FONDAZIONE ENI ENRICO MATTEI

Implications of 2030 EU Resource Efficiency Target on Sustainable Development (FEEM NdL 2015.036)

Lorenza Campagnolo and **Fabio Eboli**
FEEM, CMCC

FEEM seminar
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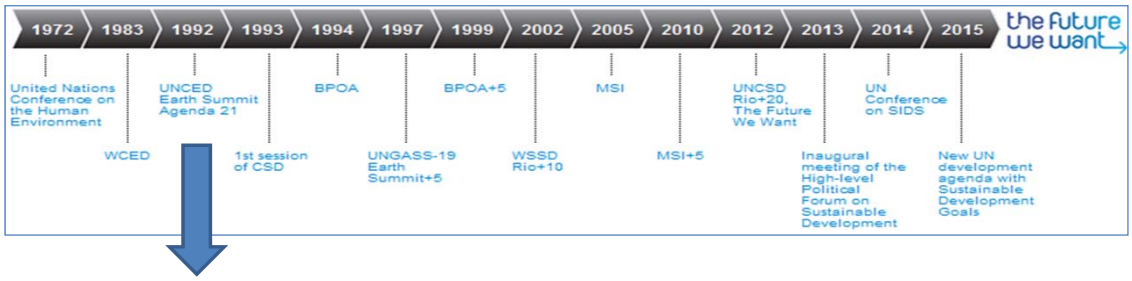
OUTLINE

- *SUSTAINABLE DEVELOPMENT: QUANTITATIVE ASSESSMENT*
- *THE EU RESOURCE EFFICIENCY STRATEGY*
- *THE METHODOLOGY*
- *SCENARIO ANALYSIS*
- *CONCLUSIONS and FURTHER RESEARCH*

SUSTAINABLE DEVELOPMENT: UN PROCESS (1)



- ***Rio 1992 outcomes:***
- ✓ Agenda 21
- ✓ Rio Declaration on Environment and Development
- ✓ Statement of Forest Principles
- ✓ United Nations Framework Convention on Climate Change
- ✓ United Nations Convention on Biological Diversity

SUSTAINABLE DEVELOPMENT: UN PROCESS (2)

- ***MILLENNIUM DEVELOPMENT GOALS (2000-2015)***
- ***SUSTAINABLE DEVELOPMENT GOALS (2016-2030)***

25-27 September 2015 (New York)

=> UN Secretary General Ban Ki-Moon will adopt the new SUSTAINABLE DEVELOPMENT GOALS (and TARGETS) to be fulfilled by 2030

OTHERS THAN UN: GGKP

GREEN GROWTH knowledge platform

Global Green Growth Institute

OECD

UNEP

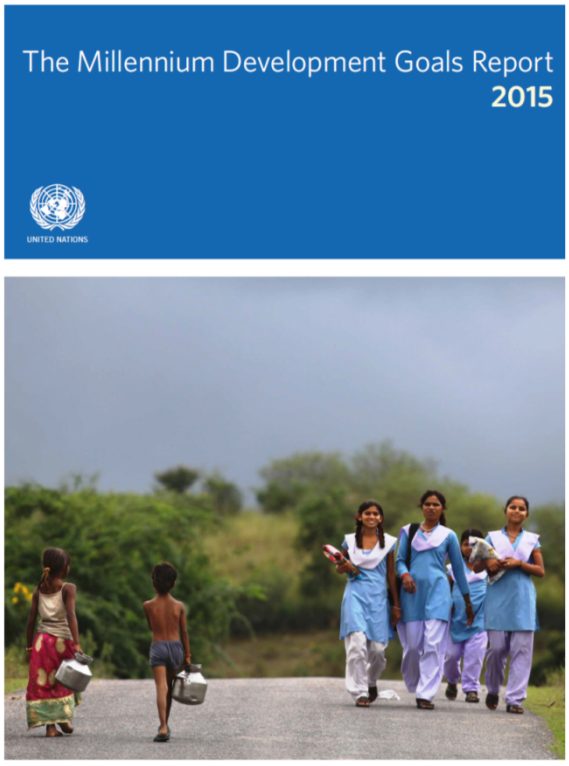
THE WORLD BANK

Third Annual Conference of the
Green Growth Knowledge Platform

Fiscal Policy and the Green Economy Transition: Generating Knowledge - Creating Impact

Venice, 29-30 January 2015

MILLENNIUM DEVELOPMENT GOALS



Measure what we treasure: sustainable data for sustainable development

- What gets measured gets done
- Only by counting the uncounted can we reach the unreached
- Global standards and an integrated statistics system are key elements for effective monitoring
- Real-time data are needed to deliver better decisions faster

