies[7]) and revenues (e.g., taxes) are transactions that are already registered in public sector accounts. However, to identify them as climate related, they must be reclassified based on agreed-on definitions of what constitutes a climate change policy response. This requires a methodology to identify precisely what climate change expenditures and their associated activities are and how they relate to the policy response, mitigation, adaptation, or management of climate-related disasters and risks.[8]

Moreover, since the final objective of policymakers is to assess the impact of policy responses, it must be possible to trace the effect of policy instruments on other variables of interest. The question is whether the government policy response achieved the expected results and whether it was cost effective. Did the response mitigate, increase adaptive capacity, or effectively respond to climate emergencies? Answering this question requires a clear assessment of the change in the state of the environment and the changes in drivers and pressures on the climate as a result of the implementation of the policy instrument.[9]

7 Some subsidies are not explicit in public budgets. For example, for economies that export a given fossil energy product but charge less for it in the domestic markets, the domestic subsidies are implicit; they have no direct budgetary impact as long as the price covers the cost of production. The subsidy, in this case, is the opportunity cost of pricing domestic energy below international market levels (International Energy Agency [IEA], https://www.iea.org/topics/energy-subsidies).

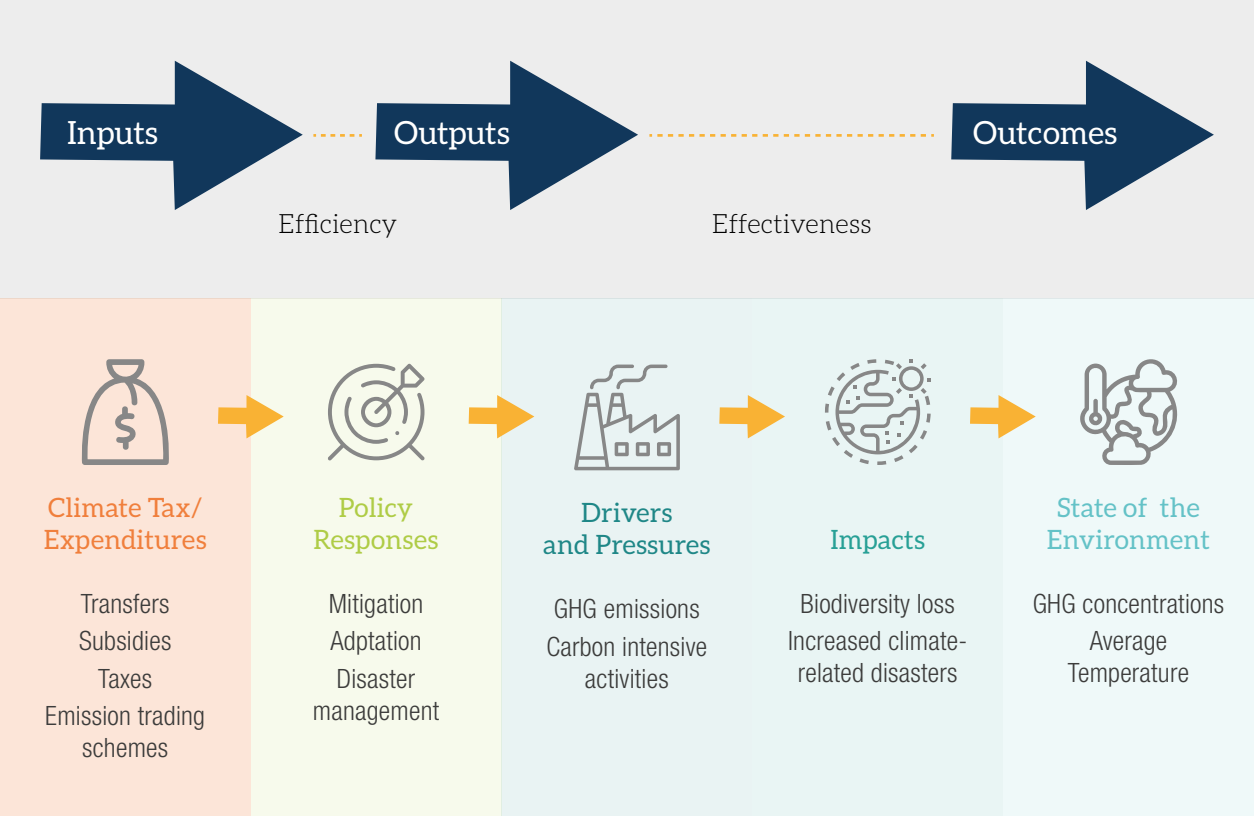
8 The methodology requires two central pillars: (i) a methodology that can classify climate change expenditures and (ii) an operational methodology or an estimation method.

9 For a full discussion see Pizarro (2020).

In sum, for analytical purposes, identifying climate change related expenditures is not enough. It is also necessary to map expenditures to policy responses and connect them to the potential impacts, drivers, and pressures associated with climate change. While climate budget tagging does not need to resolve all these analytical questions immediately, for the methodology to support policymaker's final objective, at least conceptually, it needs to be able to trace climate change expenditures and their effect on relevant categories. For this, the connection with current statistical classification systems is essential.

Given that climate change is ubiquitous, to clearly assess the impact of policy instruments, policymakers require a range of information from different policy domains and geographical and temporal scales. Figure 1 presents a simple information model. In this model, policy instruments can be viewed as "inputs" in a process that generates "outputs" (policy responses) that produces "outcomes" (i.e., reduces negative impacts and improves the state of the environment).

