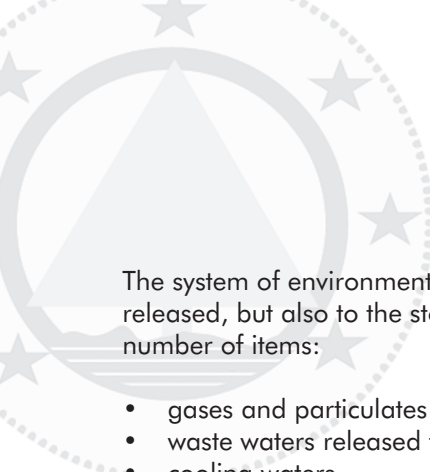# 5.0 Application Case Study: Malopolska

5.1 Context & Objectives

Concern for environmental issues is growing. This is especially true in the transition countries, like Poland, where - to deal with the remnants of the previous regime - a new environmental policy was implemented in 1991. In Poland, this is supplemented with regional programs of both environmental protection and waste management. The programme of Environmental Protection 2005-2012 in Małopolska sets the targets, priorities and direction of activities for the sustainable development and environmental protection of the region. The main strategic goal is identified as the prevention of health hazards and the minimisation of risks relating to exposure to harmful substances. The most significant risks to human health currently relate to:

- water pollution and potable water quality,
- air pollution,
- municipal waste,
- natural disasters (droughts and floods)

In Poland, apart from the strategic plans and programs, there is a system of environmental financial instruments in operation, such as environmental charges (fees and fines), which was introduced to internalise the external costs and promote incentives for sustainable development. The reasoning behind the charges was that every user of the environment should pay for it, since the resources are scarce. Environmental charges are collected through special funds, i.e. the National Fund of Environmental Protection and Water Management, as well as local community funds.
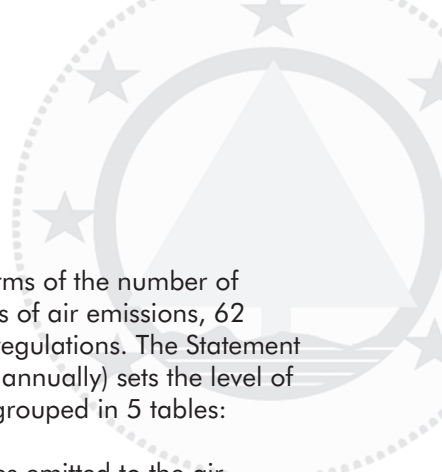
The system of environmental charges applies not only for pollutants released, but also to the storage of waste. The charges cover an extensive number of items:

- gases and particulates released to the air,
- waste waters released to soil and water,
- cooling waters,
- waste to landfill,
- underground and surface water abstraction,
- run-off from the contaminated areas.

Table 1 Example of Environmental Charges Rates in 2005 (Annual average exchange rate 1 EUR = 4.3978 PLN).

Substance	Unit	Fee /Unit in PLN	Fee / Unit in EUR
Sulphur dioxide (to air)	kg	0.41	0.09
Cadmium (to air)	kg	144.34	32.82
Benzene (to air)	kg	6.60	1.50
Carbon dioxide	Mg	0.22	0.05
Benzene (to water)	kg	91.44	20.79
Waste from metal ore mining	t	14.87	3.38
Waste from copper, zinc and lead mining (tailings)	t	9.59	2.18
Flotation waste containing dangerous substances	t	43.86	9.97

The system in Poland is unique in Europe in terms of the number of substances that are subject to charges. In terms of air emissions, 62 elements and compounds are covered by the regulations. The Statement from the Ministry of the Environment (updated annually) sets the level of charges pertaining to the emissions to the air grouped in 5 tables:

• Table A - Unit fees for gases and particulates emitted to the air.
• Table B - Unit fees for gases emitted to the air during the handling of gasoline. These are the fees paid per tone of handled gasoline, where handling means filling and emptying the containers, cisterns, etc.
• Table C - Unit fees for gases or particulates emitted to air from boilers with a capacity of up to 5MW fuelled by coal, coke, wood, oil, or gas, which do not require either IPPC or air emission permits. The fees are per unit of fuel burned in tonnes or cubic metres.
• Table D - Unit fees for gases and particulates emitted to the air from the combustion of fuels in combustion engines. The fees are per unit of burned fuel in tonnes.
• Table E - Unit fees for gases and particulates emitted to the air from poultry breeding. The fees are per 100 stands.

