SDG Indicator 8.4.2/12.2.2

Domestic material consumption

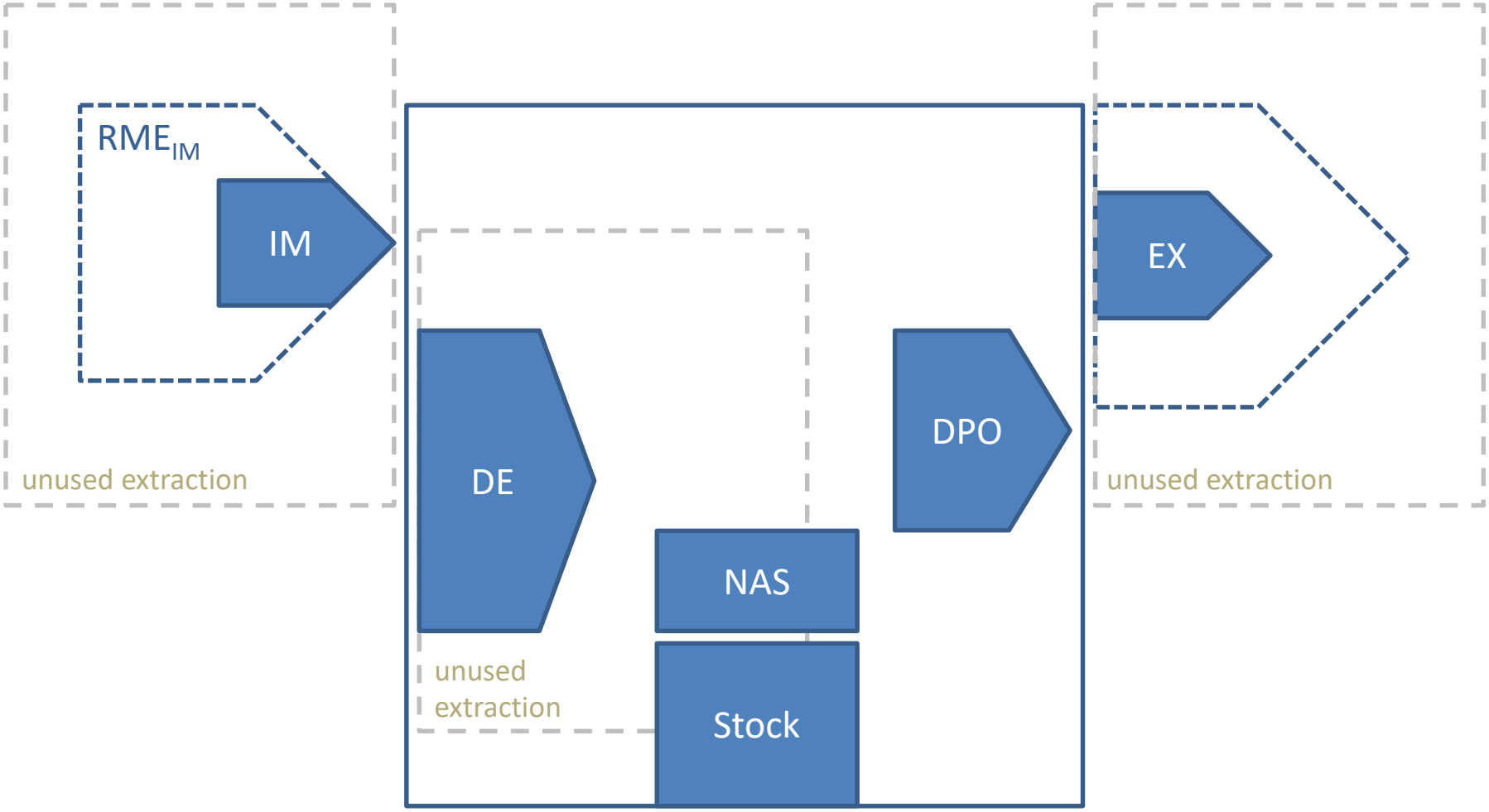
Introduction

Goal 12:	**Ensure sustainable consumption and production patterns**
Target 8.4 : **Target 12.2**	Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead By 2030, achieve the sustainable management and efficient use of natural resources
Indicator 8.4.2 and 12.2.2	Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP

Rationale

- Environmental pressures and impacts are unintended consequences of modern systems of production and consumption
- Dual objectives – increasing well-being and material standards of living while conserving resources and reducing waste and emissions
- Supply security focus: food, energy, water, fuel, metals
- Sustainability policy issues are complex and often contested
- Long-time horizons and high levels of uncertainty
- Require concerted policy effort to manage trade-offs and nexus issues
- Economic information and indicators provide an incomplete picture and we need satellite accounts for natural resource use (materials, energy and water), waste and emissions
- New challenges for environmental (and economic statistics)

