FEEM SUSTAINABILITY INDEX REPORT 2011

Project description

FEEM Sustainability Index (FEEM SI) is an aggregate index, which provides future projections of sustainability at the national and macro-regional scale over time. FEEM SI addresses the necessity of "going beyond GDP" within the well-being assessment. It manages to summarise and merge the information derived by a selection of relevant sustainability indicators chosen among the most reliable international indicator sets.

FEEM SI analysis is built on the recursive-dynamic computable general equilibrium model ICES-SI that provides a comprehensive picture of the sustainability of countries over time. The model calculates the index based on various economic, social, and environmental assumptions, thereby providing useful information regarding the effects that different polices have on sustainability. Another important aspect of FEEM SI is the aggregation approach, which is based on experts' elicitation and exploits all the interactions across indicators.

FEEM SI methodological steps and the novelties of the 2011 release are summarised below.

A

Selection of indicators

The indicator set is selected from the existing literature on sustainable development. Therefore, indicators are grouped according to different sustainability topics and sub-topics.

NOVELTIES: *Some key issues have been added to the new version as: economic exposure (public debt and relative trade balance); population density; social vulnerability (namely, energy security as energy access and energy dependence).*

B

Modelling Framework

Indicators are constructed in a computable general equilibrium model and projected over time under different assumptions on the world economy.

NOVELTIES: *The base year is 2004 and relies upon the GTAP7 economic database. FEEM SI 2011 analysis has introduced renewable energy sources; Kyoto GHGs emissions (CO2, CH4, N2O, PFCs, HFCs, SF6); electricity access; inhabitable land.*

C

Normalisation

Indicators are normalised to a common scale (0-1) in order to achieve a full comparability among indicators following a policy-oriented benchmarking procedure.

NOVELTIES: *The benchmarks have been updated for all indicators according to development in sustainability literature and policy targets.*

