Comparative Analysis of National Accounts
Incorporating Environmental Issues

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Abstract: Two main integrated environmental and economic accounting systems, the SEEA and the NAMEA frameworks, are reviewed in this paper with an emphasis on derived indicators. NAMEA indicators in physical terms better serve the multi-dimensional needs of sustainable development than the adjusted monetary macro-indicators in the SEEA, which rely on the maintenance cost valuation. While maintenance costs are crucial for policy making, approximating the depreciation of natural assets with maintenance costs is controversial and misleading. Physical accounts should be the core of integrated accounts, and they should always be made public.

[Keywords: Environmental accounting, green GDP, SEEA, NAMEA]

1. Introduction

Increasing scarcity of natural resources and serious degradation of the environment resulted in a more pronounced call for an integrated environmental and economic accounting system in the early 1990s. Evidence has been accumulating suggesting that future generations will have to pay a high price for our careless use of the environment. What we want to achieve is known as sustainable development: "Development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1989, p. 363). The cornerstone document for sustainable development, the Agenda 21 report (UN, 1993/b), explicitly calls for the development of an integrated accounting framework.

Two major approaches emerged: the Satellite System of Integrated Environmental and Economic Accounts (SEEA), and the National Accounting Matrix, including Environmental Accounts (NAMEA). Neither system suggests the replacement of the SNA, but they aim to provide supplementary information in the form of satellite accounts, as suggested in the 1993 SNA (Commission of European Communities et al, 1994). This paper will briefly introduce the key elements of these frameworks, review country estimates and comparatively analyze the recording of environmental data and the indicators derived from the systems. The reason for focusing on the indicators is that, as we will see, part of the NAMEA is included in the SEEA, the part which is not included is the themes account where the physical aggregate indicators are derived. In fact, the SEEA can be considered as a system advocated by the "monetary valuation school", whereas the NAMEA represents the "physical (non-monetary) evaluation school", and the clearest point of confrontation is with the indicators, while other parts of the two systems are similar. The discussion on indicators will necessarily look into the question of monetary valuation and its problems.

2. Comparison of key elements of the SEEA and the NAMEA

2.1 Development and current status
(1) SEEA: The United Nations Statistics Division proposed the "Interim version" of the SEEA (UN, 1993/a) in
1993. It is complicated while providing few practical guidelines. Further research and experience from trial estimates resulted in a simplified handbook: "An Operation Manual", published in 2000 (UN, 2000), which gives "step-by-step" guidelines on implementation and details on policy uses. More than ten countries made SEEA estimates (UN, 2000), but no country has introduced SEEA on a regular basis. A revised version, the SEEA2003, is available for downloading on the internet at the time of writing. This edition focuses more on physical accounting and some parts will be closer to the NAMEA principles. However, the handbook has not been published yet, thus its content are not covered in this paper.

(2) NAMEA: The first NAMEA was constructed in the early 1990s in the Netherlands, and it has been part of the national accounts since 1994. Currently, the NAMEA is being developed in the European Union, and the Eurostat is monitoring member state projects. Estimates are also available in Norway and Japan. There are trials to extend the NAMEA with social issues through the inclusion of the Social Accounting Matrix.

2.2 Concept and structure

(1) SEEA: In addition to economic assets in the SNA, all natural assets which "function as providers not of natural resource inputs into production but of environmental services of waste absorption, ecological functions such as habitat and flood and climate control, or other non-economic amenities such as health and aesthetic values" (UN, 2000, p. 26) are covered in the SEEA. These assets are divided into wild biota, subsoil assets (proven reserves), land (with ecosystems and soil), water and air under the Classification of Non-Financial Assets (UN, 2000, Annex III). The stocks are recorded in physical units, or if it is impossible, quality is recorded in supplementary accounts. Monetary values are calculated by the net price method or the user cost allowance method 1). However, these methods do not account for the value of non-economic functions such as the ecological function, climate control, aesthetic values, etc. Monetary valuation of non-market functions was suggested in the “Interim version” through damage valuation applying contingent valuation method, hedonic pricing, or the travel cost method. In addition to the inherent problems with these methods, they are not suitable for regular implementation at national level because of their large data requirement. As a result, damage valuation was omitted in the “Operating Manual”. If the stock of an asset cannot be valued, changes in quality are recorded in monetary terms though “maintenance costs (MC) valuation method”. MC are expenses that would have been incurred during the accounting period to avoid or mitigate the environmental damage that was actually caused. MC (if paid) would internalize the unpaid social cost of pollution, can be regarded as capital maintenance, and would guarantee strong sustainability (where the level of different types of capital has to be maintained). The valuation can be based on one of the following activities (UN, 1993/a, paragraph 307): (a) reduction or abstention from economic activities, (b) substitution of outcomes, (c) substitution of inputs (d) prevention (end-of-pipe technologies), and (e) restoration. Following the principle of economic efficiency the most economically viable one has to be applied.

