

# Identifying data sources & synergies with other reporting obligations



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Workshop on Material Flow Accounts and Waste  
Statistics for SDG indicators

Focus: domestic  
extraction (DE)

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# DE Biomass – MFA structure

A.1 Biomass			A.1.2 Crop residues (used), fodder crops, grazed biomass		
A.1.1 Primary crops					
A.1.1.1	Cereals	<b>Crops from ...</b> <ul style="list-style-type: none"><li>• <b>arable land</b> (cereals, vegetables, fibres, etc.)</li><li>• <b>permanent cultures</b> (fruits, nuts, wine)</li></ul>	A.1.2.1	Straw	<b>Timber from cultivated and non-cultivated forests (including bark)</b>
A.1.1.1.1			A.1.2.2	Other crop residues and fodder	
A.1.1.1.2			A.1.2.3	Fodder from grassland	
A.1.1.1.3			A.1.2.4	Grazed biomass	
A.1.1.2	Roots, tubers and starchy vegetables		A.1.3 Wood		
A.1.1.3	Sugar crops		A.1.3.1	Timber (incl. wood chips)	<b>Fire wood (incl. gathering of fire wood)</b> <b>Other forestry products (forest litter, cork, natural rubber)</b>
A.1.1.4	Pulses		A.1.3.2	Wood fuel and other extraction	
A.1.1.5	Nuts		A.1.4 Wild harvest n.e.c.		
A.1.1.6	Oil bearing crops	<b>Aquatic:</b> <ul style="list-style-type: none"><li>• <b>fish capture</b> (including recreational fishing)</li><li>• <b>other animals/plants extracted from unmanaged fresh and seawater systems</b></li></ul>	A.1.4.1	Wild fish catch	
A.1.1.7	Vegetables		A.1.4.2	All other wild aquatic animals catch	
A.1.1.8	Fruits		A.1.4.3	Wild aquatic plant harvest	
A.1.1.9	Fibres		A.1.4.4	Wild terrestrial plant harvest n.e.c. (incl. gathering)	
A.1.1.10	Other crops		A.1.4.5	Wild terrestrial animal catch (incl. hunting)	
A.1.1.10.1	Spice, beverage, pharmaceutical crops	<b>Terrestrial:</b> <ul style="list-style-type: none"><li>• <b>Gathered wild terrestrial plants</b> (mushrooms, berries etc.)</li><li>• <b>Hunted wild terrestrial animals</b></li></ul>			
A.1.1.10.2	Tobacco				