D

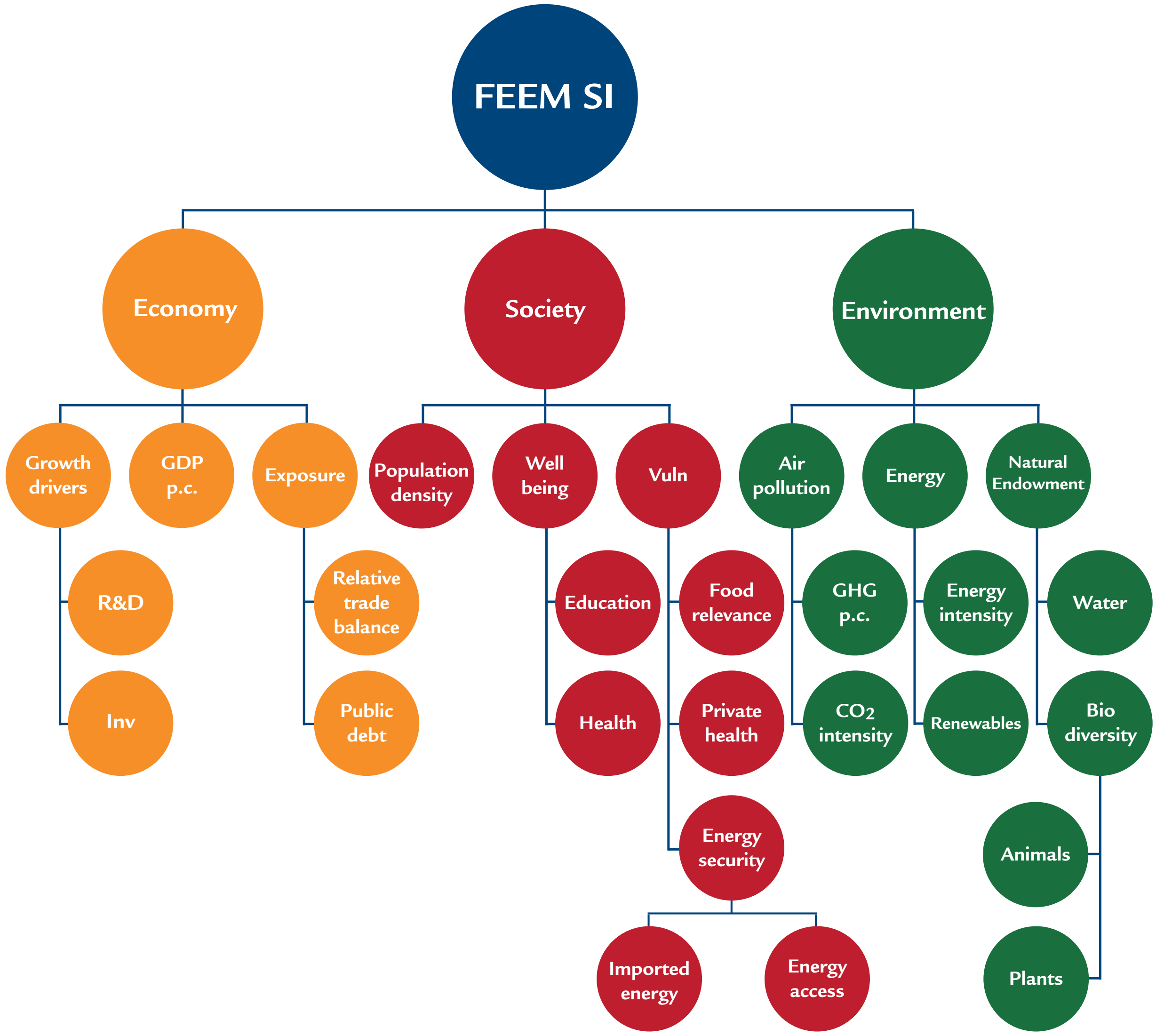
Aggregation

Indicators are composed following a non-linear aggregation methodology, which incorporates the evaluations of experts into a sustainability measure, accounting interactions across different indicators. A sub-section on sensitivity analysis provides more information to judge the stability of sustainability rankings over time.

NOVELTIES: *Weights assigned to indicators have been elicited through an "ad hoc" questionnaire where key experts expressed their individual preferences on specific performances of each sustainability indicator and their coalitions.*

Indicators structure

In line with the sustainability theory, the structure of FEEM SI 2011 is composed of the three main pillars of sustainability: economic, social, and environmental. For each of these dimensions, the FEEM SI 2011 indicators' tree covers the following main areas of research on sustainability assessment: economic growth drivers, GDP per capita, economic exposure, population density, well-being, social vulnerability, energy, air quality and natural endowments.