(2) NAMEA: The NAMEA is an extension of the national accounting matrix with two environmental accounts without monetary valuation. The flow of polluting substances and natural resources flows are recorded in the “substances account”, next to the industries that emit or use them. In the other, the “themes account”, the substances are weighted and aggregated into categories of environmental issues, resulting in a number of environmental indicators. The weights are based on the potential environmental threat or on another common feature of substances. The typical environmental themes are: global warming, ozone layer depletion, acidification, eutrophication, waste, and changes in natural resources. Substances and environmental themes may be added or removed according to the needs of individual countries or if changes in environmental conditions require that. There is also an additional tax account to show environmental taxes.

Another important feature of both the SEEA and the NAMEA is the environment-related disaggregation of the SNA accounts. Environmentally related activities, goods and services, and expenditures are separately recorded from others in each sector.

2.3 Indicators

(1) SEEA: Aggregate indicators in the SEEA are in monetary units. Environmental costs are viewed as the consumption of natural capital, qualitatively or quantitatively, and are deducted from the NDP to arrive at the environmentally adjusted net domestic product (EDP). In practice, the depreciation of man-made capital is often not accounted for and the result is called the “green GDP”. Another indicator is the “environmentally adjusted net
capital formation” (ECF), which is net capital formation less environmental costs. The “genuine savings” indicator (Hamilton, 1994) is also often quoted, where savings are adjusted by the environmental costs.

(2) NAMEA: In addition to the traditional macroeconomic indicators, we can find environmental indicators in the themes accounts. Each indicator has its own unit of measure that best suits the environmental problem in question, for example, global warming potential (GWP), acidification equivalents (AE), etc.

2.4 Applications

(1) SEEA: The reassessment of environmental-economic performance with the help of adjusted indicators and supplementary environmental indicators, such as the Driving-force-State-Response indicators 2), for the environment are also necessary. Economic policies should aim at internalizing the social cost of depletion and degradation through environmental taxes, emission charges, pollution permits and the abolishment of environmentally harmful subsidies, consequently reducing environmental costs. The breakdown of imputed environmental costs by sector and input-output analysis can trace the original sources of environmental pressure and assess the outcome of environmental-economic policies. International comparison of new indicators can be used to compare sustainable economic strength, allocate development aid, and evaluate investment opportunities.

(2) NAMEA: “Eco-efficiency” indicators show the contribution of industries to production, employment and environmental problems by presenting the relevant indicators together, usually as ratios. Indirect (cumulative) emission of each industry can be calculated by input-output analysis. Here, environmental pressure from the production of input materials is also accounted for. The NAMEA records pollution from domestic economic activities and foreign economic activities separately. A country’s “pollution trade balance” for given substances can be derived from the system. The database in the SEEA and the NAMEA can serve as an input into macroeconomic and environmental models and simulations, similarly to the SEEA database. The database in the NAMEA can also serve as a basis for monetary valuation.

3. Comparing country experiences

The aim of this section is to review how the SEEA and the NAMEA were used in practice to give us a basis for the evaluation in section 4. The environmental-related disaggregation of the SNA accounts is part of both systems, but these estimates are not discussed in this paper.

(1) SEEA: Published SEEA estimates concentrated on the calculation of the environmentally adjusted indicators. Let us look at the ECF results first.

