Environmental limits and Swiss Footprints based on Planetary Boundaries

A study commissioned by the Swiss Federal Office for the Environment (FOEN)

Damien Friot, PhD
Director at Shaping Environmental Action
damien.friot@shaping-ea.com

Hy Dao, PHD
Professor at UNIGE
Geographer at UNEP/GRID
hy.dao@unepgri.ch

June 12 2015_v2

Who we are

www.grid.unep.ch

Data and analytics Center for UNEP

A partnership: UNEP, University of Geneva, Swiss Confederation

Keep the environment under review:

- Integrated environmental assessments
- Global changes and vulnerability assessments
- Spatial data infrastructures

www.shaping-ea.com

Center of innovation and expertise (2014)

Shift the momentum from environmental assessment to pragmatic action:

- From data to knowledge
- Enabling actors
- Restructuring design processes & organisations
- Sound strategies

Planetary Boundaries – the concept

What

A set of nine physical and biological limits of the global Earth system to be respected in order not to leave a "Safe Operating Space", i.e. not to put the planet's human-friendly living conditions into peril.

i.e. another set of indicators but **absolute global values**:

- Setting common objectives
- Benchmarking
- Ranking

In this project: PB = maximum quantity of resources that could be used.

Objectives of the project

Application to a **national context**

To assess the sustainability of Switzerland

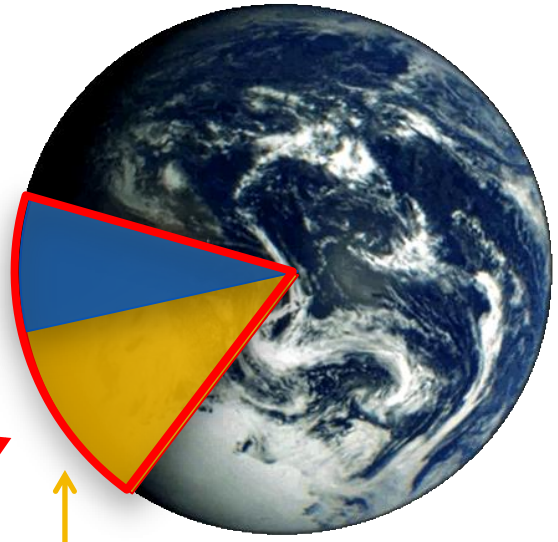
- **Long-term** global perspective (2100)
- Principles of Sustainable Development
- Similar **rights for past, current and future populations**

Report: Environmental limits and Swiss Footprints based on Planetary Boundaries (pb.grid.unep.ch)