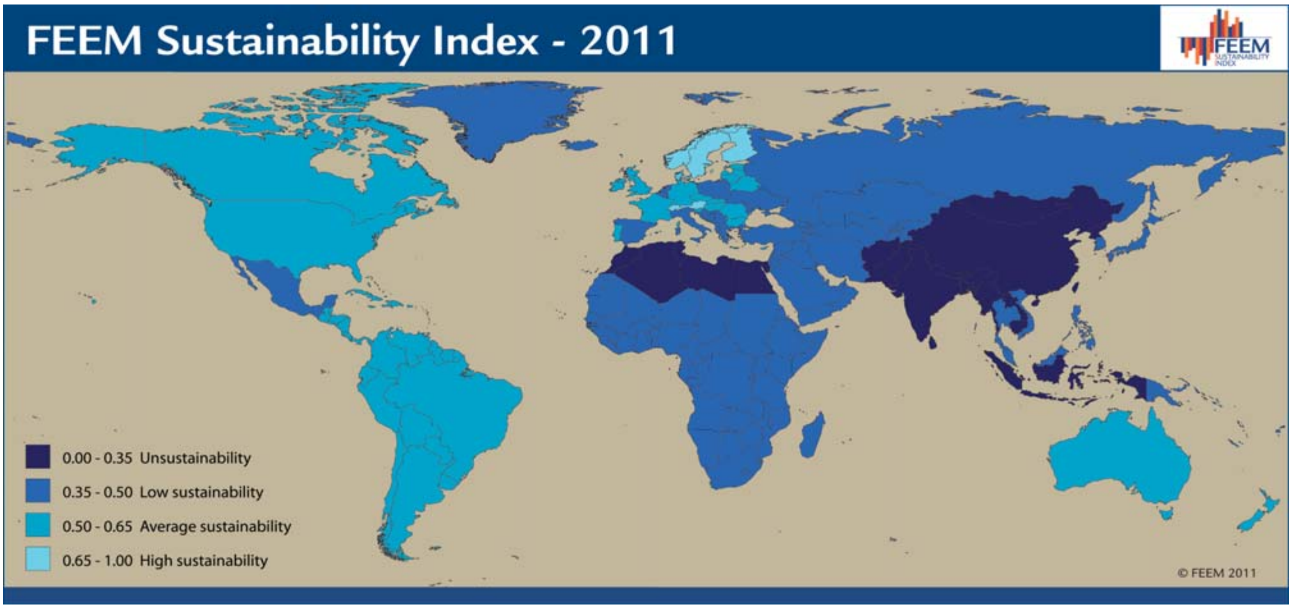


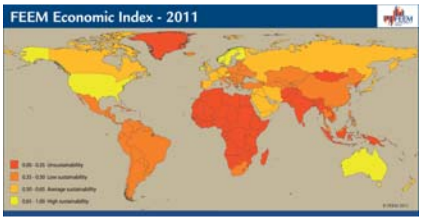
Normalisation and aggregation

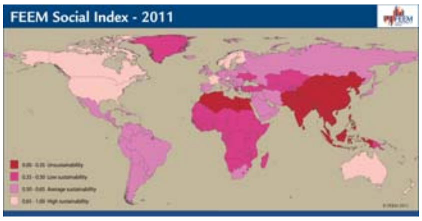
- FEEM SI 2011 indicators have been translated into a 0-1 scale using an indicator-specific normalisation grid defined by considering either relevant policy targets or an average-based criterion.
- The preference elicitation on sustainability indicators is obtained with an "ad hoc" questionnaire that elicits individual preferences on the specific performance of each sustainability indicator and their coalitions. This allows capturing a broader view on sustainability throughout the world.
- A consensus measure among experts' valuations is considered in order to derive a 'representative' weight assigned to each sustainability indicator. For this purpose, the metric distance measure is used to assign weights to valuations of each respondent at each node in the decision tree.
- The FEEM SI 2011 optimises the trade off between simplicity and effectiveness in representing preferences by focusing specifically on the interrelations across indicators. Therefore, a suitable algorithm based on the Choquet integral aggregates all criteria into a single outcome, taking into account all the coalition weights.

FEEM SI 2011 maps

The FEEM SI 2011 provides a synthetic overview (overall and by pillar) of sustainability across the World in 2011 through FEEM Sustainability Maps.

