On the Reliability of International Forest Sector Statistics

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Contents

- Background:
  - what is forest sector?
  - where do we need global data on that sector?

- FAOSTAT: the main statistical source for the forest sector globally

- Uncertainties in the existing data shown with some illustrative examples
- Data gaps

- Summary

The forest-based sector

Economic activities including

- harvest of roundwood & other forest biomass
- production of forest-based industries & wood-based energy
- consumption of forest products & wood-based energy
- recovery for reuse
- trade in the products across the sector and regions

that are linked to form the markets for

- roundwood & other forest biomass, final-, intermediate- and by-products of the industries, recycled fibers & wood

Forest-based bioeconomy: above broadened to include demand and supply also other ecosystem services.

Statistical data on the sector needed to consider, e.g.,

- *Future prospects* of it under
  - resource constraints, technological development, market growth, policies and structural changes
- *Impacts of policies* and other issues of interest
- *Environmental performance and impact* of the sector, for instance
  - Carbon removed from forests but stored in the harvested wood products
  - Use of resources: efficiency and circularity

To say something on the future we need to know

- where we are now?
- what the past development has been like?

The data are fed to models for analyses

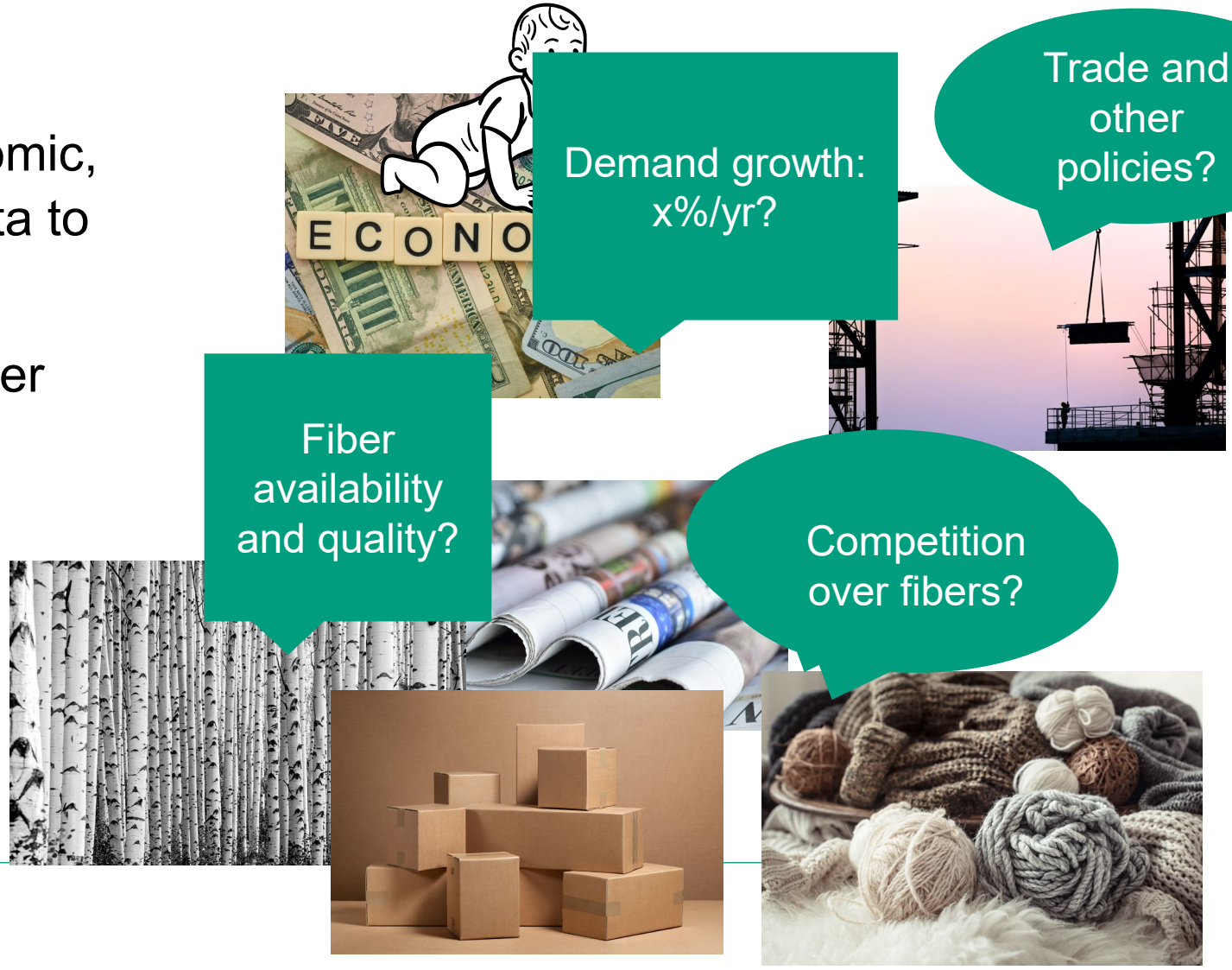
- **Econometric models** estimated from *time series data* to respond to, e.g.,
  - How does the consumption of sanitary papers in India react to a change in prices, GDP and population?
  - How does the sawlog supply in Germany change if price, interest rates or growing stock change?