Figure 1. Conceptual Model of Climate Change Expenditure Efficiency and Effectiveness



Source: Authors' elaboration based on Mandl, Dierx, and Ilzkovitz (2008).
GHG = greenhouse gas

While budget tagging can answer the question of what the inputs are, information on policy outputs and outcomes can only be found in other databases with their own classification systems. Moreover, the information needs to be consistent across statistical systems, and the only way of doing this is connecting budget tagging exercises with statistical classification systems.[10]

Integrated, or at least connected, classification systems provide a means for policymakers to assess the implementation of climate change policy responses by easily accessing information from economic, social, and environmental policy domains, all of which are relevant in the case of climate change.

By accounting for the costs and impacts of the policy instruments implemented, it is possible to evaluate the scope and magnitude of climate change policy responses, and therefore their benefits; thus, adequately informing the policy process. This accounting is especially important for ministries of finance interested in assessing the allocation efficiency of their climate change expenditures. Finance ministries do this with, for example, public expenditure reviews.[11]

10 While this is a challenge for all policy issues, it is especially acute for climate change given the breadth of impacts and drivers.

11 Finance ministries use public expenditure reviews to assess whether public resources are allocated optimally and efficiently. Such reviews can refine medium- and long-term budget allocation and identify potential risks in the fiscal position. The quality of a public expenditure review depends on the availability of information and the development of relevant indicators. The fundamental concern of efficiency and effectiveness requires information on the relationship between inputs, outputs, and outcomes.

2. EXISTING ACCOUNTING FRAMEWORKS AND THEIR CLASSIFICATION SYSTEMS

Classification systems are sets of discrete, exhaustive, and mutually exclusive observations that can be assigned to one or more variables to be measured in the collation and/or presentation of data (OECD, 2004). Governments record a range of information related to public activities, policies, and budgetary processes, and different classifications systems have been developed at the national and international levels. However, once classified, the information must be coherently organized, which is the more general purpose of a statistical standard and an accounting framework.

Statistical standards are systems that organize statistical information in a conceptually coherent structure. They provide a comprehensive set of guidelines for data collection, including (OECD, 2004)

- a set of definition(s) associated with clear analytical concepts;
- a set of statistical units;
- a classification system, ideally connected with other classification systems;
- coding process(es); and
- output categories that should include a structure to organize information and relevant indicators, which may include an accounting framework, such as the System of National Accounts.

Statistical standards also serve as an analytical framework since they can provide succinct policy indicators and are the basis for more sophisticated analytical techniques, such as input–output analysis or computable general equilibrium models. Furthermore, if common or integrated classification systems are developed, analytical capacity can be increased since it is possible to access data systems from other policy domains.[12] The sections that follow explore statistical frameworks in the context of their classifications systems.

2.1 STRUCTURAL AND FUNCTIONAL CLASSIFICATION SYSTEMS

In general, classification systems can be structural or functional. Structural classifications refer to the intrinsic nature of the description of an agent, activity, product, or operation. Functional classifications depend on the final purpose or intent of a government action or activity, such as why an expenditure has been realized.

Functional classifications arise because structural classifications are not sufficient to meet the diverse analytical needs of information users. They identify the purpose of an activity or product, aiming to answer the question of why a transaction or activity is being carried out. Therefore, they depend on the motivation or intent of the policymaker in funding or carrying out a specific activity. This can also be dynamic in time and has some element of subjectivity.

For example, the International Standard Industrial Classification (ISIC) is a structural classification of producing agents that classifies activities.[13] For example, consider the expenditures associated with tree planting classified under the ISIC 0210 classification (UNSD, 2008). This activity, "silviculture and other forestry activities," refers to a group of activities that includes tree planting. If the purpose of carrying out this activity is exclusively economic, it would not have an environmental purpose and, consequently, the associated expenditures should be defined as economic, but if the intent is to deal with land degradation, the expenditures can be considered to have an environmental purpose. If, in addition, the plantation is intended to mitigate climate impacts, the expenditures could be considered as having a climate

12 For example, input–output analysis and the more sophisticated computable general equilibrium models can be used to assess economic policy options. They use the same categories applied to the public sector, such as households and corporations, and to the non-profit sector. These can be integrated with environmental phenomena through extended environmental input–output tables or extended computable general equilibrium models and serve as modelling techniques to assess the impact of the environment on the economy and vice versa. However, to do this, common classification systems are needed for both economic and environmental data systems.

13 ISIC is a structural classification of production agents. It classifies economic activities according to their main production and technology (UNSD, 2008). It is divided into 21 sections that are further subdivided into divisions, groups, and classes.

adaptation or mitigation intent. Note, however, that while the purpose of the expenditures may change, the activity—tree planting—remains the same and its impact on climate mitigation is the same, regardless of the intent of the policymaker.

A methodology that identifies climate change expenditures must, therefore, develop a functional classification of expenditures based on intent and a structural classification of activities based on impact. That is, it must identify those expenditures that have been executed because of the intent of the policymaker to respond to climate change, and those activities that, regardless of the intent of the policymaker, have a positive (or negative) impact on climate change.

Moreover, given the interest of broadening analytical capacity, these classification systems must be connected to other relevant classification systems. There are currently two internationally accepted functional classifications that are relevant to implementing a climate change expenditure identification methodology. The Classification of Environmental Activities (CEA) classifies activities and the Classification of the Functions of Government (COFOG) classifies expenditures.

The classification systems identified above are the basis for different statistical standards or accounting frameworks, such as the SEEA and the Government Finance Statistics Framework (GFSF) (UN, 2014a; IMF, 2014). Also, the United Nations Statistical Office has developed a Framework for the Development of Environmental Statistics (FDES) (UNSD, 2017), which organizes statistical information that describes the environment.

Given their relevance, extended use, and analytical power, these statistical standards and their associated classification systems should form the basis of any methodological proposal to classify climate-related expenditures. The most important systems and elements are detailed below.

2.2 THE GOVERNMENT FINANCE STATISTICS FRAMEWORK

Most countries organize their monetary and financial statistics based on the GFSF, which was developed by the IMF (2014). This conceptual framework is built to support fiscal analysis and is consistent with the System of National Accounts (SNA).