This system has worked well in a country in transition to increase efforts in environmental protection. Moreover, because of the significant impact of environmental charges on competitiveness, the level of any charges for any pollutant should be uniform within the EU. Experience in Poland would indicate that the introduction of the appropriate level of charges can promote environmental and economic efficiency, but it is an extremely complex and difficult task.

The objective of developing the RAMEA for Małopolska was to establish the link between the environment and the economy and to identify the most burdensome economic activities in the region. The RAMEA for Małopolska was prepared in accordance with the guidelines of Eurostat (2004). In particular the tables provided in the guidance were used. The Polish data used came from different publications from the National Office of Statistics (GUS), the Regional Data Bank and various publications from National Emissions Centre. The objective of the case study was to determine the sectoral structure of the entities required to pay for the use of the environment in order to improve emissions control system and fees collection.

5.2 Application to the Activities of the Marshal Office

5.2.1 Application of RAMEA

This case study covers the application of RAMEA to the Marshal Office activities relating to environmental protection, one of the many potential applications. These activities include not only the development and implementation of the environmental protection programmes but also collection of the environmental fees. RAMEA was used to indicate which sectors should receive the most attention from the Marshal Office, regarding emission monitoring, and the most appropriate target areas for a concentration of investments. Poland has the opportunity to use European Structural Funds for technology/infrastructure development and by using RAMEA it is possible to define sectors which should have priority for investment. A questionnaire survey was carried out on the Marshal Office to ascertain areas where RAMEA can be used and where it could be enhanced.

5.2.2 Findings/Output

RAMEA for Małopolska was prepared for the year 2003, an extract of which is shown in Table 2 opposite.

The output data, gross value added and intermediate consumption by sectors is regional data from Office of Statistics. The allocation of output of sector D is estimated on the basis of distribution of production sold in industries in Poland, as more detailed information on production is not collected.

The employment data is the average employment in the sectors, with the data on full-time jobs coming from the regional database of the Office of Statistics (available online). For the sector D the full-time jobs are estimated on the basis of average employment in the medium sized enterprises. Output within the manufacturing sector is allocated on the basis of the production sold.

The air emissions data are restricted to plants generating significant emissions as only these are monitored by sector and region. However they represent almost 70% of total CO_2 emissions recorded for Poland and 6.39% for Małopolska, which is slightly lower than region's share of the production sold for the sectors (C, D and E) at 6.41%.
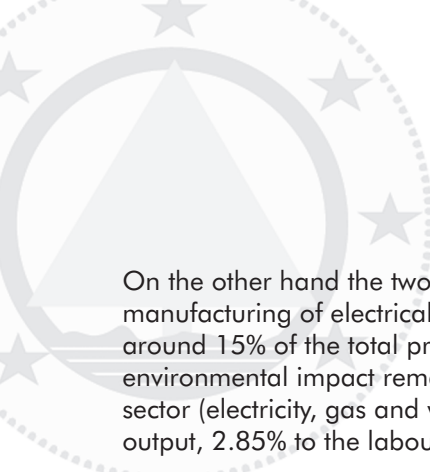
The Małopolska's share of the output is equal to 7.11%, with GVA 7.30%. The biggest contributor to both output and CO_2 emissions is the manufacturing sector (29.46% of output, 25.51% of labour input and 27.07% of the emissions) and within this sector the biggest share of CO_2 emissions is attributed to manufacture of basic metals, although it represents only 5.51% of the total production sold by this sector.

Table 2. Extract from the RAMEA for Małopolska (PL) (2003)
Contribution of Production to Output, Gross Value Added, Employment and CO_2 Emissions

2003		Ouwtput Małopolska %	Production sold Małopolska %	Labour input Małopolska %	GVA Małopolska %	CO_2 emissions Małopolska %
Total economic activities		100	100	100	100	100
A+B	Agriculture hunting forestry fishing	3.50		0.68	2.84	
C	Mining and quarrying	0.89	1.11	0.48	1.05	0.29
D	Manufacturing	29.46	90.09	25.51	18.03	27.08
DA	Food, beverages and tobacco		15.37	5.21		0.45
DB+DC	Textile and leather products		3.30	2.69		0.05
DE	21 Paper and paper products		1.23	0.28		0.08
	22 Publishing and printing		4.34	0.87		
DF	Coke, refined petroleum, nuclear fuel		3.42	0.17		0.34
DG	Chemical products		8.79	1.60		7.88
DH	Rubber and plastic products		4.31	1.19		
DJ	27 Manufacture of basic metals		5.51	0.96		15.45
	28 Manufacture of metal products		8.08	2.49		
DK	Machinery and equipment		3.96	2.13		0.40

