

Introduction to Physical Flow Accounts

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Purpose

- Describe *physical* flows
 - From the environment to the economy
 - From the economy to the environment
 - Within the economy
- Measurement unit:
- In principle all *natural units* can be used (depending on purpose) Tonnes, Joules, cubic metres



Scope of physical flow accounting

SEEA defines three types of "stuff" that flows

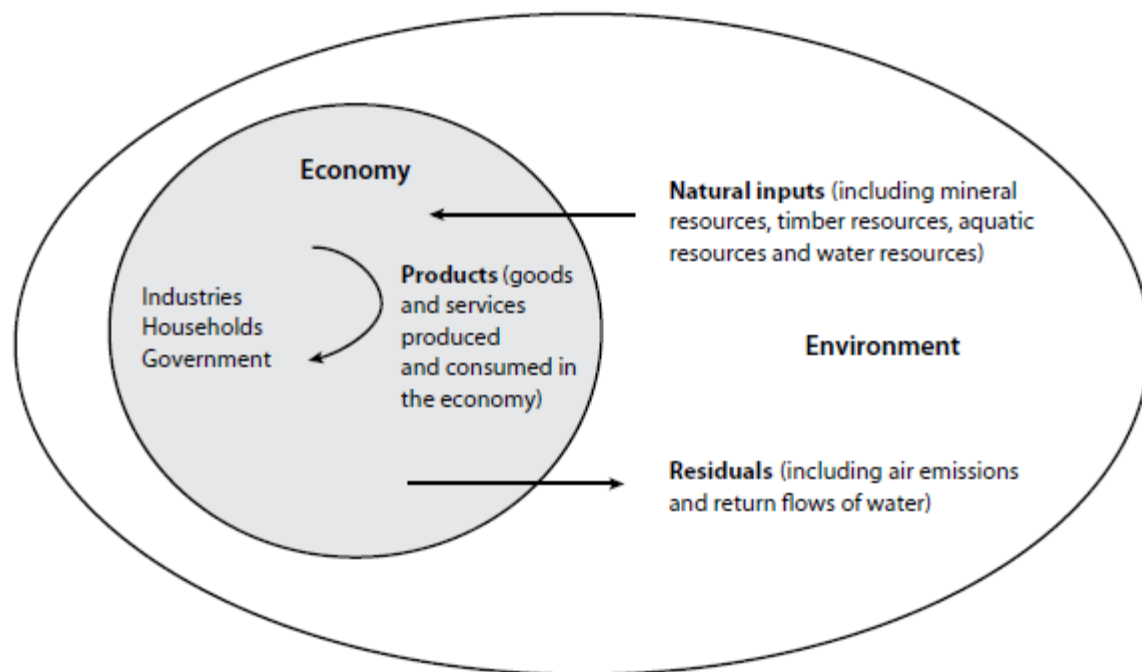
Figure 2.1

Physical flows of natural inputs, products and residuals

Natural inputs

Products

Residuals



Natural inputs (natural resources)

Table 3.2
Classes of natural inputs

1	Natural resource inputs
1.1	Extraction used in production
1.1.1	Mineral and energy resources
1.1.1.1	Oil resources
1.1.1.2	Natural gas resources
1.1.1.3	Coal and peat resources
1.1.1.4	Non-metallic mineral resources (excluding coal and peat resources)
1.1.1.5	Metallic mineral resources
1.1.2	Soil resources (excavated)
1.1.3	Natural timber resources
1.1.4	Natural aquatic resources
1.1.5	Other natural biological resources (excluding timber and aquatic resources)
1.1.6	Water resources
1.1.6.1	Surface water
1.1.6.2	Groundwater
1.1.6.3	Soil water
1.2	Natural resource residuals

2	Inputs of energy from renewable sources
2.1	Solar
2.2	Hydro
2.3	Wind
2.4	Wave and tidal
2.5	Geothermal
2.6	Other electricity and heat
3	Other natural inputs
3.1	Inputs from soil
3.1.1	Soil nutrients
3.1.2	Soil carbon
3.1.3	Other inputs from soil
3.2	Inputs from air
3.2.1	Nitrogen
3.2.2	Oxygen
3.2.3	Carbon dioxide
3.2.4	Other inputs from air
3.3	Other natural inputs n.e.c.

