Global Footprint Network
Advancing the Science of Sustainability

Harmonizing the National Footprint Accounts with the System of Integrated Environmental and Economic Accounting

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- Part I provides a background of the National Footprint Accounts (NFA), related research questions, and scope.

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- Part III: Final Remarks


Part I: EF Background

Part I provides a background of the National Footprint Accounts (NFA), related research questions, and scope.

Ecological Footprint

Part I: Background

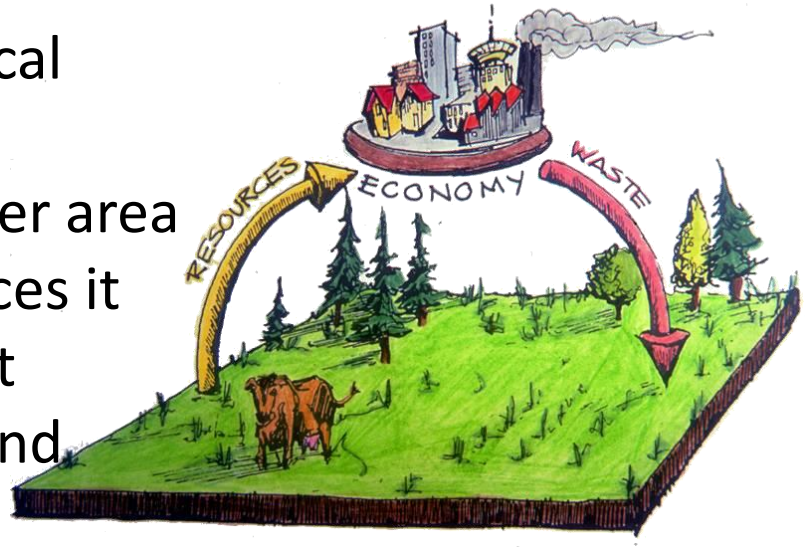
Research question

How much of the biological capacity of the planet is demanded by the residents of a nation (state, city, etc.) ?

How much is available?

EF accounting tool

To answer this question, the Ecological Footprint measures the amount of biologically productive land and water area a nation uses to produce the resources it consumes and to absorb the waste it generates with today's technology and resource management practices.



Components of the EF

Land Type	Provision/Consumption of…
Cropland	Plant-based food and fiber products
Grazing land	Animal-based food and other animal products
Fishing grounds (marine and inland) areas	Fish-based food products
Forest areas	Timber and other forest products
Carbon-uptake land	Anthropogenic CO_2 emissions
Built-up areas	Physical space for shelter and other infrastructure

From Flow to Area

The Ecological Footprint is a flows indicator, though it is measured in terms of the bioproductive land areas needed to generate such flows (expressed in the unit of global hectares - gha).

$$EF = \frac{P}{Y_N} \cdot YF \cdot EQF$$

Input variable: flow of resource used by humans

From FLOW to AREA:

- Y_N is used to convert the consumption of a resource flow into the correspondent amount of area locally required to produce that flow
- YF is used to scale national to world average productivity for a given land use type
- EQF is used to arrive at gha.

Harmonizing NFA with SEEA means harmonizing P used in calculating the Footprint with P defined in SEEA.

Scope of Ecological Footprint

- The Ecological Footprint is an indicator of human demand for ecological goods and services linked directly to ecological primary production.