Table 2 Cont'd. Extract from the RAMEA for Małopolska (PL) (2003)
Contribution of Production to Output, Gross Value Added, Employment and CO_2 Emissions

2003		Output Małopolska %	Production sold Małopolska %	Labour input Małopolska %	GVA Małopolska %	CO_2 emissions Małopolska %
Total economic activities		100	100	100	100	100
DL	Electrical and optical equipment		14.21	2.90		0.09
DM	Manufacture of transport equipment		3.89	1.23		0.31
DN	Manufacturing n.e.c.		2.36	1.03		
E	Electricity, gas and water supply	2.95	8.79	2.86	2.77	64.15
F	Construction	7.87		5.49	6.35	8.27
G+H	Trade and repair, hotels	20.47		16.17	23.71	
I	Transport, storage and communication	6.18		4.62	6.04	
J	Financial intermediation	2.51		2.69	3.34	
K	Real estate, renting and business activities	11.46		6.82	13.39	
L	Pub. admin., defence, social security	4.00		6.70	6.36	
M	Education	3.57		15.58	6.32	
N	Health and social work	3.29		9.54	4.95	
O	Other community, social and personal service activities	3.47		2.87	4.15	0.20

On the other hand the two sectors of food, drink and tobacco and manufacturing of electrical and optical equipment together represent around 15% of the total production sold by this sector, while their environmental impact remains relatively low at less then 0.5%. The utilities sector (electricity, gas and water supply) contributes only 2.95% to the output, 2.85% to the labour input, but 64.15% of the of CO_2 emissions.
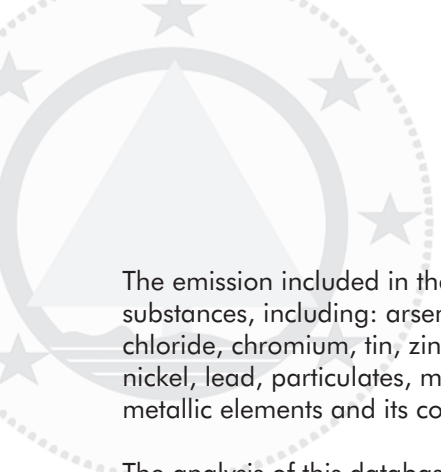
The RAMEA for Małopolska was prepared in conjunction with the regional Marshal Office, which is the body responsible for the recording and collection of environmental fees, and the main source of air emission data at a regional level. This covers all the emissions that are subject to environmental fees for using the environment (Environmental Protection Act from 27.04.2001 with later changes). The database is created by the Marshal Office to record the reports from companies on the fees for using the environment. The reporting is based on standardised forms and this duty to report is compulsory for every entity that conducts the activities that produce emissions. The database consists of information divided into four modules:

- gases and particulates released to the air,
- water abstraction
- waste waters released to soil and groundwater,
- waste to landfill.

Since the RAMEA for this case study covers the emissions to the air, the database content pertaining to these emissions is presented in more detail:

1. Air emissions by source
   a. Source of the emission
      i. Type, e.g. furnace, installation
      ii. Source capacity
      iii. Type of protection device
   b. The emission volume
      i. Type of fuel/substance, e.g. SO_2, NO_2, CO, CO_2, particulates, etc.
      ii. The effectiveness of protection device
      iii. The emission volume
   c. The place of emission, i.e. commune name

2. Air emissions from the handling of engine fuels is specified separately and includes:
   a. The volume of fuel handled
   b. The effectiveness of protection device
   c. The place of emission, i.e. commune name

3. Air emissions from boilers are another also reported and includes:
   a. Boilers of capacity smaller than 5MW
   b. Fuelled by coal, coke, wood, oil or gas
   c. Boilers for which the IPPC is not required
   d. Number of boilers
   e. Volume of fuel used

4. Air emissions from combustion engines
   a. Cars
   b. Trucks
   c. The type of fuel
   d. Volume of fuel used

The emission included in the Marshal Office database covers 62 substances, including: arsenic, ammonia, asbestos, benzene, vinyl chloride, chromium, tin, zinc, sulphur dioxide, carbon dioxide, methane, nickel, lead, particulates, mercury, carbon monoxide, nitrogen oxides, metallic elements and its compounds, etc.