A realistic assumption for demand growth: ?%/yr

The data are fed to models for analyses

Complex **global or national forest sector models** using various economic, technical, biological and societal data to address, e.g.,

- development of the sector under various circumstances
- impact on policies
- sustainability
- competitiveness
- …



FAOSTAT – valuable data source for data for analysts

- Forestry database provided by the UN's Food and Agriculture Organization (FAO)
- Annual time series from 1961 onwards
  - Production, imports & exports (in value and quantity), direction of trade
  - For all countries
  - For all main forest products

- Distinguishes between official data, estimated data and calculated data.

«Forestry Production and Trade» easily available at https://www.fao.org/faostat/en/#data/FO

Errors and uncertainties in the global FAOSTAT data

Kallio & Solberg (2018)* and some other studies show

→ **The data in the FAOSTAT are of low quality in some cases and countries.**

Inconsistencies with a magnitude of several millions of cubic meters of wood used in some countries.

→**if these data are applied as such, serious errors may be passed into further analyses.**

* On the Reliability of International Forest Sector Statistics: Problems and Needs for Improvements. Forests 2018, 9(7), 407. *https://doi.org/10.3390/f9070407*

Errors in FAOSTAT inspected systematically

Are the FAOSTAT data consistent and logical?

Wood available in a country ≈ Plausible wood use by the industries in a country?

Wood availability = harvest + imports - exports + by-products in case of pulpwood.

Wood use = forest industry*) productions x *plausible wood input coefficients*.

Main method: Linear programming (LP) for finding the best balance of wood use while minimizing the conflicts within statistical data on production, exports and imports.

*)*Products directly made of wood: mechanical forest industry products and wood pulps*.

Next: results related to the FAOSTAT data

I will show some examples of coarse errors in the data as found in

- Our study from 2018 using data “FAOSTAT 2017”

As several countries have revised their past data, I add some result based on

- Running the same LP model with the latest data, “FAOSTAT 2022”.

Furthermore, I will present some recent changes in the harvest data in the EU

- To demonstrate, particularly: uncertainty on fuelwood production

FAOSTAT data

Plausible wood use by the industries in a country ≈ Wood available in a country ?

