Appendix 19.4 The UNSTAT proposals

The recent version of the international System of National Accounts (SNA), published in 1993 by the United Nations Statistical Division (UN, 1993b), addressed for the first time the possible incorporation of environmental costs and assets into the SNA. However, the report does not recommend the integration of environmental accounts into the central or core SNA. Instead it proposes, for those countries interested in and capable of compiling environ-mental accounts, a system of satellite accounts. These take the standard SNA as a starting point, showing how they might be complemented or modified by the inclusion of stocks and flows arising from the interaction between the economy and the environment. The section of the report dealing with this is more of a review of the current state of the art, and a guide to national accounts practitioners who may wish to experiment with environmental accounting, than a firm proposal for a particular design and methodology.

The discussion and presentation are closely modelled on the System of Environmental Economic Accounts (SEEA) proposed in the UN handbook *Integrated Environmental and Economic Accounting* (UN, 1992). The SEEA focuses on (i) accounting adequately for the depletion of scarce natural resources and (ii) measuring the costs of environmental degradation and its prevention. The basic structure of the SEEA and its links with the SNA is illustrated in Table 19.11, which can also be used to explain the derivation of the main aggregates of the satellite environmental accounts.

The shaded part of Table 19.11 covers the conventional SNA aggregates. Row i records opening assets, $\mathbf{K0_{p.ec}}$ being the value of stocks of human-made (produced) capital, and $\mathbf{K0_{np.ec}}$ the value of stocks of natural resources (oil and gas, cultivated forests, and so on) regarded as economic assets by the SNA.[i] Row ii records total supply, comprising domestic production (**P**) and imports (**M**).

Row iii shows how total supply is used. A proportion of supply is used in further production (**Ci**); the balance is either exported (**X**), consumed by households or government (**C**), or invested (**Ig**).

Column 1 shows the cost structure of domestic production **P**, comprising the cost of goods and services used in production (**Ci**), the cost of consumption of fixed (human-made) capital (**CFC**), and the balancing value-added, or net domestic product (**NDP**). Note that **NDP** + **CFC** = Gross Domestic Product. Consumption of fixed capital also appears as a negative item in Column 4; gross investment **Ig less** capital consumption **CFC** = net investment **I**.

Table 19.16 *Basic structure of the SEEA*

				Economic activities		Environment	
		Production	Rest of world	Final consumption	Produced assets	Economics assets: non-produced natural assets	Economic assets: other non-produced natural assets
		1	2	3	4	5	6
Opening stock of assets	i				$K0_{p.ec}$	$K0_{np.ec}$	
Supply	ii	P	M				
Economic uses	iii	Ci	X	C	Ig		
Consumption of fixed capital	iv	CFC			–CFC		
Net domestic product	v	NDP	X-M	C	I		
Use of non-produced natural assets	vi	Use_{np}				$–Use_{np.ec}$	$–Use_{np.env}$
Other accumulation of non-produced natural assets	vii					$I_{np.ec}$	$–I_{np.env}$
Environmentally adjusted aggregates in monetary environmental accounting	viii	EDP	X-M	C	$A_{p.ec}$	$A_{np.ec}$	$–A_{np.env}$
Holding gains/losses	ix				$Rev_{p.ec}$	$Rev_{np.ec}$	
Other changes in volume of assets	x				$Vol_{p.ec}$	$Vol_{np.ec}$	
Closing stock of assets	xi				$K1_{p.ec}$	$K1_{np.ec}$	

Source: UN (1993b)

Row v yields the familiar national accounts identity

$$\text{NDP} = (X - M) + C + I$$

Rows ix and x include various adjustments to the stock of produced and non-produced assets, including adjustments to account for changes in prices of assets, destruction of assets due to natural disaster, and certain other changes which affect the level of stocks of assets. For produced economic assets, opening stocks $\mathbf{K0_{p.ec}}$ plus net investment **I**, plus or minus adjustments $\mathbf{Rev_{p.ec}}$ and $\mathbf{Vol_{p.ec}}$, gives closing stocks $\mathbf{K1_{p.ec}}$ (or opening stocks in the next accounting period). For non-produced economic assets, the entries $\mathbf{Rev_{np.ec}}$ and $\mathbf{Vol_{np.ec}}$ denote corresponding adjustments to opening stocks $\mathbf{K0_{np.ec}}$, resulting in closing stocks $\mathbf{K1_{np.ec}}$. The 'Other changes in volume of assets', $\mathbf{Vol_{np.ec}}$, include changes in known economic reserves of natural assets.

The non-shaded part of the table shows how the system can be extended to incorporate other environmental accounts, which may be expressed in physical or monetary units, or both. Expressed in physical units, these additional flows can be viewed as supplementary to the SNA: expressed in monetary units, they could be used to obtain environ-mentally adjusted measures of domestic product, as discussed in the chapter.

The additional column 6 covers natural capital not classified as economic (because their usage does not involve market or quasi-market transactions), such as air, uncultivated land, particular ecosystems, virgin forest, and most forms of surface water. The additional row vi

records the use or consumption of non-produced natural assets, $\mathbf{Use_{np}}$ – that is, the depletion/degradation of natural capital, analogous to **CFC** for human-made capital. $\mathbf{Use_{np}}$ itself comprises $\mathbf{Use_{np.ec}}$ – the depletion of economic natural assets such as subsoil minerals, commercially exploited forests, and so on – and $\mathbf{Use_{np.env}}$ – the degradation of other natural assets caused by human activities, such as air, water and soil pollution, extinction of species, and so on. These are entered as negative elements in columns 5 and 6, hence reducing the stocks of natural assets.