The analysis of this database was carried out for the year 2005 since these data are available in electronic format and the results are presented in the Table 3. This shows that those same sectors that report the most emissions to the Marshal Office are those identified in the RAMEA as emitting the highest levels of air emissions e.g. of CO_2. For CO_2 emissions these include among others, electricity, gas and water supply (E), chemical products (DG) and manufacture of metals (DJ). The difference however is in the amount reported, but this may be due to the fact that the statistical information on which RAMEA is based covers only the most polluting plants.

Table 3. Emissions Data from Marshal Office database [t]

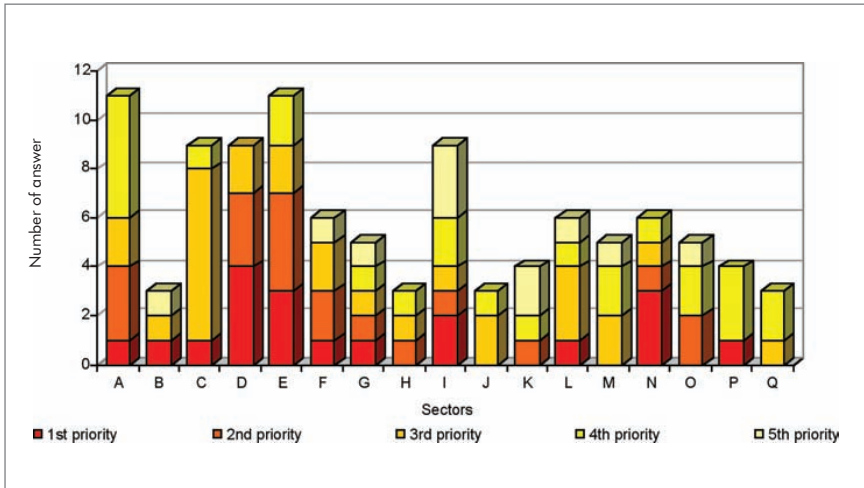| Sectors	CO_2	CH_4	NH_3	SO_2	CO
Section AB	2 605	–	0.06	59	8
Section C (CA)	0	51 170	–	0	2
Section C (CB)	70	–	–	1	32
Section D (DA)	65 991	132	3.23	614	347
Section D (DB+DC)	5 945	–	0.84	75	109
Section D (DD)	1 352	–	–	0	26
Section D (DE)	16 246	–	0.18	91	77
Section D (DF)	3 291	–	–	18	0
Section D (DG)	377 023	6	181	4 750	146
Section D (DH)	227	–	2.87	3	1
Section D (DI)	9 050 168	80 166	0.12	260	1 559
Section D (DJ)	65 322	–	0.34	701	259
Section D (DK)	21 636	0	0.40	114	98
Section D (DL)	6 846	–	0.01	1	2
Section D (DM)	39 230	–	–	91	242
Section D (DN)	14 540	–	–	822	74
Section E	5 134 635	111	0.01	37 298	1 573
Section F	8 289	–	–	39	79
Section G	5 264	–	0.03	27	44
Section H	909	–	–	2	0
Section I	0	4	–	0	0
Section K	24 171	–	3.76	102	181
Section L	2 962	–	–	9	32
Section M	0	–	–	1	1
Section N	24 197	–	–	66	57
Section OPQ	7 512	–	–	14	8
Not allocated	3 203 228	732	20.69	11 791	39 015
Total	18 081 659	132 320	214	56 950	43 973

5.2.3 Use of Findings (policy, intervention, fiscal)

In Małopolska, the Marshal Office is the body responsible for the preparation and implementation of the environmental programmes and policies. The questionnaire was developed in conjunction with representatives from the Marshal Office to analyse the possible uses of the initial RAMEA project results and its application to set goals for environmental programmes and monitor their achievements / progress as well as identifying the needs for data in Marshal Office. The questionnaire was then distributed among the employees of the Marshal Office at the Department of Environment and Development of Rural Areas. The questionnaire consisted in 22 questions and 16 people responded.