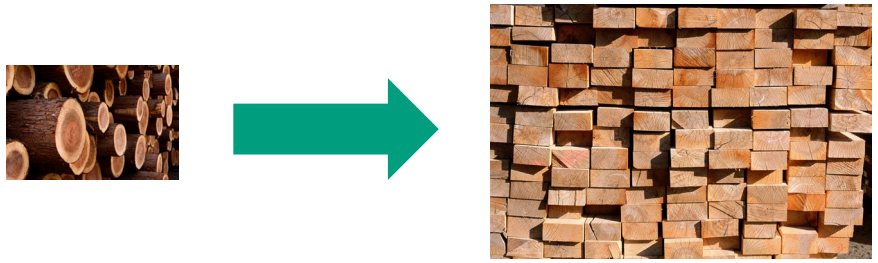
x

m^3wood/unit

≈

China: an example of big statistical problems

In China, 1 m^3 of a solidwood product needs less than 1 m^3 sawlogs…



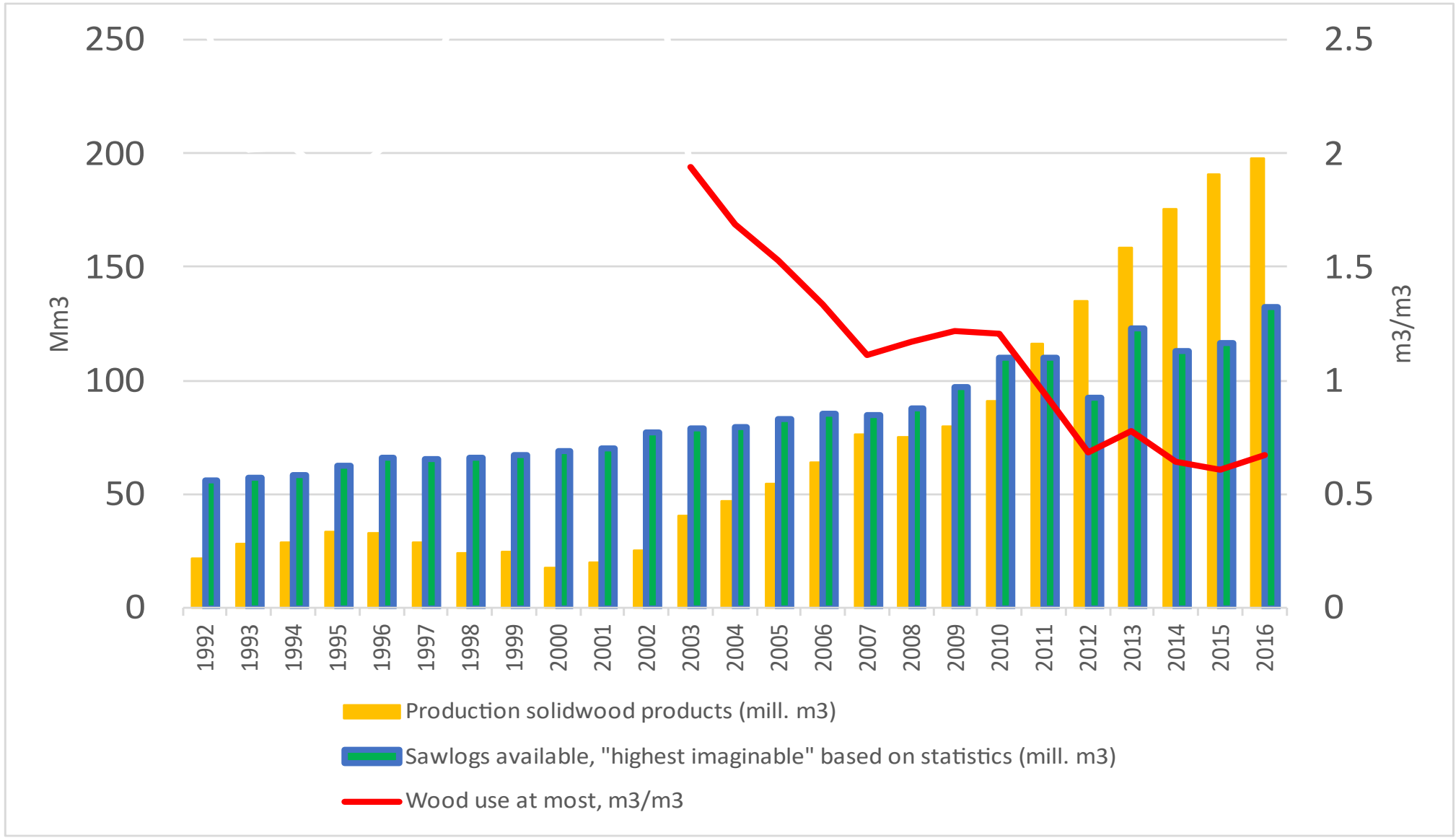
x
m^3/unit

The reported production of sawnwood, plywood & veneer was larger than any amount of sawlogs that could have been available according to the data.

→Enormous «statistical wood deficit»