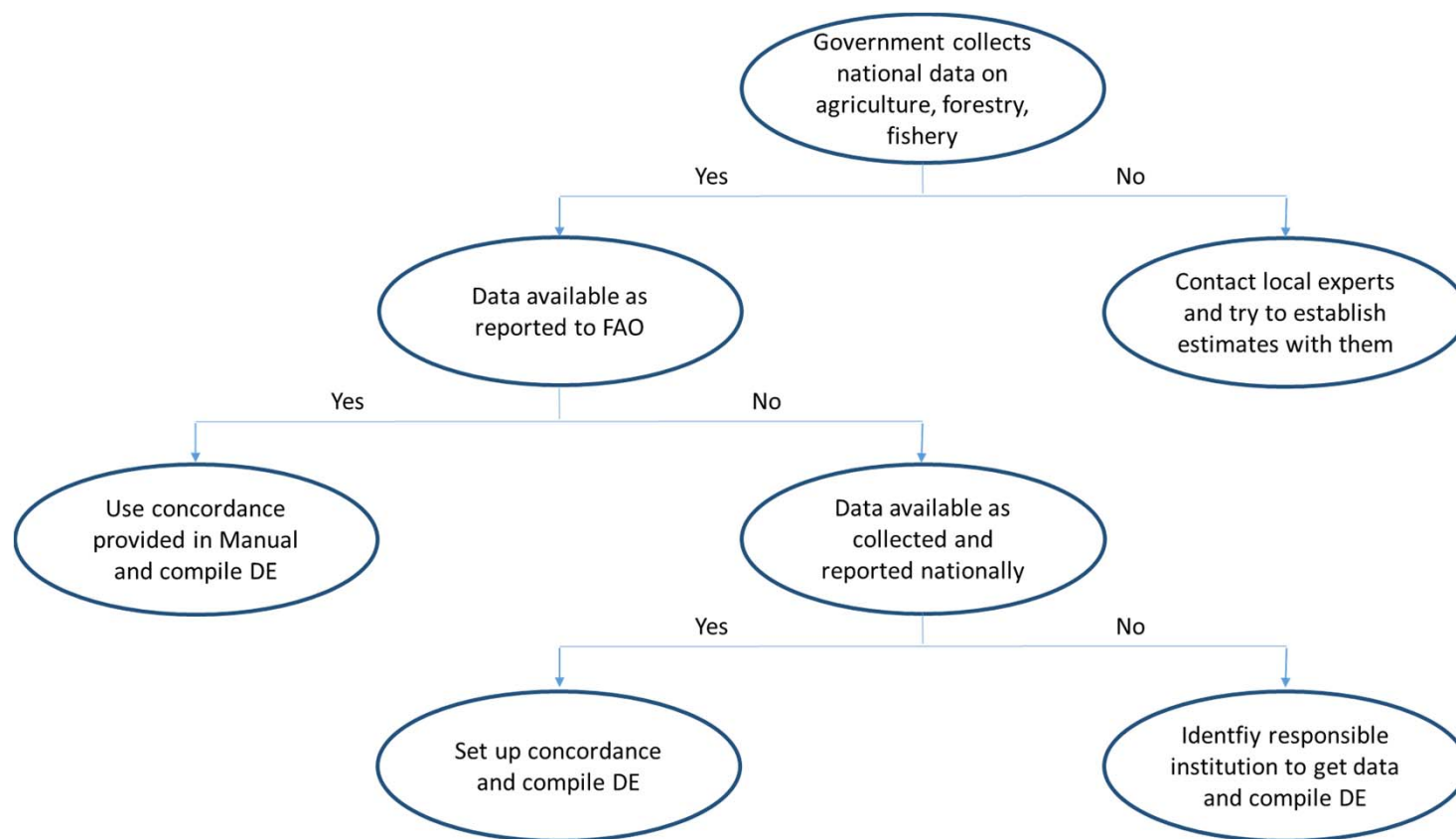
# Biomass - Data sources

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Data sources generally cover:

- the harvest of all types of **crops** (A.1.1) and **wood** (A.1.3), and biomass extraction by **fishing** (A.1.4.1) and **hunting** activities (A.1.4.5).
- In some cases **crop residues** (A.1.2.1 and A.1.2.2), harvested **fodder crops** and biomass **harvested from grassland** (A.1.2.3).
- Usually not estimated by official statistics: **grazed biomass** (A.1.2.4).
  - Of high quantitative significance
  - Apply estimation procedures
- Primary data source: national agricultural, forestry, and fishery statistics
- Other national data source: national feed-, food- and wood-balances
- Estimation procedures described in Eurostat manual and UN manual