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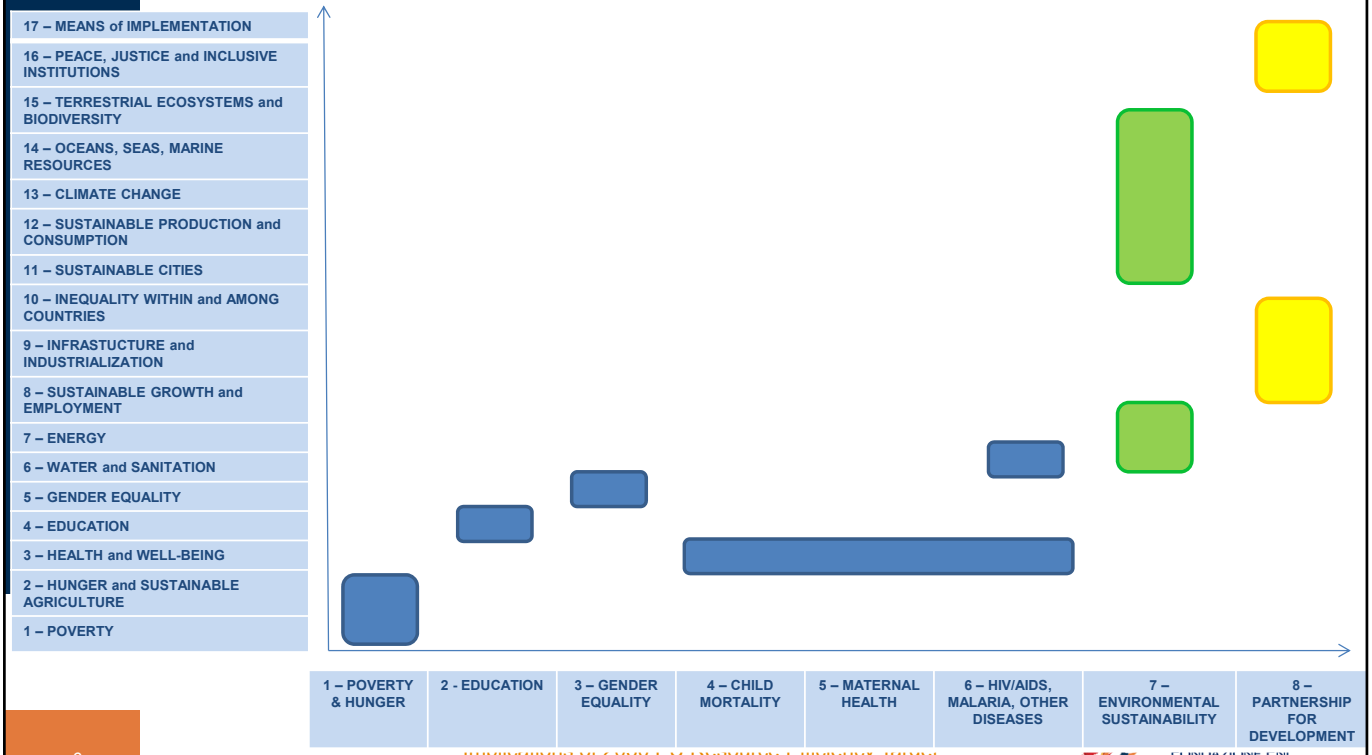
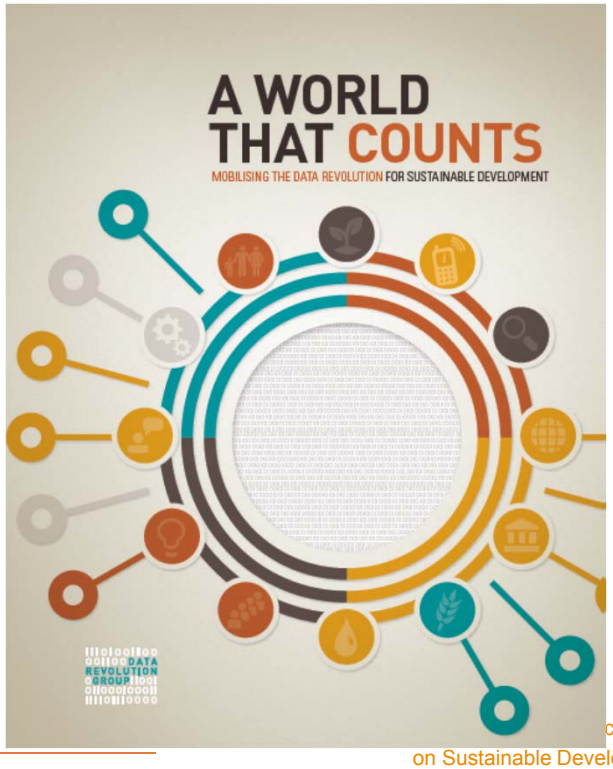
MAPPING MDGs and SDGs



SDGs MAPPING by DIMENSIONS

N.	SDGs	ECONOMY	ENVIRONMENT	SOCIETY	GOVERNANCE
1	POVERTY	X		X	
2	HUNGER and SUSTAINABLE AGRICULTURE	X	X	X	
3	HEALTH and WELL-BEING	X		X	
4	EDUCATION			X	
5	GENDER EQUALITY	X		X	
6	WATER and SANITATION		X	X	
7	ENERGY		X	X	
8	SUSTAINABLE GROWTH and EMPLOYMENT	X		X	
9	INFRASTUCTURE and INDUSTRIALIZATION	X			
10	INEQUALITY WITHIN and AMONG COUNTRIES	X		X	
11	SUSTAINABLE CITIES		X	X	
12	SUSTAINABLE PRODUCTION and CONSUMPTION	X	X		
13	CLIMATE CHANGE		X		
14	OCEANS, SEAS, MARINE RESOURCES		X		
15	TERRESTRIAL ECOSYSTEMS and BIODIVERSITY		X		
16	PEACE, JUSTICE and INCLUSIVE INSTITUTIONS			X	
17	MEANS of IMPLEMENTATION				X

SDGs (2016-2030) and the DATA REVOLUTION



- United Nations Secretary-General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development (IEAG) (www.undatarevolution.org)

The data ible develop

- **Data**
- **Data**
- **Data** most impo dict future fferent times eful for *solvi they are p connected system*, not tied to one project or research question

ce Efficie on Sustainable Development

HOW TO MEASURE SUSTAINABILITY?

- ✓ Immediate focus on collection of ***"sustainable development indicators"*** *=> A statistical measure that gives an indication on the sustainability of social, environmental and economic development.*
- ✓ Dashboards from institutional bodies:
  - ➢ UN (Millennium Development Goals, Sustainable Development Goals)
  - ➢ OECD (Inclusive and Green Growth indicators, Better Life Index)
  - ➢ WORLD BANK (World Development Indicators)
  - ➢ EUROPE => EUROPE 2020 (smart, sustainable, inclusive Europe); EUROSTAT (Sustainable Development indicators)
  - ➢ ISTAT (Benessere Equo e Sostenibile), Ambiente Italia & Legambiente (Ecosistema Urbano)

ARE COMPOSITE INDICES USEFUL?

