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Realising the Transition towards the Circular Economy

*A discussion on political and economic indicators for
circular economy assessment*

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“you manage what you measure” (EU Efficiency Scoreboard).



In order to execute a successful transition towards circular economy, it is essential to develop right regulatory framework and policies.

But public and private decision-makers should be guided by sound **indicators** and potential resource efficiency **targets**.

Targets are essential for guiding action, for making sure that we are moving in the right direction, while indicators are needed to measure progress (EC, 2014).

Measuring Circular Economy. The EU Efficiency Scoreboard.



Resource efficiency indicators (1/4)

| Theme | Sub theme | Indicator | Source |
|----------------------|---|--|---------------|
| Lead indicator | Resources | Resource productivity | Eurostat |
| Dashboard indicators | Materials | Domestic material consumption (DMC) per capita | Eurostat |
| | Land | Built-up areas | Eurostat |
| | | Productivity of artificial land | Eurostat |
| | Water | Water exploitation index | Eurostat, EEA |
| | | Water productivity | Eurostat, EEA |
| | Carbon | Greenhouse gas emissions per capita | EEA |
| | | Energy productivity | Eurostat |
| | | Energy dependence | Eurostat |
| | Share of renewable energy in gross final energy consumption | Eurostat | |

Sustainable Materials Management.

OECD 2012, Paris.



Resource Efficiency and **Resource Productivity** are largely identical in the way that they are used in many reports (e.g. OECD).

They refer to the effectiveness with which an economy or a production process is using natural resources. It can be defined with respect to:

- the *physical or technical efficiency*,

the amount of resources input required to produce a unit of output, both expressed in physical terms. The focus is on maximising the output with a given set of inputs and a technology ...or on minimising the inputs per output.

- the *economic-physical efficiency*,

the money value added (VA) of outputs per mass unit of resource inputs used. The focus is to decouple VA and resource consumption.

- the *economic efficiency*,

the money value of outputs relative to the money value of inputs. The focus is on minimising resource input costs.

Productivity, Intensity, Efficiency ... too much confusion!!!



Resource Intensity (e.g. toe/GDP) is the inverse of **Resource Productivity** (e.g. GDP/toe).

According to Bor (2008) [“Consistent multi-level energy efficiency indicators and their policy Implications”, Energy Economics]:
[energy intensity is]... ‘a fundamental tool for understanding the impacts of various energy efficiency policy options, measuring the impact and effects of energy policies’.

- The same kind of statements may be found in reports from the IEA, EU Commission, WWF, etc.

Centre for European Economic Research (ZEW):

‘we frequently use the terms energy efficiency and energy intensity equivalently where energy intensity - the ratio of energy use and gross output - is the reciprocal of energy efficiency’.

- Similar claims appear in reports published by well-known consulting companies such as Deloitte, ABB and Menlo Energy Economics.

Productivity, Intensity, Efficiency ... too much confusion.



They have been extensively used for:

- Decoupling Analysis,
- to define Policy Objectives and Targets (Chinese voluntary pledges to UNFCCC),
- to conduct Assessments (e.g., for firms, countries, sectors; European Countries with regard to the EU energy savings targets).

They have been extensively used as proxies of Efficiency:

- in the Academic Literature,
- by well know Think Tanks, International Organizations (e.g., OECD, IEA, UN), Governments (e.g., EU, China).

Sustainable Materials Management.

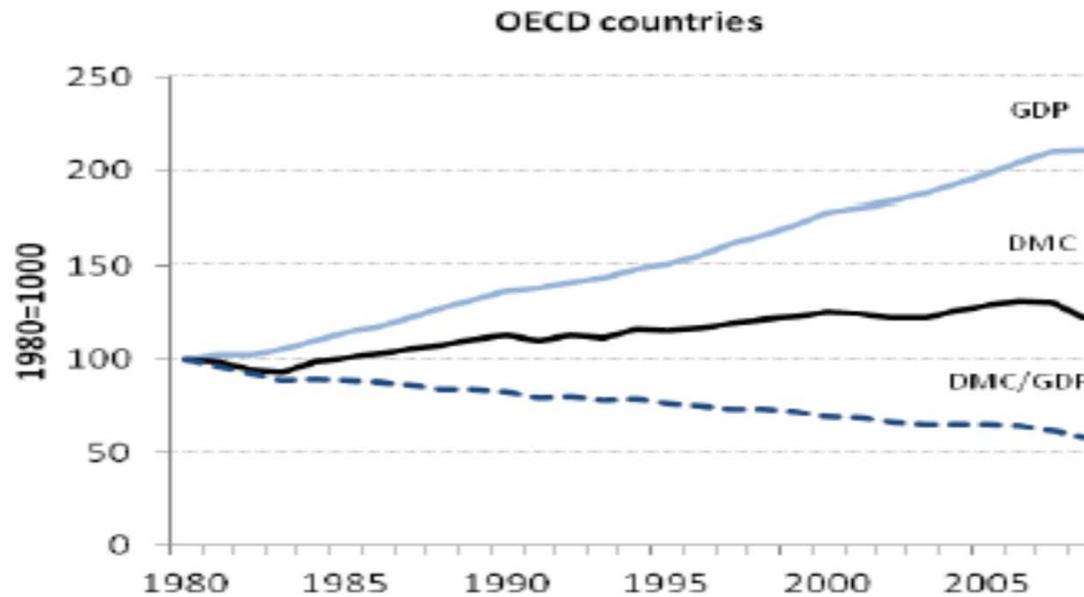
OECD 2012, Paris.