Accounting for Indonesia's petroleum, forest, and soil (Repetto et al, 1989), ECF was negative for two consecutive years from 1971 to 1984. (The depreciation of man-made assets was not deducted.) In a different study regarding Indonesia (Bartelmus, 1999), ECF was negative from 1970-81 (positive from 1982-84), also negative in Ghana in 1991-93 (Bartelmus, 1999), and in Mexico in 1985 (Bartelmus, 1994). The genuine savings indicator was negative for Sub-Saharan Africa from 1977 to 1992 (and mostly positive between 1961 and 1976) (Hamilton, 1994), and in the Philippines for the agricultural industry from 1970-83 (Kojima, 1997). These countries are using up their natural resources either for the short-term interest of rapid growth or merely for survival. The following countries had positive EFCs throughout the whole period: Korea (1970-88), Japan (1970-95), U.K (1980-90), The Philippines (1988-93) (all in: Bartelmus, 1999) and Papua New Guinea (1986-90) (Bartelmus, 1994). The OECD average of the genuine savings indicators was positive from 1961 to 1991 (Hamilton, 1994). Positive ECF (or genuine savings) means that the level of total capital expressed in monetary terms is maintained, meeting the condition of weak sustainability.

Now, let us turn to the EDP which is typically compared to the traditional domestic product. In Indonesia GDP growth averaged 7.1% annually between 1971 and 1984; meanwhile, environmentally adjusted GDP increased only 4% (Repetto et al, 1989). In a number of projects in South-Asian countries serious adjustments had to be made to the domestic product 3) due to unsustainable resource depletion (Kojima, 1997). In the Philippines (Domingo, 1998) the EDP was about 3.7% lower than the NDP in 1988, while this difference shrank to 0.36% by 1992. In Korea and Japan, in addition to depletion, the degradation of environmental quality was also accounted for by maintenance costing. In Korea (Kim at al, 1998) the EDP was about 3% lower than the NDP in 1986, while
Table 1 Annual change in environmental indicators in percentages

|                          | Japan 1990-1994 | The Netherlands 1991-94 |
|--------------------------|-----------------|------------------------|
| Greenhouse effect (CO2-equivalents) | 2.2             | 6.4                    |
| Ozonelayer depletion (CFK11-equivalents) | -27.9           | -19.9                  |
| Acidification (AEQ)       | 1.8             | -0.2                   |
| Eutrophication (EEQ)      | -0.9            | -2.8                   |
| Waste (million kg)        | 0.4             | -14.2                  |

Sources: Keuning and de Haan (1998), Keuning et al. (1999), and Ike (1999).

Table 2 Eco-efficiency indicators for 1993/1994

| Environmental indicator unit/ GDP billion $ | The Netherlands | Japan | UK   | Sweden |
|--------------------------------------------|-----------------|-------|------|--------|
| Greenhouse effect (CO2-equivalents)         | 877.5           | 515.6 | 752.6| 429.0  |
| Ozonelayer depletion (CFK11-equivalents)    | 7.58            | 10.72 | 9.45 | x      |
| Acidification (AEQ)                         | 0.60            | 0.03  | x    | x      |
| Eutrophication (EEQ)                        | 1.02            | 0.03  | x    | x      |
| Waste (million kg)                          | 57.8            | 120.5 | x    | 101.9  |

Sources: Keuning et al. (1999), Ike (1999), Hellsten et al. (1999), Vaze (1999), and CIA World Factbook at http://www.theodora.com/wfb/.

Note: The Netherlands and Japan for 1994, the UK and Sweden for 1993.

The difference fell to 2% in 1992. In Japan (EPA, 1998) too, between 1970 and 1995 the difference between the traditional domestic product and the EDP decreased from around 3% to 1%.

All estimates the author reviewed showed increasing EDP, and, with the exception of Indonesia its rate of increase was higher than that of the GDP.

(2) NAMEA: Environmental indicators show how the total environmental stress (TES) changed. For Japanese and Dutch results, see table 1.

The assimilative capacity of the environment does not depend on the size of our economy; therefore, these indicators expressing TES are very important. To evaluate the progress in greener production and consumption, however, TES has to be compared to the size of the economy. These are eco-efficiency indicators. Some results are presented in table 2.

National eco-efficiency indicators can show large differences, partly due to the different economic structures of countries. Industry level eco-efficiency analysis is more useful for investigating the reasons for different eco-efficiency figures. An example is the study on the eco-efficiencies of the French and Dutch metal and chemical industries (Anite Systems, 1999).