Structure of the accounts



MFA Accounting modules

Module 1: Direct material flows (Domestic Extraction, Imports and Exports

Module 2: Indirect material flows (Raw material equivalents of trade, material footprint)

Module 3: Waste and emissions (Domestic processed output)

Module 4: Material balance and stock accounts (Net Additions to Stock)

Module 5: Unused extraction

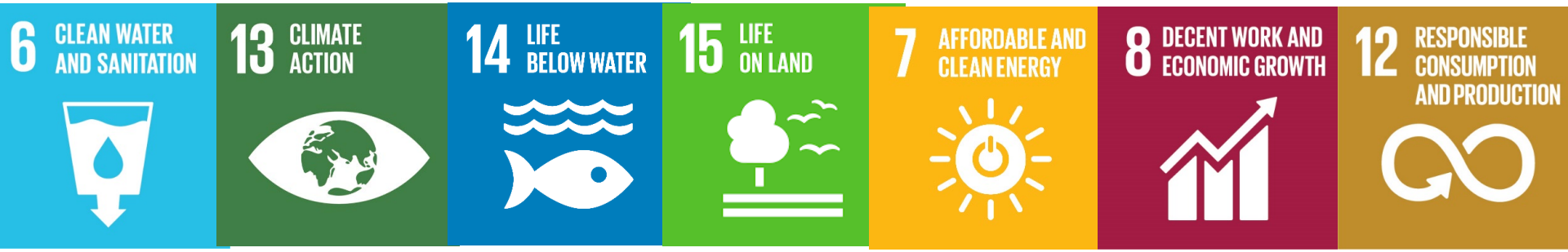
Module 6: Material flow accounts by industry sector (Physical Input-Output Tables)

MFA indicators

Abbreviation	Indicator name	Accounting module
DE	Domestic Extraction (used in the economy)	Module 1
IM	Imports of Materials (direct)	Module 1
DMI	Domestic Material Input (DE + IM)	Module 1
EX	Exports of Materials (direct)	Module 1
PTB	Physical Trade Balance (IM – EX)	Module 1
DMC	Domestic Material Consumption (DE + PTB)	Module 1
$RME_{Imports}$	Raw Material Equivalents of Imports	Module 2
$RME_{Exports}$	Raw Material Equivalents of Exports	Module 2
RTB	Raw Material Trade Balance	Module 2
MF	Material Footprint	Module 2
DPO	Domestic Process Output	Module 3
NAS	Net Addition to Stock	Module 4
MS	Material Stock	Module 4
DE_{unused}	Unused Domestic Extraction (returned to the environment without economic use)	Module 5

Natural resource use in the context of 2030 development agenda and the SDG's

- SDG's present an ambitious global policy agenda to align objectives for people, prosperity, planet and piece achieved through participation
- Natural resources are addressed in several SDG's



Current reporting of mfa

- European Union countries report material flows to the European Statistical Office (EUROSTAT)
- Japan and China have national material flow accounts
- Mongolia and Thailand have preliminary accounts
- UN Environment International Resource Panel reports MFA data for all countries in the world
- Current accounting standard established by EUROSTAT (since 2001, latest edition in 20xx)
- In this project we establish a Global Material Flow Accounting Manual and collaborate with four National Statistical Offices of the Philippines, Laos, South Africa and Chile to test its implementation.
- Aim to seek approval by the UN Statistical Commission for the Global MFA Manual if case studies are successful.

