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Natural resource use and management expenditure accounts

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Revision of chapters 5 and 6 of SEEA2003:

Draft outcome paper on

Natural resource use and management expenditure accounts

(revised version following the 13TH Meeting of the London Group on Environmental Accounting – Brussels, 29 September - 3 October 2008)

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1. Background

In the wider context of the revision of chapters 5 and 6 of SEEA2003, the area of natural Resource Use and Management Expenditure Account (RUMEA) was suggested for development in the UNCEEA preliminary list of research items. With connection to this, the London Group considered the development of the classification of natural resources management expenditures as an important issue to be addressed during the SEEA revision for inclusion in the standard. This reflects the opinion, emerged in the group, that the revision of chapters 5 and 6 of SEEA2003 should emphasize the EPEA accounting methodology as holding for all areas of environmental expenditure, while the main conceptual issues to be dealt with as far as RUMEA is concerned would relate to the scope and classification of resource use and management activities and expenditures.

Istat has developed since 2006 a classification for RUMEA purposes – called CRUMA (Classification of Resource Use and Management Activities and expenditures) – which is fully consistent with the Classification of Environmental Protection Activities and expenditures (CEPA). CRUMA was presented at the 12th London Group meeting held in Rome in December 2007. The London Group considered it as very promising and a good basis for developing a classification in this area and invited Istat to prepare an issue paper, to be drafted in consultation with IMF, FAO and Eurostat.

The requested issue paper was presented by Istat at the 13th London Group meeting held in Brussels in 2008[1].

The issue paper was appreciated by the London Group, which agreed upon the scope and classification of RUMEA. The Group appreciated in particular that CRUMA was fully consistent with CEPA and was, like CEPA, strongly linked with COFOG. Possible improvements were foreseen mainly in the following areas:

- Energy saving and production of renewable energy;
- Description of the content of certain categories.

The London Group recommended that RUMEA be included in Volume I of the SEEA and asked Istat to prepare a slightly revised paper, taking into consideration the comments received during the discussion; the revised version of the issue paper was to be posted on the London Group website for comments.

After collection of comments from the Eurostat reflection group and LG members, the issue paper on RUMEA, updated as appropriate, will be submitted to the next London Group meeting

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[1] The issue paper was prepared by Istat on the basis of a draft submitted to Eurostat, FAO and IMF members of the London group. Eurostat's contribution has been developed within the Reflection group on RUMEA, made up of the following experts:
- Danica Bizjak (Statistical Office of the Republic of Slovenia)
- Maria Luisa Egido, Francisco Javier Sanz Pascual (Statistics Spain)
- Federico Falcitelli (Istat, Italy)
- Ian Gazley (ONS, Office for National Statistics, UK)
- Constantin Mindricelu (INS, National Institute of Statistics, Romania)
- Tone Smith (Statistics Norway)
- Nancy Steinbach (Statistics Sweden)
- Alexandra Wegscheider (Statistics Austria).

From Istat's side, a contribution was provided also by Aldo Femia with reference to all the issues dealt with in the paper. Cesare Costantino supervised the preparation of the whole paper.

for adoption. It was also suggested, depending on its stage of development, to have CRUMA included in the international family of classifications on the par with CEPA. This process would require that CRUMA be submitted to the United Nations Expert Group on Classifications.

The present document is the revised issue paper requested by the London Group at the 13th meeting held in Brussels. It includes a revised version of CRUMA obtained by adjusting the Italian CRUMA according to the comments received. The main adjustments concern:

- the treatment of energy saving and production of renewable energy;
- changes in a number of labels;
- an improvement in the description of the content of some categories.

The following issues are dealt with in the paper:

a) Scope of RUMEA (§ 2);

b) Criteria for setting up a classification of RUM activities and expenditures, with special consideration of arrangements provided by Istat's CRUMA (§ 3). Obviously, the resulting classification – presented in §§ 3.2-3.3 and Annexes 2-3 – is no more the *Italian* one but the new version obtained by adjusting the Italian CRUMA according to the comments received;

c) Overview of EPEA methodological aspects holding also for the RUMEA (§ 4);

d) Conclusions and future steps with a view to reach an agreement on the classification and to elevate it as a standard classification (§ 5).

Remark: Paragraphs quoted between brackets refer to SEEA2003 if not otherwise specified.

2. Scope of RUMEA

The natural resource use and management sector in the wider context of environmental activities and expenditures

Environmental activities and actions (and corresponding expenditures) can be defined in general as all the measures aiming at preserving and maintaining the functions of environmental assets.

In the SEEA, the asset boundary of the SNA is expanded to cover all environmental entities that are of interest and measurable. Accordingly, the environmental assets are grouped into the following broad categories (§ 2.125):

- Natural resources:
  - Mineral and energy resources;
  - Soil resources;
  - Water resources;
  - Biological resources;
- Land and associated surface water;
- Ecosystems.

According to the SEEA, the functions provided by the environmental assets are (§ 1.23):

- "**Resource functions** cover natural resources drawn into the economy to be converted into goods and services for the benefit of mankind. Examples are mineral deposits, timber from natural forests, and deep sea fish.
- **Sink functions** absorb the unwanted by-products of production and consumption; exhaust gases from combustion or chemical processing, water used to clean products or people, discarded packaging and goods no longer wanted. These waste products are vented into the air, water (including sea water) or are buried in landfill sites. These three destinations are often referred to as "sinks".
- **Service functions** provide the habitat for all living beings including mankind. Some aspects of habitat are essential, such as air to breathe and water to drink. These are called *survival functions*. If the quantity and quality of survival functions are diminished, biodiversity of species is threatened, not excluding the human species. Some service functions are not essential in the same way but improve the quality of life, for example by providing a pleasing landscape for leisure pursuits. These are called *amenity functions* and affect mankind only (or at least are the only ones measurable to us in human terms".

According to the capital approach, the long-term sustainability of development is seen to depend upon the maintenance of natural capital (in addition to the other forms of capital). If stocks of natural capital decline to the point where they are no longer able to adequately provide the functions listed above, any pattern of development that relies on these functions is not sustainable. Of course, this is not to say that some other pattern of development is not possible, only that change will be required to either 1) eliminate the need for a particular natural capital service or 2) find a means of replacing the natural capital service with a service of produced capital. (§ 1.24).

Different kinds of environmental activities and expenditures can be defined depending on the kind of environmental asset and the kind of environmental function concerned.

Environmental Protection (EP) activities and expenditures, as defined according to CEPA2000, preserve and maintain the sink and service functions provided by all kinds of environmental assets covered by the SEEA, except for the mineral and energy resources which are mainly relevant from the point of view of their resource functions.

EP activities and expenditures can be carried out by all economic and institutional sectors, as principal, secondary or ancillary activities.

Resource Management (RM) activities and expenditures aim at preserving and maintaining the stock of natural resources against depletion phenomena. They relate to the resource functions of all natural resources covered by the SEEA except for soil resources which are mainly protected through EP activities[2].

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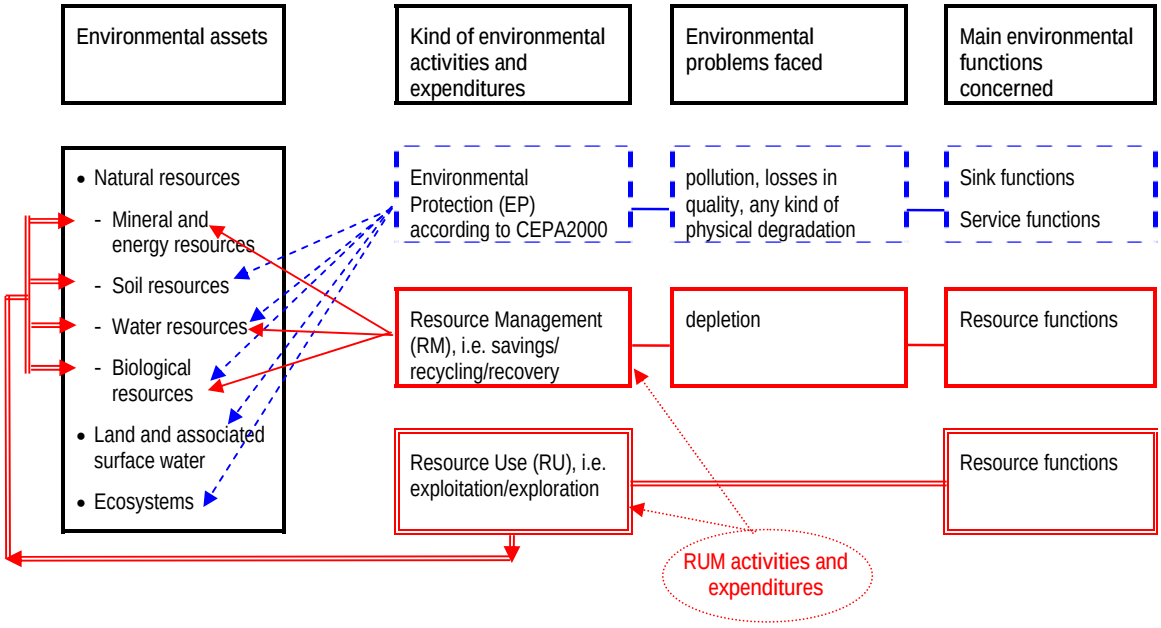
[2] According to the SEEA soil resources include soil found on agricultural land as well as that found elsewhere within the national territory (§ 7.44). In practice, it is agricultural soil. Topsoil that is extracted from one place and used to supplement soil elsewhere may be of sufficient importance in some countries to warrant compilation of an account. Sand and gravel resources are generally defined to be part of non-metallic mineral resources rather than soil resources. In some instances, the distinction between topsoil and sand and gravel is not clear-cut and it may be the case that topsoil resources end up included in the measurement of sand and gravel or vice versa (§ 7.45). It must be recognised that estimating the total stock of soil resources in physical terms may be very difficult, even for countries with sophisticated land statistics. Thus, the physical account for soil may show only the change in soil resources from one period to the next. Since soil forms very slowly, in practice the only change that would be shown in such an account would be the depletion of agricultural soil due to erosion or the extraction of topsoil. It should be noted that qualitative degradation of soil due to compaction, salinisation, loss of organic matter and other impacts of economic activity are accounted for in principle elsewhere in the classification (§ 7.46).

It is worth noting that a given environmental asset can be preserved through different kinds of activities depending on the functions to be protected: e.g. natural forests can be protected from a qualitative point of view (EP activities) in order to preserve their sink functions (carbon binding) or service functions (protection of biodiversity and landscapes); the same environmental assets can also be protected from a quantitative point of view (RM activities) in order to preserve their stock against depletion phenomena (resource functions). Separating the different activities aimed at preserving the various functions of a natural asset is not always easy. The picture given in Figure 1 is understood as representing an association between environmental activities and environmental functions of natural assets according to the main purpose criterion[3]. Obviously the reality is more complex: e.g. the possibility of using water (resource functions) depends not only on the amount of water available, but also on its quality, which in turn may be affected by the occurrence of sink functions; nevertheless it seems reasonable to apply the main purpose criterion and, accordingly, to consider wastewater management activities as EP activities preserving mainly the sink and service functions, and water saving activities as RM activities preserving mainly resource functions.

RM activities and expenditures can be carried out by all economic and institutional sectors, as principal, secondary or ancillary activities.

Figure 1 Environmental assets and expenditures



Resource Use (RU) activities include abstraction, harvesting and extraction of natural assets, including exploration and development. The standard classification of economic activities (ISIC) includes several activities that are typically resource-related industries, such as fisheries, forestry, mining and water supply. These industries carry out RU activities as their main activity. RU activities can be also carried out as secondary or ancillary activities within other ISIC sectors.