The indirect (cumulative) pollution of industries which use inputs from heavily polluting industries increases compared to their direct pollution share. Such indirect emission calculations were made in the Netherlands, Sweden and Germany. The Swedish results regarding SOx emissions are presented in figure 1. With further details, "following economic flows in the input-output system, it is possible to trace industrial emissions to categories of goods" (Hellsten et al, 1999, p. 61) which help to design environmental policies.

Based on the NAMEA database, GDP growth simulation with an assumption of meeting the Dutch environmental standards was calculated in the Netherlands. In Sweden, economic models based on the NAMEA were used to analyze the consequences of closing the Swedish nuclear power stations, to analyze the environmental implications of official growth forecasts, and design environmental taxes.
4. Comparative analysis and evaluation

4.1 Recording stocks and flows

In the SEEA matrix the flow of a given substance is put under the asset category which it degrades, and then maintenance costs (MC) are imputed as the “use of non-produced natural assets”. Let us observe some aspects of this imputation of asset depreciation.

MC are calculated in the following way: by calculating the unit cost of reduction and then multiplying it by the amount of total emission (UN, 2000, paragraph 207). This method was followed in the Japanese estimates for BOD (biological oxygen demand) discharge. The unit cost of removal was estimated as the average cost of removal. MC using average prices for the whole amount of discharge may be different from the real pollution abatement costs. The latter depends on the shape of the marginal abatement cost function which is generally downward sloping, and marginal costs can sharply increase as the amount to be reduced decreases. In the Korean estimates for BOD discharge they used “the levelized annual cost of construction of an activated sludge treatment plant of 20,000-100,000 tons/day capacity with 15 years of life expectancy and a discount rate of 10%, and adding current costs” (Kim et al. 1998). Using investment and running costs in the calculations will bring us closer to the real cost of abatement, and also follows the standard cost calculation of economic activities.

Another observation about MC calculations is that the target level for emissions is often set at zero, resulting in overestimation. Although it may be difficult to set reliable sustainability levels, a realistic policy target would still give more acceptable results than zero emission (except for toxic substances).

Can maintenance costs be accepted as the depreciation of natural assets? The SEEA “Operating Manual” (UN, 2000) states:

Figure 1 Direct and accumulative SO$_2$ emissions in relation to production values in Sweden for 1991

Source: Hellsten et al., (1999).
Paragraph 108: The rational behind this approach is based on the following (...) criteria: The extension of the national accounts concept of replacement cost of the consumption of fixed capital, to the use of non-produced natural assets.

Paragraph 109: (...) the use of maintenance costs for valuing environmental functions is similar to valuing the services of produced capital in the national accounts, based on the consumption (wear and tear) and replacement of fixed capital.

The statements refer to the Valuation - General principles section of the SNA (Commission of the European Communities et al, 1994)

Paragraph 2.69: The appropriate valuation basis for assets and liabilities is the price at which they might be bought in markets at the time the valuation is required 4).

The implicit assumption is that there are replacements with associated replacement costs for lost or damaged natural assets. Although the restoration of the original state of the environment may be considered as a replacement, there is often a permanent deterioration of environmental quality. Even when restoration work is possible, the costs may exceed the costs of prevention. We have to choose the cheaper one as MC according to the SEEA rules, which contradicts the “replacement cost” rule, however.

Let us suppose that a discharge of a chemical agent destroys a man-made asset in a river: a wooden pier. It also pollutes the river, but restoration of the original state is possible, costing $1 million. Let us further suppose that the spill of the chemical could have been avoided by the use of a stronger tank that could have held the chemical, costing $100,000. Following the SEEA rules, the MC (used as the depreciation of water assets) are the extra cost of the stronger tank. The depreciation of the pier is its replacement cost, which in the balance sheet accounts comes under the: “unanticipated destruction or disappearance of assets” (Commission of the European Communities et al, 1994, Chapter XIII, para 13.92 b), and is given by the value of the pier, say $1 million, at the beginning of the period, as it was zero at the end of it. Following the SEEA accounting rules on maintenance costs we arrive at $1.1 million as total depreciation of assets. In contrast, the replacement cost rule in the SNA will put the depreciation at $2 million. When replacement is possible the SEEA efficiency rules for maintenance costs will not comply with the replacement cost rule in the SNA. When replacement is not possible, expressing depreciation in monetary terms is controversial. Instead of regarding maintenance costs as capital depreciation values, they should be viewed as what they are: the costs of economically efficient steps to achieve a specified level of environmental quality.