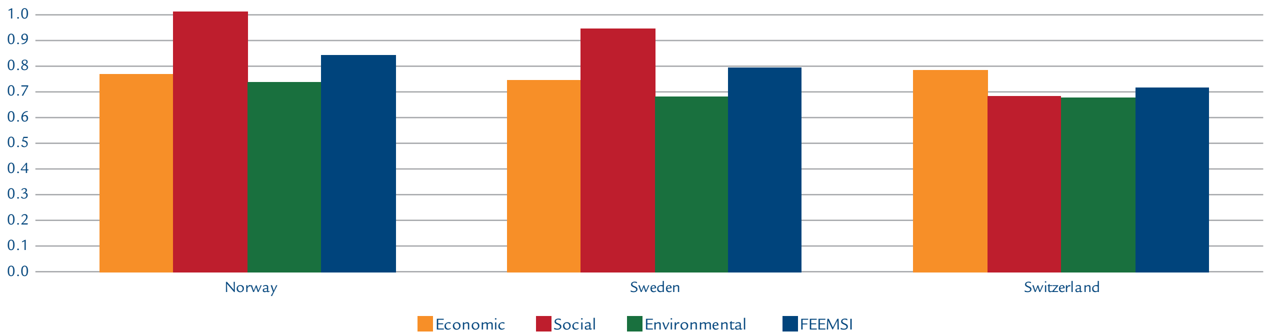




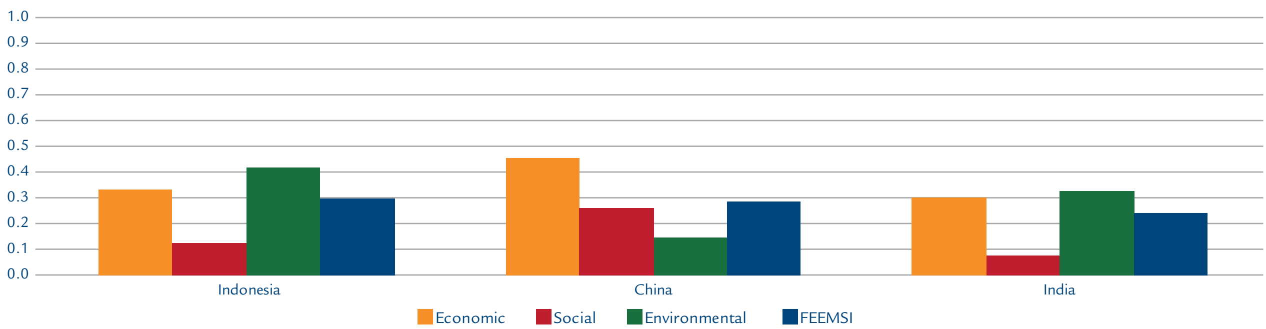


The best performing countries within the FEEM SI 2011 share homogeneously high levels of economic, social, and environmental sustainability, while the components are less equally distributed for the bottom three countries. This can be easily seen by comparing the two graphs below.

Top three countries in 2011



Bottom three countries in 2011



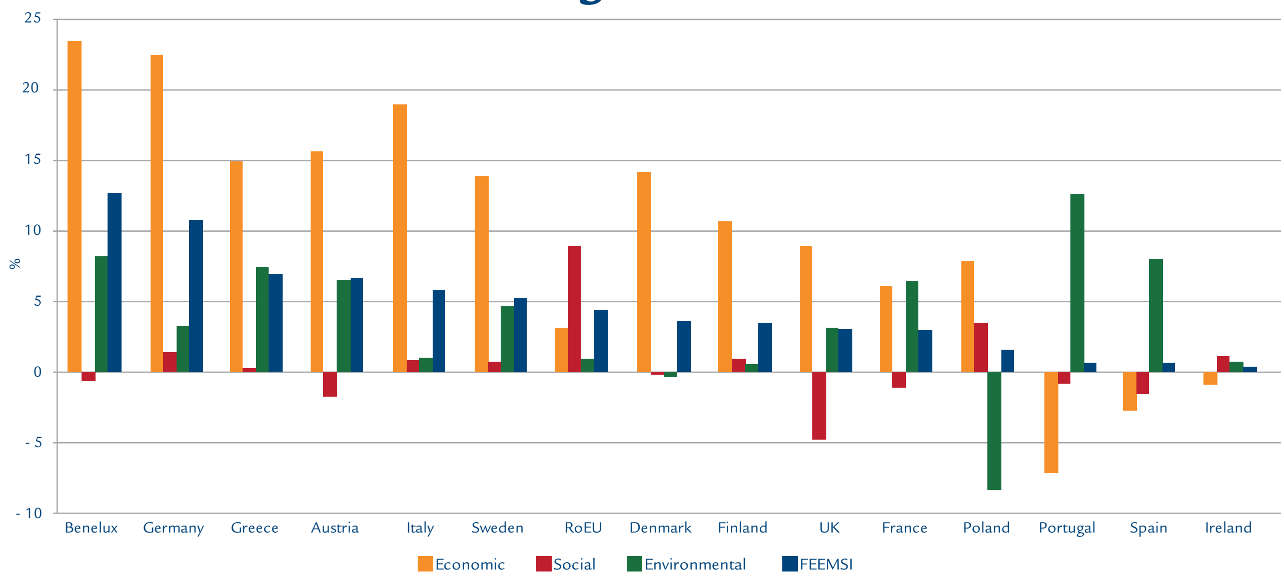
Future perspectives 2011-2020

The ability to project indicators over time is a feature of FEEM SI, which makes it much more than a simple assessment tool, and extends its potential as a real policy simulation environment. The table below presents the changes of FEEM SI values from 2011 to 2020 in a Business-As-Usual scenario (BAU).