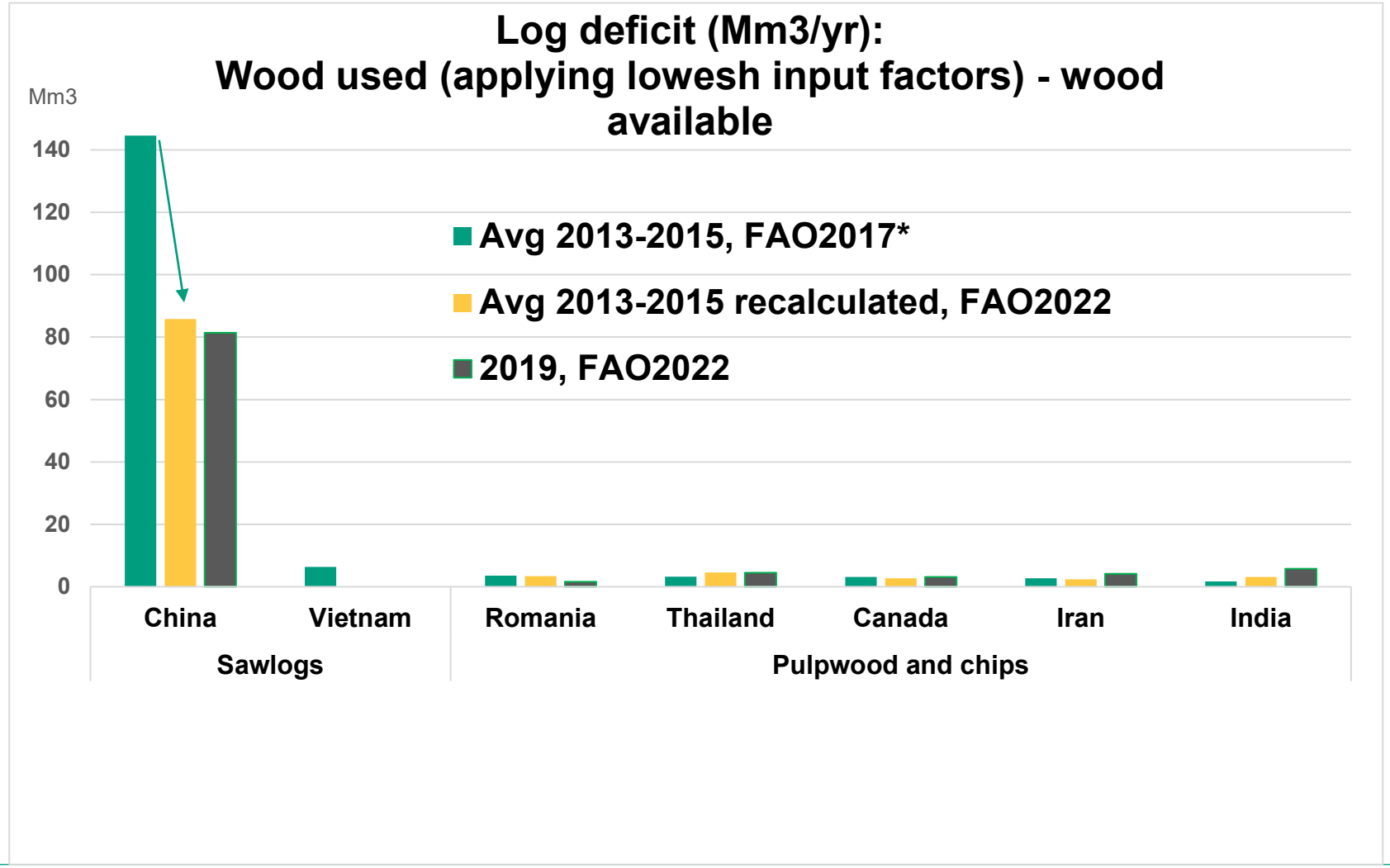
The error is too big to be explained by illegal wood harvests and imports.

Given FAOSTAT data loaded in 2018 for China, 1 m^3 sawnwood and plywood were produced from less than 1 m^3 wood



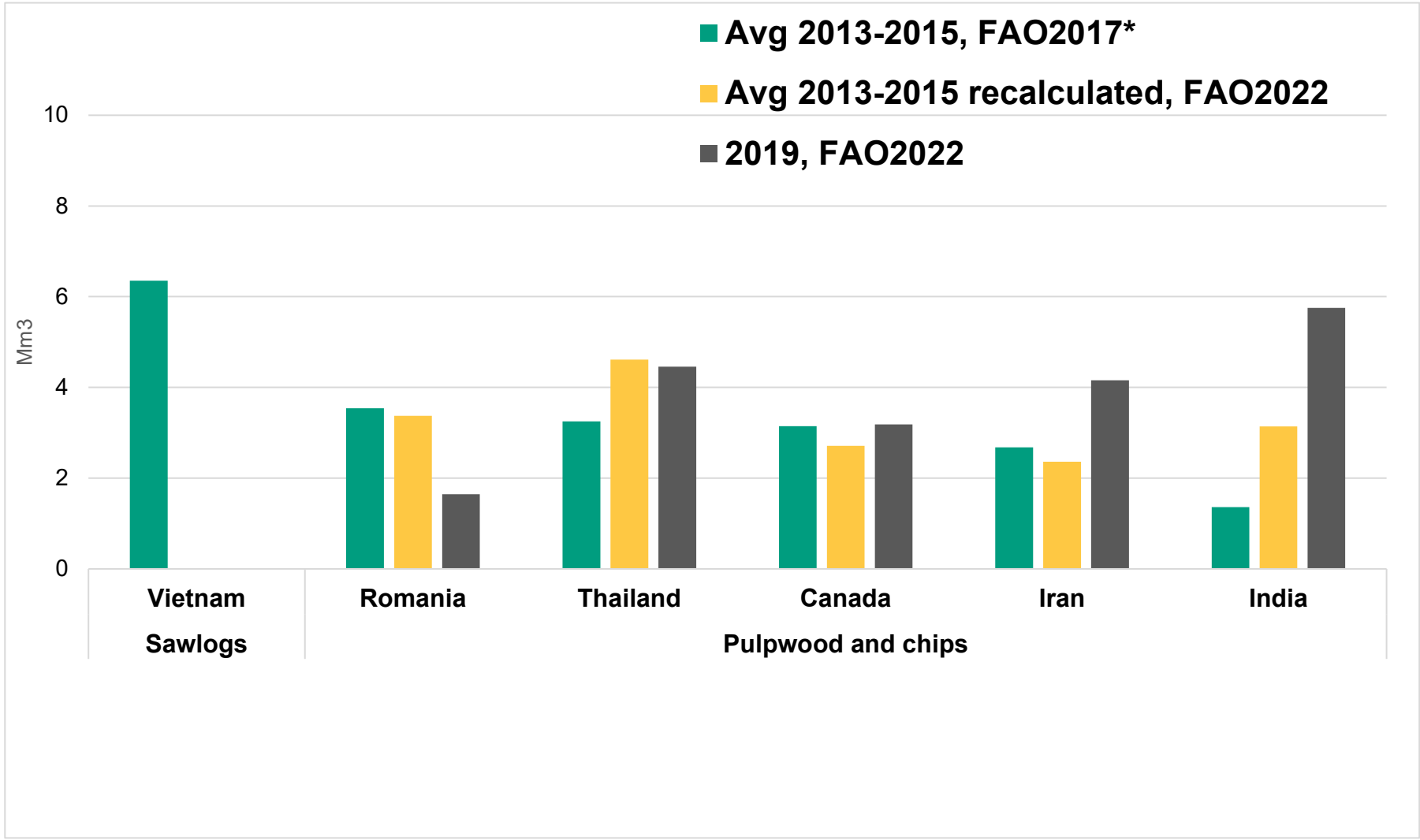
Assumption behind «highest imaginable» availablility of wood: Sawlog exports = 0; All wood imports = sawlogs.