The NAMEA does not contain information on assets in addition to those that are already part of the SNA asset accounts. A suitable way to cover stocks of non-economic assets in the NAMEA has not been established yet, and some argue that it is difficult to constrain non-economic natural assets such as biodiversity within a nation’s borders (Holub et al, 1999). Nevertheless, European countries are working on projects to include forests, the use of space, change in biodiversity, and water use.

Let us briefly look at the recording of flows in the frameworks. The recording of residual and resource flows is straightforward in the NAMEA as described earlier, and can be viewed as an extended input-output table with environmental data.

The recording of flows in the SEEA is twofold: physical recording of flows and monetary valuation of these flows. The physical accounts are similar to the NAMEA, thus the SEEA Operating Manual that the NAMEA is a “halfway” elaboration of the SEEA” (UN, 2000, paragraph 91). The main difference between the two systems is that the NAMEA includes an additional “themes” account for the aggregation of substances into environmental indicators, whereas after recording physical data, the SEEA introduces the monetary valuation to arrive at the environmentally adjusted aggregate indicators.

4.2 Indicators

Let us elaborate on the interpretation of the ECF first. If we only account for resource depletion, negative ECF indicates non-sustainability because the total productive capital is diminishing even when full substitutability between different forms of capital is assumed. However, we cannot say much when the ECF is zero or positive. A decrease in natural capital can be more than compensated for by an increase in man-made capital. Although this situation is referred to as weak sustainability, such “transformation of capital” is surely not sustainable in the long
run from an ecological point of view if renewable resources are also covered in the estimations. In the author's view
"strong sustainability" (where different forms of capital are accounted for separately) is closer to the original
intent regarding sustainable development. After accounting for changes in the quality of assets, the ECF is an even
less valid measure since MC as depreciation of capital is not justified, as discussed in the previous section.

What information does the EDP convey to us? Rao (2000, p. 220) states that “Conventionally, ‘green’ NNP
is the maximum amount of produced output, that can be consumed at a point in time while leaving this measure of
wealth constant, and genuine saving is the difference between green NNP and consumption.”5). It is assumed that
environmental cost calculations are correct, and that it is justified to subtract them from the NDP. It was mentioned
earlier that setting the target level at zero emission overestimates MC. On the other hand, it also brings along the
exclusion of substances from the estimation for which zero is an impossible emission target, for example CO2.
Moreover, many environmental problems, such dioxin, heavy metals, particulate matter, noise, etc., were not
targeted in the SEEA trial estimates. Therefore, MC largely underestimate the real costs of meeting better standards.
This is reflected in the unrealistically low 1-2 percentage difference between the NDP and the EDP in the trial
estimates. Setting realistic targets (such as the Kyoto Protocol targets for CO2), including more environmental
problems and improving the estimation methods are crucial for more realistic maintenance costs.

Regardless of the calculation method of the MC, several authors (Keuning, 2000, O'Connor, 2001) point out
that it is incorrect to deduct imputed environmental costs from the GDP. If imputed hypothetical costs were real
expenditures, production and consumption behavior and technological development would change in a direction to
reduce these costs. Moreover, if environmental costs were paid, somebody would receive this amount and would
spend it or save it (affecting interest rates and investment behavior). As a result, the economy and the GDP would
look different. Calculation of a “green GDP” can only be achieved through modeling; calculating what the GDP
would be if all environmental standards were met (often referred to as “greened GDP”). Even if the volume of the
GDP does not change, its composition would change towards less polluting economic activities. This in turn
would reduce the maintenance costs and consequently increase EDP.

At industrial or company level we can think of environmental costs as eco-margins, the amount of money
that remains at the company in the form of a profit because it does not pay the costs of keeping environmental
standards. It is part of the value added (VA), whereas it should not be. Deducting environmental costs from the VA
will give us an “environmentally adjusted VA”, that is, VA without exploiting the environment. The sum of these
amounts for the economic entities will give us the environmentally adjusted VA at the national level. In the case of
the traditional indicators, NDP and VA, they are equal. Naturally, the environmentally adjusted amounts are equal,
too, but the concepts behind the two calculations are fundamentally different. In the EDP, environmental costs are
viewed as the depreciation of environment assets, whereas in the environmentally-adjusted VA, environmental
costs are eco-margins. While the latter is an acceptable concept, the former one is controversial. Environmental
costs as depreciation of the environment constitutes monetary valuation of the environment that many are
opposed to 6), whereas the eco-margin concept only divides the value added at the company into different
categories.