A comparison of limits and uses

1. Per PB: set a limit per country = exclusive share
2. Per PB: compare the limit with a country use.

Swiss share

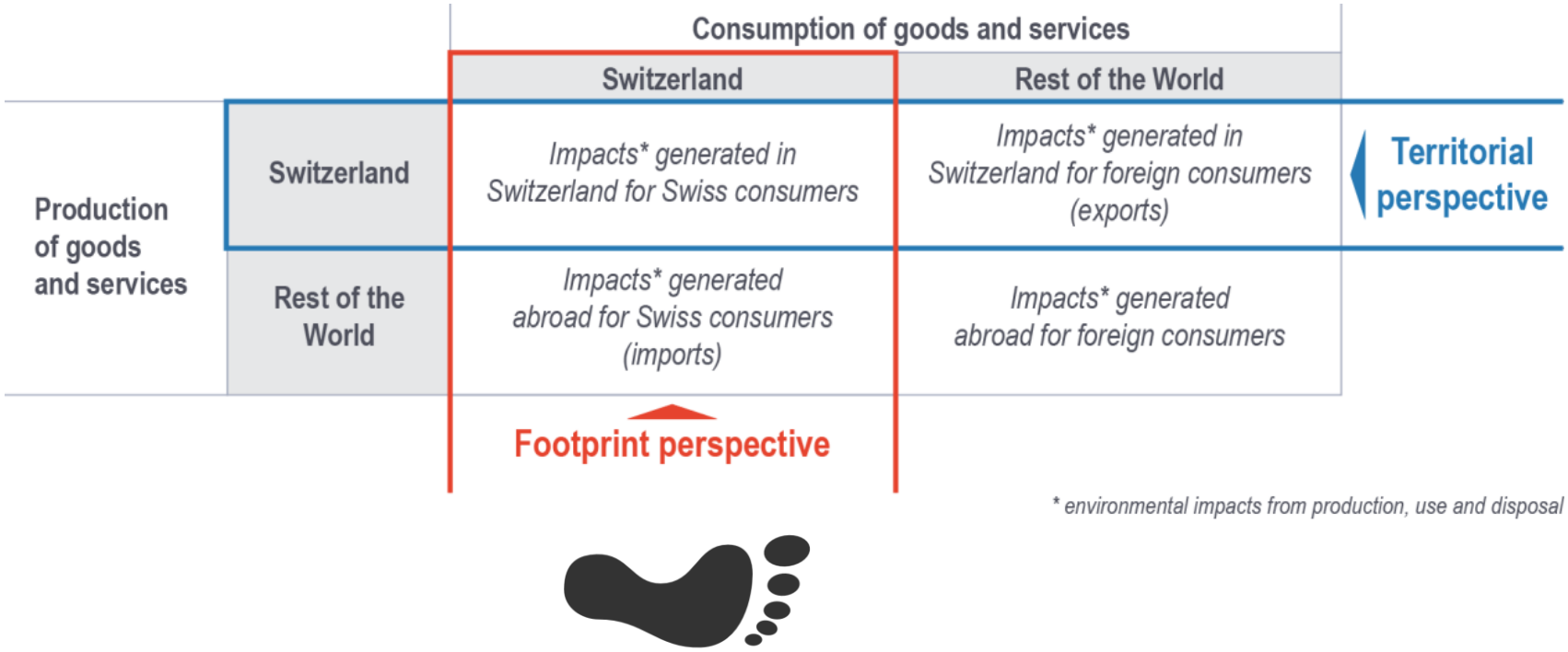


Swiss use

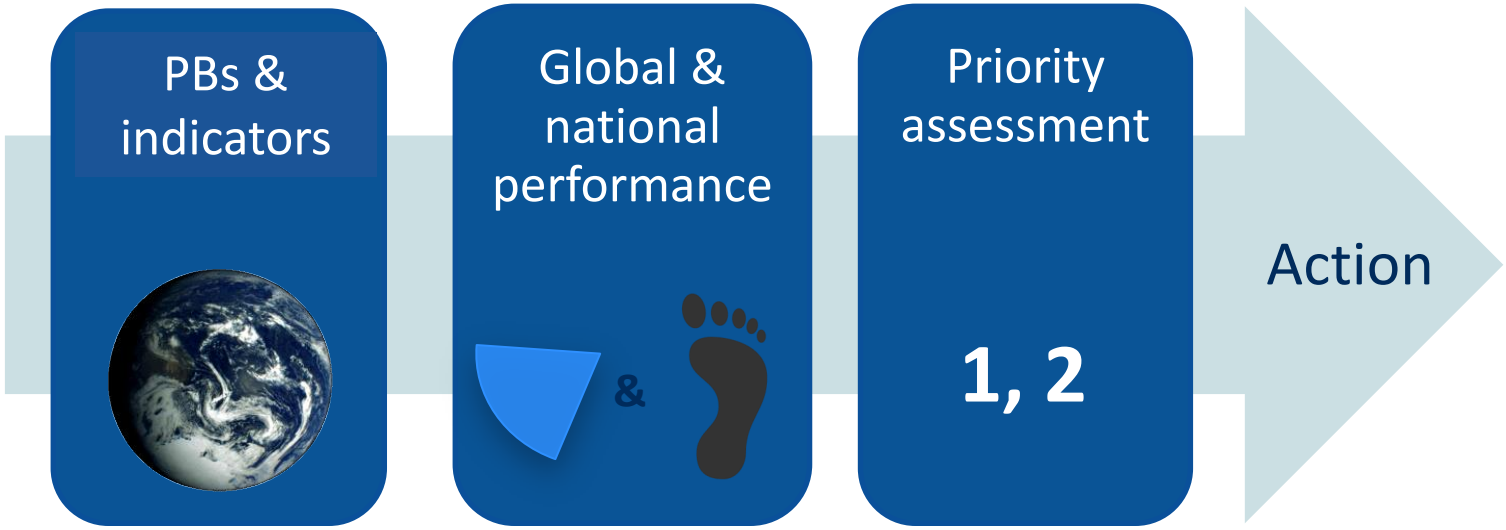
Overshoot ?