Almost everyone (94%) agreed that it was important to consider all sectors of economy. However, 27% of the respondents indicated that they believed it was enough to consider only those sectors with the most significant environmental impact. Moreover, the respondents were given the opportunity to prioritise the sectors according to their importance (highest priority 1, lowest priority 5). The sectors identified as being of the highest priority were: agriculture, hunting and forestry (A) and electricity, gas and water supply (E) – almost 70% of those polled voted for these sectors.

The second group of sectors identified by 56% of the answers were: mining and quarrying (C), manufacturing (D) and transport, storage and communication (I). The third most important group of sectors was construction (F), public administration and defence; compulsory social security (L) and Health and social work (N), all indicated by 38% of respondents. Figure 1 presents the details of the responses and assigned priority of the sectors. These answers confirm the findings from the project, as RAMEA indicates the same sectors to be those with the biggest impacts – both economic and environmental.

Figure 1: Assessment of Priority Sectors Based on Responses Received.
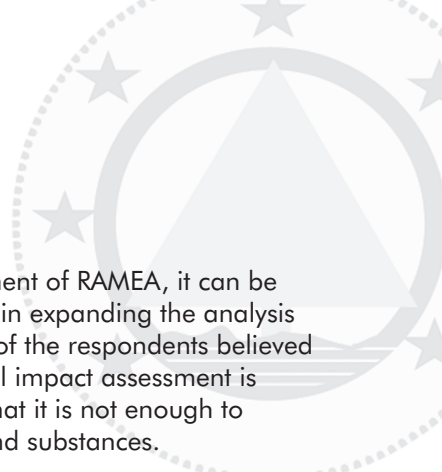

A simple weighting was applied to the answers to perform the uniform ranking of the sectors. The results of this are presented in the Table 4, which indicates the top priority was assigned to the electricity, gas and water supply (E), followed by manufacturing (D) and agriculture, hunting and forestry (A).

Table 4. Weighted sector ranking

Sector	Sector name	Weighted priority
E	Electricity, gas and water supply	41
D	Manufacturing	38
A	Agriculture, hunting and forestry	33
C	Mining and quarrying	28
N	Health and social work	24
I	Transport, storage and communication	24
F	Construction	20
L	Public administration and defence; compulsory social security	17
G	Wholesale and retail trade	15
O	Other community, social and personal service activities	13
P	Activities of households	11
M	Education	11
H	Hotels and restaurants	9
B	Fishing	9
K	Real estate, renting and business activities	8
J	Financial intermediation	8
Q	Extra-territorial organizations and bodies	7

A high level of detail of environmental impact assessment and complexity was requested by the respondents, with everyone agreeing that a high level of detail is important for analysis, 87% of replies indicating that the desired level of detail should include group or class in terms of NACE classification.

This indicates that a higher level of detail is required than RAMEA currently provides, as the sector level was deemed sufficient by only 13% of respondents. The complexity of the environmental impact assessment in terms of covering all impacts (air emissions, water emissions, wastes) was considered important by all respondents. Only 19% indicated that they considered it sufficient to cover only those elements of the environmental impact assessment indicated, with, 69% being of the opposite view.
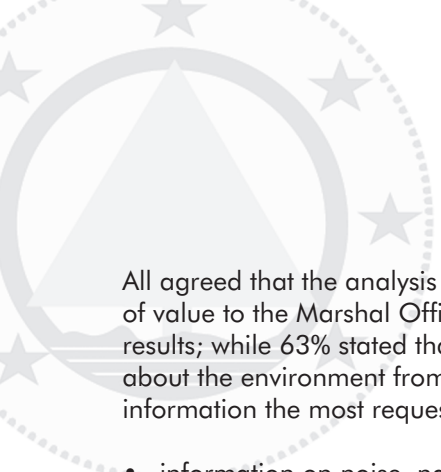
Referring these findings to the future development of RAMEA, it can be concluded that there is a considerable interest in expanding the analysis beyond just air emissions. The majority (94%) of the respondents believed that a high level of detail for the environmental impact assessment is essential with 75% of respondents indicating that it is not enough to consider only the most significant pollutants and substances.

The majority of those polled (81%) stated that all possible pollutants and substances should be considered in the analysis. All respondents stated that it was important that the analysis be based on the most current data and that the environmental and economic data should be analysed in a time series.

The questionnaire showed the importance of versatility and simplicity of a tool like RAMEA, together with its modelling possibilities and credibility. All agreed on the value of being able to compare between the regions and the simplicity of RAMEA (in terms of being able to understand how it is calculated).