- ***Main limitation of lists of indicators: overall sustainability (at all levels of governance) difficult to evaluate and compare => inherent trade-offs among indicators and dimensions***
- ***Composite indicators****: the compilation of individual indicators into a single index, on the basis of an underlying model of the multi-dimensional concept that is being measured.*
- ***OECD Handbook on constructing composite indicators (2008)***
- ***Sen-Stiglitz-Fitoussi Commission's concerns (2009):***

✓ heterogeneity among indicators

✓ the arbitrary character of the procedures used to weight their various components

AVAILABLE COMPOSITE INDICES

- ***Worldwide***
  - Human Development Index (economic & social) + Ecological Footprint (economic pressure on environment)
  - Index of Sustainable Economic Welfare, Genuine Savings - Adjusted Net Savings, Genuine Progress Indicator (adjusted GDP)

- ***Italy***
  - PIQ (Symbola), Quars (Sbilanciamoci), Oltre Il PIL (UnionCamere Veneto)

RATIONALE OF RESEARCH ON SUSTAINABILITY

IDENTIFICATION OF CRITICALITIES/GOALS

DEFINITION OF TARGETS

CHOICE OF INDICATORS

ASSESSMENT OF INDICATORS' PERFORMANCE

IF BELOW THE TARGET, POLICY IMPLEMENTATION

POLICY EVALUATION
- SPECIFIC INDICATOR
- OTHER INDICATORS
- FINANCIAL MECHANISM

FUTURE

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FEEM APPROACH (1)

Main drawback

data collection to monitor the past, but we may want to predict possible future outcomes => ex-ante assessment

- ***FEEM SI tries to fill this main gap => how sustainability may evolve in the future at country scale***

➢ under different assumptions on economic, social, environmental drivers

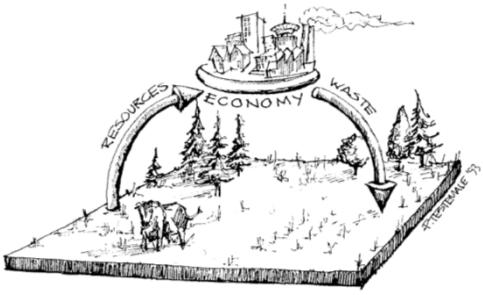
➢ considering a set of sustainability policies

➢ interdisciplinary approach (all dimensions considered at once)

FEEM APPROACH (2)

- Complementary to the data collection under SDGs
- METHODOLOGY => Using a recursive dynamic macro-economic model to simulate future trends – up to 2030 – of selected indicators worldwide
- PURPOSE:
  - ✓ SUSTAINABILITY OVER (FUTURE) TIME
  - ✓ SUSTAINABILITY ACROSS COUNTRIES (RANKING)
  - ✓ SUSTAINABILITY THROUGH STATES OF THE WORLD (SCENARIO ANALYSIS)
- VALUE ADDED:
  - ✓ Verify fulfillment of targets in the BAU (when available)
  - ✓ Assess distance-to-target
  - ✓ Compute investments effort and mechanisms required to match targets (if feasible)
  - ✓ Detect hidden trade-offs among indicators

RESOURCE PRODUCTIVITY: ENDORSEMENT …



From the **cowboy economy** to the **spaceman economy** (Kenneth Boulding, The Economics of the Coming Spaceship Earth, 1966)

"…WE HAVE NOT YET MANAGED TO ADOPT A **CIRCULAR MODEL OF PRODUCTION** CAPABLE OF PRESERVING RESOURCES FOR PRESENT AND FUTURE GENERATIONS … MODERATING THEIR CONSUMPTION, MAXIMIZING THEIR EFFICIENT USE, REUSING AND RECYCLING THEM…"

(ENCYCLICAL LETTER OF THE HOLY FATHER FRANCIS LAUDATO SI' ON CARE FOR OUR COMMON HOME, 18/6/2015)

RESOURCE EFFICIENCY IN THE EU VISION

PRIORITIES

SMART | SUSTAINABLE | INCLUSIVE

TARGETS

EMPLOYMENT (>75%)	R&D (3% of GDP)	CLIMATE&ENERGY (20-20-20)	EDUCATION (>40% third level)	POVERTY (-20 million)

FLAGSHIP INITIATIVES

- DIGITAL AGENDA FOR EUROPE
- INNOVATION UNION
- YOUTH ON THE MOVE
- INDUSTRIAL POLICY FOR GLOBALISATION ERA
- RESOURCE EFFICIENT EUROPE
- AGENDA FOR NEW SKILLS AND JOBS
- EUROPEAN PLATFORM AGAINST POVERTY

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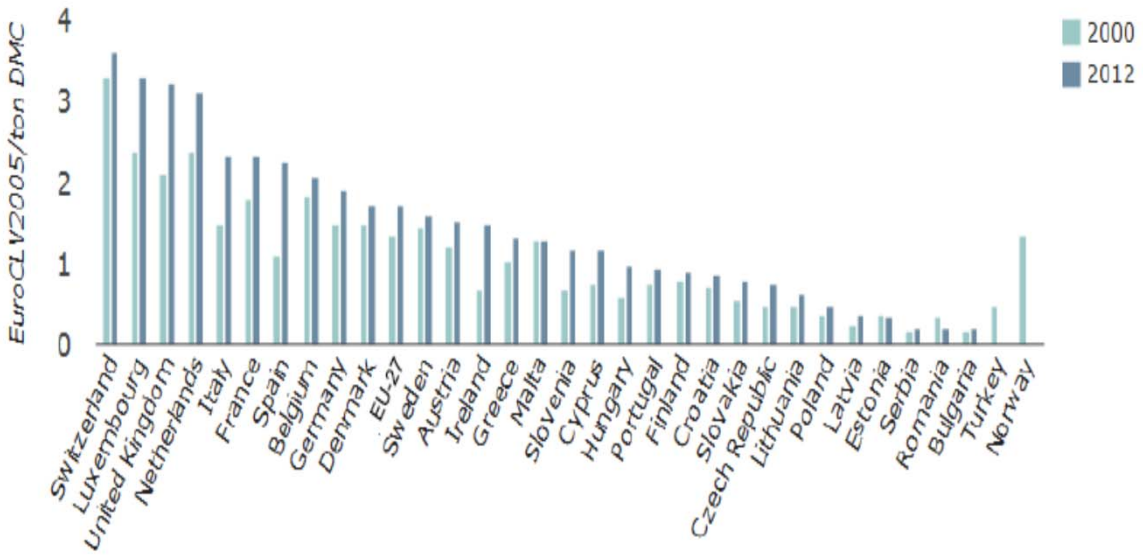
ations of 2030 EU Resource Efficiency Target
on Sustainable Development