China has adjusted its plywood data down in FAOSTAT, but remains the worst example of «statistical wood deficit».



Countries with wood balance mismatch of 2 Mm^3 or more. *As calculated in Kallio & Solberg (2018) using LP.

Other examples of «statistical wood deficit»



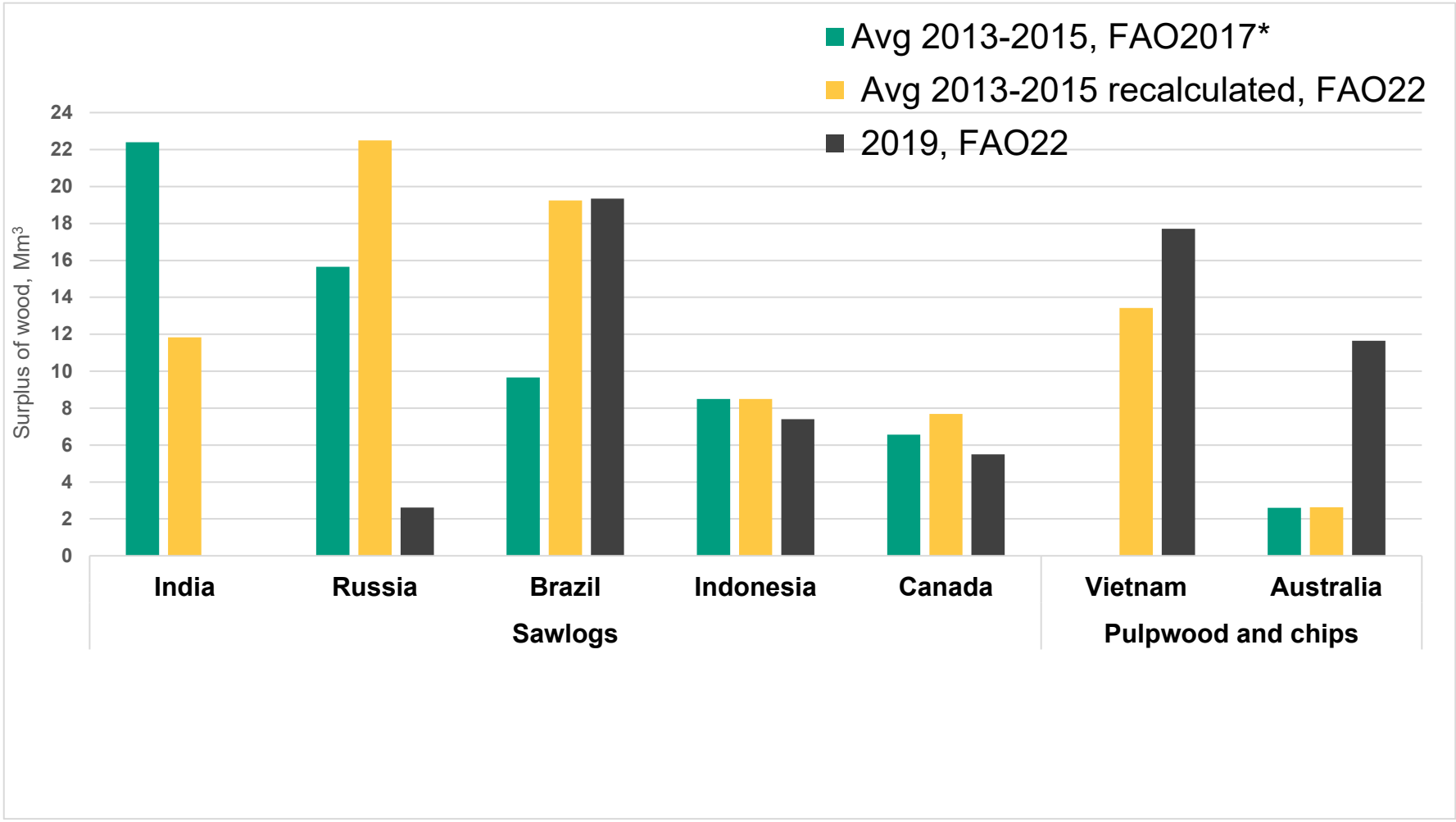
Countries with wood balance mismatch of ≥ 2 Mm^3, 2013-15. *As calculated in Kallio & Solberg (2018) using LP.