The main objective of the GFSF is to organize monetary and financial statistics to provide a framework for analyzing and evaluating fiscal policy, especially the performance of the government sector and, more broadly, of the public sector in any country. Traditionally, public sector statistics have been used to analyze the size of government; its contribution to aggregate demand, investment, and savings; the impact of fiscal policy on the economy, including the use of resources, monetary

conditions and national indebtedness, the tax burden and the social protection network.

The general government sector has two broad economic functions: to provide certain goods and services to the community, mainly on a non-market basis, and to redistribute income and wealth through transfers. These functions are largely fulfilled through expenditure transactions that are classified in two ways: according to an economic classification and according to a functional classification (IMF, 2014). Therefore, it seems reasonable to use this framework as the basis for a methodology on climate change expenditures. However, the framework has limitations since not all activities or expenditures associated with climate change, and therefore of interest to policymakers, are covered under the classification system embedded in the GFSF framework.

2.2.1 GOVERNMENT EXPENDITURE CLASSIFICATIONS: CLASSIFICATION OF THE FUNCTIONS OF GOVERNMENT

Public sector financial classification systems group income and expenditure items according to certain criteria, whose ordering is based on common and differentiated aspects of government operations.[14] However, to support policymaking and assess the outcomes of public sector expenditures, governments also classify their expenditures based on final purpose. The most relevant classification, the COFOG (Eurostat, 2011), is a functional classification system that presents public spending according to the nature of the services that public institutions provide to the community.

The functional classification of public expenditures provides information on the purpose for which spending was incurred.[15] The COFOG is structured in 10 divisions, which are then divided into groups and then classes. Divisions identify the general objectives of governments, while groups and classes define the means through which these objectives are met (Eurostat, 2011).

Division 5 refers to environmental protection and 5.3 pollution abatement, which includes protection of ambient air and climate activities. Other actions related to climate change activities can be identified throughout the other groups and classes (Table 1).

Not all countries have adopted the same functional classification system for expen-

14 Important classification systems are by program or object, and institutional or economic. For a full discussion see IMF (2014).

15 The clearest example is military expenditures, which are typically identified as institutional expenditures, namely all expenditures that go to the military. However, a large proportion of military spending goes to health (e.g., military hospitals) and pensions (e.g., veterans). A functional classification would reclassify those expenditures as health and social services related.

ditures, and some may have developed their own. However, all are inspired by the logic of the COFOG and all maintain the conceptualization of classification systems based on main purpose or intent.

Table 1. COFOG Divisions and Groups

Nº	DIVISIONS	GROUPS
1	General public services	Executive and legislative organs, financial and fiscal affairs, external affairs; foreign economic aid; general services; basic research; R&D related to general public services; general public services n.e.c.; public debt transactions, transfers of a general character between different levels of government.
2	Defense	Military defense; civil defense; foreign military aid, R&D related to defense; defense n.e.c.
3	Public order and safety	Police services; fire-protection services; law courts; prisons; R&D related to public order and safety; public order and safety n.e.c
4	Economic affairs	General economic, commercial and labor affairs; agriculture, forestry; fishing and hunting; fuel and energy; mining, manufacturing and construction; transport; communication; other industries, R&D related to economic affairs; economic affairs n.e.c.
5	Environmental protection	Waste management; water waste management; pollution abatement; protection of biodiversity and landscape; R&D related to environmental protection.
6	Housing and community amenities	Housing development; community development; water supply; street lighting; R&D related to housing and community amenities; housing and community amenities n.e.c.
7	Health	Medical products, appliances and equipment; outpatient services; hospital services; public health services; R&D related to health; health n.e.c.
8	Recreation, culture, and religion	Recreational and sporting services; cultural services; broadcasting and publishing services; religious and other community services, R&D related to recreation, culture and religion; recreation; culture and religion n.e.c.
9	Education	Pre-primary, primary, secondary, and tertiary education, post-secondary non-tertiary education, education non definable by level, subsidiary services to education, R&D; n.e.c.
10	Social protection	Sickness and disability; old age; survivors; family and children; unemployment; housing; R&D; social protection and social exclusion n.e.c.

Source: Eurostat (2011).

2.3 SYSTEM OF ENVIRONMENTAL-ECONOMIC ACCOUNTING

The SEEA uses the principles, accounting concepts, structures, rules, and classifications of the SNA. It provides a comprehensive systems approach to organizing environmental and economic information, covering both stocks and flows and coherently conceptualizing the interconnected relationship between the environment and the economy (UN, 2014a).

The SEEA therefore connects the different policy domains associated with environmental and economic data, precisely the type of information needed to inform climate change policy. Within the SEEA, the classification of environmental activities (CEA) system is the criterion used to determine if an activity is included in the definition of environmental activity and, if so, where it is assigned (Eurostat, 2017). Based on this classification system, the SEEA has developed a special account, the environmental protection expenditures account (EPEA) to register environmental protection activities for the public and private sectors.

The SEEA does not explicitly address climate change; however, the conceptual approach and many of the specific accounts are directly relevant for climate policy analysis, particularly the development of information and indicators across different policy domains. Moreover, due to the modular structure of the SEEA, as new issues emerge, new accounts or tables can be compiled, providing information and indicators to assess a specific policy problem (Pizarro, 2020).

Pressures and drivers of climate change are associated with the economic activities that are reflected in both the SNA and SEEA Central Framework (SEEA-CF), as well as specific accounts such as air emissions, water, energy, agricultural, and land use accounts. In turn, climate change generates pressures and impacts on both economic and environmental assets, which affects the flow of ecosystem services from those assets.