Rank FEEMSI 2011	Country	FEEMSI 2011	△RANK	FEEMSI 2020	Country	Rank FEEMSI 2020
1	Norway	0.823	=	0.846	Norway	1
2	Sweden	0.774	=	0.814	Sweden	2
3	Switzerland	0.700	-1	0.736	Austria	3
4	Austria	0.691	1	0.695	Switzerland	4
5	Finland	0.661	=	0.684	Finland	5
6	Denmark	0.653	=	0.676	Denmark	6
7	Canada	0.641	=	0.665	Canada	7
8	France	0.630	=	0.648	France	8
9	Ireland	0.620	-1	0.633	New Zealand	9
10	New Zealand	0.609	1	0.622	Ireland	10
11	USA	0.554	-6	0.581	Germany	11
12	Australia	0.553	=	0.576	Australia	12
13	Brazil	0.546	-2	0.558	Benelux	13
14	UK	0.531	=	0.547	UK	14
15	RoEurope	0.529	-1	0.544	Brazil	15
16	Germany	0.525	5	0.537	RoEurope	16
17	Portugal	0.522	-2	0.534	USA	17
18	RoLA	0.512	=	0.526	RoLA	18
19	Spain	0.497	-2	0.526	Portugal	19
20	Benelux	0.495	7	0.514	RoEU	20
21	Russia	0.493	-5	0.500	Spain	21
22	RoEU	0.493	2	0.499	Italy	22
23	Mexico	0.492	-2	0.493	Korea	23
24	Korea	0.477	1	0.493	Japan	24
25	Italy	0.472	3	0.483	Mexico	25
26	Japan	0.456	2	0.481	Russia	26
27	Turkey	0.453	=	0.476	Turkey	27
28	MiddleEast	0.450	=	0.465	Middle East	28
29	Poland	0.430	=	0.437	Poland	29
30	SouthAfrica	0.426	=	0.429	SouthAfrica	30
31	Greece	0.399	=	0.426	Greece	31
32	RoAfrica	0.398	=	0.401	RoAfrica	32
33	RoWorld	0.385	=	0.390	RoWorld	33
34	SEastAsia	0.368	=	0.364	SEastAsia	34
35	RoFSU	0.367	=	0.356	RoFSU	35
36	NorthAfrica	0.342	=	0.342	NorthAfrica	36
37	RoAsia	0.325	=	0.339	RoAsia	37
38	Indonesia	0.299	-1	0.323	China	38
39	China	0.287	1	0.321	Indonesia	39
40	India	0.240	=	0.291	India	40

The EU27 presents a general increase in the economic pillar and improvements in the environmental pillar. These two components explain the positive evolution of overall sustainability, even if the social pillar shows either a smaller increase or a decline.

EU 27 – Percentage variation 2011-2020

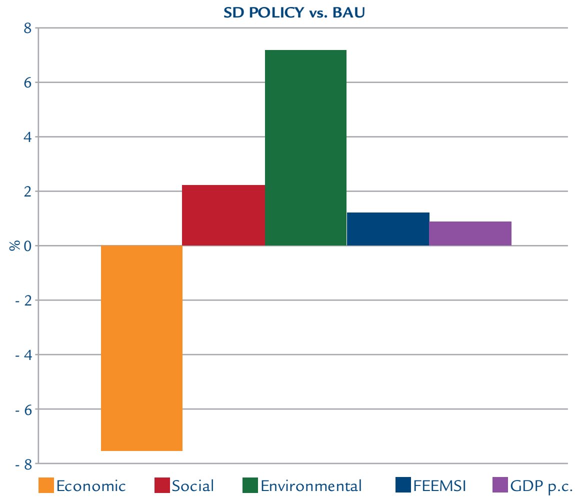


Policy scenarios

Three different policy scenarios aimed to improve the overall sustainability over time are compared with the Business-As-Usual scenario. A "Social Policy" and an "Environmental Policy" have been separately evaluated. An additional scenario, based on a multi-faced policy called "Sustainable Development Policy" ("SD Policy"), includes actions on all sustainability dimensions. The following graphs present the effects of each policy on World sustainability dimensions, overall FEEM SI performance, and GDP per capita in 2020.