Fondazione Eni Enrico Mattei

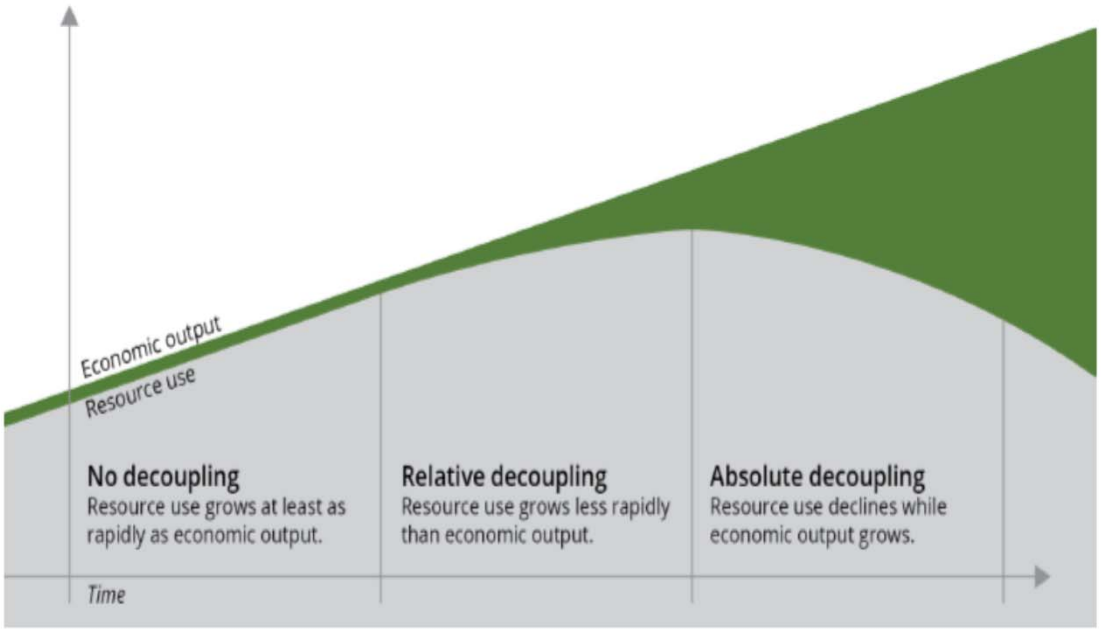
RESOURCE PRODUCTIVITY IN EUROPE

GDP/DMC



Source: THE EUROPEAN ENVIRONMENT - STATE AND OUTLOOK 2015 (EEA, 2015)