Consistently with SEEA definition of soil resources, the activities that can be carried out for protecting these resources (e.g. protection against erosion, salinisation, etc.) are EP activities to be classified mainly within CEPA 4. It should be noted that CEPA does not explicitly deal with activities carried out for avoiding or reducing depletion of soil resources that is caused by extraction of topsoil.

[3] This is the criterion used for classifying EP activities according to CEPA.

The labels used above for the three main categories of environmental activities are consistent with what can be found e.g. in handbooks, guidelines and compilation guides developed by international organizations. In particular, according to this literature "Resource Management (RM) activities" refers conventionally to all the activities and actions preserving natural resource stocks against depletion, while the expression "Resource Use (RU) activities" refers to all the activities and actions relating to exploration, withdrawals and distribution of natural resources.

In the light of the above, environmental activities and expenditures can be connected to environmental assets and the environmental functions they provide as shown in Figure 1.

On the way of presenting the environment-related activities as described in this paragraph there appears to be an unanimous agreement, as shown in the comments received on the version of the issue paper presented at the meeting in Brussels. The description made here was considered to be useful and clarifying and would have to be included in the revised SEEA chapter 5.

Scope of the natural resource use and management sector

The scope of RUM would have to be identified similarly to the scope of EP, making sure that any overlapping between the two fields is avoided.

The EP scope has been defined by identifying the different kinds of pollution or degradation to be faced (called "environmental domains") and the kinds of activities and actions that can be carried out for preventing, reducing or eliminating the different kinds of pollution and degradation.

Similarly, the RUM scope can be defined by identifying the different kinds of natural resources to be used and managed and the kinds of activities and actions that can be carried out for their use and management.

Natural resources

Consistently with the picture given in Figure 1, in the SEEA four main categories of natural resources are identified as relevant for RUMEA purposes (chapter 5): sub-soil assets, inland waters, forest resources, wild flora and fauna (see Table 1). In the SERIEE (chapter X) the same kinds of natural resources are identified, with the only difference that, within the "Mineral and energy resources" group, fossil energy and raw materials are shown separately.

Table 1 Natural resource categories identified as relevant for RUMEA purposes in the SEEA and the SERIEE

Natural resources	Categories identified as relevant for RUMEA purposes	
	SEEA2003 (ch. 5)	SERIEE 1994 (ch. X)
o Mineral and energy resources	Sub-soil assets	Fossil energy Raw Materials
o Soil resources		
o Water resources	Inland waters	Inland waters
o Biological resources	Forest resources Wild flora and fauna	Natural forest resources Wild flora and fauna

As far as biological resources are concerned, both in the SEEA and the SERIEE the categories identified as relevant for RUMEA purposes relate only to non-cultivated resources[4]. This restriction stems from the main policy issue to which the development of RUMEA is connected, i.e. the need of more efficient use and sustainable management of natural resources, given their scarcity and related depletion problems.

In defining the RUM scope for developing the Italian CRUMA, Istat adopted the five natural resource categories identified as relevant for RUMEA purposes in the SERIEE. The comments received indicate that there is a general agreement on taking into account these five categories in the revised chapter 5 of the SEEA and on the need to highlight better the limitation to non-produced assets.

The Eurostat Reflection group on RUMEA suggested that a further break down / specification would be needed in order to establish a closer link between data on RUM expenditures and Economy-wide MFA data (in particular on input flows). Consistently with the existing and upcoming international guidelines on Economy-wide MFA (EU standard tables and methodological guide, OECD guidance manual, joint OECD/Eurostat Ew-MFA Implementation guide), such further break down / specification could be as follows:

1. Fossil energy
    a. coal
    b. oil
    c. gas
    d. other (e.g. bituminous shale)
2. Raw materials, i.e. Minerals
    a. Metal ores and concentrates
    b. Non metallic minerals
        i. industrial minerals
        ii. construction minerals
3. Inland waters
4. Natural forest resources
5. Wild flora and fauna

In addition to these categories, Ew-MFA experts suggested to consider, for completeness, also *unused materials* as defined in the Ew-MFA domain, which would have to be regarded as a further category rather than a specification of those listed above, which coincide with *used materials* in Ew-MFA. It was also recommended to use the label "Minerals" instead of "Raw materials" for clearness and consistency with the other category denominations.

Other specific points were raised also with a view to ensuring suitable links between data on RUM expenditures and data in physical units:

[4] E.g. in the SEREIEE: "Only those natural resources corresponding to non-produced natural assets whose use takes the form of goods, are dealt with in the natural resource use and management account. Hence, produced natural resources (livestock, plants) are excluded as well as those environmental services which result from uses of certain functions of natural assets (assimilation of pollutants, aesthetic value, etc.)" (SERIEE 1994 §§ 10043-10045).

- *pastures and hayfields*: the biomass from pastures and hayfields represents an input for the economy accounted for in the Ew-MFA in physical terms. The expenditure carried out by the industries for the use of such biomass (RU activities) can be considered as related to wild flora resources (non-cultivated resources); in land use classifications the same pastures and the hayfields are considered agricultural fields (cultivated assets);
- *soil resources*: soil resources represent an input for economic activities such as agriculture, forestry, etc., accounted for in physical terms in the Ew-MFA. Expenditures for the use of soil resources (RU activities) in principle could be accounted for in RUMEA, but no examples of management activities purely related to soil resources (RM activities) have been found. The RM activities that can be carried out for preserving the stock of soil resources seem to fall always under environmental protection characteristic activities classified according to CEPA: e.g. protection of soil against physical degradation phenomena (erosion, compacting, etc.) or protection of landscapes. As a matter of fact neither SEEA2003 nor SERIEE1994 consider soil resources within the RUMEA scope (see Table 1 above and Figure 2 below).

Finally it should be mentioned that use and management-type activities may be carried out also for environmental assets other than natural resources. For example land is used, is preserved (often through environmental protection activities falling within CEPA) and is managed (in some countries, the general government allocates land to farmers). Nevertheless for the time being it seems reasonable to limit RUMEA to (non-produced) natural resources, since most of the activities for managing other environmental assets (land, ecosystems) is covered by CEPA with a few exceptions.

Kinds of activities and actions

A natural resource use and management account is intended to describe activities for the use and management of natural resources, linking monetary data with physical data (SERIEE1994 §§ 10041-10042). With reference to this, SEEA and SERIEE take into account activities and actions aiming at managing natural resources and reducing their intake as well as exploration and exploitation activities. The consideration of all these activities together with EP activities enables us to arrive at a more comprehensive description of the transactions related to the interaction between human activity and the environment.

The main kinds of activities identified by SEEA and SERIEE are:

- research for new resources,
- withdrawals from existing resources,
- activities aimed at reducing withdrawals (recovery, recycling, saving or substitutions of resources),
- administration and regulatory activities and in general activities of natural resource management authorities,
- monitoring, control and surveillance, data collection and statistics,
- R&D activities in the field of natural resource use and management.

Activities and transactions specific for environmental protection, for example management of protected forests, are not included (they are included under environmental protection expenditure activities). Similarly, qualitative protection activities of natural resources, for example activities for biodiversity and landscape protection or activities aimed at preserving certain

functions or the quality of the natural environment (air, water, soil and groundwater), are also included under environmental protection (§ 5.39).

Exploitation activities include abstraction, harvesting and extraction of natural assets including exploration and development. These accounts typically correspond to the standard economic accounts for various natural resource-related industries such as fisheries, forestry, mining and water supply. They complement the asset accounts described in chapters 7 and 8 of SEEA2003 (§ 5.41).

"Activities which consist in the transformation of natural resources, i.e. corresponding to their use as input for the production of another product are not described in the account; however activities aimed at lowering their consumption, whether directly or indirectly are considered" (SERIEE § 10047, see also SEEA2003 § 5.42)

Consistently with these general concepts, SEEA and SERIEE provide also a provisional overview of the main kinds of management and use activities relevant for the different types of natural resources (Figure 2).

Figure 2 Natural resources use and management activities according to SEEA2003 and SERIEE1994

SEEA2003, Table 5.3

Resources	Management	Exploitation
Sub-soil assets	Administration of permits, planning supervision, research, regulation	Exploration and extraction
Inland waters	Administration of water ways and water bodies, supervision, research, elaboration of plans and legislation, water police	Exploration, extraction, treatment, distribution
Forest resources	National forest inventories, research for pest control, regulation	Silvicultural activities including harvesting and reforestation
Wild flora and fauna	Supervision and control of fishing fleets, assessment of stocks, administration of quotas and licenses, research, regulation	Harvesting, fishing, hunting

SERIEE1994, § 10048

Activities / Resources	mobilisation/exploitation withdrawals	savings/recycling/recovery
inland waters	research, harnessing, treatment, distribution, recharging, regulation	savings, recycling
natural forest resources	exploitation	
wild flora and fauna	harvesting, fishing, hunting	
raw materials	research, extraction	recycling, savings, etc.
fossil energy	research, exploitation	energy savings, development of renewable energy

The conceptual examples given in chapter X of SERIEE suggest that, within the RUMEA, expenditures for reducing the intake of natural resources should be accounted for separately from exploration and exploitation expenditures. The two groups of activities have a different relevance from an environmental perspective and can be linked to different types of physical data (e.g. in the case of inland waters, mobilization expenditures could be linked to physical data on uses, while saving or recharging expenditures could be linked to data on gross increase on proven reserves). This would lead to build separately, for each natural resource, an account for mobilization expenditures (RU activities) and another one for recycling/saving-type expenditures (RM activities).

Following this distinction, a generalization of the activities identified by SEEA and SERIEE for each natural resource is provided by the list of activities that have been considered by Istat for developing the Italian CRUMA, as shown in Table 2. Such list includes all the activities identified by SEEA and SERIEE with the addition of teaching, training, information and communication activities. This addition is consistent with CEPA, which includes explicitly such kind of activities.

Exploration and exploitation activities are kept separated from activities aiming at reducing the intake of natural resources: in the Italian CRUMA, for each natural resource, the exploration and exploitation activities are grouped together under an ad hoc category referred to as "Direct management of natural resource stocks".

Table 2 Natural resource use and management activities identified for the developing CRUMA

"RM activities" Activities aimed at preserving natural resource stocks		- activities aimed at reducing withdrawals: recovery, reuse, recycling, savings, substitution of natural resources - restoration activities: increases/ recharges of natural resource stocks (for renewable resources, i.e. inland waters, forest and wild flora and fauna) - natural resource administration and regulation activities carried out by the general government (including e.g. the elaboration of plans, the release of any kind of licenses and permits for exploiting resources, the enforcement of quotas, …) - monitoring, control and surveillance (including the control on the observance of licenses, permits, quotas, …), measurement, inventories, data collection and the like - teaching, training, information and communication activities - R&D activities in the field of natural resource use and management
"RU activities" Activities relating to exploration, withdrawals and distribution of natural resources	*Exploration*	- research and exploration for new reserves and resources
	Withdrawals and distribution	- withdrawals from existing resources - management and maintenance activities carried out by the public or private authorities in charge of the direct management and exploitation of the reserves of natural resources - distribution of natural resources (only for inland waters)

So far Istat has built a RUMEA for the whole economy only for water resources. Such experience shows that in practice accounting for exploitation expenditures separately from expenditures for reducing the intake of natural resources may be very difficult, especially in the case of specialised producers that are in charge of managing and exploiting reserves of natural resources. These producers often carry out exploration and exploitation activities together with

measures aimed at reducing the intake (e.g. more resource efficient technologies, savings, etc.), without separate registration of the corresponding expenditures.