2.3.1 ENVIRONMENTAL PROTECTION EXPENDITURE ACCOUNT

Expenditures on environmental protection are those that a society incurs to respond to environmental problems. Specifically, they can be defined as expenditures to finance activities whose fundamental purpose is to prevent, reduce, or eliminate pollution and other forms of environmental degradation.

The EPEA records the monetary transactions of institutional units considered environmental. In effect, they record the value added of activities that protect the environment, such as output, wages, intermediate consumption, and gross fixed capital formation (Eurostat, 2017). The account is coherent and consistent with the SNA, which quantifies the resources

directed toward environmental protection of a nation.

The EPEA reorganizes the accounting records that are already in the SNA using a functional definition of expenditure based on the classification of environmental protection activities (CEPA), discussed further below (Figure 2).

For our purposes, the EPEA is relevant because it provides an accounting framework to organize environmental protection information—expenditures intended to protect the environment. If the definition of environmental protection spending, which already includes some climate change expenditure categories, can be expanded to include all categories of interest to policymakers, the same accounting framework can be used as the basis for organizing climate expenditures.

Figure 2. EPEA Structure

Production	From Output to Uses	Uses (Expenditures)	Financing Expenditures
• Output of EP services (produced by resident units)		• Uses of EP services (produced by resident units)	• Financing uses of EP services
• Gross capital formation	Imports/exports and taxes and subsidies on products	• Gross capital formation • Uses of EP goods • Specific transfers	• Gross capital formation • Uses of EP goods • Specific transfers

Source: Eurostat (2017).
Note: EP = environmental protection

2.3.2 CLASSIFICATION OF ENVIRONMENTAL ACTIVITIES

The CEA is a functional classification system that regroups government and private producer activities related to environmental goods and services that are intended to protect the environment. For example, engineering services are in ISIC, but environmental engineering services are not explicit. The motivation behind developing this classification is the need to develop the SEEA for policy analysis.

Although climate actions go beyond actions related to environmental activities,

this classification system could be the basis for their identification and analysis. The CEA has two divisions: Classification of Environmental Protection Activities (CEPA), which is the classification system for EPEA, and Classification of Resource Management Activities (CREMA), which is also used in the Environmental Goods and Services Sector account.

CEPA classifies activities whose main purpose is preventing, reducing, or eliminating pollution or any other form of environmental degradation. CREMA classifies activities aimed at preserving and conserving the stock of natural resources and, therefore, avoiding their depletion. It includes measures taken to restore the environment because of pressures caused by human activities.

To be considered as protection of the environment, the actions and activities must meet the criterion of the main purpose—that the intent is to protect the environment. Actions and activities that have favorable effects on the environment but are intended for other purposes are not considered environmental protection. Therefore, those activities that, although benefiting the environment, primarily satisfy other technical needs are excluded from this classification. With this criterion, then, activities that mitigate climate change but do not have the intent of mitigating would not be considered climate change activities and the related expenditures should not be tagged as such. This problem is further discussed below.

Table 2 presents the CEA categories. Note that CEPA category 1 is "protection of ambient air and climate," while CREMA category 13 is related to managing fossil energy resources. Though climate change activities are not distinguished within those categories, they could be further subdivided. For example, a filter that removes particles to control air pollution and whose main purpose is environmental protection would be categorized in CEPA 1, but it is not a climate change expenditure. Similarly, activities related to transforming the energy supply to mitigate climate change would be categorized in CREMA 13 but are not currently identified.

Furthermore, several categories could be related to adaptation activities, such as CEPA 4, soil protection, and CREMA 11, forest resources management. However, some mitigation and most adaptation activities will be outside the CEA classification. In other words, although there are products, activities, and transfers related to climate action that can be classified using the CEA classification, many are outside the environmental classification currently in force, agreed and validated by international statistical agencies.

Table 2. Classification of Environmental Activities

CLASSIFICATION OF ENVIRONMENTAL PROTECTION ACTIVITIES	CLASSIFICATION OF RESOURCE MANAGEMENT ACTIVITIES
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 (excluding workplace protection) 6. Protection of biodiversity and landscapes 7. Protection against radiation (excluding external safety) 8. Research and development for environmental protection 9. Other environmental protection activities for environmental protection	10. Management of water resources 11. Management of natural forest resources 12. Management of wild flora and fauna 13. Management of fossil energy 14. Management of minerals 15. Research and development activities for natural resource management 16. Other natural resource management activities

Source: Eurostat (2000; 2017).

2.4 THE FRAMEWORK FOR THE DEVELOPMENT OF ENVIRONMENTAL STATISTICS

Unlike economic information, the field of environmental statistics has no single overarching internationally agreed classification system. Rather, many classifications systems coexist for specific subject areas, including standardized statistical classifications and less formalized groupings or categories that deal with different areas, geographical and temporal scale levels, and conceptual approaches. Moreover, some of the classifications and categories that have been used in the environmental field have not been developed specifically for statistical purposes and, therefore, must be linked to statistical classifications.

Given the range of statistical systems that exist in the environmental field, the United Nations Statistical Office, in conjunction with other international offices, developed the FDES, a multipurpose conceptual and statistical framework for organizing statistical information about the environment.

The FDES considers that people and their social and economic activities (the human subsystem) as integral parts of, and interact with, the environment. From this conceptual foundation, data systems are organized based on a hierarchical structure that at its highest level has six components, as presented in Figure 3. These components are further divided into subcomponents, statistical topics, and individual statistics, as presented in Table 3.

Figure 3. Components of the FDES

Source: UNSD (2017).