NO SPECIFIC EU TARGET IN THE LONG RUN

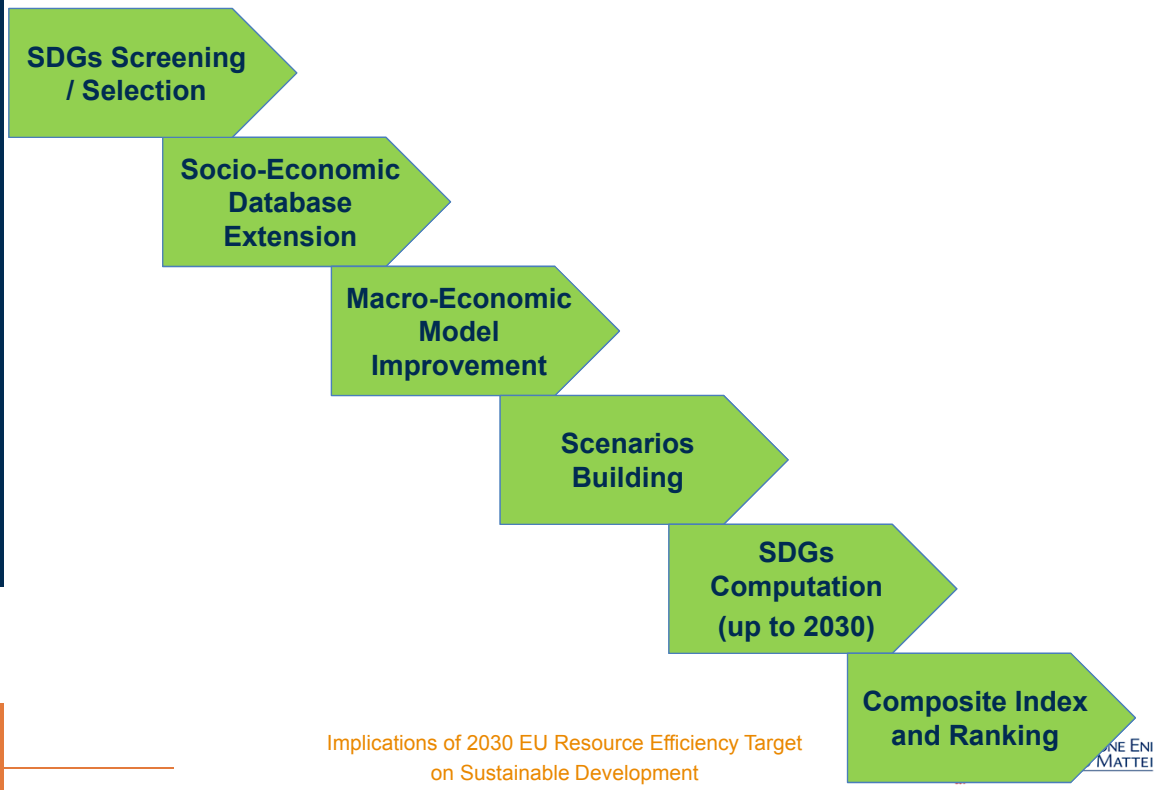


Source: EEA

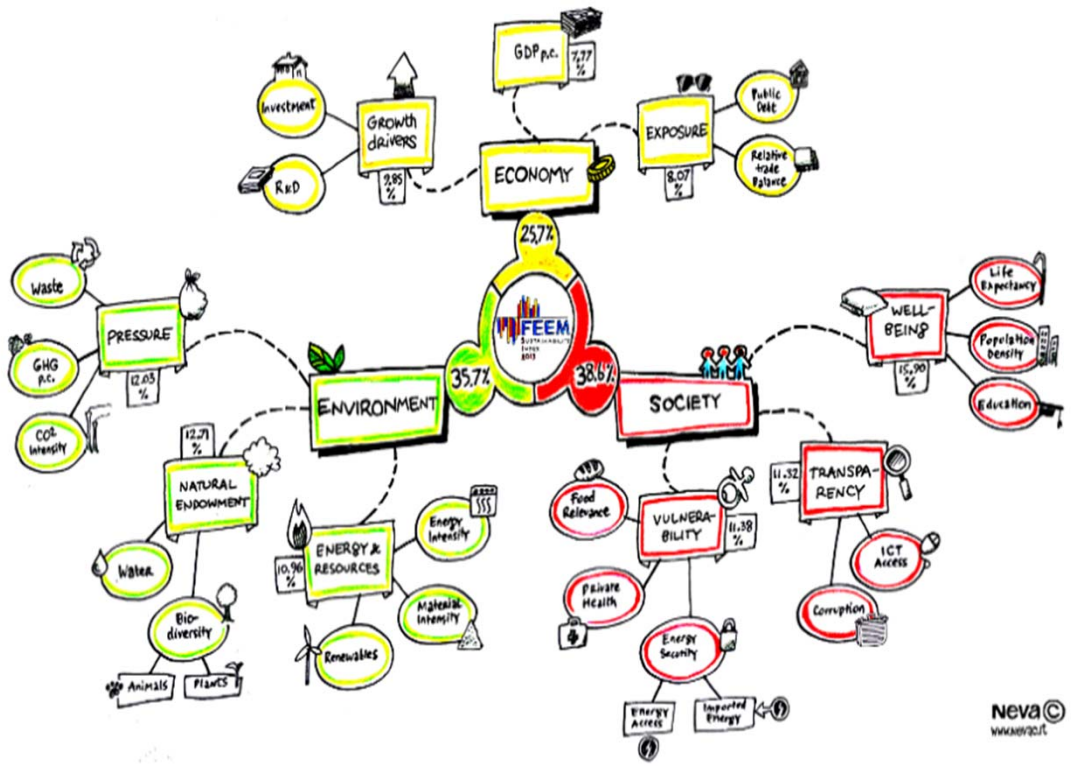
PAPER'S AIM AND STRUCTURE

- AIM => ASSESSING THE IMPACTS OF EU **RESOURCE EFFICIENCY** IN 2030 ON **SUSTAINABILITY**, INCLUDING SYNERGIES AND TRADE-OFFS AMONG DIFFERENT DIMENSIONS/GOALS
- CURRENT **LIMITATION** ON SDGs ASSESSMENT => BACKWARD LOOKING (EX POST)
- FOR **EX-ANTE ASSESSMENT**=> MODEL-BASED APPROACH => RECURSIVE-DYNAMIC COMPUTABLE GENERAL EQUILIBRIUM FRAMEWORK
- MACRO-ECONOMIC MODEL (BASIC)
  - ✓ stylized behavior for economic agents
  - ✓ interactions occurring within the economic system due to future economic development (input-output linkages, time dynamics and international trade)
- MACRO-ECONOMIC MODEL (IMPROVED)
  - ✓ connections and feedbacks to social and environmental variables and indicators
- REFERENCE SCENARIO BUILDING
  - ✓ GTAP8 (worldwide & economywide economic database; baseyear 2007)
  - ✓ Time lenght: 2011-2030 (SSP2)
  - ✓ 40 countries / regions
  - ✓ 20 sectors (public sector and RES expanded)

MULTI-STEP METHODOLOGY



DASHBOARD OF INDICATORS



ECONOMIC INDICATORS

NAME	MODEL IMPLEMENTATION
GDP p.c.	GDP PPP / population
Investment	Net Investment / Capital Stock (%)
R&D	R&D Expenditure / GDP (%)
Public Debt	Government Debt / GDP (%)
Relative Trade Balance	(Net export) / (import + export)

SOCIAL INDICATORS

NAME	MODEL IMPLEMENTATION
Life Expectancy	Expected number of years for the lifetime (proxy: Health Expenditure / GDP (%))
Population Density	Population / Country Surface
Education	Education Expenditure / GDP (%)
ICT Access	Internet users / Total Population (%)
Corruption	F = (GDP p.c., share of oil exports over total country exports, share of public expenditure over GDP)
Food relevance	Food Consumption / Private Expenditure (%)
Private health	Private Health Expenditure / Total Health Expenditure (%)
Imported energy	Energy Imported / Energy Consumed (%)
Energy access	Population with Access to Electricity / Total Population (%)