The comments received show that it is unanimously agreed that the scope of RUMEA is clearly and consistently defined by the SEEA and SERIEE in terms of kinds of natural resources and broad categories of RUM activities and actions. The two accounting frameworks appear also to be consistent in delimiting the RUMEA scope to non-produced natural resources and, in general, in defining it with no overlapping with the EPEA scope. Furthermore, according to the comments received, there is agreement on considering the list of activities and actions of Table 2 as appropriate for defining the RUMEA scope. It has been underlined that RM activities should be kept separate from the RU ones; among the RU activities, exploration and exploitation activities (i.e. withdrawals and distribution) should be kept separate as well.

3. Classification of natural resource use and management activities and expenditures

The scope of natural resource use and management activities appears to be well identified in terms of natural resources and broad categories of activities and actions: SEEA2003 and SERIEE1994 approaches are substantially consistent and identify the RUM scope as complementary to that of environmental protection. However, while a classification has been developed and internationally agreed upon for EPEA purposes (i.e. CEPA), a similar classification has not been set up, until now, for RUMEA purposes.

In this regard a relevant attempt has been made within the OECD/Eurostat manual on eco-industries[5], whose classification is referred to by chapter 5 of SEEA2003. In this classification, like in any other international environmental accounting framework, activities and products for managing and abating pollution and degradation are classified according to CEPA, which has been developed by cross-classifying in a systematic way the different kinds of pollution or degradation ("environmental domains") and the activities that can be carried out to protect the environment against them (see next paragraphs). The resource use and management activities, instead, are classified under very broad categories, identified on the basis of criteria that appear to be not homogeneous and very much different from those of CEPA: some categories refer to economic activities (e.g. "water supply", "sustainable agriculture and fisheries", …) with no systematic reference to the natural resource involved and the kind of activity carried out; some categories are focused on technologies (e.g. "renewable energy plant"); some others on the output ("recycled materials"). Differently from CEPA, the approach followed in the OECD/Eurostat manual on eco-industries actually does not provide a proper list of activities. On the other hand, for those categories that are identified according to industries within which environmental activities are carried out (e.g. sustainable agriculture, fisheries, forestry, tourism) the measures actually carried out for preserving natural resources are not clearly pointed out, leading to possible overlapping with CEPA. Furthermore the classification of the OECD/Eurostat manual on eco-industries does not seem to cover all the natural resources and kinds of activities included in the RUM scope according to SEEA and SERIEE.

All these considerations support the idea that the there is a need of a standard classification of RUM activities, which is complementary, comparable and consistent with CEPA.

Next paragraphs deal with the following:

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5 OECD – Eurostat (1999).

- classification criteria and principles to be followed in order to set up a classification of RUM activities consistent with CEPA (§ 3.1);
- the CRUMA classification developed as a result of the application of such criteria and principles. The new version of CRUMA dealt with hereafter is obtained by considering the Italian CRUMA as a starting point and by adjusting it endorsing the comments received (§ 3.2);
- specific borderline cases (EP *versus* RUM activities) (§ 3.3);
- relationship between "sustainable" economic activities (e.g. sustainable agriculture, fisheries, etc.) and EP and RUM activities (§ 3.4);
- regrouping activities for particular policy needs: the case of climate change-related activities (§ 3.5).

All the positions endorsed in the next paragraphs stem from what has been agreed by the London Group during the 13th meeting held in Brussels and by the experts who have provided comments.

Classification criteria and principles

A classification of RUM activities that is complementary, comparable and consistent with CEPA should comply with a number of criteria and principles that characterize the CEPA itself:

- it should be a classification of the economic activities carried out for RUM purposes, regardless of the institutional and ISIC sectors which the producers belong to, i.e. a classification of "characteristic" activities concerning the RUM field (***economic activities for RUM purposes, "characteristic" activities***);
- even though defined in terms of economic activities, RUM categories should be general enough as to allow the use of the classification as a functional classification, i.e. a tool suitable for classifying not only activities but also products, producers, actual outlays and any kind of transactions (***functional multi-purpose classification***);
- the classification should be built according to the "main purpose" principle, to be identified taking into account the technical nature as well as the policy purpose of an activity: for example, activities which have a favourable impact on the environment but which serve other goals do not come under environmental protection (***"main purpose" classification principle, emphasis on the technical nature of the activity***);
- it should have no overlapping with CEPA; if the application of the "main purpose" criterion is not sufficient for avoiding overlapping, classification rules should be established, possibly without changing those of CEPA in order to avoid breaks in the existing time series (***no overlapping with CEPA***);
- it should have the same structure and organization of CEPA in order to maximize the consistency between the two classifications and to make it possible to apply the classification of RUM activities on the basis of the same practical experience acquired until now by using CEPA (***same structure and organization of CEPA***).

The application of the proposed criteria and principles for developing CRUMA

Istat has developed a Classification of natural Resource Use and Management Activities and expenditures (CRUMA) for the purpose of developing the RUMEA within the SERIEE system. The Italian CRUMA is described in the following documents:

- Istat (2007), *The Classification of Resource Use and Management Activities and expenditure – CRUMA. Developed by Istat consistently with CEPA2000 for the Resource Use and Management Expenditure Accounts of SERIEE*. Rome, 2 August 2007, Carolina Ardi, Federico Falcitelli;
- Istat (2008), *Revision of chapters 5 and 6 SEEA 2003: Natural resource use and management expenditure accounts. Issue paper for the London Group, Brussels, 29 September – 30 October 2008*. Rome, 22 July 2008, Federico Falcitelli.

Hereafter the new version of CRUMA is described which has been obtained starting from the Italian version and adjusting it according to the comments received.

The new version of CRUMA is indeed slightly revised compared to the Italian one. The main adjustments concern:

- **the treatment of energy saving and production of renewable energy;**
- **changes in a number of labels;**
- **the improvement of the description of the content of some categories.**

CRUMA is made up of 7 classes of activities (numbered from 10 to 16, continuing the numbering of CEPA). The classification[6] is reported in Annex 2. As far as General Government is concerned, Annex 3 reports the bridge system between on the one hand the SERIEE classifications – i.e. CEPA + CRUMA – and on the other hand the COFOG[7]; such a bridge system has been developed by Istat in order to ensure consistency with national accounting figures.
CRUMA is developed by complying with all the criteria and principles described in par. 3.1 and following the same approach that had been used for setting up CEPA2000. CEPA2000 was built starting from a classification matrix which cross-classifies the different kinds of activities carried out to protect the environment and the different kinds of environmental domains (i.e. different kinds of pollution and degradation). By applying such a classification matrix (Table 3) the different CEPA classes (1 digit) and categories (2 or more digits) were identified (see Annex 1). In order to proceed in the same way, the following steps have been carried out for developing CRUMA:

- first a classification matrix has been set up (Table 4) which cross-classifies the different kinds of activities carried out to use and manage the natural resources and the different kinds of natural resources. Natural resources are grouped according to the five categories identified in chapter X of the 1994 SERIEE manual; the kinds of activities are identified by further breaking down the broad categories previously shown in Table 2;
- secondly, a list of CRUMA categories was derived by identifying the possible resource use/management activities falling within each cell of the classification matrix (see Annex 2 for the full CRUMA and Table 5 for the 1-digit categories).

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6 So far it has been applied in Italy in its complete version (classes 10-16) to the general government sector; for the class 10 (use and management of water resources) data are produced also for the whole economy (GG, Enterprises, Households, NPISHs).

7 It is worth noting that while there is an exact correspondence between the CEPA scope and the division "05 Environmental protection" of the COFOG, CRUMA categories fall mainly within COFOG divisions 04 and 06 together with non-environmental activities.

Table 3 The *type of activity* by *environmental domain* classification matrix used to develop the CEPA2000

	Environmental domains: types of environmental media or pollution-nuisance-degradation						
Types of activity	Air pollution (and related climatic risks)	Surface water pollution	Waste	Soil and ground water pollution, erosion and other physical degradation of soil	Noise and vibration	Degradation of biodiversity and landscape	Radiation
Pollution/degradation prevention activities							
Pollution/degradation reduction activities							
- reduction of emissions and discharges							
- reduction of pollution levels and degradation of environmental media							
Measurement and control activities							
Research and development activities							
Teaching and training activities							
Administrative activities							

Table 4 The *type of activity* by *natural resource* classification matrix used to develop the CRUMA

	Natural resources				
Types of activity	Inland waters	Natural forest resources	Wild flora and fauna	Fossil energy	Raw materials
Reduction of the intake of natural resources through preventive in-process modifications					
Use of alternative resources					
Reduction of losses, leaks and scraps					
Reduction of the intake of natural resources indirectly through the reduction of the consumption of natural resource-related products (energy savings, water savings, etc.)					
Reuse, recycling					
Increase/recharge of natural resource stocks					
Direct management of natural resource stocks (mobilization/exploitation, exploration, extraction, treatment, distribution, etc.)					
Measurement and control activities					
Research and development activities					
Teaching and training activities					
Administrative activities					

Main characteristics of CRUMA, which is structured and organized similarly and consistently with CEPA, are as follows (Table 5):

- each of the first five classes (10-14) groups together all the RUM activities related to one specific natural resource, except for R&D-type activities;
- all R&D activities with RUM purposes are allocated to CRUMA 15, similarly to those with EP purposes which in CEPA2000 are classified all together within CEPA 8;

- all the transversal activities other than R&D activities, i.e. administration and management as well as education, training and information, should, to the extent possible, be allocated to the 'Other' positions in CRUMA 10-14. When these activities concern simultaneously two or more natural resources they should be allocated respectively to 16.1 or 16.2 positions (this rule is derived – *mutatis mutandis* – from CEPA rules, according to which "Administration and management as well as education, training and information should, to the extent possible, be allocated to the 'Other' positions in CEPA 1-7. When these activities concern simultaneously two or more environmental domains they should be allocated respectively to 9.1 or 9.2 positions");
- each of the first five classes (10-14) includes the following kinds of categories :
    - activities aiming at reducing the intake of the natural resource upstream;
    - activities aiming at reducing the intake of the natural resource downstream;
    - restoration activities (increases/recharges), only for renewable resources;
    - direct management of natural resource stocks (mobilization/exploitation, exploration, extraction, treatment, distribution, etc.);
    - measurement and control activities.

Table 5 CEPA2000 and CRUMA

CEPA2000	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 9.1 General environmental administration and management 9.2 Education, training and information 9.3 Activities leading to indivisible expenditure 9.4 Activities not elsewhere classified
CRUMA	10 Use and management of water resources 11 Use and management of natural forest resources 12 Use and management of wild flora and fauna 13 Use and management of fossil energy 14 Use and management of minerals 15 Research and development activities for natural resource use and management 16 Other natural resource use and management activities 16.1 General administration of natural resources 16.2 Education, training and information 16.3 Activities leading to indivisible expenditure 16.4 Activities not elsewhere classified

The rationale underlying the labelling of the first five CRUMA classes is the following one:

> *"use and management of" + [the natural resource that is used and/or protected against depletion phenomena, e.g. "inland waters", "fossil energy", ...].*

For example, according to this rationale, under the headings of CRUMA "13 Use and management of fossil energy" all the activities preserving the stock of fossil energy sources against depletion are encompassed, including e.g. the production of energy through renewable sources.

The content of each class is defined as much as possible consistently with the other international frameworks relevant for the production and reporting of data on natural resources. For example the CRUMA class "11 Use and management of natural forest resources" covers activities and actions concerning not only wooded resources but also non-wooded forest products, consistently with the FAO Global Forest Resources Assessment and the European Framework for Integrated Environmental and Economic Accounting for Forests (IEEAF). This implies e.g. that the production of recycled products which reduce the intake of wooded and non-wooded forest products is classified within CRUMA "11 Use and management of natural forest resources". In general, according to the proposed approach – based on the classification matrix introduced above – all types of activities (at least within the first five CRUMA classes) are classified by natural resource without creating specific categories for homogenous kinds of activities (for example a category concerning all the activities for the production of recycled products regardless of the natural resource concerned).