Table 3. Components and Subcomponents of the FDES

COMPONENTS	SUBCOMPONENTS
1: Environmental Conditions and Quality	1.1: Physical Conditions
	1.2: Land Cover, Ecosystems, and Biodiversity
	1.3: Environmental Quality
2: Environmental Resources and their Use	2.1: Mineral Resources
	2.2: Energy Resources
	2.3: Land Cover, Ecosystems, and Biodiversity
	2.4: Soil Resources
	2.5: Biological Resources
	2.6: Water Resources
3: Residuals	3.1: Emissions to the Air
	3.2: Generation and Management of Wastewater
	3.3: Generation and Management of Waste
	3.4: Release of Chemical Substances
4: Extreme Events and Disasters	4.1: Natural Extreme Events and Disasters
	4.2: Technological Disasters
5: Human Settlements and Environmental Health	5.1: Human Settlements
	5.2: Environmental Health

COMPONENTS	SUBCOMPONENTS
6: Environmental Protection, Management, and Engagement	6.1: Environmental Protection and Resource Management Expenditure
	6.2: Environmental Governance and Regulation
	6.3: Extreme Event Preparedness and Disaster Management
	6.4: Environmental Information and Awareness

Source: UNSD (2017).

2.4.1 CLASSIFICATION OF ENVIRONMENTAL STATISTICS

Since there is no single overarching internationally agreed on classification system for statistical information about the environment, the United Nations Economic Commission for Europe (UNECE) developed the Standard Statistical Classifications for the Environment, which include classifications of Water Use (1989); Land Use (1989); Wastes (1989); Ambient Air Quality (1990); Surface Freshwater Quality for the Maintenance of Aquatic Life (1992); Marine Water Quality (1992); Environment Protection Activities and Facilities (1994); and Flora, Fauna, and Biotopes (1996). These classifications are the basis of the work on environmental statistics by the UNECE, the OECD, Eurostat, the United Nations Statistical Office, and various regional and national bodies for international data collection. Some have since been superseded by other more recent international classifications.

Furthermore, there are other classification systems that, while not originating in the statistical community, are used by the environmental community and may be relevant for climate change analysis, such as

- the classifications of natural and technological disasters produced by the Centre for Research on the Epidemiology of Disasters Emergency Events Database (CRED EM-DAT);
- classifications of protected areas and threatened species developed by the United Nations Environment Program's World Conservation Monitoring Centre (UNEP-WCMC) and the International Union for Conservation of Nature and Natural Resources (IUCN);
- ecosystem reporting categories used by the Millennium Ecosystem Assessment and the SEEA Experimental Ecosystem Accounts;
- source categories for GHG emissions from the Intergovernmental Panel on Climate Change (IPCC); and
- the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC).

3. CLIMATE CHANGE EXPENDITURES AND STATISTICAL SYSTEMS

Climate change expenditures are transactions that are registered in the SNA or the government expenditure accounts and whose purpose is to implement specific climate change actions. However, if the intention is to develop a methodology to connect and serve broader analytical purposes, proposed classifications should be connected to other databases and statistical systems. It seems reasonable, given their international acceptability, that the FDES, SEEA, GFSF, CEA, and COFOG classifications systems should be the basis of an internationally accepted methodology to classify and tag climate change related expenditures.

However, while these statistical standards provide a conceptually coherent framework to organize information and are based on classifications that identify many climate change expenditures and activities, they do not completely resolve all issues raised by the classification of climate change actions. Therefore, although a climate change tagging methodology must use the international statistical standards as a basis, it must propose a new coherent methodology to deal with all these issues. These are examined in turn.

3.1 CONNECTIONS ACROSS STATISTICAL SYSTEMS

The advantage of adopting existing classification systems is that they identify climate expenditure categories and facilitate a connection with broader statistical and accounting frameworks. Table 4 provides an example of the relationship between COFOG, CEPA, and ISIC. COFOG could be further subdivided using CEA as a basis to identify the most

relevant climate expenditure categories associated with mitigation and adaptation.

Furthermore, as discussed above, climate change policy analysis requires economic, social, and environmental information, as well as expenditure categories. The FDES provides a structure to analyze climate change policy and a set of environmental topics and individual environment statistics that are relevant for climate change. These should be complemented with social and economic statistics from, for example, the SEEA and functional expenditure categories from the MFSF, to provide comprehensive information for policy evaluation.

Figure 4 provides an application of the FDES to climate change, identifying the FDES components to provide information about the various aspects of climate change. Climate change expenditures as they relate to the responses that have been identified above are presented in subcomponents presented in the mitigation and adaptation component.

Table 4. Comparison between COFOG, CEPA, and ISIC

COFOG	CEPA, 2000	ISIC, rev 4
5.1 Waste management	3. Waste management	381; 382; 39; 8129
5.2 Wastewater management	2. Wastewater management	37
5.3 Pollution abatement	1. Protection of ambient air and climate	39
	4. Protection and remediation of soil, groundwater, and surface water	39
	5. Noise and vibration abatement (excluding workplace protection)	4329; 7120
	7. Protection against radiation (excluding external safety)	3812; 3822
5.4 Protection of biodiversity and landscape	6. Protection of biodiversity and landscapes	9103
5.5 R&D environmental protection	8. Research and development	72
5.6 Environment protection n.e.c	9. Other environmental protection activities	8412; 9499

Source: Authors' elaboration based on Eurostat (2011).