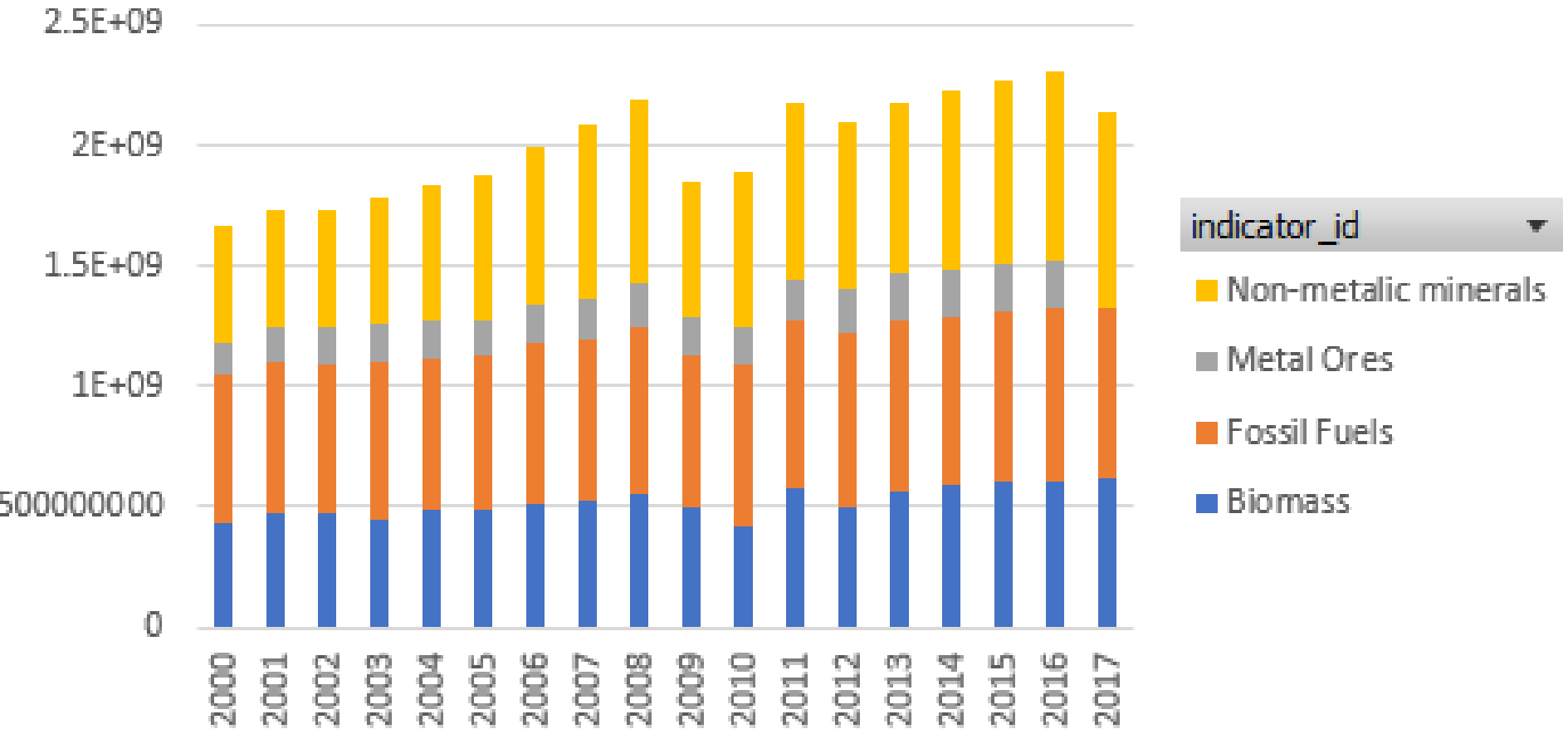
What are physical accounts?

- Physical accounts can be defined as the stocks and flows of all tangible physical things underlying an economy.
- Are in contrast to notional or intangible accounts, notably financial accounts
- Include stocks and flows of materials, energy, and water. All have important uses for environmental and economic policy formation

HOWEVER

- For the workshops, our main emphasis will be mainly on flows of a set of materials i.e. those included in economy wide material flow accounting (EW-MFA)
- Biomass, fossil fuels, metal ores, non-metallic minerals

Total environmental pressure from domestic extraction – DMC in tonnes



DOMESTIC EXTRACTION OF BIOMASS

Origins of current manual

Eurostat manual evolution:

- EW-MFA accounts established in early 1990s for Austria, Germany, Japan.
- “Economy-wide material flow accounts and derived indicators: A methodological guide” (Eurostat 2001).
- Eurostat Compilation Guide (first published in 2007, and the latest version from 2013.

Why not just use Eurostat manual?

- Assumes pre-existing data availability high compared to reality for many developing countries
- Desirability of more detailed treatment of minerals in particular, and expectation that data collected should serve a range of other practical development goals

Why the emphasis on domestic extraction?

New manual has sections on many materials related things, however it, and the workshops, will strongly emphasizes DE.

Establishing a good basis for DE is both the most crucial thing to get right at local level, and something which local authorities have control over.

Nobody else looks after it (no IEA, FAO equivalents for some categories, no public prominence like GHG emissions).

It provides a major and missing foundation for material footprinting, as well as the territorial accounts.

The main thrust of pilot testing the manual will be establishing whether it is a practical basis for establishing DE accounts.

Establishing other material accounts (and touching on other physical accounts) desirable but secondary.