The complete list of CRUMA categories is reported in Table 11 of Annex 2. The content of each category is described by providing explanatory notes that, in some cases, are derived – *mutatis mutandis* – from those concerning analogous categories of CEPA; in most cases explanatory notes and examples are derived from international manuals (like e.g. 1994 SERIEE manual, the Eurostat IEEAF manual or the FAO/UN manual on Integrated Environmental and Economic Accounting for Fisheries,) as well as from Eurostat standard tables.

Boundary cases between EP and RUM activities

There are a few cases of activities (explicitly dealt with in the explanatory notes of the CRUMA, Table 11) for which the allocation to EP or RUM is not necessarily straightforward and requires careful understanding of the main purpose[8]:

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[8] The case of *production of energy from renewable resources and energy saving*, considered to be a boundary case in the previous version of the issue paper discussed at the 13th meeting of the London Group, is now skipped from the current list following the comments received and decisions taken.. In principle these activities can be carried out for the main purpose of reducing air pollution (and then they should be classified within CEPA 1) or for the main purpose of reducing the intake of fossil energy resources (and then they should be classified within the RUM field). For establishing the main purpose of such activities, mainly the specific features of the economy should be considered as well as the main policy concern: e.g. for countries that are rich of fossil energy resources the main concern could be the depletion of their own stocks, while reduction of pollution could be the main purpose for countries which mostly import energy. Accordingly, the production of energy from renewable resources and energy saving activities should be classified respectively within CRUMA 13.1 and 13.2 only if their main purpose is the reduction of the intake of non-renewable energy resources. If the main purpose is the reduction of pollution, instead, the activities should be classified within CEPA 1. As a matter of fact, production of energy from renewable resources and energy saving have been often (and properly) classified within CEPA 1 so far, following the main purpose criterion: for example at European level, as far as general government is concerned, the Eurostat discussion group on COFOG and the Eurostat Task Force on general government and specialised producers' EPE agreed upon a general rule: i.e. to classify, by convention, energy conservation and renewable energy sources as COFOG 5.3 – Pollution abatement (corresponding to CEPA 1). **For the specific case of production of energy from renewable resources and energy saving, a conventional solution has been suggested which is now endorsed in the new version of CRUMA included in the present paper: i.e. to classify energy saving and all kinds of production of renewable energy (including hydropower) always as aiming at reducing the intake of fossil energy (CRUMA 13), never for reducing air pollution (CEPA 1)**. This point has been discussed in depth also by the Task Force on Environmental Goods and Services Sector of the Eurostat Working Group

- recycling. According to the explanatory notes of CEPA, recycling activities should be classified within CEPA 3 to the extent that they substitute waste management activities (collection, transport and disposal). Only the processing of waste and scrap aimed at transforming them into new raw materials and production of recycled goods represent RUM activities aiming at reducing the intake of raw materials. These activities are classified according to the natural resource concerned as follows:
    - within CRUMA 11.2 if they concern natural forest materials (e.g. recycled paper);
    - within CRUMA 14.2 if they concern minerals (e.g. recycled glass);
    - within CRUMA 12.1 if they concern non-cropped resources (non fossil organic materials) (e.g. recycled natural textile fibers);
    - within CRUMA 13.1 if they concern fossil organic material (i.e. oil) (e.g. recycled plastic);
- waste incineration. According to the International Energy Agency (IEA) renewable energy includes the energy produced from burning wastes[9]. If the main purpose of waste incineration is energy production then it should be classified within CRUMA 13.1; if the main purpose is waste disposal and treatment it should be classified within CEPA 3.3 or 3.4[10];
- other cases for which the main purpose (EP *versus* RUM) often needs to be identified by considering the specific features of the territory where the activities are carried out (see explanatory notes of the Italian CRUMA):
    - some activities aimed at the replenishment of water stocks (CRUMA 10.3) in certain territories can have the main purpose of protecting the soil against erosion (CEPA 4.3) or improving water quality or fighting salinity (CEPA 4.4);
    - activities for protecting forests against fires (CRUMA 11.4) or managing forest areas (CRUMA 11.5) should be classified within CEPA 6 if the forest areas concerned are mainly relevant from the point of view of landscape and biodiversity (e.g. protected areas) and not for their "resource functions";
    - some activities aimed at the replenishment of wild flora and fauna stocks (CRUMA 12.2) in some cases can have the protection of biodiversity as their main purpose (CEPA 6.1), not the restoration or maintenance of the resource stock per se;
- transversal activities:
    - R&D activities: they should be classified within CEPA 8 if their main purpose relates to pollution and degradation issues (EP), while they should be classified in the RUM field if they relate mainly to natural resource use and depletion issues (class 15 of the Italian CRUMA). For some (multi-purpose) R&D projects that

"Environmental Expenditure Statistics", which agreed on the same solution. It is generally argued that the development of a classification of RUM activities and expenditures gives rise to the need of reconsidering the criteria adopted when only CEPA was available, in particular considering production of energy from renewable resources and energy saving as having always the main purpose of management and saving of fossil energy sources. It is a shared opinion that such approach should be endorsed in CRUMA, possibly leading to some changes in the implementation of CEPA as appropriate.

9 OECD/IEA (2007), *Renewables in global energy supply*.

10 For example, at European level the waste incineration activities for the purpose of waste treatment and for the purpose of energy production are separately identified by means of specific codes according to the Directive 2006/12/EC.

relate to both EP and RUM issues, there is no way to identify a main purpose (or to distribute the activities and the expenditure between the different purposes). Istat classifies such multi-purpose projects by convention within CEPA 8, based on the consideration that in the absence of an official classification of RUM activities they are probably classified within CEPA 8 in any case;

- General administration activities: they should be classified within CEPA 9.1 if their main purpose is EP, while they should be classified in the RUM field if their main purpose is the management of natural resources (CRUMA 16.1). Often general administration activities can involve several environmental aspects, belonging to both EP and RUM fields, and there is no way to identify a main purpose. In the Italian CRUMA, in the absence of an official classification of RUM activities, the following rule has been adopted: if the general administration activities concern both environmental protection and use and management of natural resources, they should be broken down between CRUMA 16.1 and CEPA 9.1; if this is impossible, they should be classified in CRUMA 16.1 or alternatively in CEPA 9.1. according to the "main purpose" criterion; if this is impossible as well, they should be classified within CEPA 9.1, given that in other countries they are probably classified within CEPA 9.1;
- Education, training and information: here the same classification principles as for general administration activities apply (in this case the choice is between CEPA 9.2 and CRUMA 16.2).

According to what is argued in the comments provided by the Eurostat Reflection group on RUMEA, the above presentation of the borderline cases is exhaustive and useful and should be included in the revised chapter 5 of the SEEA.

"Sustainable" economic activities *versus* EP and RUM activities

Labels such as "sustainable agriculture", "sustainable fisheries" and the like are sometimes used, especially in the context of work related to the production of statistics on the environmental goods and services industries ("eco-industries").
The OECD/Eurostat manual on eco-industries includes this kind of labels within the "resource management group". In the manual the "sustainable" activities at issue are defined in a very generic way as corresponding to the presence of measures (equipments, technologies, specific materials, goods, services) "which reduce the negative environmental impact" of agriculture, fisheries, etc., No example is provided with reference to any of these "sustainable" activities and, differently from CEPA activities, they are identified on the basis of the ISIC sector where the environmental measures are undertaken.

CEPA is a classification of environmental protection activities that in principle can be carried out by producers belonging to every ISIC activity. CEPA includes EP activities that make an ISIC activity "sustainable" by lowering its degradation potential: for example CEPA 4.3 includes "agricultural and grazing practices less harmful for soils and water bodies", which are activities that contribute to make agriculture more "sustainable" from an environmental perspective.

Including in a classification of RUM activities labels like e.g. "sustainable agriculture" would certainly lead to overlapping with EP activities, unless the activities already covered by CEPA were excluded. For example a concept of "sustainable agriculture" can be encompassed in the RUM field without overlapping with the EP field, only if it includes essentially activities aiming at a more efficient water use, since other environmental activities, like protection of soil, groundwater quality, biodiversity, etc., are already covered by CEPA. The issue is then whether

labels such as "sustainable agriculture" should be part of a classification of RUM activities and how their meaning would have to be specified.

In order to understand in depth this issue, a fundamental question needs to be addressed: what does it mean "sustainable" for an economic activity? A general answer could be that, from an environmental point of view, the more an activity is carried out with technologies and measures that protect the environment and/or save natural resources, the more it can be considered as "sustainable". This general concept relates both to RUM and EP activities and in principle can concern every ISIC activity. As a matter of fact, however, in the literature the word "sustainable" is used only for labelling certain ISIC activities, like in particular agriculture, forestry, fisheries, transport, tourism (e.g. nobody speaks about "sustainable manufacturing"). Indeed this delimitation – together with the fact that, as already pointed out, the content corresponding to these labels is not well clarified – has its main origin in the political debate, which may vary in time and space. On the other hand, denominations of environmental activities that are categorised according to their main purpose and identified essentially on the basis of technical aspects (e.g. like in CEPA), are independent of the emphasis attached to different words in somewhat volatile policy statements and can better hold in time and space.

Consistently with the above considerations and rationale, the proposed CRUMA does not include labels such as "sustainable agriculture", "sustainable fisheries", etc..

One main criterion, like in the Italian CRUMA, is to avoid creating RUM categories with possible overlapping with CEPA classes. This does not allow to show activities such as "sustainable agriculture", "sustainable transport", etc. as separate categories, since these usually include also several kinds of environmental protection activities covered by CEPA. This does not mean, however, that the demand for statistical information on the "sustainable" activities at issue cannot be met, because there is still the possibility of regrouping environmental activities according to criteria based on ISIC activities (see for example Table 6).

The comments received indicate that there is agreement on this approach. It has been suggested to avoid the use of the word "sustainable" for identifying specific kinds of activities for classification purposes. The arguments supporting this position include the fact that many EP and RUM activities are usually carried out by many ISIC sectors as ancillary activities, as well as the lack of an agreed definition of what is a sustainable activity.

This point has been discussed also within the Task Force on Environmental Goods and Services Sector of the Eurostat Working Group "Environmental Expenditure Statistics", where the same conclusion has been reached.

It is worth noting that such a conclusion will bring about a remarkable clarification and change with respect to the classification criteria used so far for the eco-industries belonging to the "resource management group" as defined according to the 1999 OECD/Eurostat manual.

Table 6 Regrouping environmental protection and resource management activities by ISIC activity

	ISIC activities			
Environmental protection and resource use and management activities	Sustainable agriculture	Sustainable forestry	Sustainable fisheries	Sustainable transport

Environmental protection activities (CEPA2000)	1 protection of ambient air and climate	X	X	X	X
	2 waste water management	X	X	X	X
	3 waste management	X	X	X	X
	4 protection and remediation of soil ..	X	X		
	5 noise and vibration abatement				X
	6 protection of biodiversity and landscapes	X	X	X	X
	...				
Resource use and management activities (CRUMA)	10 use and manag. of water resources	X			
	11 use and manag. of natural forest resources		X		
	12 use and manag. of wild flora and fauna			X	
	…	…	…	…	…
	13 Use and manag. of fossil energy				X
	…	…	…	…	…

Regrouping activities for particular policy needs: climate change-related activities

Decision makers can ask for information related to particular policies. CEPA and CRUMA are classification of environmental activities and actions that are identified mainly according to their technical nature. This implies that not necessarily all the activities and actions related to a specific policy are grouped together in a single CEPA or CRUMA category because a policy can require activities and actions which are different from the point of view of their technical nature. Then in order to match policy needs, it can be necessary to regroup some CEPA/CRUMA activities.