Use = a country footprint

A life cycle perspective: an aggregation along global production-consumption chains.



Approach & challenges



1. Are Planetary Boundaries **truly global** ?
2. Can **relevant indicators be computed** for the world & for Switze ?
3. How to **allocate a fair share** of the limits to each country ?
4. How to assess **performance** ?

Are Planetary Boundaries truly global ?

Three types of Planetary Boundaries

Global issues with global limits (3)

Climate Change, Ocean Acidification, Stratospheric Ozone Depletion

Regional issues with a global cumulated limit (3 + 1)

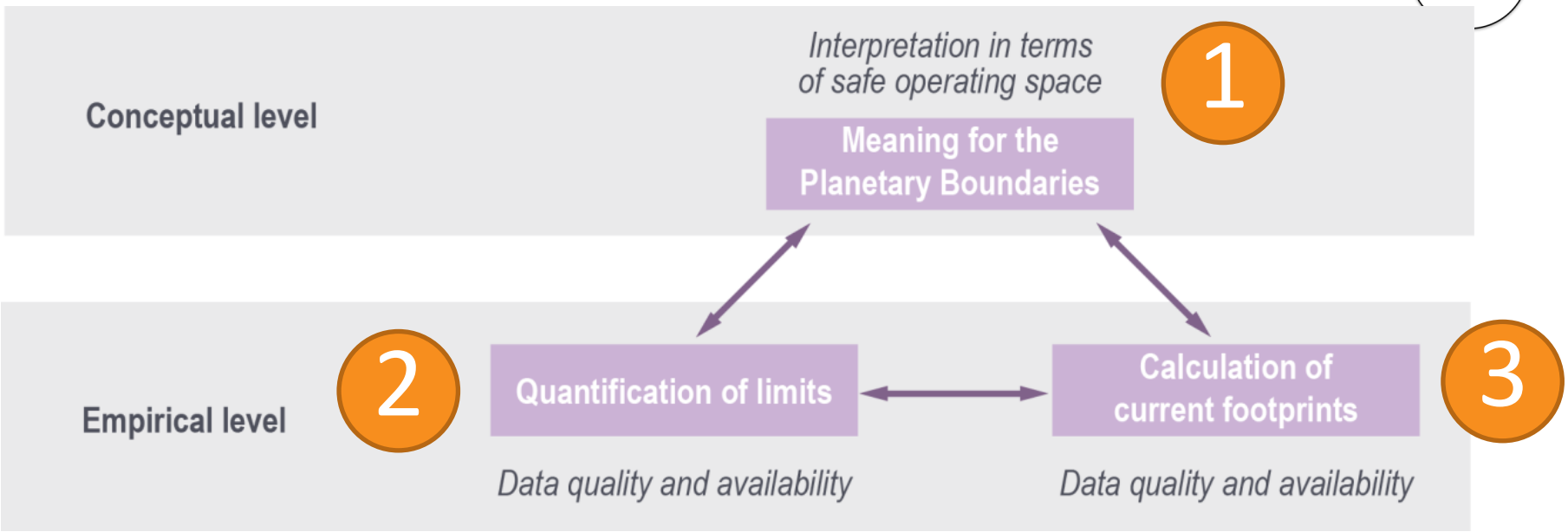
Nitrogen and Phosphorus losses, Land Cover Anthropisation, Biodiversity Loss

Regional issues with a regional limit only, yet (3)