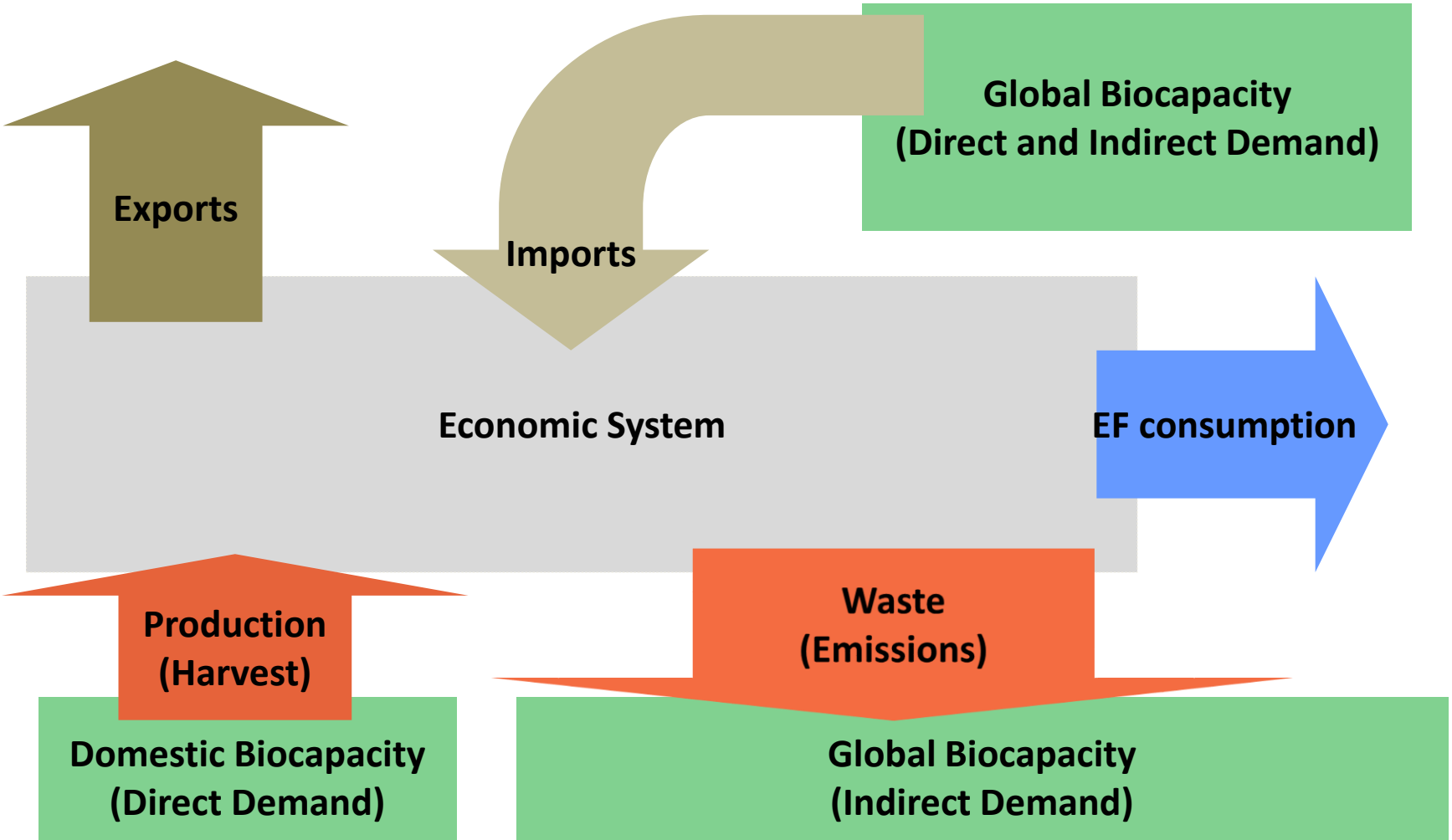
- The EF addresses very specific aspects of the economy–(living) environment relationship, and should not be taken as a stand-alone overall sustainability indicator.

- It should be used in the context of a broader set of indicators that provide a more complete picture of sustainability.

Part II: Methodology

Ecological Footprint accounting tool in combination with the System of Integrated Environmental and Economic Accounting: differences, compatibilities, advantages and disadvantages of the potential merge.