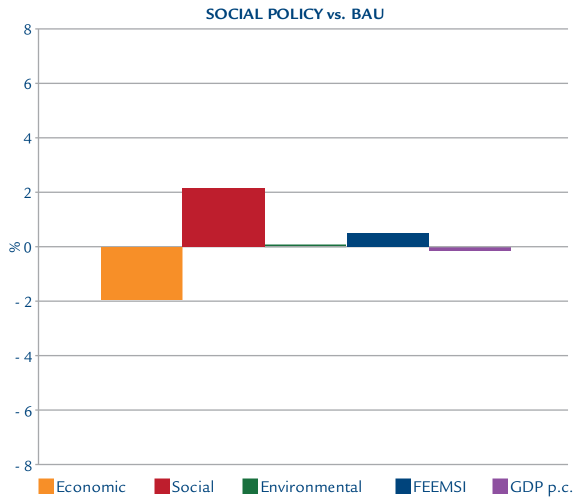
SD Policy

- Subsidies on R&D in Advanced Economies and technological transfer in agriculture and industrial sectors in Least Developed Countries (LDC)
- Subsidies on Education in LDC (MDG targets)
- Subsidies on Public Health in LDC (MDG targets)
- Climate Policy (Cancún high pledges and coordinated action)
- Increased water use efficiency in agriculture and industrial sectors in all countries



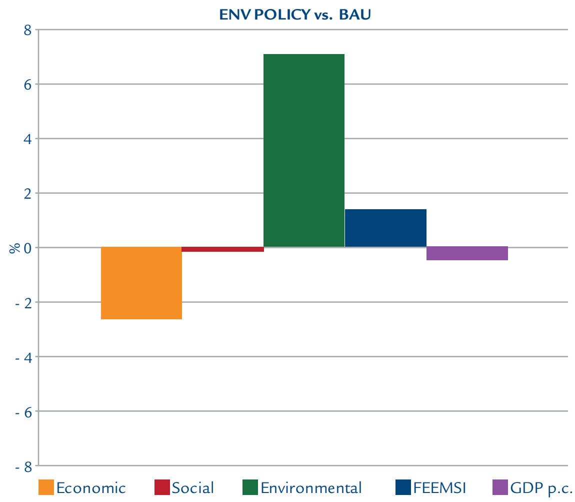
Social Policy

- Subsidies on Education in LDC (MDG targets)
- Subsidies on Public Health in LDC (MDG targets)



Envinronmental Policy

- Climate Policy (Cancún high pledges and coordinated action)
- Increased water use efficiency increased in agriculture and industrial sectors in all countries

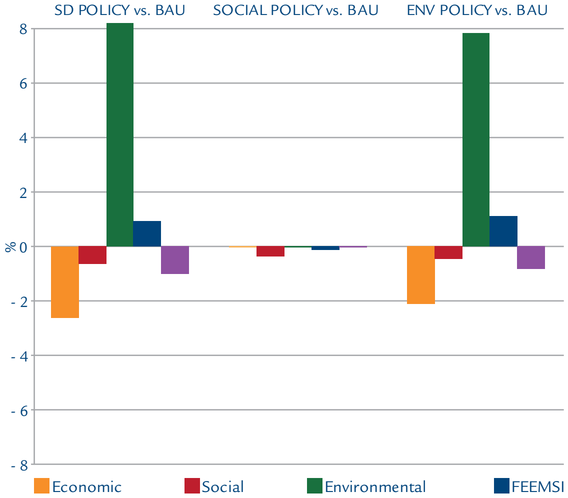


Even though the SD Policy negatively affects the economic sustainability, it appears to be an effective intervention at the global level. The mutual and consistent improvement in the social and environmental pillars boosts overall sustainability. This progress goes along with a relatively small variation in World GDP per capita.