# Biomass - Data sources



# Fossil fuels – general approach

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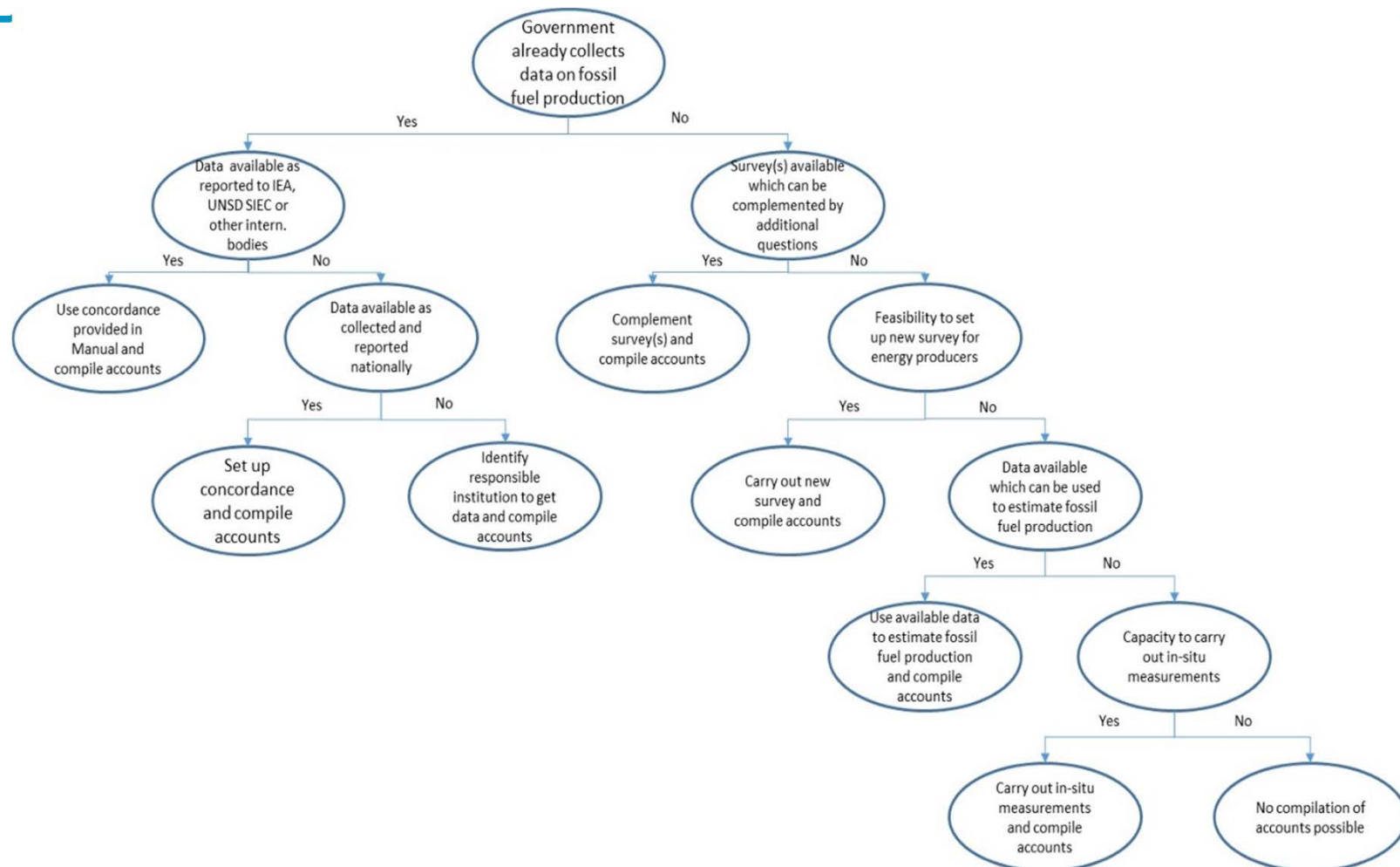
- Energy statistics and energy balances - to the International Energy Agency (IEA) - provide comprehensive illustration of supply and use of all energy carriers.
- In EW-MFA the domestic extraction of energy materials/carriers limited to extraction of fossil energy carriers
- Primary renewable energy carriers, such as hydro, wind, solar and geothermal energy not included
- materials required to construct e.g. hydropower dams, wind turbines or solar panels are considered in metal or mineral accounts
- Biomass for energy purposes reported under biomass.
- Uranium reported under metals