Figure 4. Structure of Climate Change Statistics in the FDES Structure

CLIMATE PROCESS DRIVERS	
Subcomponent 1.3	Subcomponent 3.1: Emission to Air
1.3.1 Air quality	3.1.1 Emission of greenhouse gases
	3.1.2 Comsumption of ozone-depleting substances (ODS), by substances

CLIMATE CHANGE EVIDENCE	
Subcomponent 1.1: Physical Conditions	Subcomponent 4.1: Natural Extreme Events and Disasters
1.1.1 Atmosphere, climate, and weather	4.1.1 Ocurrence of natural extreme events and disasters
1.1.2 Hydrological characteristics	

CLIMATE CHANGE IMPACTS AND VULNERABILITY						
Subcomponent 1.1: Physical Conditions	Subcomponent 1.2: Land Cover, Ecosystem, and Biodiversity	Subcompo-nent 1.3: Environmental Quality	Subcomponent 2.3: Land	Subcomponent 4.1: Natural Extreme Events and Disasters	Subcomponent 5.1: Human Settlements	Subcomponent 5.2: Environmental Health
1.1.2 Hydrological characteristics	1.2.1 Land cover	1.3.3 Marine water quality	2.3.1 Land use	4.1.2 Impact of natural extreme events and disasters	5.1.3 Housing conditions	5.2.1 Vector borne diseases
1.1.4 Soil characteristics	1.2.2 Ecosystem and biodiversity					5.2.4 Health problems associated with excessive UV radiation exposure
	1.2.3 Forest					

MITIGATION AND ADAPTATION			
Subcomponent 2.2: Energy Resources	Subcomponent 6.1: Environmental Protection and Resource Management Expenditures	Subcomponent 6.2: Environmental Governance and Regulation	Subcomponent 6.3: Extreme Events Preparedness and Disaster Management
2.2.2 Production, trade, and consumption of energy	6.1 Government environmental protection and resource management expenditures	6.2.2 Environmental regulation and instruments	6.3.1 Preparedness for natural extreme events and disasters
	6.1.2 Corporate, non-profit institution, and household environmental protection and resource management expenditures	6.2.3 Participation in MEAs and environmental conventions	

Source: UNSD (2017).

3.2 IN SEARCH OF A METHODOLOGY TO IDENTIFY CLIMATE CHANGE EXPENDITURES

The discussion above suggests that a methodology consistent with the analytical objectives of policymakers and with a statistical standard must contain at least

1. a system of definitions coherent with the accepted concepts and understanding of mitigation, adaptation, and management of climate-related disasters and risks;

2. a classification system ideally connected to current international classification systems; and

3. a framework that organizes statistics in a coherent system, providing relevant policy indicators.

In other words, the methodology would need to solve at least three main issues: i) policy sensibility, (ii) statistical boundaries, and (iii) analytical capacity. These are examined in turn.

3.2.1 THE POLICY-SENSIBILITY ISSUE: DEFINING CLIMATE CHANGE EXPENDITURES

First and foremost, definitions of climate change expenditures must be consistent with policymakers' analytical and policy interests. There are at least three expenditure categories that policymakers are interested in tracking: mitigation, adaptation, and management of climate-related disasters and risks.

Currently, functional classifications use the principal purpose or motivation criteria to identify spending associated with environmental phenomena. The problem with this criterion is that it excludes expenditures for activities that have a significant effect on climate change but that are not explicitly intended to deal with climate change. For example, investment in a renewable energy plant would not be considered a climate change mitigation expenditure if the intent of the project is energy production, not climate mitigation, but it is an investment that mitigates climate change.

Another example is mitigation or adaptation expenditures to respond to climate change impacts, such as an extreme event (e.g., a hurricane). Though most developing countries would identify such expenditures as relevant to climate change, they are not considered as such in the current functional classification frameworks since their purpose or intent is capital formation and/or economic production.

Thus, the principal purpose criterion may be too limited to construct a set of definitions of climate change consistent with

policymakers' interests.[16] In short it may not deal effectively with the policy-sensibility problem. Therefore, a broader set of definitions may be necessary to create a climate change expenditure classification system and a climate change activities taxonomy (IBD, 2020, forthcoming, for a discussion).

3.2.2 THE STATISTICAL BOUNDARY ISSUE: DEVELOPING A CLASSIFICATION SYSTEM FOR CLIMATE CHANGE EXPENDITURES

Since climate change actions and policymakers' interests are broader than environmental activities, as defined by current classification systems, it may be necessary to develop a specific system for climate change activities. This classification system must clearly delineate those activities and expenditures that respond to climate change but maintain coherence with the logic of current classification systems: the boundary issue. In other words, a new classification system must be consistent with the CEPA and COFOG while maintaining a set of definitions consistent with policymakers' interests.

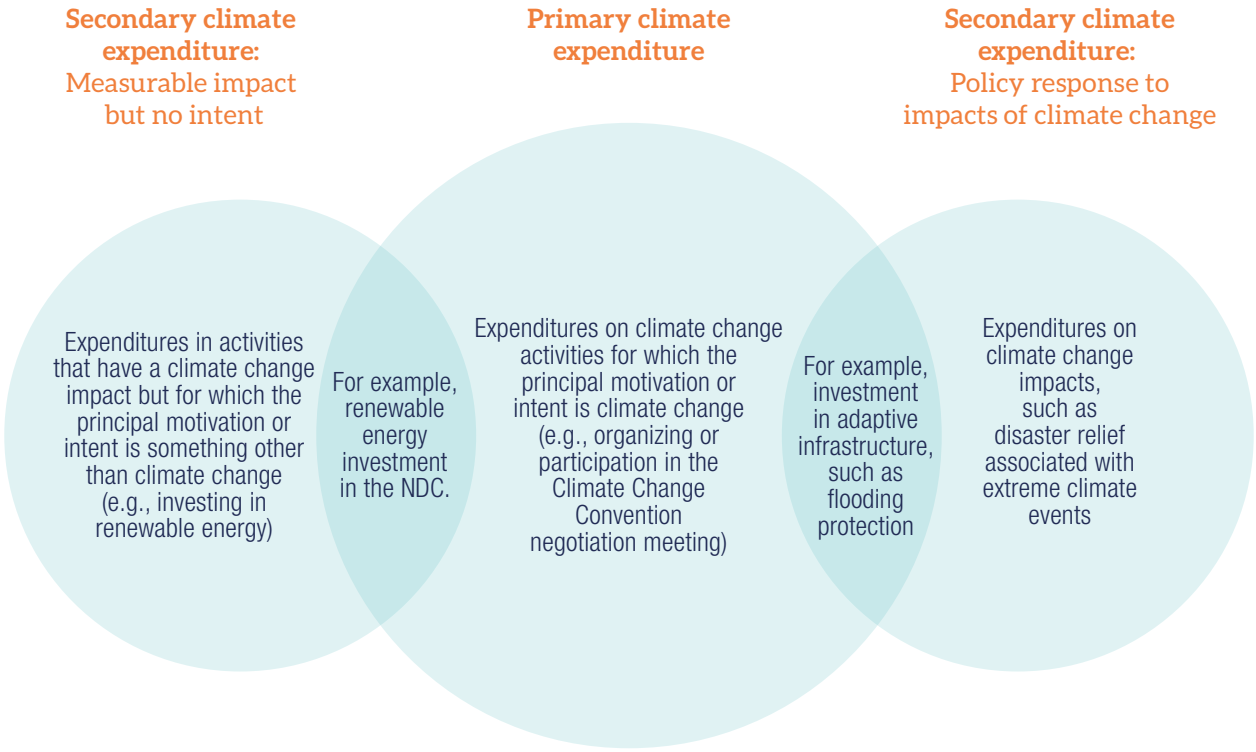
One solution may be to develop a double entry classification system, namely a primary and secondary purpose approach. A primary functional climate change classification can tag expenditures based on purpose or intent, while a secondary purpose classification can tag activities, actions, or products based on impact, within all primary expenditure categories. The primary classification tag would then require a reclassification of the COFOG categories, while the secondary classification tag can be viewed as a number of attributes within one expenditure category that can be used for analytical purposes.