$$EF_C = EF_P + EF_I - EF_E$$



			Intermediate Demand						Final Demand		
									Households	Exports	Totals
			(I)	(I)	(III)	(IV)	(V)	(VI)	(y)	(e)	
National Economy	Monetary Input-Output Table	Agriculture Animal production Forestry Fishing Manufacturing Services	(I) (I) (III) (IV) (V) (VI)	Z					y	e	x
		Imports	(m)	m					m^{hh}	e^{t}	m^{t}
		Value Added	(V)	v							v^{t}
		Total Output	(X)	x							x^{t}
National Environment	Natural Resources	Crops (tonnes)	(CR)	$P^{CR,I}$	0	0	0	0	0	$P^{CR,hh}$	$P^{CR,t}$
		Grazing (tonnes)	(GR)	0	$P^{CR,I}$	0	0	0	0	$P^{CR,hh}$	$P^{CR,t}$
		Forest (m3)	(FR)	0	0	$P^{FR,III}$	0	0	0	$P^{FR,hh}$	$P^{FR,t}$
		Fishing (tonnes)	(FS)	0	0	0	$P^{FS,V}$	0	0	$P^{FS,hh}$	$P^{FS,t}$
	Residuals	CO2	(CO)	$e^{CO,I}$	$e^{CO,II}$	$e^{CO,III}$	$e^{CO,IV}$	$e^{CO,V}$	$e^{CO,VI}$	$e^{CO,HH}$	$e^{CO,t}$
	Land Cover	Built-up land	(BL)	$a^{BL,I}$	$a^{BL,II}$	$a^{BL,III}$	$a^{BL,IV}$	$a^{BL,V}$	$a^{BL,VI}$	$a^{BL,HH}$	$a^{BL,t}$
National EF of production	Production Footprint (EFp)	Cropland	(CR)	$EFp^{CR,I}$	0	0	0	0	0	$EFp^{CR,hh}$	$EFp^{CR,t}$
		Grazing land	(GR)	0	$EFp^{GR,IV}$	0	0	0	0	$EFp^{CR,hh}$	$EFp^{CR,t}$
		Forest	(FR)	0	0	$EFp^{FR,III}$	0	0	0	$EFp^{FR,hh}$	$EFp^{FR,t}$
		Fishing ground	(FS)	0	0	0	$EFp^{FS,V}$	0	0	$EFp^{FS,hh}$	$EFp^{FS,t}$
		Ecological services accounting - CO2.	(ES)	$EFp^{ES,I}$	$EFp^{ES,II}$	$EFp^{ES,III}$	$EFp^{ES,IV}$	$EFp^{ES,V}$	$EFp^{ES,VI}$	$EFp^{CO,HH}$	$EFp^{CO,t}$
		Built-up land	(BL)	$EFp^{BL,I}$	$EFp^{BL,II}$	$EFp^{BL,III}$	$EFp^{BL,IV}$	$EFp^{BL,V}$	$EFp^{BL,VI}$	$EFp^{BL,HH}$	$EFp^{BL,t}$
		Total Production Footprint	(EFp)	$EFp^{.I}$	$EFp^{.II}$	$EFp^{.III}$	$EFp^{.IV}$	$EFp^{.V}$	$EFp^{.IV}$	$EFp^{.hh}$	$EFp^{.t}$

Rest of the world Environment: Natural Resources, Residuals and Biocapacity.

$$EF = \frac{P}{Y_N} \cdot YF \cdot EQF$$

Differences between EF and SEEA

- EFc relies on a consumption-based approach, while SEEA and the production footprint rely on a production-based approach.
- A consumption approach implies the necessity of a modeling technique for exports and imports, i.e. trade.
- EF consumption = EF production +
  Biocapacity embodied Imports (EF imp.) -
  Biocapacity embodied Exports (EF exp.)

Differences between EF and SEEA

Currently used in the National Footprint Accounts (NFA):

Life Cycle Assessment (LCA)

- Advantage: Detailed import and export flows of goods
  - 625 commodities measured for embodied import / export of carbon Footprint.
  - 413 crops measured for embodied import / export of cropland Footprint.
  - 156 livestock products measured for embodied import / export of grazing land Footprint.
  - 117 fish products measured for embodied import / export of fishing grounds Footprint.
  - 33 forest products measured for embodied import / export of forest land Footprint.

- Disadvantage: Apparent consumption.

Input-Output Analysis based on the UN's System of National Accounts (SNA)

- Comparability of results due to the standardized national accounting.
- Input-Output Analysis (IOA) lies in consistent accounting of all upstream life-cycle impacts, including services – currently omitted in the NFA.
- There is sufficient data on consumer and other final demand expenditure.
- In a environmental extended MRIO model based on the SNA data, it would possible to calculate EF intensities for all imports, considering different technologies and techniques of production.

Source: Wiedmann, 2009.

Compatibilities

- We consider direct biological materials that enter to the economic system, excluding unused biological material flows.

- Boundaries: the borderline between the nature and the economy is defined by the harvest of the finished crops, considering thus the agriculture sector as a part of the environment.

NFA: Data Sources and Classifications

Data Sources	Description	Bridge tables Between NFA and SNA
FAOSTAT - FAO ProdSTAT - FAO ForesSTAT - FAO FishSTAT	- 164 crop products, - 41 livestock products, - 33 forest products and - 1439 fish products expressed in tonnes produced or harvested per year.	CPC v2
International Energy Agency (IEA)	-45 products and categories expressed in tonnes of carbon dioxide emissions per year.	ISIC
UN COMTRADE	-625 commodities	SITC
FAO LCCS	Built-up land types	????

Part III: Final Remarks

Final Remarks

- One of the challenges at combining NFA and SNA is the estimate of the biocapacity embodied in imports.
- Harmonizing the National Footprint Accounts with the SEEA will enable the Ecological Footprint and biocapacity indicators to follow internationally agreed upon agreed practices.
- Ecological Footprint within an input-output model based on SNA provides useful information on the economy-environment interactions that are needed at various stages of the ‘policy cycle’.
- Resource Constraints

THANK YOU!

How much of Biocapacity is available?

Biocapacity = Area * Yield Factor * Equivalence Factor