Let us turn to the interpretation of changes in EDP over time. To recall the definition:

\[ EDP_t = NDP_t - EC_t \]  \hspace{1cm} (1)

Let us observe two years \( Y_e \) and \( Y_f (f > e) \) with the following assumptions:
There is no inflation (or deflation), NDP is growing (\( NDP_f > NDP_e \)), there is environmental pollution (\( EC > 0 \)),
and there is no change in residual flows, environmental technologies and their prices. This last condition means that:

\[ EC_e = EC_f \Rightarrow \Delta EC = 0 \]  \hspace{1cm} (2)

Thus the change in EDP:

\[ \Delta EDP = \Delta NDP - \Delta EC = \Delta NDP \]  \hspace{1cm} (3)

\[ \Delta EDP / EDP = \Delta NDP / EDP \]  \hspace{1cm} (4)
The comparison of growth rates:

\[
\frac{\Delta EDP_e}{EDP_e} = (\frac{\Delta NDP_e}{NDP_e}) \times (\frac{NDP_e}{EDP_e}) \tag{5}
\]

Since the last factor in equation 5 is larger than 1, the growth rate of EDP exceeds that of the NDP, while environmental pollution remains the same. Therefore, the growth rate of EDP may convey misleading information. At the same time, unchanged EC and growing NDP also mean that the economy is producing more with unchanged environmental stress, i.e. the environmental stress per unit of NDP decreased. This will show improved eco-efficiency.

In support of environmentally adjusted monetary indicators it is often mentioned that they are easily understandable. As the SEEA puts it: “the ‘nutshell’ information is preferred by policy makers” (UN, 2000 paragraph 92). EDP growth rates, however, can be misleading. While policy makers and the public surely understand monetary terms better than “global warming potential”, we do not necessarily have to opt for this second best solution: “If it is true that in a political context only aggregated monetary variables bear any weight, the correct response does not lie in delivering more such variables but rather in providing information on the associated problems and in a subsequent reorientation” (Holub et al., 1999). Ecological concerns cannot be accurately expressed in monetary units. Using an aggregate indicator for the environment can hide serious problems in some areas. The solution is to educate policy makers and taxpayers alike so that they understand key environmental concerns expressed in units other than money.

In the NAMEA the indicators are constructed by the weighted aggregation of substances in physical units and thus represent the annual volume of such flows. The values by themselves (unless zero) mean little to the observer, and give no information on sustainability. A possible interpretation of these indicators is that an improvement means that we are “closer” to sustainable development than before. Although this view is oversimplified, it points to the fact that an improvement in the indicators is a positive sign, something that did not apply to EDP.

We can also compare the indicators to target levels. This way “for each type of emission (and sector), several levels may be stipulated and expressed as key ratios: ambitions, requirements, interim targets, ultimate targets, etc” (Hellsten et al., 1999, p. 60). If such distances are expressed as relative deviations, they will become easily comprehensible to the public. Unfortunately, for most substances unquestionable scientific target levels are not available yet.

The indicator from the “natural resources” account in the NAMEA covering the extraction of non-renewable natural resources is difficult to interpret. A reduction in the extraction of these does not necessarily bring us closer to sustainability and vice versa, as these amounts should be related to stocks (reserves). While the environment has a certain degree of assimilative capacity, thus we can allow for some residual discharge, the subsoil assets are finite, therefore only zero extraction means long-term sustainability. Subsoil assets have no ecological functions and their only value is that they are inputs into production. Therefore, the treatment of subsoil assets is more appropriate in the SEEA, even if their market prices are not optimal.