Products

Detailed structure and explanatory notes

Notes

CPC Ver.2

(Central Product Classification, Ver.2)

Click on any code to see more detail. Click [here](#) for top level only.

- 0 - Agriculture, forestry and fishery products
 - 01 - Products of agriculture, horticulture and market gardening
 - 02 - Live animals and animal products (excluding meat)
 - 03 - Forestry and logging products
 - 04 - Fish and other fishing products
- 1 - Ores and minerals; electricity, gas and water
 - 11 - Coal and lignite; peat
 - 12 - Crude petroleum and natural gas
 - 13 - Uranium and thorium ores and concentrates
 - 14 - Metal ores
 - 15 - Stone, sand and clay
 - 16 - Other minerals
 - 17 - Electricity, town gas, steam and hot water
 - 18 - Natural water
- 2 - Food products, beverages and tobacco; textiles, apparel and leather products
 - 21 - Meat, fish, fruit, vegetables, oils and fats
 - 22 - Dairy products and egg products
 - 23 - Grain mill products, starches and starch products; other food products
 - 24 - Beverages
 - 25 - Tobacco products
 - 26 - Yarn and thread; woven and tufted textile fabrics
 - 27 - Textile articles other than apparel
 - 28 - Knitted or crocheted fabrics; wearing apparel
 - 29 - Leather and leather products; footwear
- 3 - Other transportable goods, except metal products, machinery and equipment
 - 31 - Products of wood, cork, straw and plaiting materials
 - 32 - Pulp, paper and paper products; printed matter and related articles
 - 33 - Coke oven products; refined petroleum products; nuclear fuel
 - 34 - Basic chemicals
 - 35 - Other chemical products; man-made fibres
 - 36 - Rubber and plastics products
 - 37 - Glass and glass products and other non-metallic products n.e.c.
 - 38 - Furniture; other transportable goods n.e.c.
 - 39 - Wastes or scraps
- 4 - Metal products, machinery and equipment
 - 41 - Basic metals
 - 42 - Fabricated metal products, except machinery and equipment
 - 43 - General-purpose machinery
 - 44 - Special-purpose machinery
 - 45 - Office, accounting and computing machinery
 - 46 - Electrical machinery and apparatus
 - 47 - Radio, television and communication equipment and apparatus
 - 48 - Medical appliances, precision and optical instruments, watches and clocks
 - 49 - Transport equipment
- 5 - Constructions and construction services
 - 53 - Constructions
 - 54 - Construction services
- 6 - Distributive trade services; accommodation, food and beverage serving services; transport services; and electricity, gas and water distribution services
 - 61 - Wholesale trade services
 - 62 - Retail trade services
 - 63 - Accommodation, food and beverage services
 - 64 - Passenger transport services
 - 65 - Freight transport services
 - 66 - Rental services of transport vehicles with operators
 - 67 - Supporting transport services
 - 68 - Postal and courier services
 - 69 - Electricity, gas and water distribution (on own account)
- 7 - Financial and related services; real estate services; and rental and leasing services
 - 71 - Financial and related services
 - 72 - Real estate services
 - 73 - Leasing or rental services without operator
- 8 - Business and production services
 - 81 - Research and development services
 - 82 - Legal and accounting services
 - 83 - Other professional, technical and business services
 - 84 - Telecommunications, broadcasting and information supply services
 - 85 - Support services
 - 86 - Support services to agriculture, hunting, forestry, fishing, mining and utilities
 - 87 - Maintenance, repair and installation (except construction) services
 - 88 - Manufacturing services on physical inputs owned by others
 - 89 - Other manufacturing services; publishing, printing and reproduction services; materials recovery services
- 9 - Community, social and personal services
 - 91 - Public administration and other services provided to the community as a whole; compulsory social security services
 - 92 - Education services
 - 93 - Human health and social care services
 - 94 - Sewage and waste collection, treatment and disposal and other environmental protection services
 - 95 - Services of membership organizations
 - 96 - Recreational, cultural and sporting services
 - 97 - Other services
 - 98 - Domestic services
 - 99 - Services provided by extraterritorial organizations and bodies