At its 13th meeting, the London Group suggested to explicitly identify those activities in CEPA and CRUMA linked in particular to climate change, in order to highlight the policy relevance of the data provided.

Table 7 shows the CEPA e CRUMA categories that include climate change-related activities.

As far as CEPA is concerned, climate change-related activities are classified in classes 1 and 8. These classes include 3-digits categories exclusively devoted to activities and actions "for the protection of climate and ozone layer": such categories are foreseen under the activities of class 1 related to the prevention of pollution (CEPA 1.1) and the treatment of exhaust gases (CEPA 1.2) as well as the research and development activities for the protection of ambient air and climate (CEPA 8.1). These are certainly the CEPA activities most relevant for climate change-related policies.

Table 7 Regrouping environmental activities related to climate change

Environmental activities		**Relevance for climate change**
Environmental protection	**1 Protection of ambient air and climate**	
	1.1 Prevention of pollution through in-process modifications	

activities (CEPA2000)	1.1.1 for the protection of ambient air	
	1.1.2 for the protection of climate and ozone layer	X
	1.2 Treatment of exhaust gases and ventilation air	
	1.2.1 for the protection of ambient air	
	1.2.2 for the protection of climate and ozone layer	X
	1.3 Measurement, control, laboratories and the like	
	of which: for the protection of climate and ozone layer (i.e. activities mainly or exclusively aiming at monitoring climate change)	(x)
	1.4 Other activities	
	of which: for the protection of climate and ozone layer (i.e. administrative activities or education, training and information activities mainly or exclusively related to climate change)	(x)
	...	
	8 Research and development	
	8.1 Protection of ambient air and climate	
	8.1.1 Protection of ambient air	
	8.1.2 Protection of atmosphere and climate	X
	...	
Resource use and management activities (CRUMA)	...	
	13 Use and management of fossil energy	
	13.1 Reduction of the intake	
	of which: production of renewable energy	X
	...	
	13.4 Measurement, control, laboratories and the like	
	of which: production of renewable energy (i.e. activities mainly or exclusively aiming at monitoring renewable sources for the purpose of energy production)	(x)
	13.5 Other activities	
	of which: production of renewable energy (i.e. administrative activities or education, training and information activities mainly or exclusively related to production of renewable energy)	(x)
	...	
	15 Research and development activities for natural resource use and management	
	...	
	15.4 Fossil energy	
	of which: for production of renewable energy	X
	...	

X = Highest relevance

(x) = Low relevance in general. It may be highly relevant in specific contexts

In addition to that, some instrumental activities can be carried out exclusively for the protection of climate, such as specific monitoring and assessment activities (to be classified within CEPA 1.3.) and administrative, education, training and information activities (to be classified within CEPA 1.4). These activities are not explicitly identified by means of ad hoc 3-digits categories and one may reasonably suppose that they can be less relevant (with possible local exceptions) compared to the activities explicitly identified within CEPA.

CRUMA activities related to climate change are classified within classes 13 and 15. They concern the production of renewable energy which is recognised as one of the main ways not only for

reducing the intake of fossil resources but also for the protection of climate. The production of renewable energy is classified within CRUMA 13.1, while research and development activities in the field of renewable energy are classified within CRUMA 15.4.

As in the case of CEPA, some instrumental activities can be carried out with reference exclusively to renewable energy, such as specific monitoring and assessment activities (to be classified within CRUMA 13.4) and administrative, education, training and information activities (to be classified within CRUMA 13.5). These activities, similarly to the corresponding ones of CEPA, may be considered as less relevant for climate change compared to those classified within CRUMA categories 13.1 and 15.4.

CRUMA activities concerning exclusively renewable energy are not explicitly identified by means of 3-digits categories. Such a further break down could obviously be foreseen.

It is worth noting that, according to the IEA definition which is adopted for CRUMA purposes, renewable energy includes sources which imply to some extent air emissions, such as hydropower or energy production through waste incineration. From the point of view of climate change-related policies, one may be interested in only those renewable sources that can be considered with "zero air emissions" like solar or wind sources. This would imply to consider not all the activities related to renewable energy but only a subgroup of them.

We can conclude that the most important activities aiming at climate protection can be easily captured by considering the ad hoc 3-digits categories already existing within CEPA (classes 1 and 8) plus the activities related to renewable energy classified within CRUMA (categories 13.1 and 15.4). A more comprehensive information can be obtained by considering also instrumental activities (administrative activities as well as education, training and information activities) exclusively related to climate protection and renewable energy (CEPA categories 1.3 and 1.4, plus CRUMA categories 13.4 and 13.5).

In order to make easily available for the users information on activities and expenditures for climate protection, data collection and reporting systems would have to include specific headings under which all the relevant activities can be grouped and shown together. This approach is going to be adopted by the Eurostat Task Force on Environmental Goods and Services Sector, which is setting up a system of standard tables for European countries that includes – following the London Group recommendation – a number of "of which" categories devoted to highlight the climate protection part of CEPA 1 and CRUMA 13 as well as of research and development activities in both classifications.

It is worth noting that, besides singling out climate protection activities in the classification adopted for the collection of statistical information from the member countries, it is necessary to strongly recommend countries to gather themselves data with the proper break down. As a matter of fact, although CEPA already includes categories exclusively related to protection of climate, many countries do not deliver information with this break down, probably due to the lack of basic data.

4. Overview of methodological issues to be developed for setting up the RUMEA

The environmental expenditure accounts are "functionally oriented satellite accounts" as defined by the SNA. The functionally oriented satellite accounts highlight the part of national account transactions and aggregates concerning a specific function to be analysed. For this purpose they must apply principles, rules and classifications of national accounts, including the valuation

concepts as well as the definitions of transactions and aggregates used in the national accounts. The SNA provides guidelines on how to further specify national account concepts and break down classifications for functionally oriented satellite analyses. A number of conceptual issues are pointed out by the SNA, such as: characteristic activities (to be identified and classified); specific products (including connected products); specific transfers; grouping of units by several criteria like institutional sector, economic activity, market/non-market output, the role played (producers, users, beneficiaries, financers); etc.

As far as the environmental expenditures are concerned, the SNA guidelines on functionally oriented satellite accounts have been, so far, fully developed only for the Environmental Protection Expenditure Accounts (EPEA). In particular:

- the EPEA applies the principles, rules and classifications of national accounts, as well as the valuation concepts, the definitions of transactions and aggregates used in the national accounts;
- the following concepts and definitions have been established according to SNA guidelines: scope and definition of "Environmental Protection", EP characteristic activities, EP specific products (i.e. characteristic activities, connected and adapted products), EP specific transfers; classification of EP activities and expenditures (CEPA); classification of units according to their role (characteristic producers – specialised, non-specialised, ancillary –, non-characteristic producers, users, beneficiaries, financers);
- the EPEA accounting system is fully consistent with the SNA and is based on the supply and use framework of the SEEA2003 as well as on the sequence of the five accounting tables set up by the SERIEE (Tables A, B, B1, C, C1).

In order to develop satellite accounts for environmental expenditures that complement EP expenditures there is no need to go through the whole process already carried out for developing the EPEA; as a matter of fact, most of the methodological elements established for the EPEA hold also for other environmental expenditure accounts like, in particular, the RUMEA.

Table 8 gives an overview of the methodological elements established and internationally agreed for the EPEA (first column) and points out those holding also for the RUMEA and those that need to be developed.

In particular the following aspects hold also for the RUMEA without any further development:

- all the aspects directly taken from the SNA, such as the definition of units and grouping of units, the definition of transactions and aggregates, the valuation system
- the accounting system, tables and calculation methods taken from the SERIEE: there is no reason for changing the EPEA tables, accounting rules and techniques when expenditure have a RUM purpose instead of an EP one.

For the concepts taken directly from the SNA that hold also for RUMEA, such as those concerning characteristic activities, specific products (of which connected and adapted products), and specific transfers, what is needed is to specify them for the particular case of the RUM field; this could be done by means of examples. A specific issue concerns the definition of RUM adapted products, i.e. resource efficient products: in the EPEA, EP adapted products (cleaner products) are products which comply two criteria: a) they are less polluting at the time of their consumption and/or scrapping than equivalent normal products; b) they are more costly to be made available to the user than equivalent normal products. It should be agreed whether the extra cost criterion for defining cleaner products applies also for resource efficient products.

As far as classifications are concerned, in addition to those derived from the SNA the following is to be established:

- a classification of natural resource use and management activities and expenditures, to be developed similarly to CEPA2000. The only available example is the Italian CRUMA discussed in previous paragraphs. It is to be decided "if" and "to what extent" this national example can be used for developing an internationally agreed classification;
- a classification of connected and adapted products. A proper classification has not been developed so far even for EP connected and adapted products, for which only a short list has been provided at European level; this list includes items respectively for mandatory, recommended and possible adoption (the list is reported in chapter 5 of SEEA2003). As a first step for the time being, a short list of RUM connected and adapted products could be set up similarly to the EP one set up at the European level. For this purpose a useful contribution can be derived from the current work on Environmental Goods and Service Sector developed by the Eurostat Working Group on "Environmental Expenditure Statistics".

One thing that seems mature enough to be definitely established is the definition of the scope of the RUMEA. SEEA2003 and SERIEE approaches appear to be very clear and consistent and lead to delimit the RUMEA scope as outlined above in § 2.2. What remains to do is to set up a definition of the concept of "natural resource use and management" in general terms, similarly to the definition of "environmental protection".

A RUMEA-type account has been implemented by Istat for expenditures related to the use and management of water reources, leading to achievements that support the above overview. In particular, in building RUMEA Istat applies EPEA accounting tables, rules and methodologies as well as concepts, definitions and classifications derived from the SNA. From an operational point of view, Istat's experience also shows that the same main data sources and processing methods are to be used for RUMEA as for EPEA. One major lack of data concerns RUM ancillary activities, for which, consistently with the experience gathered with EPEA, an ad hoc survey seems to be necessary (at European level the collection of a number of variables on enterprises' ancillary EPE is mandatory according to the Regulation on Structural Business Statistics).

The comments received pointed out that in the revised chapter 5 of the SEEA an overview as described above and further developed as appropriate should be present: in particular the basic definitions, concepts and ideas of EPEA and RUMEA should be described clearly and interlinked, highlighting correspondences and differences.

The value added of RUMEA from the point of view of the potential use of figures should also be highlighted with connection to EPEA (more complete picture of the size and structure of the environmental expenditure, kinds of indicators and aggregates that can be derived from the accounts, …).