Also cases with «statistical wood surplus» exist

Plausible wood use in a country **<** **Wood available in a country.**

x
m^3/units

Countries reporting too high harvests and/or too low forest industry production and wood exports → wood «surplus»



Countries with wood balance mismatch of ≥ 2 Mm^3, 2013-15. *)As calculated in Kallio & Solberg (2018) using LP.

Consequences of poor match between reported wood supply vs. forest industry production

When too high forest industry production is reported:

- Efficiency and competitiveness of the industry in a region becomes overrated
- Consumption (production + imports – exports) becomes wrong:
  - Errors in making an outlook for demand
  - Stock of harvested wood products estimated too high (climate statistics!)
- Applying a realistic wood using coefficient (e.g., 1.5 m^3/m^3 for sawnwood) to a wrong production/demand level leads to forest sector model calibration that
  - Immediately exaggerates the tightness of roundwood markets
  - Fails to replicate the statistics of roundwood harvests and trade

Roundwood production that is too low with respect to the forest industry production comes with rather similar consequences.

Considerations related to the FAOSTAT data: **Wood chips & particles and wood residues**

The data could be used

- for considering circular/cascading production
- as an aid for defining wood input coefficient (for some models).

BUT: the contents of these data seem too vague to be very useful.

Data contents of wood chips & particles and wood residues categories are problematic.

Wood chips and particles *) :

".. include intermediate products that **may be manufactured from e.g., wood in the rough, residues or recovered wood products** and have a great variety of uses (e.g. for pulp, particle board, fibreboard or energy purposes)."

Wood residues *) :

"…consist of wood that has passed through **some form of processing** but which also constitutes the raw material of a further process (e.g. for particle board, fibreboard or energy purposes).

*) From FAO. 2022. Forestry Working Paper 29.

Negative consumptions of chips and particles do not help the situation

Table 3. Annual productions, exports, imports, and apparent consumption of industrial roundwood and wood residues in 2015 and in the period of 2011–2015 on average (1000 m^3). Only countries where apparent consumption in 2015 was <−5000 m^3 are shown. C = coniferous, NC = non-coniferous.

Country	Production 2015	Imports 2015	Exports 2015	Consumption 2015	Production 2011–2015	Imports 2011–2015	Exports 2011–2015	Consumption 2011–2015
Chips and particles								
Albania	2		37	−35	2	0	32	−30
Bangladesh		0	20	−20		0	20	−20
Congo		0	36	−36		0	145	−144
Fiji	210	0	244	−34	210	0	230	−20
Gambia		0	59	−59		0	25	−25
Indonesia	1788	0	2491	−703	1788	5	2675	−882
Liberia		0	33	−33		0	101	−101
Libya		0	22	−22		0	22	−22
Montenegro		0	16	−16		0	18	−18
Mozambique		0	49	−49		0	10	−10
Papua New Guinea		0	6	−6		0	7	−7
Singapore		3	160	−157		3	70	−67
South Africa	1926	7	2319	−385	2125	4	2247	−119
Thailand	4239	52	4398	−107	2512	154	4712	−2047
Vietnam	3312	3	13,347	−10,032	3290	106	12,002	−8607

From: Kallio & Solberg, 2018

Production of chips, particles and residues vs. relevant forest industry productions: various & sometimes strange proportions

Table 4. Production of solid wood products (column C), chips and particles (D), and wood residues (E), their difference (F), and the resulting coefficient of wood use per solid wood product output (G, sum of all outputs divided by the solid wood output) in year 2015. The countries are ranked according to the value in column (F).