5. Concluding remarks

The NAMEA-type reorganization of data is a crucial step towards the integration of economic and environmental accounts and should always be implemented. This process is also part of the SEEA, but such databases are rarely made public when the results of the estimates are presented. Instead of the optional implementation of some “versions” of the SEEA, a “core” SEEA should be decided on, which would include the environment-oriented disaggregation of the accounts in the SNA and detailed presentation of environmental data. Monetary valuation should focus on improving estimations for MC, but these should not be viewed as a depreciation of natural assets to be deducted from the NDP, but as the cost of policies to achieve environmental standards. Without MC figures responsible decisions cannot be made, but “green GDP” may provide misleading information about the environmental-economic state of our world. Deciding between two projects which have mixed effects on the environment and the economy, a common denominator may be useful, but in these cases environmental costs are generally measured as damages, which cannot regularly be implemented at national level. Therefore, the
common denominator practice should remain at project level.

NAMEA-like environmental indicators could serve as key indicators. In addition to providing these indicators, it is significant to make the public and policy-makers understand that sustainable development is a multi-dimensional concept that can only be grasped through several indicators of different dimensions.

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1) For details, see UN (2000), paragraphs 102-105.
2) For details, see United Nations (1999), Indicators of Sustainable Development, http://www.un.org/esa/sustdev/indisd/english/english.htm
3) In the studies that Kojima (1997) mentions, some projects calculated green GDP, while others did green NNP or green NDP.
4) For details when market prices are not available, see Commission of the European Communities et al. (1994), paragraph 2.69.
5) Although Rao does not talks about domestic but national product, the argument remains the same.
6) See, for example, Beder (1994) and Holub et al. (1999)
7) This approach is followed, for example, in the United Kingdom, where 15 “headline indicators” were developed, 7 of which are environmental indicators. It is stated: “The government’s aim is for all the headline indicators to move in the right direction over time…” (The British Government (2001), p.33).

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"Private Landholding" in Russia: Traditions and the Present Time
Hiroshi Okuda (Graduate School of Economics, University of Tokyo)

In Russia in the 1990s the land reform was carried out, but the essential characteristics of newly organized agricultural enterprises are not so different from those of former kolkhozy and sovkhozy, and private farmers (fermerly) did not develop rapidly contrary to the expectations of the power. This report aims to look at the historical background of these contemporary problems with the special comments on peasant commune in the 1920s, and collectivization of agriculture in the 1930s. This report also introduces the interesting viewpoint of a Russian scholar, I. E. Koznova, on this subject.

The EU Enlargement toward Kaliningrad
Yuh Hasumi (Faculty of Economics, Rissho University)

The problems of Kaliningrad - enclave within the EU- are the test of Europe after enlargement of the EU. The failure of the Special Economic Zone brings about depression and the shadow economy is growing, which broaden the socio-economic gap between this region and the EU. The prospect for getting rid of the gap is vital to solve the problems. Russia should push forward with the development plan based on the national strategy to change this region from Symbols of dividing to Footholds of cooperation, coming close to the EU system through the Common European Economic Space.

China’s Regional Disparity and the Trickling-Down Effect from Coastal Regions to Inland Regions: An Analysis Using a Multi-Regional Input-Output Model
Shiro Hioki (Faculty of Economics, Tohoku University)

This study examines the trickling-down effect from the coastal regions to the inland regions of China to better understand her regional disparity. Here the trickling-down effect is analyzed mainly from the perspective of the interregional input-output analysis. Using a multi-regional input-output model, our analysis shows that the magnitude of the effect (especially the one to the western regions) is quite small, although two coastal growth poles (i.e. the central coastal region and the southern coastal region) have some effects to their adjacent inland regions. The results show the validity of the China’s recent development strategy for her western regions.

Comparative Analysis of National Accounts Incorporating Environmental Issues
Zoltan Denes (Hitotsubashi University Graduate School of Economics, Ph.D. student)

Two main integrated environmental and economic accounting systems, the SEEA and the NAMEA frameworks, are reviewed in this paper with an emphasis on derived indicators. NAMEA indicators in physical terms better serve the multidimensional needs of sustainable development than the adjusted monetary macro-indicators in the SEEA, which rely on the maintenance cost valuation. While maintenance costs are crucial for policy making, approximating the depreciation of natural assets with maintenance costs is controversial and misleading. Physical accounts should be the core of integrated accounts, and they should always be made public.

Interregional Migration in Russia: An Application of the Gravity Model
Kazuhiro Kumo (Faculty of Economics, Kagawa University)

The objective of this study is to test the applicability of the gravity model on interregional migration patterns in the Russian