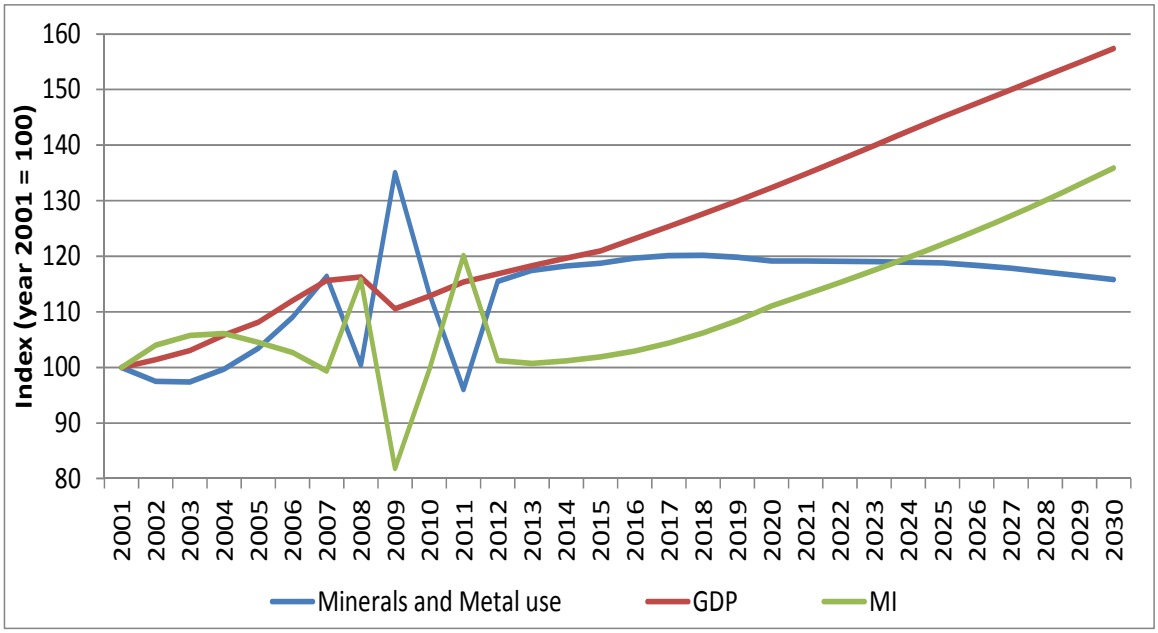
ENVIRONMENTAL INDICATORS

NAME	MODEL IMPLEMENTATION
CO_2 intensity	CO_2 Emissions / Total Primary Energy Consumption
GHG p.c.	GHGs Emissions / Population
Waste	Waste generation / Population
Biodiversity – Animal	Endangered Species / Total Species (%)
Biodiversity – Plants	Endangered Species / Total Species (%)
Water	Water Use / Total Available Water (%)
Renewables	Renewable Energy Consumption / Total Primary Energy Consumption (%)
Material intensity	Industrial Output (economic value) / Raw Material (physical amount)
Energy intensity	Total Primary Energy Supply / GDP PPP

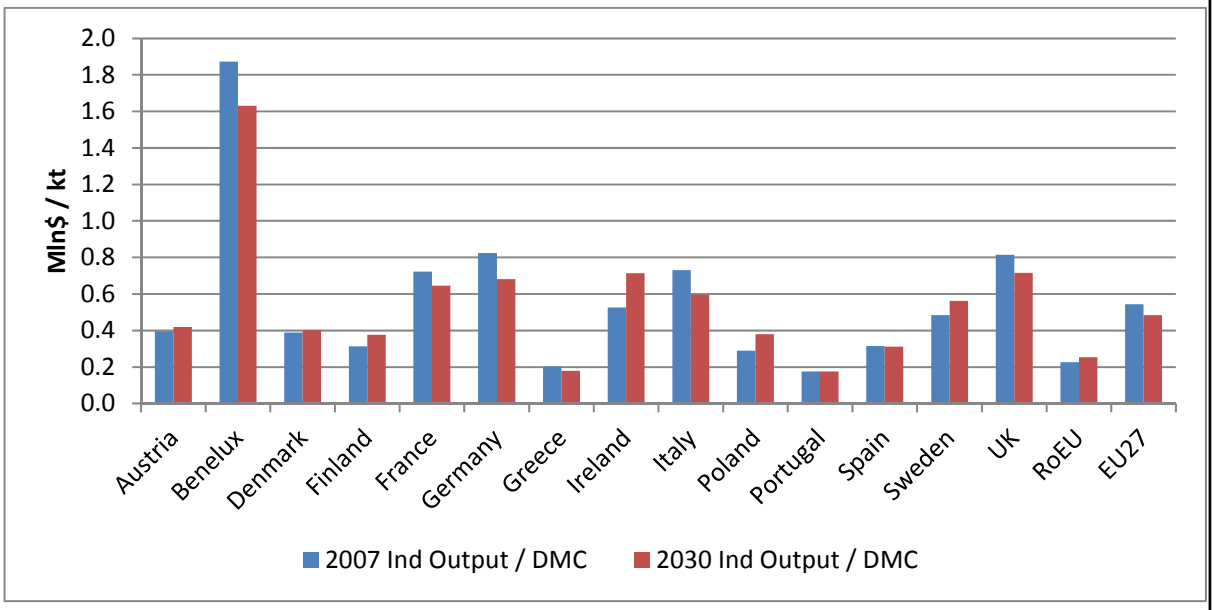
CURRENT SUSTAINABILITY IN EU

Region	FEEM SI Ranking	FEEM SI Value	Economy	Society	Environment	Material productivity
Sweden	1	0.62	0.69	0.87	0.49	0.15
Austria	4	0.54	0.60	0.77	0.42	0.25
Finland	5	0.54	0.64	0.84	0.38	0.11
France	6	0.53	0.54	0.75	0.44	0.36
Benelux	9	0.48	0.58	0.72	0.35	0.54
Denmark	10	0.48	0.61	0.85	0.28	0.21
RoEU	11	0.47	0.47	0.55	0.45	0.24
UK	12	0.47	0.53	0.73	0.34	0.55
Germany	14	0.45	0.58	0.67	0.31	0.39
Ireland	16	0.45	0.54	0.74	0.30	0.09
Portugal	19	0.43	0.44	0.61	0.36	0.21
Italy	20	0.42	0.42	0.52	0.38	0.39
Spain	26	0.40	0.49	0.62	0.27	0.20
Poland	27	0.40	0.41	0.56	0.33	0.19
Greece	30	0.35	0.43	0.49	0.26	0.29