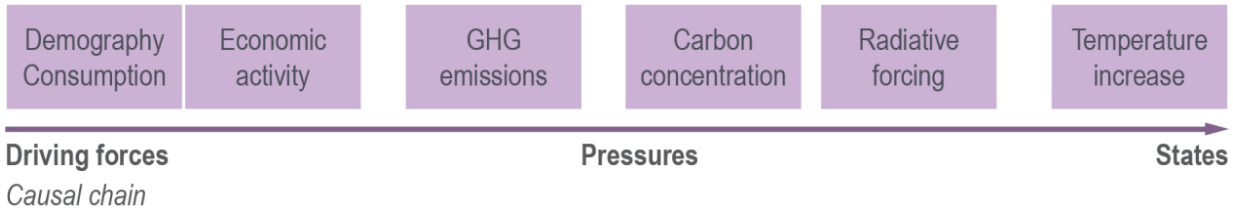
Freshwater use, Atmospheric Aerosol Loading, Chemical Pollution

Can the relevant indicators be computed for Earth and for Switzerland ?

Four aspects are considered



4 A preference for 'state' indicators (DPSIR) unless linkages are clearly established



Selected indicators

	Indicator	DPSIR
1. Climate Change	GHG emissions (tCO_2 eq. per year)	Pressure
2. Ocean Acidification	Carbon dioxide emissions (tCO_2 per year)	Pressure
3. Stratospheric Ozone Depletion	-	-
4. Nitrogen Losses	Loss of reactive nitrogen to the environment (Kg N per y)	Pressure
Phosphorus Losses	Use of fertilizer with phosphorus (Kg P per y)	Driving-Force
5. Atmospheric Aerosol Loading	-	-
6. Freshwater Use	-	-
7. Land Cover Anthropisation	Share of anthropised land (%)	State
8. Biodiversity Loss	Average biodiversity damage potential (%)	State
9. Chemical Pollution	-	-

Indicators are different from:

- Rockström and from Nykvist proposals
- Indicators relevant at country scale

How to allocate a fair share of the limits to each country ?

How to allocate a fair share of the limits to each country ?

Rationales ?

No recognised mechanism for the allocation

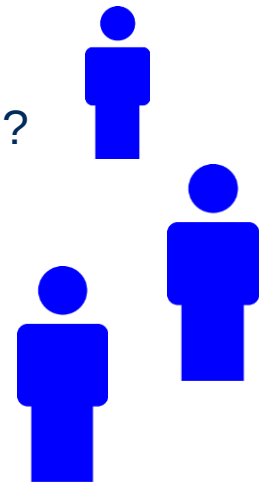
- Of global resources
- According to footprinting approaches.

Area, territorial specificities ?
Population, population structure ?

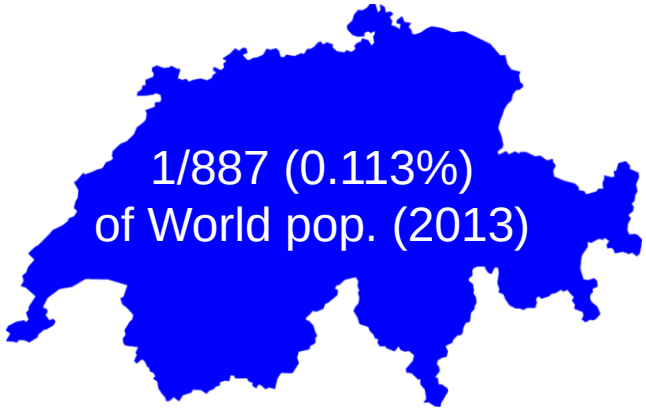
Needs ?
Rights, responsibilities ?
Income ?

Equity, equality ?

Past, future ?