Country	A	B	C = a + B	D	E	F = C − D − E	G = (C + D + E)/C
	Sawn-Wood	Veneer and Plywood	Solid Wood Products	Chips and Particles	Wood Residues	Difference	Logs Use Coefficient
	1000 m^3	1000 m^3	1000 m^3	1000 m^3	1000 m^3	1000 m^3	m^3/m^3
France	7514	367	7881	5740	19,920	−17,779	4.26
Brazil	14,797	3829	18,626	11,788	19,140	−12,302	2.66
Australia	5085	296	5381	13,962	2577	−11,158	4.07
Thailand	2850	305	3155	4239	8200	−9284	4.94
Poland	4835	445	5280	3178	6500	−4398	2.83
Italy	1470	446	1916	4800		−2884	3.51
Portugal	1134	80	1214	1275	2331	−2392	3.97
Chile	8372	1494	9866	10,208	1916	−2257	2.23
Sweden	18,174	95	18,269	9965	10,175	−1871	2.10
Finland	10,640	1207	11,847	8341	5314	−1807	2.15
Netherlands	185		185	899	808	−1522	10.22
Estonia	1770	164	1935	1870	1155	−1090	2.56

From: Kallio & Solberg, 2018

Other issues related to the FAOSTAT data: Data revisions

Some EU member states have also changed their past harvest data in FAOSTAT recently.

Possibly related to data improvements during preparions of the LULUCF Forest Reference Levels?

Several EU countries have revised their harvest data in FAOSTAT recently

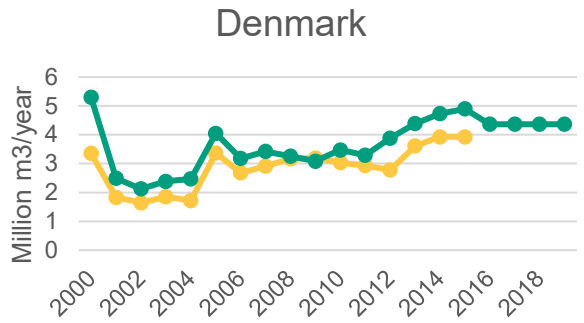
The issue is largely, though not only, related to fuelwood production.

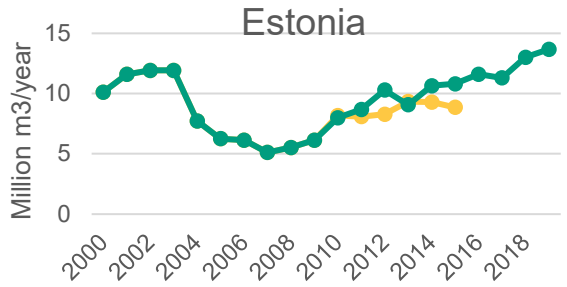
The volumes of fuelwood harvests are uncertain*:

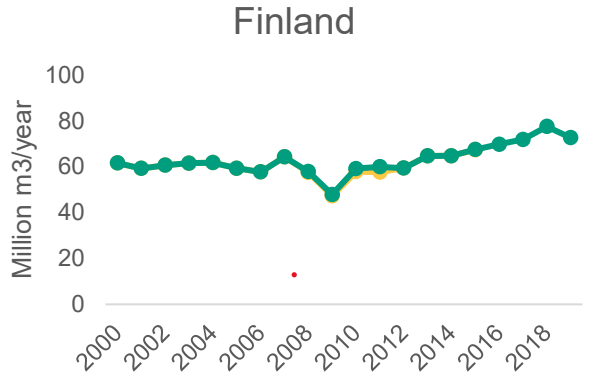
- Fuelwood taken for forest owners' own use.
- Household use of fuelwood: not always registered through official market channels.

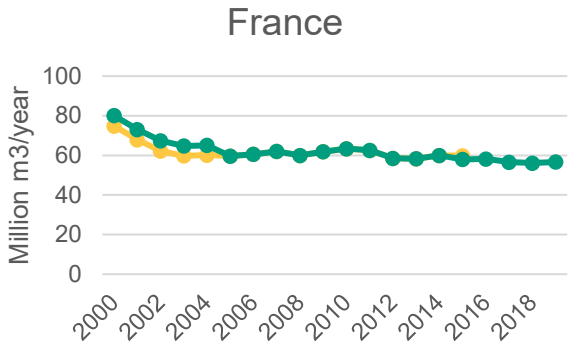
*See e.g., Camia et al. 2018. 2018. Biomass production, supply, uses and flows in the European Union. First results from an integrated assessment. EUR 28993 EN, Publications Office of the European Union.