SCENARIO ANALYSIS: BASELINE TRENDS

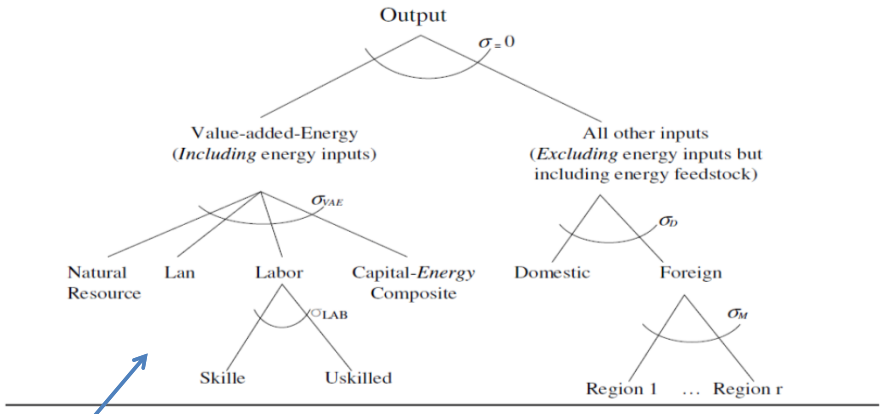


SCENARIO ANALYSIS: BASELINE TRENDS

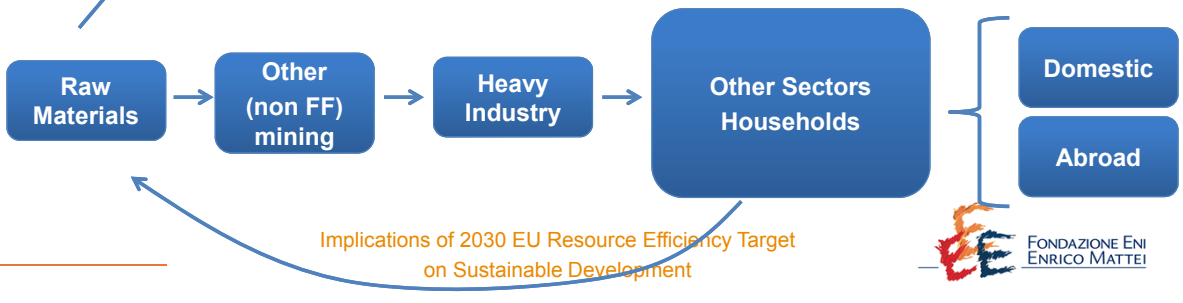


MODELLING DETAILS AND POLICY FRAMING

Figure 16 GTAP–E Production Structure



Source: Burniaux and Troung (2002)



Implications of 2030 EU Resource Efficiency Target on Sustainable Development

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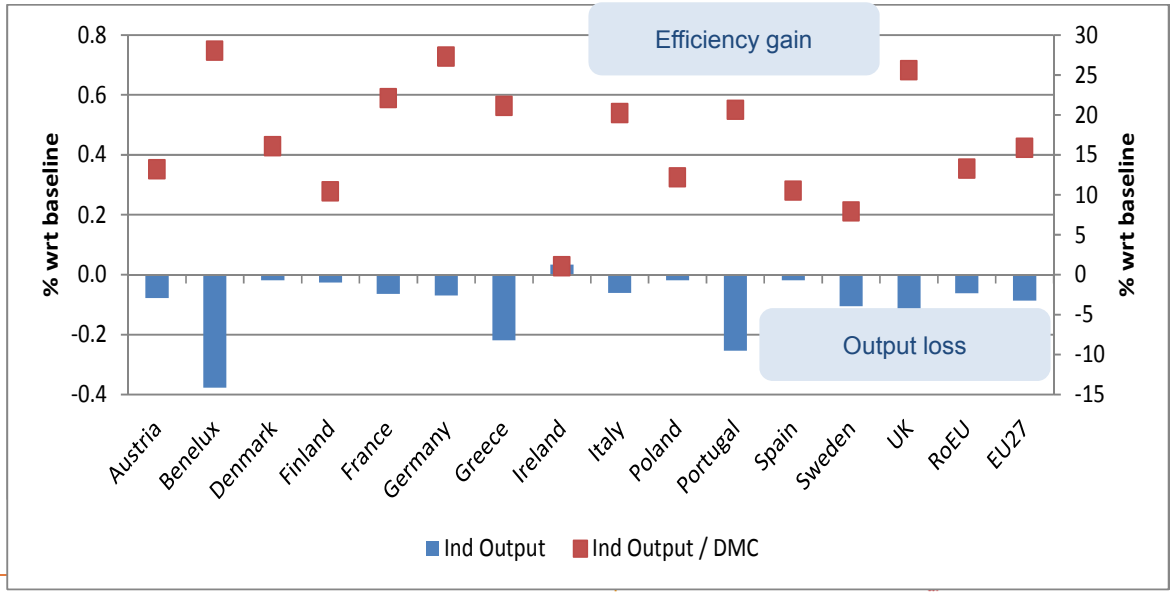
RESOURCE EFFICIENCY POLICY

DOUBLING MATERIAL EFFICIENCY WITH RESPECT TO CURRENT LEVELS BY TAXING USE OF RAW MATERIALS (OTHER MINING)