Basic approach



People as final beneficiaries

Population growth = pressure

Usually: legal rights or economic allocation

The default 'equal share per capita'

A second hybrid approach

A 2-steps allocation

1. To countries as indirect allocation pathway
   - Fixed country share at a given reference date
2. To the inhabitants per country

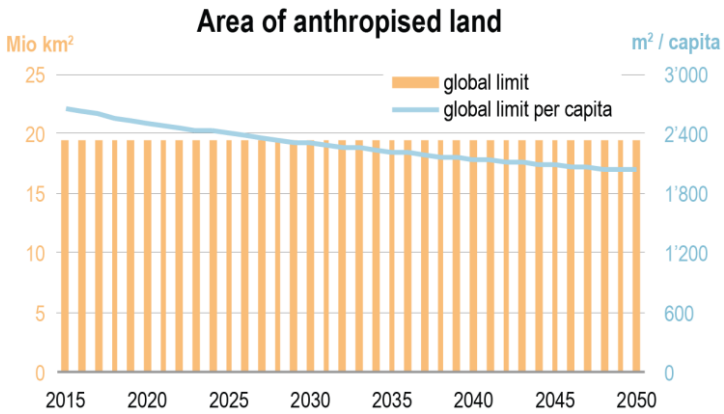
(+) The allocation per capita: internal demographics of each country.

(+) Enable considering a time perspective

Time perspective: all indicators

Yearly budgets

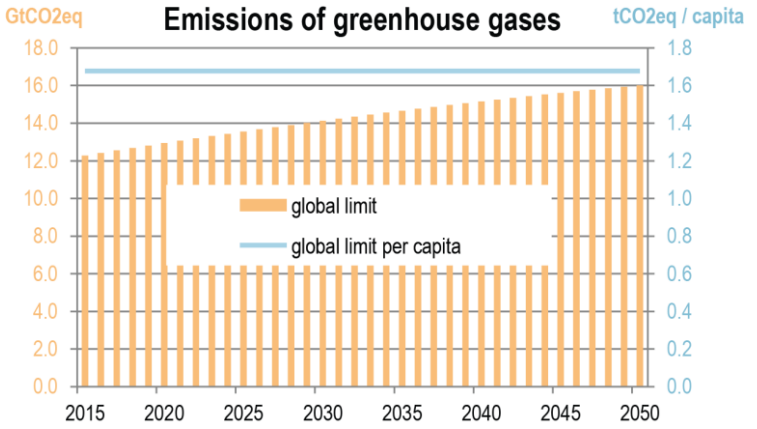
country limit = cst



Nitrogen &Phosphorus losses
Land Cover Anthropisation
Biodiversity Loss

Budgets over time

per capita limit = cst



Climate Change
Ocean Acidification

Past & Future

How to assess performance ?

We need a way to

- Communicate to a large public
- Go beyond complex LCA barcharts (multi-indicators)
- Go beyond a simplistic ‘one planet’ indicator
- Combine global priorities & national actions

=> to focus action on what matter the most.