This approach satisfies both the policy sensibility issue—all climate policy expenditures and activities can be identified regardless of intent—and the statistical boundary issue—primary purpose climate change expenditures are consistent with the COFOG.

There will be some overlap between these categories. For example, spending on renewable energy projects would be tagged as a secondary climate expenditure if the intent is energy generation and as a primary climate expenditure if the spending is associated with actions identified in a country's Nationally Determined Contribution (NDC) (Figure 5).

16 Although policymakers' interests are not always completely clear, policymakers are interested in tracking activities that mitigate climate change regardless of intent, expenditures that may have a significant impact on greenhouse emissions (anti or negative mitigation), a broad range of adaptation activities, and responses to climate-related risks and disasters, including emergency responses and capital formation.

Figure 5. Government Expenditures on Climate Change Actions



Source: Authors' elaboration.

One way to approach this would be to maintain the COFOG division structure, with expenditures whose principal purpose is climate change in Division 5, Environmental Protection. For expenditures related to climate action but whose main purpose is not climate action, there would be a double classification. Table 5 presents the classification of climate expenditures, tagging them as primary or secondary, consistent with the COFOG. Note that climate relevant expenditures are found in different divisions of government functions.

This double tagging approach allows budget offices to reorganize information based on different criteria and therefore allows consistency across different classification systems. Such a system would satisfy international comparability, but also give national policymakers the flexibility to track those climate expenditures that are

relevant for national policymaking but not considered international climate change expenditures using international classification systems. However, this approach would probably require upstream tagging, ideally at the project budget or program level. As a result, ex-post estimation methodologies using sector-based expenditure questionnaires would have more difficulty applying this type of approach.

Table 5. Proposed Climate Change Classification System Based on COFOG

FUNCTIONS OF GOVERNMENT	TAGGED AS PRIMARY (PRINCIPAL PURPOSE IS CLIMATE CHANGE)	TAGGED AS SECONDARY (CLIMATE CHANGE IS A SECONDARY RESULT)
1. General public services		
2. Defense		✓ (e.g., emergency defense expenditure relief after a climate-related disaster)
3. Public order and safety		✓ (e.g., fire control after a climate-related disaster)
4. Economic affairs		✓ (e.g., investment in energy projects that reduce carbon emissions)
5.1. Environmental protection		
5.2. Climate change	✓	
4. Housing and community amenities		✓ (e.g., emergency housing for populations affected by climate-related disasters)
5. Health		✓ (e.g., increased investment in health services due to climate impacts)
6. Recreation, culture, and religion		
7. Education		
10. Social protection		✓ (e.g., employment benefits because of climate impacts)

Source: Authors' elaboration.

3.2.3 THE ANALYTICAL CAPACITY ISSUE: ESTABLISHING AN ACCOUNTING FRAMEWORK

Once definitions and a classification system have been determined, it is necessary to establish an accounting framework to organize the statistical information. An accounting system should deal with the analytical problem by organizing information coherently and providing policy-relevant indicators. A logical accounting structure would be the EPEA adapted to climate policies through the classification system.

Following we provide three tables organized in the EPEA format that can be used to organize information once climate change expenditures have been identified and support their analysis.

1: Cross-Classifying Economic and Functional Expenditures

Many finance and planning ministries are interested in analyzing expenditures based on the economic impact and policy objectives and crossing economic and functional expenditure categories. The analysis in Table 6 is not only relevant for climate change policy, but also to determine the economic impact of this expenditure.

Table 6. Cross-Classification of Climate Change Expenditures and Economic Classifications

CLIMATE CHANGE FUNCTIONS OF GOVERNMENT	COMPENSATION OF EMPLOYEES	USE OF GOODS AND SERVICES	CONSUMPTION OF FIXED CAPITAL	INTEREST	SUBSIDIES	GRANTS	SOCIAL BENEFITS	OTHER EXPENSES	NET INVESTMENT IN NON-FINANCIAL ASSETS	TOTAL
Climate activities										Sum climate activities
Mitigation										
Adaptation										
Management of climate-related disasters and risks										
Total	Sum compensation of employees									Sums are equal

Source: Authors' elaboration, adapted from Table 6A.2 from IMF (2014).
Note: Cells would be filled with the monetary value of these expenditures.