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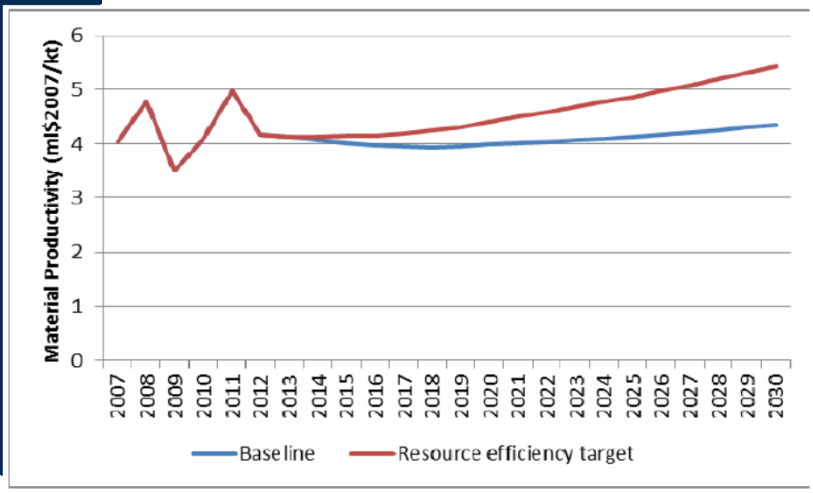
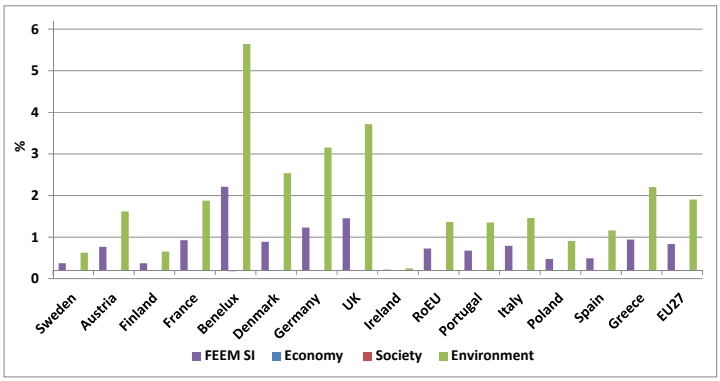
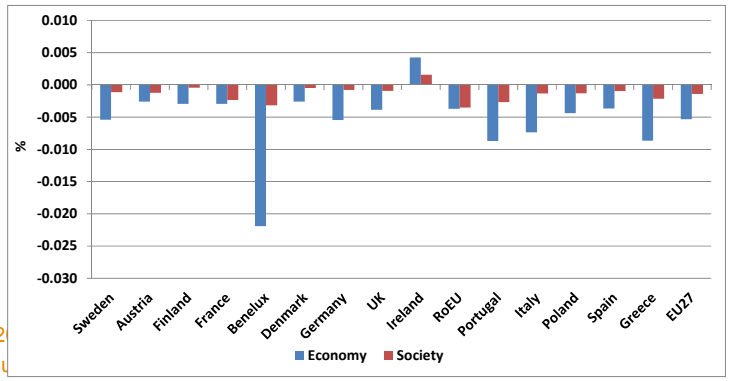
RESOURCE EFFICIENCY POLICY



% change power of tax on mining resources	2030
Austria	11.45
Benelux	24.17
Denmark	13.88
Finland	9.03
France	19.03
Germany	23.41
Greece	18.27
Ireland	0.91
Italy	17.44
Poland	10.55
Portugal	17.90
Spain	9.12
Sweden	6.91
UK	22.00
RoEU	11.49

SUSTAINABILITY IMPLICATIONS (EU MS)





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Implications of 2
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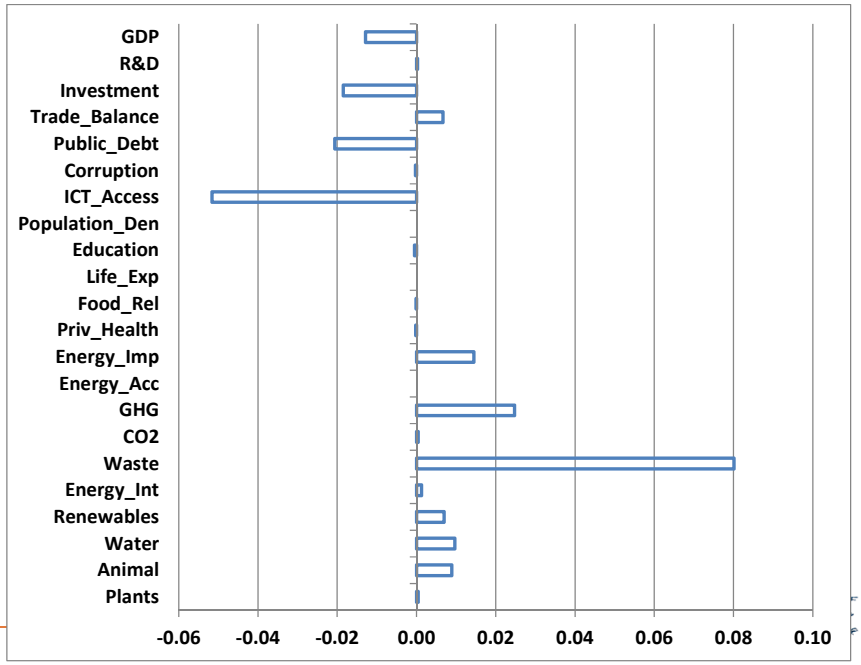
SUSTAINABILITY IMPLICATIONS (EU27)

% change in normalized values
(+/- improvement /deterioration in indicator perfomance)



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CONCLUSIONS AND FURTHER RESEARCH

❖ **Preliminary conclusions**

- Resource efficiency / Material Productivity needs to be investigated to assess effects other than environmental benefits
- In spite of limited costs to double resource efficiency in 2030 wrt historical, the increase in material saving can be substantial
- Co-benefits larger than economic and social costs (aggregate index better off)

❖ **Further research**

- Revenue recycling schemes (EU FP7 Dynamix project)
- Waste as an explicit substitute of raw materials (GTAP-E style)
- Getting closer to the UN SDGs set of indicators

Thank you for your attention!

fabio.eboli@feem.it