A.1 Biomass – structure of MFA account

Primary crops	A.1.1.1.1	Rice
	A.1.1.1.2	Wheat
	A.1.1.1.3	Cereals n.e.c.
	A.1.1.2	Roots and tubers
	A.1.1.3	Sugar crops
	A.1.1.4	Pulses
	A.1.1.5	Nuts
	A.1.1.6	Oil bearing crops
	A.1.1.7	Vegetables
	A.1.1.8	Fruits
	A.1.1.9	Fibres
	A.1.1.10	Other crops n.e.c
	A.1.1.11	Spice - beverage – pharm…
	A.1.1.12	Tobacco

Crop residues (used)…	A.1.2.1.1	Straw
	A.1.2.1.2	Other crop residues (sugar…
	A.1.2.2.1	Fodder crops (including bio…
	A.1.2.2.2	Grazed biomass
Wood	A.1.3.1	Timber (Industrial rou…
	A.1.3.2	Wood fuel and other ext..
Wild harvest n.e.c.	A.1.4.1	Wild fish catch
	A.1.4.2	All other wild aquatic ani…
	A.1.4.3	Wild aquatic plant harvest
	A.1.4.4	Wild terr. plant harvest n.e.c.
	A.1.4.5	Wild terrestrial animal catch

Compiling A.1.1 Crops – First check if you are already compiling data

Lao PDR		
Crop	**tonnes**	**Flag**
Bananas	5E+05	
Beans, dry	4000	
Cassava	2E+06	
Cereals,Total	5E+06	A
Citrus Fruit,Total	98336	A
Coffee, green	1E+05	
Cotton lint	1225	
Cottonseed	4000	F
Lemons and limes	4520	
Oranges	51409	Im

Philippines		
Crop	**tonnes**	**Flag**
Agave fibres nes	4000	F
Asparagus	2939	
Avocados	20061	
Bananas	8884857	
Beans, dry	32144	
Beans, green	19075	Im
Carrots and turnips	75700	
Cassava	2540254	
Castor oil seed	44	
Chicory roots	4591	Im

: Official data

* : Unofficial figure

A : Aggregate, may include official, semi-official, estimated or calculated data

F : FAO estimate

Fc :Calculated data

Im : FAO data based on imputation methodology

Compiling A.1.1 Crops – If FAO has official data (blue) someone is providing it

Lao PDR		
Crop	**tonnes**	**Flag**
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Beans, dry	**4000**	
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FAO also compiles other biomass accounts, check if you are reporting for those

Relevant FAO databases include:

- Forestry production statistics
- Wild fish capture - FishstatJ application
- Aquatic plant production

FAO isn't compiling all the statistics necessary for:

- Crop residues
- Grazed biomass

For these, the data supplied to the FAO is important (crops production, herd sizes), but require local coefficients as well (grass consumed per cow, recovery of residues from field)

Who might have this additional data? (Discuss)

Feedback / workshop prep. questions: Who might hav local biomass coefficients and other data?

Agricultural researchers?

- Ruminant grazing requirements per head?
- Recovery of residues for animal feed?
- Stocking numbers per hectare, and estimates of grass production per hectare? (back calculate plausible grass per head).

Other researchers?:

- Recovery of crop residues for fuel?
- Known biomass fuelled processes and figures for biomass fuel mix?
- Other uses for crop residues?

DOMESTIC EXTRACTION OF FOSSIL FUELS

A.4 Fossil fuels– structure of MFA account

Brown coal	A.4.1.1.1	Lignite (brown coal)
	A.4.1.1.2	Other sub-bituminous coal
Hard coal	A.4.1.2.1	Anthracite
	A.4.1.2.1	Coking coal
	A.4.1.2.3	Other bituminous coal
Peat	A.4.1.3	
Crude oil, condensate and natural gas liquids	A.4.2.1.1	Crude oil
	A.4.2.1.2	Natural gas liquids
Natural gas	A.4.2.2	
Oil shale and tar sands	A.4.3	

Compiling A.4 Fossil fuels – Are you already compiling data?

Are you already responding to:

- IEA questionnaires?
- UN statistics Division?

If not, seriously consider doing it.