Resource productivity (the inverse of DMC/GDP) has been improving throughout the OECD with a 42% increase between 1980 and 2008 (Figure 3).

This can be at least partly attributed to a range of policies that OECD countries have put in place to improve resource efficiency and the recovery of materials from waste.

Figure 3. OECD material consumption versus GDP⁸



Resource Productivity & Decoupling

The problem:
mixing monetary and physical units

Domestic Material Consumption (DMC) is a variable used in material flow accounting. DMC measures the mass (weight) of the materials that are physically used in the consumption activities of the domestic economic system.

The drivers of Economic Growth.



The drivers of economic growth may be summarize in two main elements:

- increasing productivity levels of primary factors (human and physical/technological capital),
- increasing use of resources

$$GDP_{pc} = \frac{GDP}{\text{employment}} \times \frac{\text{employment}}{\text{population}}$$

Labour productivity

Use of resources

Problem: only primary factors “add value” ..so there is no sense for “resources productivity”.

Productivity, Intensity, Efficiency

... too much confusion.



Rodriguez, M., and Pena-Borrego, Y. (2017). Carbon Intensity Changes in the Asian Dragons. Lessons for climate policy design. Energy Economics 66.

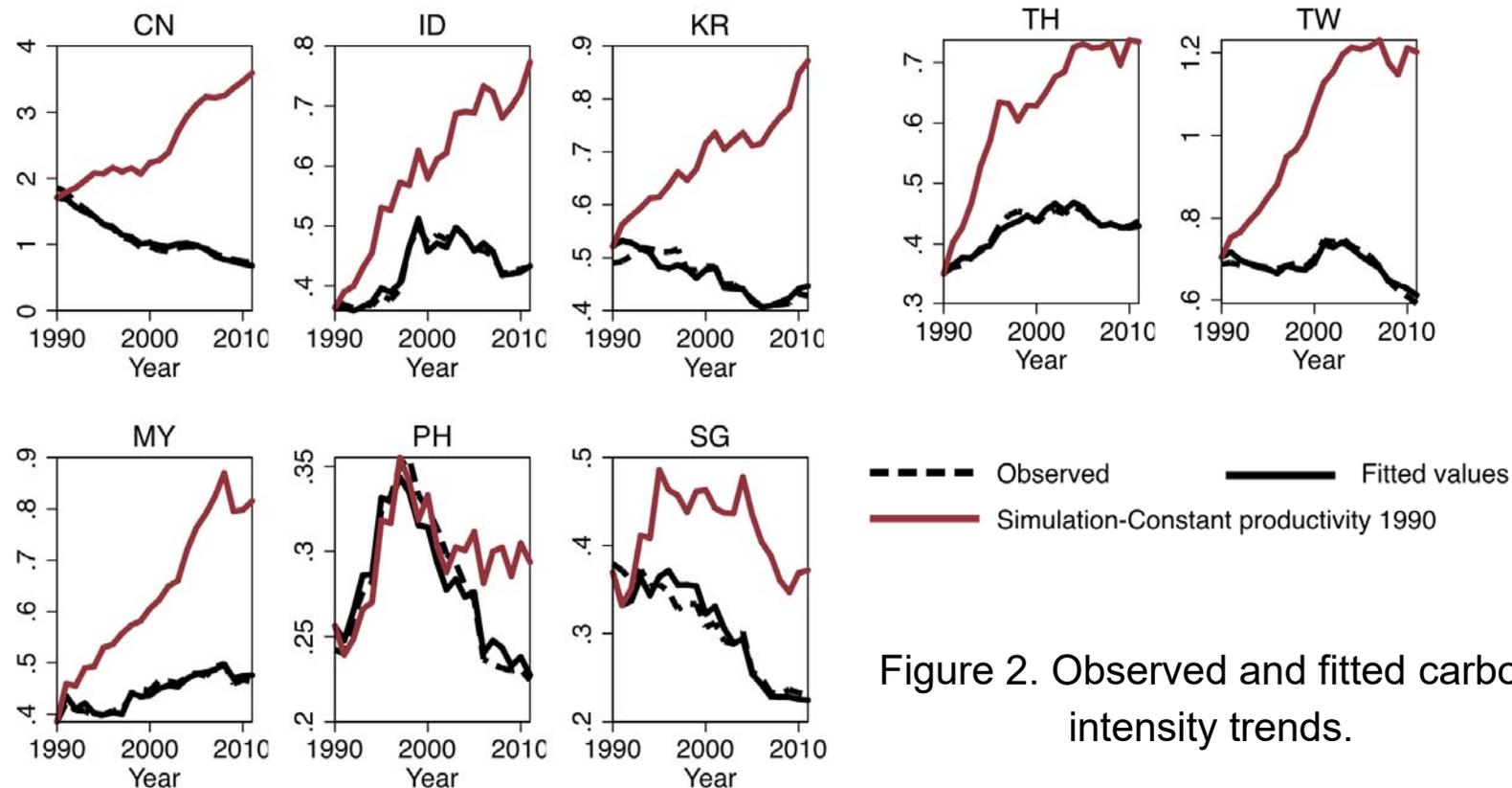


Figure 2. Observed and fitted carbon intensity trends.

The misleading conclusions from using Energy Intensity for forecasting future trends in CO₂.



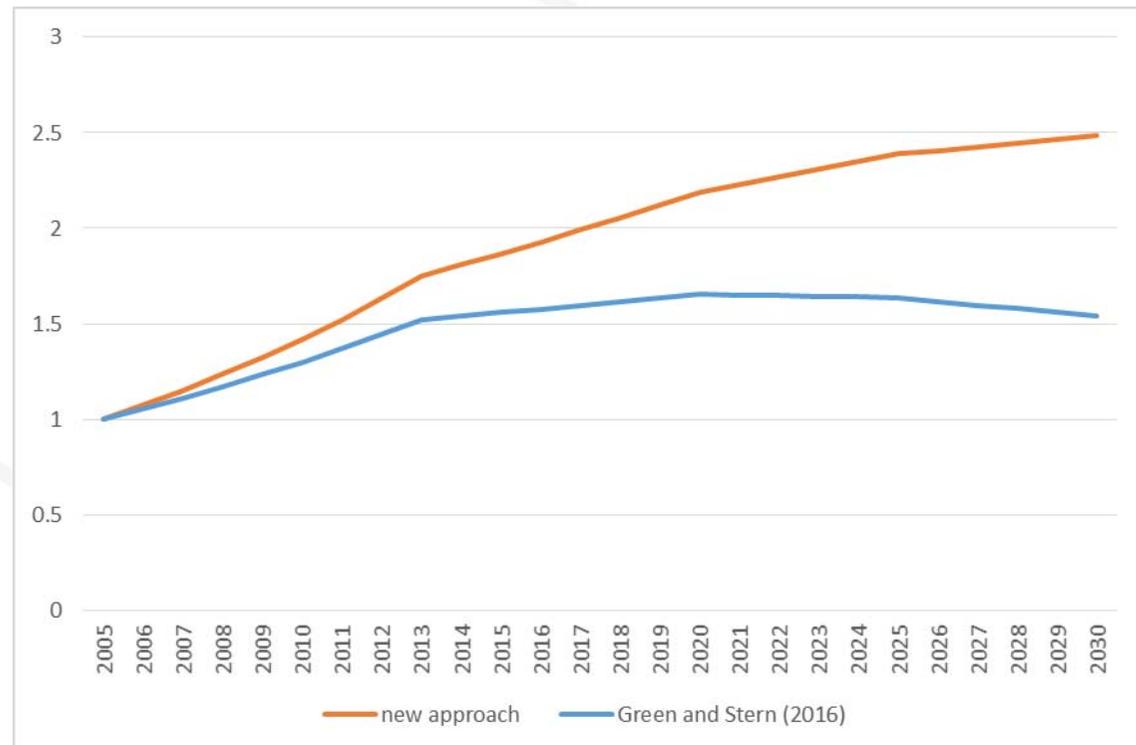
Using Energy Intensity past trends

$$CO_2 = \frac{CO_2}{Energy} \times \frac{Energy}{GDP} \times GDP$$

Using Labour Productivity instead

$$CO_2 = \frac{CO_2}{Energy} \times \frac{Energy}{Labour} \times \frac{Labour}{GDP} \times GDP$$

The case of Chinese voluntary pledges to UNFCCC.





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The annual Global Corporate Knights' 100.

It evaluates the most sustainable
companies in the World

Top company profile: BMW

BY BRENDA BOUW

POSTED JANUARY 20, 2016

WINTER 2016 ISSUE

The iconic German brand leads the Global 100 pack with strong sustainability bona fides across the board.





Thank you for your attention

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