# Fossil fuels – general approach

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	Crude oil
	A.4.2.2	Natural gas
	A.4.2.3	Natural gas liquids
Oil shale and tar sands	A.4.3	

# Fossil fuels – data availability



## Metal ores – general approach

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- For EW-MFA purposes, only that portion of the excavated rock should be counted, which is to be processed in some way, to obtain the desired metals.
- Any soil or rock which is simply excavated and moved, to gain access to the metal ore itself, should not be counted as ore (overburden and non processed rock)
- Typically, great majority (often a ratio  $> 3:1$ ) of excavated soil and rock not counted at all as part of EW-MFA
- Often, ores from same deposit processed in different ways, depending on metal content and the specific metallurgical characteristics of the ore.
- Example: high grade copper ores go directly into milling and flotation process, while low grade ores go to a “heap leaching” process. Both should be counted as mined ore.
- EW-MFA: accounting on a “run of mine” (ROM) basis



# Metal ores – structure of MFA accounts

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 is a metallic element
	....	.....
	M.2.Zn	Contained Zinc

## Metal ores – general approach

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- 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 is a large departure from previous practice in EW-MFA manuals

# Metal ores –approaches

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## Two alternative approaches

- Operator questionnaire based
  - 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.

# Metal ores – mining operator questionnaire based

Ore_Stream_ID	Year	ROM Ore (Tonnes)	Ore type	Metal	ROM Grade (ppm)	Waste rock (tonnes)
Iron Mine A	2015	25,000,000	A.2.1	M.2.Fe	580,000	62,500,000
Desert Mine A1	2015	10,000,000	A.2.1	M.2.Fe	570,000	13,000,000
Desert Mine A2	2015	7,000,000	A.2.1	M.2.Fe	470,000	21,000,000
Weipa A	2015	18,000,000	A.2.2	M.2.Al	200,000	27,000,000
AlMine	2015	10,000,000	A.2.2	M.2.Al	170,000	21,000,000
Bonanza A	2015	25,000,000	A.2.3	M.2.Cu	5,000	102,500,000
Bonanza A	2015	25,000,000	A.2.3	M.2.Au	0.9	102,500,000
Bonanza A	2015	25,000,000	A.2.3	M.2.Ag	5	102,500,000
Bonanza A	2015	25,000,000	A.2.3	M.2.Mo	105	102,500,000
Bonanza B	2015	13,000,000	A.2.3	M.2.Cu	12,000	78,000,000
Bonanza B	2015	13,000,000	A.2.3	M.2.Mo	300	78,000,000
Miscmines group A	2015	5,000,000	A.2.3	M.2.Zn	50,000	17,500,000
Miscmines group A	2015	5,000,000	A.2.3	M.2.Pb	30,000	17,500,000
Miscmines group A	2015	5,000,000	A.2.3	M.2.Ag	30	17,500,000
Iron Mine A	2016	29,000,000	A.2.1	M.2.Fe	603,200	58,750,000
Desert Mine A1	2016	9,200,000	A.2.1	M.2.Fe	524,400	10,660,000
Desert Mine A2	2016	7,700,000	A.2.1	M.2.Fe	460,600	21,840,000
Weipa A	2016	17,640,000	A.2.2	M.2.Al	228,000	21,600,000
AlMine	2016	10,000,000	A.2.2	M.2.Al	176,800	24,780,000
Bonanza A	2016	24,500,000	A.2.3	M.2.Cu	5,600	118,900,000
Bonanza A	2016	24,500,000	A.2.3	M.2.Au	1.0	118,900,000
Bonanza A	2016	24,500,000	A.2.3	M.2.Ag	4	118,900,000
Bonanza A	2016	24,500,000	A.2.3	M.2.Mo	126	118,900,000
Bonanza B	2016	10,400,000	A.2.3	M.2.Cu	10,800	82,680,000
Bonanza B	2016	10,400,000	A.2.3	M.2.Mo	246	82,680,000
Miscmines group A	2016	4,400,000	A.2.3	M.2.Zn	56,000	15,750,000
Miscmines group A	2016	4,400,000	A.2.3	M.2.Pb	25,200	15,750,000
...						