Table 8 Overview of methodological issues to be developed for setting up the RUMEA in the light of the EPEA

EPEA	RUMEA
Scope	
Environmental protection (EP)	Natural resource use and management (RUM): *the indications of SEEA2003 and SERIEE1994 appear to be consistent as well as mature enough, and lead to define the scope as outlined above in paragraph 2.2.*
Concepts, definitions, classification	
Characteristic activities	Characteristic activities: *the general concept is defined in the SNA and holds also for RUMEA*
Classifications of EP characteristic activities	Classification of RUM characteristic activities
(CEPA2000, which is a functional multi-purpose classification, used also for classifying producers, products and any kind of transaction)	To be developed. It should be complementary to, consistent and comparable with CEPA. A prototype is provided by the Italian CRUMA
Connected products	Connected products: *the general concept is defined in the SNA, within the wider concept of specific products, and holds also for RUMEA*
Adapted products, i.e. cleaner products (Products less polluting than equivalent normal products when consumed and/or disposed of. These products are also more costly to be made available to the user than equivalent product)	Adapted products, i.e. resource-efficient products: *the concept holds also for RUMEA* apart from: a) the stage at which these products are less resource intensive than equivalent normal products, i.e. only when they are consumed/used; b) the extra cost criterion, for which it is to be decided whether it applies also for resource-efficient products
Classification of connected and adapted products	Classification of connected and adapted products
(No classification has been developed for these products. EU has provided a list of products respectively for mandatory, recommended and possible inclusion. The list is reported also in chapter 5 of SEEA2003)	A list of products for mandatory, recommended and possible inclusion, could be set up for the time being. To that end the on going work on Environmental Goods and Service Sector carried out by the Eurostat Working Group on Environmental Expenditures can provide useful inputs
Specific transfers	Specific transfers: *the general concept is defined in the SNA and holds also for RUMEA*
Units and groups of units	
Grouping of units by Institutional sectors (the same as those of SNA: GG, NPISH, enterprises, households, ROW) and ISIC sector	*Holds also for RUMEA*
Grouping of units according to the role played: characteristic producers (specialised, non-specialised, ancillary), non-characteristic producers users, beneficiaries, financers	*Holds also for RUMEA*
Transactions and aggregates	
The same kinds of transactions are defined as in the SNA: EPEA accounts for that part of national account transactions and aggregates that are devoted to the environmental protection	*Hold also for RUMEA*
Main aggregates: Output of environmental services, National expenditure, Financing of national expenditure, Net cost borne by institutional sector	*Hold also for RUMEA*
Accounting system and tables	
Valuation system basic prices, purchasers' prices, etc.): the same as in the SNA for the corresponding transactions and aggregates	*Holds also for RUMEA*
Supply and use framework of SEEA2003	*Holds also for RUMEA*
The five accounting tables of SERIEE (Tables A, B, B1, C, C1)	*Hold also for RUMEA*
Accounting rules and methodologies	*Hold also for RUMEA*

Legenda:

- *Italic: methodological elements developed for the EPEA that hold also for the RUMEA*
- Bold: methodological elements that need to be developed for the RUMEA

5. Conclusions and future steps to agree a standard classification on natural resource use and management activities an expenditures

The analysis of the state of play, including the comments received, lead to the following main conclusions:

a) The **scope** of natural resource use and management is well defined in SERIEE1994 and SEEA2003 in terms of: *1) natural resources addressed* and *2) types of activities and actions carried out for using and managing natural resources*.

   - In the revised chapter 5 of the SEEA the description of the scope of RUM should be improved by starting with a more comprehensive general overview of the different activities that can be carried out for environmental purposes, i.e. EP activities and RUM activities, as well as of the corresponding expenditure accounts (i.e. EPEA and RUMEA).
   - In describing in particular the scope of RUMEA, the break down by kind of natural resource and the restriction to non-produced (non-cultivated) natural resources should be pointed out. As far as the break down is concerned, fossil energy resources and minerals could be further broken down in order to establish a closer link between data on RUM expenditures and Economy-wide MFA (in particular data on input flows). As far as the kinds of RUM activities are concerned, a list more general and comprehensive than the provisional ones provided by SERIEE1994 and SEEA2003 is the one adopted by Istat (see Table 2).

b) Despite the RUMEA scope is well defined, while for EPEA purposes a classification has been developed and internationally agreed upon (i.e. CEPA), no **classification** has been set up, until now, for RUMEA purposes.

   - So far, the main attempt made at the international level in order to classify the RUM activities is that of the OECD/Eurostat manual on eco-industries, which is referred to in chapter 5 of SEEA2003. This attempt has not been developed in a way fully consistent with CEPA and then its application can lead to overlapping with CEPA.
   - It is generally agreed that there is a need of a standard classification of RUM activities, which is complementary, comparable and consistent with CEPA. Such a classification should be – like CEPA for environmental protection – a classification of RUM "characteristic activities", structured and organized similarly to CEPA, to be used also as a functional "multi-purpose" classification (for classifying products, producers, transactions, etc.) and to be applied according to the same classification principles and rules as those of CEPA ("main purpose" criterion, etc.).
   - The approach adopted by Italy – i.e. to obtain a classification of RUM activities by cross-classifying the different kinds of activities carried out to use and manage the natural resources and the different kinds of natural resources (see classification matrix in Table 4) – is unanimously agreed by the experts who provided comments. This approach is closely consistent with CEPA.
   - The result obtained by applying this approach – i.e. the Italian CRUMA – is considered a very good basis to work on.
   - The structure and organization of the Italian CRUMA, as well as its principles and classification rules and the main contents are agreed.

c) The discussions made so far on the Italian CRUMA at European level (within the Eurostat Task Force on Environmental Goods and Services Sector and the Eurostat Reflection group on RUMEA), together with the suggestions given by other

commentators and by the London Group members at the 13th meeting, made it possible to develop the **new version of CRUMA included in this document**. It has been obtained starting from the Italian CRUMA and adjusting it by endorsing all the generally agreed proposals collected until now on both substantive and wording aspects. The main adjustments concern:

- the treatment of energy saving and production of renewable energy;
- changes in a number of labels;
- the improvement of the description of the content of some categories.

Consistently with these remarks and according to the decisions taken at the 13th meeting of the London Group, the following way forward could be envisaged in order to develop and agree a standard classification on natural resource use and management activities an expenditures:

1. to post the revised version of the issue paper including the new version of CRUMA (i.e. this document) on the website of the London Group in order to collect further comments mainly by (*the current step*):
   - ❒ the Eurostat Reflection group on RUMEA;
   - ❒ representatives of international organizations to be identified by the London Group secretariat;
   - ❒ all the London Group members;
2. to prepare a revised version of the paper for adoption by the London Group collection of comments from London group members (*14th meeting*);
3. to possibly launch the process for having CRUMA, depending on its stage of development, included in the international family of classifications on the par with CEPA. This process would require that CRUMA be submitted to the United Nations Expert Group on Classifications.

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Annex 1 The Classification of Environmental Protection Activities and expenditures – CEPA2000

Table 9 The Classification of Environmental Protection Activities and expenditures – CEPA2000

1 PROTECTION OF AMBIENT AIR AND CLIMATE
- 1.1 Prevention of pollution through in-process modifications
  - 1.1.1 for the protection of ambient air
  - 1.1.2 for the protection of climate and ozone layer
- 1.2 Treatment of exhaust gases and ventilation air
  - 1.2.1 for the protection of ambient air
  - 1.2.2 for the protection of climate and ozone layer
- 1.3 Measurement, control, laboratories and the like
- 1.4 Other activities

2 WASTEWATER MANAGEMENT
- 2.1 Prevention of pollution through in-process modifications
- 2.2 Sewerage networks
- 2.3 Wastewater treatment
- 2.4 Treatment of cooling water
- 2.5 Measurement, control, laboratories and the like
- 2.6 Other activities

3 WASTE MANAGEMENT
- 3.1 Prevention of pollution through in-process modifications
- 3.2 Collection and transport
- 3.3 Treatment and disposal of hazardous waste
  - 3.3.1 Thermal treatment
  - 3.3.2 Landfill
  - 3.3.3 Other treatment and disposal
- 3.4 Treatment and disposal of non-hazardous waste
  - 3.4.1 Incineration
  - 3.4.2 Landfill
  - 3.4.3 Other treatment and disposal
- 3.5 Measurement, control, laboratories and the like
- 3.6 Other activities

4 PROTECTION AND REMEDIATION OF SOIL, GROUNDWATER AND SURFACE WATER
- 4.1 Prevention of pollutant infiltration
- 4.2 Cleaning up of soil and water bodies
- 4.3 Protection of soil from erosion and other physical degradation
- 4.4 Prevention and remediation of soil salinity
- 4.5 Measurement, control, laboratories and the like
- 4.6 Other activities

5 NOISE AND VIBRATION ABATEMENT (excluding workplace protection)
- 5.1 Preventive in-process modifications at the source
  - 5.1.1 Road and rail traffic
  - 5.1.2 Air traffic
  - 5.1.3 Industrial and other noise
- 5.2 Construction of anti noise/vibration facilities
  - 5.2.1 Road and rail traffic
  - 5.2.2 Air traffic
  - 5.2.3 Industrial and other noise
- 5.3 Measurement, control, laboratories and the like
- 5.4 Other activities

6 PROTECTION OF BIODIVERSITY AND LANDSCAPES
- 6.1 Protection and rehabilitation of species and habitats
- 6.2 Protection of natural and semi-natural landscapes
- 6.3 Measurement, control, laboratories and the like
- 6.4 Other activities

7 PROTECTION AGAINST RADIATION (excluding external safety)
- 7.1 Protection of ambient media
- 7.2 Transport and treatment of high level radioactive waste
- 7.3 Measurement, control, laboratories and the like
- 7.4 Other activities

8 RESEARCH AND DEVELOPMENT
- 8.1 Protection of ambient air and climate
  - 8.1.1 Protection of ambient air
  - 8.1.2 Protection of atmosphere and climate
- 8.2 Protection of water
- 8.3 Waste
- 8.4 Protection of soil and groundwater
- 8.5 Abatement of noise and vibration
- 8.6 Protection of species and habitats
- 8.7 Protection against radiation
- 8.8 Other research on the environment

9 OTHER ENVIRONMENTAL PROTECTION ACTIVITIES
- 9.1 General environmental administration and management
  - 9.1.1 General administration, regulation and the like
  - 9.1.2 Environmental management
- 9.2 Education, training and information
- 9.3 Activities leading to indivisible expenditure
- 9.4 Activities not elsewhere classified

Remarks

- **General classification principles**

  Classification should be made according to the main purpose taking into account the technical nature as well as the policy purpose of an action or activity. Multi-purpose actions, activities and expenditure that address several CEPA classes should be divided by these classes. Classification under the heading 'indivisible expenditure and activities' should only be made as a last resort.

- **Classification of transversal activities and expenditure**

  Transversal activities are R&D, administration and management as well as education, training and information.

  All R&D should be allocated to CEPA 8.

  Administration and management as well as education, training and information should, to the extent possible, be allocated to the 'Other' positions in CEPA 1-7. When these activities concern simultaneously two or more environmental domains they should be allocated respectively to 9.1 or 9.2 positions.