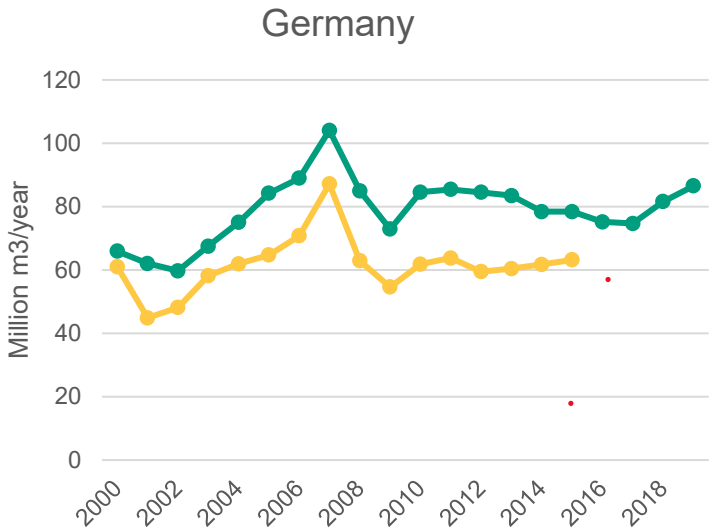
FAOSTAT roundwood production data 2000-2019 (mill. m^3/a o.b.) for EU countries with revisions in their data between 2017 and 2020: Germany changed most.

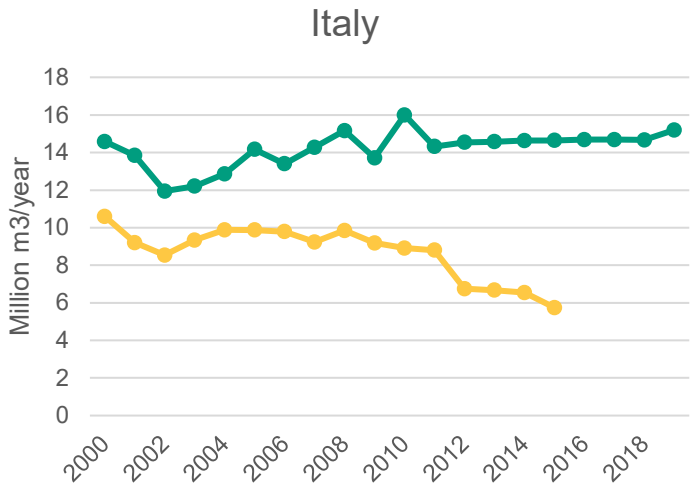


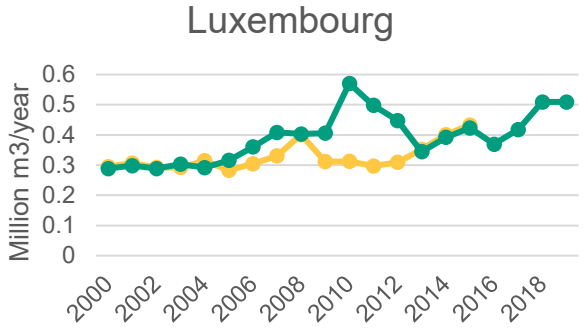


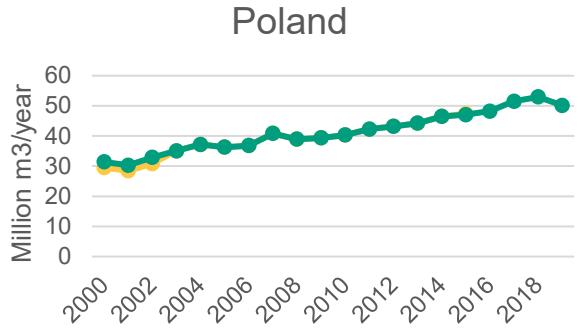












Yellow: Faostat retrieved 2017
Green: Faostat retrieved 2020

Based on: Päivinen et al., 2022, *Forest Pol Econ.* (140), 102748

Gaps in the global data based on own experience from global forest sector modeling (EFI-GTM, FORMEQ)

Data that are not freely (or easily) available globally:

- Trade of roundwood divided to sawlogs and pulpwood
- Prices of roundwood

- Division of production softwood and hardwood based products
  - Pulps, especially chemical pulps
  - Plywood and veneer

On FAOSTAT data: summary

- Some data are of low data «quality»
  - Unreliable data in some countries of global importance, e.g., China, Russia, India, Vietnam, Brazil.
  - The data used needs to be adjusted by supporting other data + own appraisal.

- The data and classifications on production of chips and wood residues should be improved to be useful.

- Large uncertainty over fuelwood harvests, also within the EU.

- The data are not stabile – good that the data are revised – but users must stay alert.

Vielen Dank für ihre Aufmerksamkeit