2: Transfers

Another application is identifying transfers across government units. Government payments are recorded in several places in both national accounts and public finance accounts. Treatment of these payments and, consequently, their analysis and impact, depends on their relationship with production and consumption, and whether by nature they are current or capital expenditures.

A transfer is a transaction in which an institutional unit (in this case the government) provides a good, service, or asset to another unit without receiving any good, service, or asset in return. As defined by the SNA, transfers can be subsidies, social benefits for households, investment subsidies, and other current and capital transfers. From the point of view of climate analysis, the type of transfer is essential to determine how climate policy is being dealt with by the state. Table 7 presents some examples.

Table 7. Government Transfers Related to Climate Expenditures

		PAYMENTS RECEIVED BY:				
		GOVERNMENT	CORPORATIONS	HOUSEHOLDS	NPISH	REST OF THE WORLD
PAYMENTS MADE BY:	**Government**	Transfers between levels of government*	Subsidies and investment grants (e.g., renewable energy subsidies)	Current and capital transfers (e.g., subsidies for solar energy panels)	Subsidies and current and capital transfers	Current and capital transfers (e.g., green funding)
	Corporations	Taxes, fees, fines, charges, and rents (e.g., carbon tax)	Rent	Rent	Donations	Donations to NPISH in the rest of the world
	Households	Taxes, fees, fines, charges, and rents			Donations	Donations
	NPISH	Taxes (e.g., on diesel)	Current and capital transfers	Current and capital transfers		Current and capital transfers
	Rest of the World	Taxes and current transfers			Donations	

Source: Authors' elaboration, adapted from Table 4.8 from UNSD (2014a).
NPISH: non-profit institutions serving households.
* This table is an example from the EPEA account and serves an analytical purpose; however, to avoid a double recording of expenditures, guidelines on how to treat intergovernmental transfers should be established.

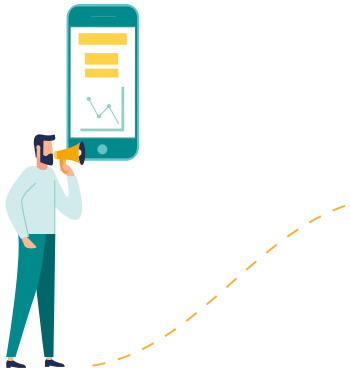
3: Carbon Taxes

Although this document has focused on climate change policy expenditures, other policy instruments may be of interest, such as carbon taxes. The EPEA has developed an environmentally related taxes and revenue account that can be used to identify taxes associated with greenhouse gas emissions (Table 8).

Table 8. Greenhouse Gas Taxes

TYPE OF ENVIRONMENTAL TAX			TAX ON INCOME				
	TAXES ON PRODUCTS	OTHER TAXES ON PRODUCTION	CORPORATIONS	HOUSEHOLDS	OTHER CURRENT TAXES	CAPITAL TAXES	TOTAL
Taxes on Energy	A	M	N	O	P	Q	A+M+N+O+P+Q
Taxes on Greenhouse Gases	A.1						
Taxes on Transport Fuels	B = (B.1+B.2)						
Carbon	B.1						
Non-carbon	B.2						
Taxes on Pollution	C						
Taxes on Resources	D						
Taxes on Carbon-Based Resources	D.1						
Total Environmental Taxes	A+B+C+D						
Total Greenhouse Gas Taxes	A.1+B.1+D.1						
Total Non-environmental Taxes	E						
% Environmental Taxes	(A+B+C+D)/ (A+B+C+D+E)						
% Greenhouse Gas Taxes	(A.1+B.1+D.1)/ (A+B+C+D+E)						

Source: Authors' elaboration, adapted from Table 4.9 from UNSD (2014a).



4. CONCLUSIONS

Climate change generates enormous social, economic, and environmental costs. It poses immense challenges to countries, not only due to the direct physical impacts, but also because of the potential fiscal risks associated with the policy response. Therefore, governments are increasingly interested in identifying and, above all, analyzing intended (those specifically directed to climate change policies) and unintended (responses to deal with climate change impacts) climate change expenditures.

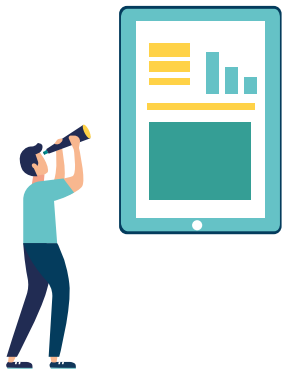
However, identifying climate change expenditures through budget tagging is not enough since both governments and international organizations need to clearly assess their impact. Given the ubiquitous nature of climate change, policy responses generate impacts across policy domains associated with different databases and different conceptual approaches, as well as geographic and temporal scales.

Therefore, to have the analytical capacity to fully understand the consequences of different climate change policy responses, it is essential to connect different statistical systems. This requires connecting classification systems and conceptualizing an accounting framework to organize the information.

While only a complete methodology to identify climate change expenditures can solve all these challenges, it is essential that the approach recognizes current classification systems and accounting frameworks, particularly those used in the budgetary process. Otherwise, the methodology may identify climate actions and their expenditures adequately but may not be consistent, comparable, or have limited analytical capacity.

Thus, our primary recommendation is that climate budget tagging methodologies need to make an explicit effort to connect

definitions and classification systems with existing international statistical standards. This paper has discussed some of the accounting frameworks and classification systems that are most pertinent. It should be considered an input to developing an internationally agreed on, consistent, and, above all, practical methodology to help countries identify their climate change policy response efforts. To this end the Inter-American Development Bank is supporting countries' efforts, but a comprehensive methodology requires an integral approach from international organizations and multilateral financial institutions.



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