An assessment in 2 steps

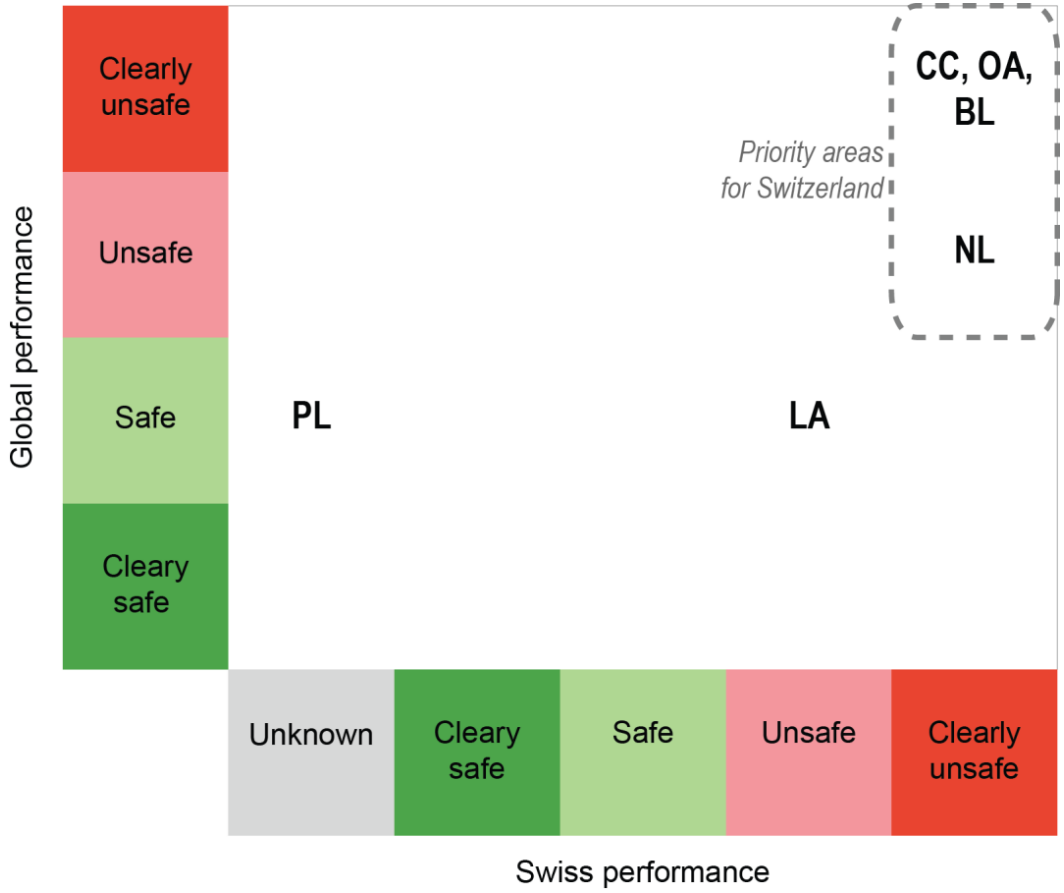
1. A semi-quantitative performance scale

Performance	*Score*	*Confidence in score*	*Trend*
Clearly Unsafe	Large overshoot	High	Rapidly deteriorating
	Small to medium overshoot	Medium to low	Rapidly deteriorating
Unsafe	Small to medium overshoot	Medium to low	Slow evolution
	No overshoot	Medium to low	Rapidly deteriorating
Safe	No overshoot	Medium to low	Slow evolution
Cleary Safe	No overshoot	High	Slow evolution

2. A 2-tiers identification of priorities

1. **The global scale**: Clearly Unsafe or Unsafe **global performance** => world priorities.
2. **The national scale**: if a world priority & Clearly Unsafe or Unsafe **national performance** => action at national level.

Identification of four priorities for CH



BL: Biodiversity Loss, **CC**: Climate Change, **LA**: Land Cover Anthropisation, **NL**: Nitrogen Losses, **OA**: Ocean Acidification, **PL**: Phosphorus Losses (Swiss performance unknown due to lack of data).

Concluding remarks

Remaining challenges

Generation of missing data/methods

- Atmospheric Aerosol Loading & Chemical Pollution
- The allocation to companies and products accounting for three-scale (global, coutry, company) coherent objectives.

Improvements

- Allocation to consider needs /development status

Communication

- Change perspective of people: footprint rather than territorial
- Adopt a global perspective: other aspects to consider, maybe irrelevant at country scale.

Interest of the applied approach

Planetary Boundaries + footprinting

- **A multi-criteria** assessment: beyond Climate Change
- Absolute limit values: **benchmarks**
- **Possible downscaling** (countries, regions, corporations, products)
- Global **priorities**

Forthcoming results: blueDot project

Classification of countries (around 50, 85% of global GDP)

Key sectors per region &PB

A combination of **global economic models & physical models** & improved data/approaches

Funding: Boninchi fundation

Check www.bluedot.global (july/august 2015)

Contact us

Damien Friot
+ 41 (0) 78 611 40 64
damien.friot@shaping-ea.com
www.shaping-ea.com

Hy Dao
+ 41 22 917 82 25
hy.dao@unepgrid.ch
www.grid.unep.ch

Report: pb.grid.unep.ch
blueDot project: www.bluedot.world