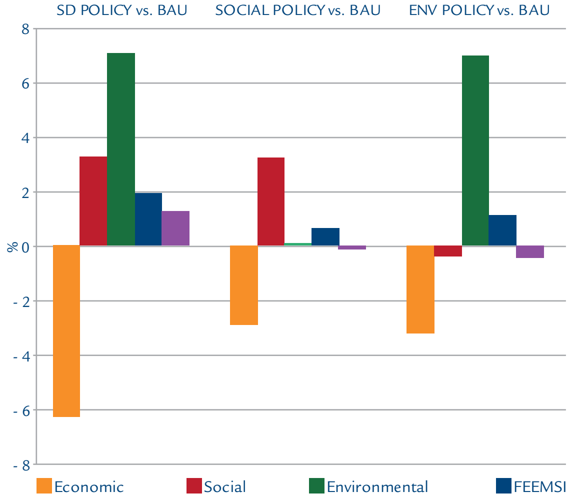
Macro-Regions: an overview

A focus on some Macro-Regions in 2020 shows heterogeneous effects of each policy on sustainability dimensions. In the EU27, Environmental and SD Policies improve overall sustainability, given the significant contribution to the environmental pillar. For the aggregate “Rest of the World”, all policies are effective; in particular, the SD Policy allows achieving a leap forward in the sustainable path, acting on both environmental and social pillars.

EU 27

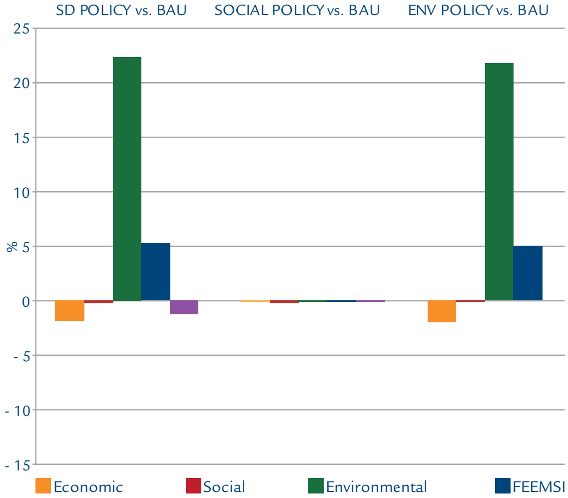


Rest of the World

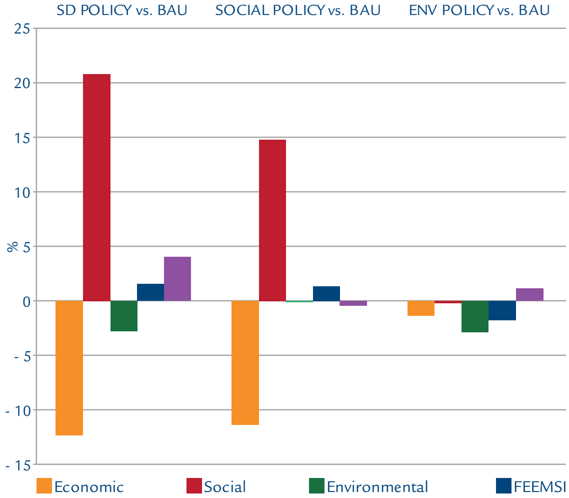


The diverse effects induced by sustainability policies are even clearer when comparing Developed and the Least Developed Countries. Developed Countries largely benefit from the Environmental Policy, which leads to a marked increase in overall sustainability in spite of a slight decline in economic performance. On the other hand, the Least Developed Countries proceed towards sustainability supported by the Millennium Development Goals stimulus; the social pillar improvement determines the overall positive performance, more than offsetting the reduced economic sustainability.

Developed Countries



Least Developed Countries



Team

Project coordinator

Carlo Carraro

Team leader

Silvio Giove

Research team

Francesco Bosello
Lorenza Campagnolo
Caterina Cruciani
Fabio Eboli
Elisa Lanzi
Ramiro Parrado
Roberta Pierfederici
Mehmet Pinar
Elisa Portale

www.feemsi.org

Fondazione Eni Enrico Mattei

Milan
Palazzo delle Stelline
Corso Magenta 63
20123 Milan, Italy
Phone: +39 02.520.36934
Fax: +39 02.520.36946
letter@feem.it

Venice
Isola di San Giorgio Maggiore 8
30124 Venice, Italy
Phone: +39 041.270.0411
Fax: +39 041.270.0412
venezia@feem.it

Viggiano
Via del Convento 16
85059 Viggiano (PZ), Italy
Phone: +39 0975.350.729
Fax: +39 0975.350.729
viggiano@feem.it

Printed on tree-free paper made from renewable annual crops and fully recyclable

www.feem.it