Philippines			
	2012	2013	2014E
Anthracite (kt)	0	0	0
Coking coal (kt)	0	0	0
Other bituminous coal (kt)	0	0	1200
Sub-bituminous coal (kt)	7349	7091	8314
Lignite (kt)	0	0	0
Patent fuel (kt)	0	0 ..	
Coke oven coke (kt)	0	0 ..	
….			
Peat (kt)	0	0 ..	
Peat products (kt)	0	0 ..	
Oil shale and oil sands (kt)	0	0 ..	
Natural gas (TJ-gross)	146887	135296	142053
Crude/NGL/feedstocks (if no detail) (kt) x	x	x	
Crude oil (kt)	781	754	804

Reporting energy according to IEA or UNSD specificatior

Detailed data required for this purpose far exceeds what is necessary for high quality MFA accounts

Yields a lot of valuable information about the structure of one of the most crucial aspects of your economy.

Is well supported by the agencies involved in terms of providing questionnaires and manuals

In short: The best way to deal with this category of MFA accounts is to begin reporting to one of these agencies – simple concordance exercise after that is achieved.

Feedback / workshop prep. questions: Fossil fuels (an energy statistics more generally)

If reporting to IEA or UN:

- Is it your department doing the reporting? (EW-MFA problem solved)
- If not, then who, and can you get access to the primary data?

If not currently reporting to IEA or UN?:

- Who would be charged with doing so?
- Where would they get their data?
- Can it be made to happen? (have a look at UN questionnaire and support at https://unstats.un.org/unsd/energy/quest.htm)

DOMESTIC EXTRACTION OF METAL ORE

A.2 Metal ores and M.2 Metal content – structure of MFA account

Iron ores	A.2.1	
Aluminium ores	A.2.2	
Other metal ores	A.2.3	
Metal content	M.2.Ag	Contained silver
	M.2.Al	Contained Aluminium
	M.2.Au	Contained Gold
	……	…..
	M.2.Cu	Contained Copper
	….	…..
	M.2.Fe	Contained Iron
	…. M.2.x	…..Contained x where x ix a metallic element
	….	…..
	M.2.Zn	Contained Zinc

Metal ores accounts have key differences to others

Unlike fossil fuels and biomass, no one international agency charged with assembling data DE data (nearest things are USGS and BGS).

Multiple basic products from same initial extraction very common – cereal plants produce one specific cereal, but mixed ores product multiple different metals

Relationship between the product usually reported, and the ore initially extracted varies hugely, making back calculation highly inaccurate.

Unlike some other difficult materials e.g. grass eaten by cattle, the data necessary usually is closely measured, as part of operations, by limited number of relatively large operations.

The preferred approach being piloted here is a large departure form previous practice in EW-MFA manuals

Compiling A.2 Metal ores and M.2 Metal content

Two alternative systems being proposed.

Operator questionnaire based (the preferred method)

Advantages: Conceptually straight forward, preserves a lot of data with practical policy and resource management uses beyond EW-MFA.

Disadvantages: Requires access to summarized operational data from mine operators, or at least an ability to produce something similar from accessible data.

Secondary mixed source (fall-back method)

Advantages: Flexible, data requirements much less prescriptive, usually possible to construct account of some type.

Disadvantages: Subject to much larger error, data produced mainly indirect, based on many assumptions (and potentially misleading), limited value beyond EW-MFA.

DOMESTIC EXTRACTION OF NON-METALLIC MINERALS

A.3 Non-metallic minerals – structure of MFA account

Ornamental or building stone	A.3.1	
Carbonate minerals important in cement	A.3.2.1	Chalk
	A.3.2.2	Dolomite
	A.3.2.3	Limestone
Agricultural or Industrial minerals n.e.c.	A.3.4.1	Fertilizer minerals n.e.c.
	A.3.4.2	Chemical minerals n.e.c.
	A.3.4.3	Industrial minerals n.e.c
Salt	A.3.5	
Gypsum	A.3.6	
Clays	A.3.7.1	Structural clays and their products
	A.3.7.2	Specialty clays
Sand, gravel, crushed rock	A.3.8.1	Industrial sand and gravel
	A.3.8.2	Sand gravel and crushed rock for construction
Other non-metallic minerals n.e.c.	A.3.9	

Non-metallic mineral - specific data characteristics an problems

Like metal ores, no one international agency charged with assembling data DE data (again nearest things are USGS and BGS).

Dominated by low unit value ($/tonne), widely available construction minerals, with significant extraction by many small to medium operators.

Direct records of extraction tend to be poorly kept, if kept at all. Often results in massive under-reported.

As a result, back-calculating from higher value downstream products and proxies is usually an important component in establishing the account.

Non-metallic mineral - Calculation of construction minera

Sand, gravel, and crushed rock can be estimated by applying factors to apparent consumption of better recorded materials, notably:

- Cement (for concrete)
- Bitumen (for road making)

Structural clays and their products can be calculated by applying factors to apparent consumption of better recorded materials, notably:

- Bricks, clay tiles etc.