The decision to carry out regional comparisons (benchmarking) using RAMEA was thus validated by the interest level of the potential users of the tool. More then half (56%) identified the importance of having a single score indicator instead of several indicators for environmental impact.

An aspect that virtually all (94%) liked about RAMEA was the possibility of simple modelling/simulation, e.g. how the emission lowers when the smelter is closed, or where a fall in production could result in a significant reduction in the amount of waste. At the same time the general acceptance of RAMEA tool was deemed important (e.g. among scientists) to establish its credibility (81% of respondents).

All agreed that the analysis prepared within RAMEA project would be of value to the Marshal Office and confirmed their interest in RAMEA results; while 63% stated that the Marshal Office has enough information about the environment from the national statistics, 25% disagreed. The information the most requested included:

- information on noise, natural resources & agriculture,
- information on the state of the environment (which the Voivodeship Inspection of Environmental Protection in Krakow collected in previous years, but this has since ceased), e.g. the soil and river polluting deposits e.g. heavy metals, etc.,
- the percentage of the inhabitants with separate Municipal Solid Waste (MSW) collection,
- the percentage of property owners with the agreements for MSW collection.

In conclusion, RAMEA was perceived as important tool that can be used not only to establish the sectoral goals for the environmental protection programme in Małopolska, but also to support the long term goals of environmental protection policy in Małopolska, i.e. compliance with the air quality norms with the associated reduction in air pollution. It is currently planned to achieve this goal by improving the transport infrastructure (roads) and the promotion of natural sources of energy, with a reduction in the use of coal and an increase of renewable energy.
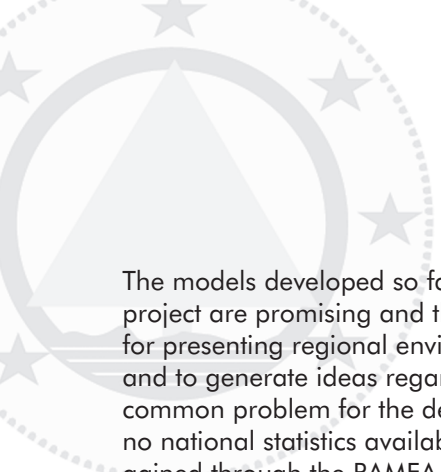
The multi-faceted analysis by RAMEA of the environmental impact in the region would allow action to be focused on the most important areas. It is also worth mentioning that there is strong interest expressed in the application of RAMEA from the neighbouring regions.

5.2.4 Monitoring Proposal

RAMEA supports the life-cycle approach to environmental policy design and responds to the needs expressed by regional policy makers for simple, understandable and reliable indicators. The project outcome creates the basis for more effective decision-making (with the emphasis on the relation between economic activities and environmental effects) as well as for the further analysis e.g. input-output analysis. On the basis of information gathered in RAMEA there is a possibility to create sustainability indicators that will allow regional decision makers to better understand the outcomes / implications of the analysis.

The most important application of these indicators at present is to inform regional policy makers and provide them with the tool to transform the environmental strategy goals into the measures necessary to accomplish them and to assess the progress and the legitimacy of implemented environmental policy. RAMEA can be used within the framework of life-cycle analysis to support actually dealing with the environmental problems instead of shuffling them, as well as a means of organising the information available. At the same time, it also gives local government a quick way to assess the outcomes of policy introduced.

The models developed so far within the framework of the RAMEA project are promising and the project is expected to form the norm for presenting regional environmental information to policy makers and to generate ideas regarding dealing with missing data, which is a common problem for the development of such tools where there are no national statistics available, as in the Netherlands. The experiences gained through the RAMEA project will hopefully be a starting point for a more comprehensive environmental information system and will form the basis for the creation and revision of the environmental policy and a benchmarking tool, against which the policy measures implemented, could be assessed.

In the opinion of both regional policy makers and the project partners, RAMEA is an important undertaking, especially for regions where there is a need for a solid background against which to set environmental policy goals, including but not limited to environmental areas most in need of attention. For further information on how a hybrid accounting system like RAMEA could be used as an instrument for policy advice, refer to the paper "The Usefulness of Hybrid Accounting Systems for Environmental Policy Advice regarding Sustainability"[23] by Malgorzata Goralczyk and Peter J. Stauvermann, which was presented at the 16th International Input-Output Conference in Istanbul, Turkey, 2-6 July 2007.

[23]http://www.iioa.at/conferences-IO.html