# Metal ores – secondary mixed source

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- Find and refer to relevant national authority charged with licensing and oversight of mining operations
- Ascertain what level of reporting of minerals production is mandated.
- Maybe more than one government authority holding relevant information, e.g. departments of mining, primary resources, environment etc.
- Data often reported only in metal content
- Using default/average ore grades, such as those provided in Eurostat's manual (2013), to back-calculate extracted ore

# Non-metallic minerals – MFA structure

<b>A.3 Non-metallic minerals</b>					
<b>A.3.1 Ornamental or building stone</b>					
<b>A.3.2 Chalk and dolomite</b>			<b>A.3.5 Salt</b>		
	A.3.2.1	<b>Chalk</b>	<b>A.3.6 Gypsum and limestone</b>		
	A.3.2.2	<b>Dolomite</b>	<b>A.3.7 Clays</b>		
	A.3.2.3	<b>Limestone</b>		A.3.7.1	Structural clays
<b>A.3.3 N/A</b>					Specialty clays
<b>A.3.4 Chemical and fertilizer minerals</b>			<b>A.3.8 Sand and Gravel</b>		
	A.3.4.1	<b>Fertilizer minerals n.e.c.</b>		A.3.8.1	Industrial sand and gravel
	A.3.4.2	<b>Chemical minerals n.e.c.</b>		A.3.8.2	Sand gravel and crushed rock for construction
	A.3.4.3	<b>Industrial minerals n.e.c.</b>	<b>A.3.9 Other non-metallic minerals n.e.c.</b>		

## Limestone:

- limestone used for industrial purposes (e.g. production of lime or cement)  
→ A.3.6 (gypsum and limestone) → bulk flows, often underreported
- crushed limestone aggregate → A.3.8 (sand and gravel)
- limestone as a dimension stone → A.3.1 (ornamental or building stone).



# Non-metallic minerals – specific issues

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- Large and dynamic flows, closely linked to economic growth and industrialization
- Majority of non-metallic minerals are used for construction purposes
  - sand, gravel, building stones, clays
- Bulk flows: widely available throughout the world; low price, large volumes → usually not sufficiently covered in official statistics
- In some cases, these materials are used without any further mechanical, thermal, or chemical processes (e.g. sand & gravel for road bedding)
- Industrial uses and uses for construction purposes (e.g. clays, sand, limestone)
  - industrial uses: well-covered in statistical reporting
  - uses for construction: mostly underreported

# Non-metallic minerals – data sources

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## National data sources:

- national mining surveys
- Production statistics
  - Production statistics report the products which are sold on the market
  - DE does not refer to a market transaction but to the act of extraction of natural resources from the natural environment.

## International data sources:

- USGS United States Geological Survey
- BGS British Geological Survey
- World Mining Data

# Non-metallic minerals – special issues

**Bulk flows** of non-metallic minerals are usually weakly covered in statistical reporting (high volume low price relations) → estimation.

- **Limestone for cement production**

limestone required in production of Portland cement: cement production \* 1.216

Note: also **dolomite** is used for cement production! Cross check to avoid double counting!

- **Sand & gravel (S&G):** sum of 4 sub-calculations:

- S&G input to produce cement: cement apparent consumption \* 5.26
- S&G for road layers → based on length of newly built roads (by type of road and year) and annual maintenance of the total existing kilometers of roads.
- S&G as ballast under train tracks per km of railway
- S&G for building road sublayers: extremely complicated, variability in soil composition, groundwater depth, weather, typical construction methods, average building loads.  
S&G from cement consumption \* 0.08

- **Clays:** conversion factors to tons of crude clay for clay products (e.g. bricks, tiles)

# Thank you for your attention!

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