Row vii – 'Other accumulation of non-produced natural assets' – records the transfer of assets from the non-economic to the economic category. For example, improved techniques of extraction have enhanced reserves of economically recoverable oil; the quantity or value of the increase in reserves would appear as a positive entry in column 5, and as an equal but negative entry in column 6. By construction, the entries in this row will sum to zero.

The addition of rows vi and vii to the table will affect one of the entries in the SNA part of the table, namely 'Other changes in the volume of (non-produced) assets', $\mathbf{Vol_{np.ec}}$. In the SNA, this item includes changes in stocks of economic natural assets, whether through depletion/degradation, or the transfer of assets from the non-economic to the economic category. In the SEEA, these components of $\mathbf{Vol_{np.ec}}$ will be recorded in rows vi and vii of column 5. If the entries in the additional rows and columns are expressed in physical units, this completes the table. The SNA monetary aggregates remain unchanged.

The environmental data supplement the monetary accounts by linking levels of economic activity with changes in the environment. However, if these environmental changes can be monetised, the conventional SNA aggregates can be modified to reflect the use of environmental assets.

Row viii records the modified data. In column 1, the consumption of natural capital (**Use_{np}**) is deducted from **NDP** (net domestic product) to give **EDP** – environmentally adjusted domestic product, which approaches the concept of sustainable income. Columns 2 and 3 remain unchanged. Columns 4–6 introduce the concept of net accumulation in place of net capital formation in the SNA. In fact, for produced assets, net accumulation is the same as net capital formation, so that $\mathbf{A_{p.ec} = I}$. For non-produced economic assets, net accumulation is the sum of depletion/degradation **$Use_{np.ec}$** (negative) and additions to economic reserves $\mathbf{I_{np.ec}}$ (positive), hence $\mathbf{A_{np.ec}}$ can be positive or negative. Net accumulation of other non-produced natural assets (**$A_{np.env}$**) is always negative.

The accounting identity between net production and expenditure noted in the equation above now becomes

$$\mathbf{EDP = (X - M) + C + A_{p.ec} + (A_{np.ec} - A_{np.env})}$$

Since $\mathbf{A_{p.ec} = I}$, and $\mathbf{I_{np.ec}}$ and $\mathbf{-I_{np.env}}$ cancel out, the term inside the brackets is equal to **$-Use_{np}$**, which is also the difference between NDP and EDP, hence the identity is maintained.

Presented as a satellite account, the SEEA has a number of obvious merits. It integrates environmental and economic accounts while maintaining continuity and consistency in time series of national accounts by retaining the conventional SNA definitions and aggregates. As satellite accounts, it is less important to attempt to achieve comprehensive coverage of environmental assets before compiling integrated accounts. For certain environmental assets, for example oil and gas, scarce subsoil minerals and commercial forestry, there are sufficient data on stocks, flows and market values to include them in a set of integrated accounts. However, as discussed in the text, even where such data are available it may be of doubtful value for the purposes of measuring sustainable income. In other cases, for example emissions of industrial pollutants, data on physical quantities may be adequate, but valuation may be difficult. As additional data become available, or acceptable methods of valuation are developed, the coverage of the satellite accounts can be extended.

Table 19.17 Two-digit ISIC categories that identify environmental protection services

Code	Category
37	Recycling
90	Sewage and refuse disposal, sanitation and similar activities
90.1[a]	Collection, transport, treatment and disposal of waste
90.2[a]	Collection and treatment of waste water
90.3[a]	Cleaning of exhaust gases
90.4[a]	Noise abatement
90.5[a]	Other environmental protection services n.e.c.
90.6[a]	Sanitation and similar services

[a] Proposed SEEA breakdown

Source: UN (1993b)

The SEEA also proposes a more transparent treatment of expenditures on environmental protection (referred to in the chapter as defensive expenditures), by proposing a finer breakdown of the ISIC codes which relate to environmental protection, and by transferring protective expenditures which are undertaken as ancillary activities from their industries of origin to the relevant subsector of environmental protection services. A possible subsectoral breakdown suggested in the SEEA is shown in Table 19.12. Thus, for example, if a paper plant collects and treats waste water from its manufacturing process, the expenditures associated with that activity should be transferred from paper manufacturing to subsector 90.2 – collection and treatment of waste water. This would make it possible to identify more exactly the levels of expenditure on environmental protection (and, as some environmentalists have proposed, to adjust the measure of domestic product to exclude such defensive expenditures). However, as remarked in the text of the chapter, it is often difficult to separately identify these ancillary expenditures. For example, the cost of catalytic converters in vehicles is included in the vehicle price and it may not be feasible to separately identify the cost of the exhaust system, and more particularly the part of the vehicle running expenses attributable to exhaust gas cleaning. Nevertheless, environmental protection services, like other services, are growing in importance in relation to overall economic activity, and this in itself supports the case for a greater degree of detail in classification.

[i] We retain the somewhat cumbersome notation used in the UN text, for ease of cross-reference.