Residuals

Table 3.4

Typical components for groups of residuals

Group	Typical components
Solid waste (includes recovered materials) ^a	Chemical and health-care waste, radioactive waste, metallic waste, other recyclables, discarded equipment and vehicles, animal and vegetal wastes, mixed residential and commercial waste, mineral wastes and soil, combustion wastes, other wastes
Wastewater ^a	Water for treatment and disposal, return flows, reused water
Emissions to air	Carbon dioxide, methane, dinitrogen oxide, nitrous oxides, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, carbon monoxide, non-methane volatile organic compounds, sulphur dioxide, ammonia, heavy metals, persistent organic pollutants, particulates (e.g., PM10 dust)
Emissions to water	Nitrogen compounds, phosphorus compounds, heavy metals, other substances and (organic) compounds
Emissions to soil	Leaks from pipelines, chemical spills
Residuals from dissipative use of products	Unabsorbed nutrients from fertilizers, salt spread on roads
Dissipative losses	Abrasion (tyres/brakes), erosion/corrosion of infrastructure (roads, etc.)
Natural resource residuals	Mining overburden, felling residues, discarded catch

^a This list of typical components for groups of residuals can also be applied to certain flows defined as products.

Physical flow accounts are formed on the basis of the monetary supply and use tables of the national accounts

Simple example:

Monetary and physical supply and use of *paper for printing*

	Basic price	Weight
	Mill. DKK	Tonnes
Supply		
Domestic production	0	0
Imports	1 043	268 782
Total supply	1 043	268 782
Use		
221200 Publishing of newspapers	458	118 356
221309 Publishing activities , excl. newspapers	32	8 373
222009 Printing activities etc.	540	139 357
Changes in stock	9	2 394
Exports	3	302
Total use	1 043	268 782

For the physical accounts it is necessary to *widen the dimensions* of the supply and use tables

Supply of natural inputs, products and residuals

SEEA CF Table 3.1

Domestic Economy

Rest of the world

Environment

Supply table

	Production; generation of residuals		Accumulation			Total
	Production; generation of residuals by industries (including household production on own account), classified by ISIC	Generation of residuals by households	Industries — classified by ISIC	Flows from the rest of the world	Flows from the environment	
Natural inputs					A. Flows from the environment (including natural resource residuals)	Total supply of natural inputs (TSNI)
Products	C. Output (including sale of recycled and reused products)			D. Imports of products		Total supply of products (TSP)
Residuals	I1. Residuals generated by industry (including natural resource residual) I2. Residuals generated following treatment	J. Residuals generated by household final consumption	K1. Residuals from scrapping and demolition of produced assets K2. Emissions from controlled landfill sites	L. Residuals received from rest of the world	M. Residuals recovered from the environment	Total supply of residuals (TSR)
Total supply						



Widening the dimensions of the supply and use tables

USE of natural inputs, products and residuals

SEEA CF Table 3.1

Domestic Economy

Rest of
the
world

Environ-
ment

	In intermediate consumption of products; use of natural inputs; collection of residuals		Final consumption*		Accumulation		Flows to the rest of the world	Flows to the environment	Total
	Industries—classified by ISIC		Households	Industries—classified by ISIC					
Natural inputs	B. Extraction of natural inputs B1. Extraction used in production B2. Natural resource residuals								Total use of natural inputs (TUNI)
Products	E. Intermediate consumption (including purchase of recycled and reused products)	F. Household final consumption (including purchase of recycled and reused products)		G. Gross capital formation (including fixed assets and inventories)	H. Exports of products				Total use of products (TUP)
Residuals	N. Collection and treatment of residuals (excluding accumulation in controlled landfill sites)			D. Accumulation of waste in controlled landfill sites	P. Residuals sent to the rest of the world	Q. Residual flows to the environment			Total use of residuals (TUR)
						Q1. Direct from industry and households (including natural resource residuals and landfill emissions) Q2. Following treatment			
Total use									

Various balances in the supply and use tables must apply

Balances for "stuff":

- Supply of products=use of products
- Supply of natural inputs=use of natural inputs
- Supply of residuals=use of residuals
- Total supply = total use

Balances for industries and households:

Total inputs must equal total outputs + Net additions to stocks (accumulation)



Implementation of *physical supply and use tables*

- In practise it is not most often not feasible to construct complete physical supply and use tables including all natural inputs, products and residuals
- Instead tables for specific parts or partial tables are constructed, e.g.
 - Physical supply and use tables for **energy**
 - Physical supply and use tables for **water**
 - Physical supply and use tables for **waste**
 - Physical supply table for **air emissions**