Table 10 CEPA2000: overview

	Environmental Domain: type of environmental media or type of pollution-nuisance-degradation						
Type of activity	Air pollution (and related climatic risks)	Surface water pollution	Waste	Soil and ground water pollution, erosion and other physical degradation of soil	Noise and vibration	Degradation of biodiversity and landscape	Radiation
Pollution/degradation prevention activities	1.1 Prevention of pollution through in-process modifications	2.1 Prevention of pollution through in-process modifications	3.1 Prevention of pollution through in-process modifications	4.1 Prevention of pollutant infiltration 4.3 Protection of soil from erosion and other physical degradation 4.4 Prevention and remediation of soil salinity	5.1 Preventive in-process modifications at the source	6.1 Protection and rehabilitation of species and habitats 6.2 Protection of natural and semi-natural landscapes	7.1 Protection of ambient media
Pollution/degradation reduction activities:	1.2 Treatment of exhaust gases and ventilation air	2.2 Sewerage networks 2.3 Wastewater treatment 2.4 Treatment of cooling water	3.2 Collection and transport 3.3 Treatment and disposal of hazardous waste 3.4 Treatment and disposal of non-hazardous waste	4.2 Cleaning up of soil and water bodies 4.3 Protection of soil from erosion and other physical degradation 4.4 Prevention and remediation of soil salinity	5.2 Construction of anti noise/vibration facilities		7.2 Transport and treatment of high level radioactive waste
- *reduction of emissions and discharges*	*1.2 Treatment of exhaust gases and ventilation air*	*2.3 Wastewater treatment* *2.4 Treatment of cooling water*	*3.3 Treatment and disposal of hazardous waste* *3.4 Treatment and disposal of non-hazardous waste*				
- *reduction of pollution levels and degradation of environmental media*		*2.2 Sewerage networks*	*3.2 Collection and transport*	*4.2 Cleaning up of soil and water bodies* *4.3 Protection of soil from erosion and other physical degradation* *4.4 Prevention and remediation of soil salinity*	*5.2 Construction of anti noise/vibration facilities*	*6.1 Protection and rehabilitation of species and habitats* *6.2 Protection of natural and semi-natural landscapes*	*7.2 Transport and treatment of high level radioactive waste*
Measurement and control activities	1.3 Measurement, control, laboratories and the like	2.5 Measurement, control, laboratories and the like	3.5 Measurement, control, laboratories and the like	4.5 Measurement, control, laboratories and the like	5.3 Measurement, control, laboratories and the like	6.3 Measurement, control, laboratories and the like	7.3 Measurement, control, laboratories and the like
Research and development activities	8.1 R&D for protection of ambient air and climate 8.8 Other research on the environment	8.2 R&D for protection of water 8.8 Other research on the environment	8.3 R&D for waste 8.8 Other research on the environment	8.4 R&D for protection of soil and groundwater 8.8 Other research on the environment	8.5 R&D for abatement of noise and vibration 8.8 Other research on the environment	8.6 R&D for protection of species and habitats 8.8 Other research on the environment	8.7 R&D for protection against radiation 8.8 Other research on the environment
Teaching and training activities	1.4 Other activities 9.2 Education, training and information	2.6 Other activities 9.2 Education, training and information	3.6 Other activities 9.2 Education, training and information	4.6 Other activities 9.2 Education, training and information	5.4 Other activities 9.2 Education, training and information	6.4 Other activities 9.2 Education, training and information	7.4 Other activities 9.2 Education, training and information
Administrative activities	1.4 Other activities 9.1 General environmental administration and management	2.6 Other activities 9.1 General environmental administration and management	3.6 Other activities 9.1 General environmental administration and management	4.6 Other activities 9.1 General environmental administration and management	5.4 Other activities 9.1 General environmental administration and management	6.4 Other activities 9.1 General environmental administration and management	7.4 Other activities 9.1 General environmental administration and management

Annex 2 The Italian Classification of natural Resource Use and Management Activities and expenditure – CRUMA

Table 11 The Classification of Resource Use and Management Activities and expenditure – CRUMA

Code	Description	Explanatory notes/Examples
10	**Use and management of water resources**	All the activities and actions aiming at minimising the intake of water resources through in-process modifications as well as reuse, recycling, savings and the use of substitutes of fresh water resources. Restoration activities aiming at the replenishment of water stocks are included as well exploitation, exploration and distribution activities. All the activities and actions concerning measurement, control, laboratories and the like are also included as well as education, training and information and administration and regulation activities.
10.1	Reduction of the intake	Reduction of the intake through in-process modifications related to the reduction of the water input for the production process. It includes all the kinds of replacement or adjustment of production processes aiming at reducing the water input needed for producing a certain output. De-salinisation of sea water is included.
10.2	Reduction of water losses and leaks, water reuse and savings	Reduction of water use through the reduction of water losses and leaks, the installation of facilities for water reuse and savings, etc.
10.3	Replenishment of water stocks	Increase of water available in water stocks. The following activities are included: recharge of groundwater bodies to increase/restore water stocks (not to improve water quality or fight salinity → CEPA 4.4); land improvement, development of vegetal cover in order to increase water infiltration and recharge phreatic water bodies (not for the protection of soil against erosion → CEPA 4.3)
10.4	Direct management of water stocks	Exploitation, management and maintenance of water resources and exploration for new stocks. Distribution of water. It includes for example water abstraction, conduction and distribution (waterworks), including water use for irrigation; lakes and reservoirs regulation; etc. The management and maintenance activities carried out by the public or private authorities in charge of the direct management and exploitation of water stocks are included, while the administration and regulation activities carried out by the General Government are excluded → CRUMA 10.6
10.5	Measurement, control, laboratories and the like	Activities aimed at measuring, controlling and monitoring the use and the level of water stocks. The following activities are excluded: measurement, monitor and control of the concentration of pollutants in wastewater and the quality of the inland water and marine water at the place wastewater is discharged → CEPA 2.5; measurement, monitor and control of the quality of surface and ground water → CEPA 4.5
10.6	Other activities	All other activities and measures aimed at the use and management of water resources. It includes regulation, administration, education, training and information activities specific to the class when they can be separated from other activities related to the same class and from similar activities related other classes. It includes for example: information campaigns to encourage water savings; release of licences for water abstraction; General Government units or part thereof which administrate and regulate the use of water resources or are responsible for water saving policies. It excludes public or private bodies which carry out e.g. water abstraction, conduction and distribution activities → CRUMA 10.4
11	**Use and management of natural forest resources**	All the activities and actions aiming at minimising the intake of natural forest resources through in-process modifications as well as recovery, reuse, recycling, savings and the use of substitutes of forest products. Restoration activities like reforestation and afforestation are included when concern natural forest as well as the management and exploitation activities of natural forest areas. All the activities and actions concerning measurement, control, laboratories and the like are also included as well as education, training and information and administration and regulation activities. Natural forests are virgin forests and, in general, non-cultivated forests. All the activities and actions related to cultivated forests are excluded.
11.1	Reduction of the intake	Reduction of the intake through in-process modifications related to the reduction of the input of forest resources for the production process. It includes all the kinds of replacement or adjustment of production processes aiming at reducing the input of forest (wood and non wood)-related products needed for producing a certain output. The substitution of forest products with other material and substances is included.
11.2	Reduction of the consumption of forest (wood and non wood)-related products	Recycling, reuse or savings of forest products and by-products (wood, paper, etc.).
11.3	Reforestation and afforestation	Replenishment of existing natural wooded areas or development of new wooded areas.
11.4	Forest fires	Prevention and control of natural forest fires (concerning forest areas relevant mainly as economic resource and not as habitats → CEPA 6.2). It includes for example: development of fireballs, mobilisation of fire fighting means or measures aimed at the prevention of fires in forest areas.

Code	Description	Explanatory notes/Examples
11.5	Direct management of forest areas (as a resource and not as a habitat)	Exploitation, management and maintenance of natural forest areas and exploration for the use of forest areas previously not exploitable. The management and maintenance activities carried out by the public or private authorities in charge of the direct management and exploitation of natural forest are included, while the administration and regulation activities carried out by the General Government are excluded → CRUMA 11.7. Examples: management and maintenance of non-cultivated forest areas available for felling and logging activities (except for reforestation and afforestation activities → CRUMA 11.3); monitoring and control activities carried out by forest rangers on forest areas as economic resources (not to protect forest habitats or the biodiversity of flora and fauna species living in forest areas → CEPA 6.1 or 6.2)
11.6	Measurement, control, laboratories and the like	Activities aimed at measuring, controlling and monitoring the use and the consistency of forest resource stocks. It includes for example inventories and assessments of forest resources. Measurement, controlling and monitoring activities related to the protection of biodiversity and landscape are excluded like e.g. inventories of flora and fauna species living in natural forest areas → CEPA 6.1 and census of natural forest protected areas → CEPA 6.2.
11.7	Other activities	All other activities and measures aimed at the use and management of natural forest resources. It includes regulation, administration, education, training and information activities specific to the class when they can be separated from other activities related to the same class and from similar activities related other classes. It includes for example: the release of logging licences; General Government units or part thereof which administrate and regulate the use of natural forest resources or are responsible for forest management policies. It excludes public or private bodies which carry out the direct management of forest areas → CRUMA 11.5.
12	**Use and management of wild flora and fauna**	All the activities and actions aiming at minimising the intake of wild flora and fauna resources through in-process modifications as well as the use of alternative resources and any other kind of measure. Restoration activities like repopulation of wild flora and fauna stocks are included when aiming at maintaining/increasing the consistency of stocks (not the biodiversity → CEPA 6). Management and exploitation activities are also included. All the activities and actions concerning measurement, control, laboratories and the like are also included as well as education, training and information and administration and regulation activities. Wild flora and fauna are stocks and reserves of non-cultivated animals and plants. The class includes all the activities and actions with the purpose of managing, maintaining and increasing the stock of wild flora and fauna. The protection of biodiversity of wild flora and fauna is excluded (→ CEPA 6).
12.1	Reduction of the intake	Reduction of the intake through in-process modifications. It includes all the kinds of replacement or adjustment of production processes aiming at reducing the input of wild flora and fauna resources needed for producing a certain output. It includes for example vessel buy-back programmes for the introduction of more efficient fishing fleets and equipments. The use of alternative resources is included.
12.2	Replenishment of wild flora and fauna stocks	Increase of the number of individuals of wild flora and fauna stocks. It includes for example breeding for the replenishment of stocks for fishing or hunting (for restocking purposes and not for protection of biodiversity → CEPA 6.1)
12.3	Direct management of wild flora and fauna stocks	Exploitation, management and maintenance of wild flora and fauna stocks. The management and maintenance activities carried out by the public or private authorities in charge of the direct management and exploitation of wild flora and fauna stocks are included, while the administration and regulation activities carried out by the General Government are excluded → CRUMA 12.5. Examples: management of fish and game reserves.
12.4	Measurement, control, laboratories and the like	Activities aimed at measuring, controlling and monitoring the use and the consistency of wild flora and fauna stocks. It includes for example: inventories and assessment of wild fauna stocks; control on the observance of licences, quotas, temporary or permanent fishing/hunting bans. Measurement, controlling and monitoring activities related to the protection of biodiversity and landscape are excluded like e.g. inventories of flora and fauna threatened species → CEPA 6.1
12.5	Other activities	All other activities and measures aimed at the use and management of wild flora and fauna resources. It includes regulation, administration, education, training and information activities specific to the class when they can be separated from other activities related to the same class and from similar activities related other classes. It includes for example: release of fishing and hunting licences, enforcement and administration of quotas, enforcement and regulation of temporary or permanent fishing/hunting bans; General Government units or part thereof which administrate and regulate the exploitation of wild flora and fauna resources or are responsible for wild flora and fauna management policies. It excludes public or private bodies which carry out the direct management of wild flora and fauna reserves → CRUMA 12.3.
13	**Use and management of fossil energy**	All the activities and actions aiming at minimising the intake of fossil energy resources through in-process modifications as well as savings, the production of energy from renewable sources and any other kind of measure. Management and exploitation of fossil energy stocks as well as exploration and discovery of new reserves are included. All the activities and actions concerning measurement, control, laboratories and the like are also included as well as education, training and information and administration and regulation activities.

Code	Description	Explanatory notes/Examples
13.1	Reduction of the intake	Reduction of the intake through in-process modifications related to the reduction of the input of non-renewable energy sources for the production process. It includes all the kinds of replacement or adjustment of production processes aiming at reducing the input of energy resources needed for producing a certain output. This category includes all the activities and actions aiming at the reduction of non-renewable energy sources exploitation through the production of energy from renewable sources (which is then excluded from CEPA 1), including, according to the International Energy Agency definition of renewables, hydropower, solar, wind, tidal, biogas, geothermal or biomass sources as well as the production of energy from the combustion of any kind of waste (the incineration of waste carried out for the main purpose of waste treatment and disposal is excluded → CEPA 3.3 or 3.4)
13.2	Reduction of heat and energy losses, and energy savings	Reduction of the use of non-renewable energy sources through the minimisation of heat and energy losses and through energy savings (energy savings is then excluded from CEPA 1)
13.3	Direct management of the stocks of non-renewable energy sources	Exploitation, management and maintenance of the stocks of non-renewable energy sources including exploration and discovery of new reserves. The management and maintenance activities carried out by the public or private authorities in charge of the direct management, exploitation and exploration of energy reserves are included, while the administration and regulation activities carried out by the General Government are excluded → CRUMA 13.5. Distribution of electricity is excluded.
13.4	Measurement, control, laboratories and the like	Activities aimed at measuring, controlling and monitoring the use and the consistency of fossil energy stocks as well as the production of energy from renewable sources. It includes for example: assessment and reassessment of existing reserves; assessment of the importance of the production of energy from renewable sources on total energy production.
13.5	Other activities	All other activities and measures aimed at the use and management of energy resources. It includes regulation, administration, education, training and information activities specific to the class when they can be separated from other activities related to the same class and from similar activities related other classes. It includes for example: release of licences for energy sources abstraction; General Government units or part thereof which administrate and regulate the exploitation of energy resources or are responsible for energy savings policies. It excludes public or private bodies which manage, exploit and explore energy reserves → CRUMA 13.3.
14	**Use and management of minerals**	All the activities and actions aiming at minimising the intake of mineral resources through in-process modifications as well as recovery, reuse, recycling, savings and the use of substitutes mineral resources. Management and exploitation of mineral resources as well as exploration and discovery of new reserves are included. All the activities and actions concerning measurement, control, laboratories and the like are also included as well as education, training and information and administration and regulation activities.
14.1	Reduction of the intake	Reduction of the intake through in-process modifications related to the reduction of the raw material input for the production process or the consumption or use of resource-efficient products.
14.2	Reduction of minerals use through the reduction of scraps and the production and consumption of recycled materials and products	Production and use of secondary raw materials or final products obtained from recovered and recycled materials and waste. It includes for example: processing of waste and scrap into a form which is readily transformed into new raw materials, production of recycled goods (recycling activities insofar as they constitute waste collection, transport, treatment or disposal activities are excluded → CEPA 3.2, 3.3 and 3.4)
14.3	Direct management of mineral stocks	Exploitation, management and maintenance of the stocks of mineral resources including research and exploration activities; management of quarrying sites (activities for the rehabilitation of abandoned mining and quarrying sites are excluded → CEPA 6.2). The management and maintenance activities carried out by the public or private authorities in charge of the direct management, exploitation and exploration of mineral stocks are included, while the administration and regulation activities carried out by the General Government are excluded → CRUMA 14.5.
14.4	Measurement, control, laboratories and the like	Activities aimed at measuring, controlling and monitoring the use and the consistency of mineral stocks. It includes for example: inventories and assessment of mineral stocks.
14.5	Other activities	All other activities and measures aimed at the use and management of mineral resources. It includes regulation, administration, education, training and information activities specific to the class when they can be separated from other activities related to the same class and from similar activities related other classes. It includes for example: release of licences for mining and quarrying activities; General Government units or part thereof which administrate and regulate the exploitation of mineral resources or are responsible for material savings and recycling policies. It excludes public or private bodies which manage, exploit and explore mineral reserves → CRUMA 14.3.
15	**Research and development activities for natural resource use and management**	Creative work undertaken on a systematic basis in order to increase the stock of knowledge and the use of this knowledge to devise new applications in the field of natural resource management and savings. Excluded are R&D activities related to environmental protection → CEPA 8
15.1	Water resources	R&D activities exclusively related to water resources
15.2	Natural forest resources	R&D activities exclusively related to natural forest resources

Code	Description	Explanatory notes/Examples
15.3	Wild flora and fauna	R&D activities exclusively related to wild flora and fauna resources
15.4	Fossil energy	R&D activities exclusively related to energy sources (non-renewable and renewable)
15.5	Minerals	R&D activities exclusively related to minerals
15.6	Other R&D activities for natural resource use and management	Other R&D activities concerning other natural resources (not specified)
16.	**Other natural resource use and management activities**	
16.1	General administration of natural resources	Any identifiable activity that is directed at the general support of decisions taken in the context of natural resource use and management whether by governmental or by non-governmental units.
16.1.1	General administration, regulation and the like	Any identifiable activity within general government and NPISH units that is directed towards the regulation, administration of the environment and the support of decisions taken in the context of natural resource use and management activities. When possible such activities should be allocated to other CRUMA classes (within the "other activities" category). If this is impossible, they should be included under this position of the classification. If the general administration activities concern both environmental protection and use and management of natural resources, they should be broken down between this position and the corresponding CEPA category (→ CEPA 9.1.1). If this is impossible, they should be classified in this position or alternatively in the CEPA one according to the "main purpose" criterion; if this is impossible as well, they should be classified within the corresponding CEPA category (→ CEPA 9.1.1)
16.1.2	Environmental management	Any identifiable activity of corporations that is directed at the general support of decisions taken in the context of natural resource use and management activities. It includes the preparation of declarations or requests for permission, internal environmental management, environmental certification processes (ISO 14000, EMAS), as well as the recourse to environmental consultancy services. Activities of units specialised in environmental consultancy, supervision and analysis are included. When possible such activities should be allocated to other CRUMA classes (within the "other activities" category). If this is impossible, they should be included under this position of the classification. If the general administration activities concern both environmental protection and use and management of natural resources, they should be broken down between this position and the corresponding CEPA category (→ CEPA 9.1.2). If this is impossible, they should be classified in this position or alternatively in the CEPA one according to the "main purpose" criterion; if this is impossible as well, they should be classified within the corresponding CEPA category (→ CEPA 9.1.2)
16.2	Education, training and information	Activities that aim at providing general environmental education or training and disseminating information on natural resource use and management. Included are high school programs, university degrees or special courses specifically aimed at training for natural resource use and management. Activities such as the production of environmental reports, environmental communication, etc. are also included. When possible such activities should be allocated to other CRUMA classes (within the "other activities" category). If this is impossible, they should be included under this position of the classification. If the general education, training and information activities concern both environmental protection and use and management of natural resources, they should be broken down between this position and the corresponding CEPA category (→ CEPA 9.2). If this is impossible, they should be classified in this position or alternatively in the CEPA one according to the "main purpose" criterion; if this is impossible as well, they should be classified within the corresponding CEPA category (→ CEPA 9.2)
16.3	Activities leading to indivisible expenditure	Natural resource use and management activities that lead to indivisible expenditure, i.e. which cannot be allocated to any other CRUMA class
16.4	Activities not elsewhere classified	This position groups together all the natural resource use and management activities that cannot be classified under other positions of the classification

Remarks

- **General classification principles**

  Classification should be made according to the main purpose taking into account the technical nature as well as the policy purpose of an action or activity. Multi-purpose actions, activities and expenditure that address several CRUMA classes should be divided by these classes. Classification under the heading 'indivisible expenditure and activities' should only be made as a last resort.

- **Classification of transversal activities and expenditure**

  Transversal activities are R&D, administration and management as well as education, training and information.

  All R&D should be allocated to CRUMA 15.

  Administration and management as well as education, training and information should, to the extent possible, be allocated to the 'Other' positions in CRUMA 10-14. When these activities concern simultaneously two or more natural resources they should be allocated respectively to 16.1 or 16.2 positions.

Table 12 CRUMA: overview

	Natural resource				
Type of activity	Water resources	Natural forest resources	Wild flora and fauna	Fossil energy	Minerals
Reduction of the intake of natural resources through preventive in-process modifications	10.1 Reduction of the intake	11.1 Reduction of the intake	12.1 Reduction of the intake	13.1 Reduction of the intake	14.1 Reduction of the intake
Use of alternative resources					
Reduction of losses, leaks and scraps	10.2 Reduction of water losses and leaks, water reuse and savings	11.2 Reduction of the consumption of forest (wood and non wood)-related products		13.2 Reduction of heat and energy losses, and energy savings	14.2 Reduction of minerals use through the reduction of scraps and the production and consumption of recycled materials and products
Reduction of the intake of natural resources indirectly through the reduction of the consumption of natural resource-related products (energy savings, water savings, etc.)					
Reuse, recycling					14.2 Reduction of minerals use through the reduction of scraps and the production and consumption of recycled materials and products
Increase/recharge of natural resource stocks	10.3 Replenishment of water stocks	11.3 Reforestation and afforestation	12.2 Replenishment of wild flora and fauna stocks		
Direct management of natural resource stocks (mobilization/exploitation, exploration, extraction, treatment, distribution, etc.)	10.4 Direct management of water stocks	11.4 Forest fires 11.5 Direct management of forest areas (as a resource and not as a habitat)	12.3 Direct management of wild flora and fauna stocks	13.3 Direct management of the stocks of non-renewable energy sources	14.3 Direct management of mineral stocks
Measurement and control activities	10.5 Measurement, control, laboratories and the like	11.6 Measurement, control, laboratories and the like	12.4 Measurement, control, laboratories and the like	13.4 Measurement, control, laboratories and the like	14.4 Measurement, control, laboratories and the like
Research and development activities	15.1 R&D for use and management of water resources 15.6 Other R&D activities for natural resource use and management	15.2 R&D for use and management of natural forest resources 15.6 Other R&D activities for natural resource use and management	15.3 R&D for use and management of wild flora and fauna 15.6 Other R&D activities for natural resource use and management	15.4 R&D for use and management of fossil energy 15.6 Other R&D activities for natural resource use and management	15.5 R&D for use and management of minerals 15.6 Other R&D activities for natural resource use and management
Teaching and training activities	10.6 Other activities 16.2 Education, training and information	11.7 Other activities 16.2 Education, training and information	12.5 Other activities 16.2 Education, training and information	13.5 Other activities 16.2 Education, training and information	14.5 Other activities 16.2 Education, training and information
Administrative activities	10.6 Other activities 16.1 General administration of natural resources	11.7 Other activities 16.1 General administration of natural resources	12.5 Other activities 16.1 General administration of natural resources	13.5 Other activities 16.1 General administration of natural resources	14.5 Other activities 16.1 General administration of natural resources

Annex 3 Correspondences between COFOG and CEPA/CRUMA

Table 13 Correspondences between COFOG and CEPA/CRUMA

CEPA 2000 (EPEA)		COFOG	
1	protection of ambient air and climat	5.3	Pollution abatement
2	wastewater management	5.2	Waste water management
3	waste management	5.1	Waste management
4	protection and remediation of soil, groundwater and surface water	5.3	Pollution abatement
5	noise and vibration abatement	5.3	Pollution abatement
6	protection of biodiversity and landscapes	5.4	Protection of biodiversity and landscape
7	protection against radiation	5.3	Pollution abatement
8	R&D for environmental protection	5.5	R&D Environmental protection
9	other environmental protection activities	5.6	Environmental protection n.e.c.
CRUMA (RUMEA)		COFOG	
10	use and management of water resources	4.2.1 6.3.1	Agriculture (irrigation and drainage systems) Water supply
11	use and management of natural forest resources	4.2.2	Forestry
12	use and management of wild flora and fauna	4.2.3	Fishing and hunting
13	use and management of fossil energy	4.3	Fuel and energy
14	use and management of minerals	4.4.1	Mining of mineral resources other than mineral fuels
15	R&D for natural resource use and management	4.8.2 4.8.3 4.8.4 6.5	R&D Agriculture, forestry, fishing and hunting R&D Fuel and energy R&D Mining, manufacturing and construction R&D Housing and community amenities
16	other natural resource use and management activities		no specifc correspondence the code "4.7.4 - Multi-purpose development projects" can be used for multi purpose activities concerning several RUM activities falling within division 04

Remarks

- **CEPA *versus* COFOG**

  There is an exact correspondence between the CEPA scope as a whole and the scope of division "05 Environmental protection" of the COFOG: i.e. all the EP activities and expenditures classified according to CEPA can be classified only within COFOG division 05, which in turn includes exclusively EP activities and expenditures that can be classified within CEPA

- **CRUMA *versus* COFOG**

  Differently from CEPA, there is no exact correspondence between CRUMA and COFOG: i.e. all the RUM activities and expenditures classified according to CRUMA can be classified appropriately within one (or sometimes more than one) COFOG category, which in turn includes also non-environmental activities and expenditures together with the RUM ones