BRINGING EUROPE AND THIRD COUNTRIES CLOSER TOGETHER THROUGH RENEWABLE ENERGIES

Socio-economic and environmental impact assessment

CIEMAT - JOANNEUM

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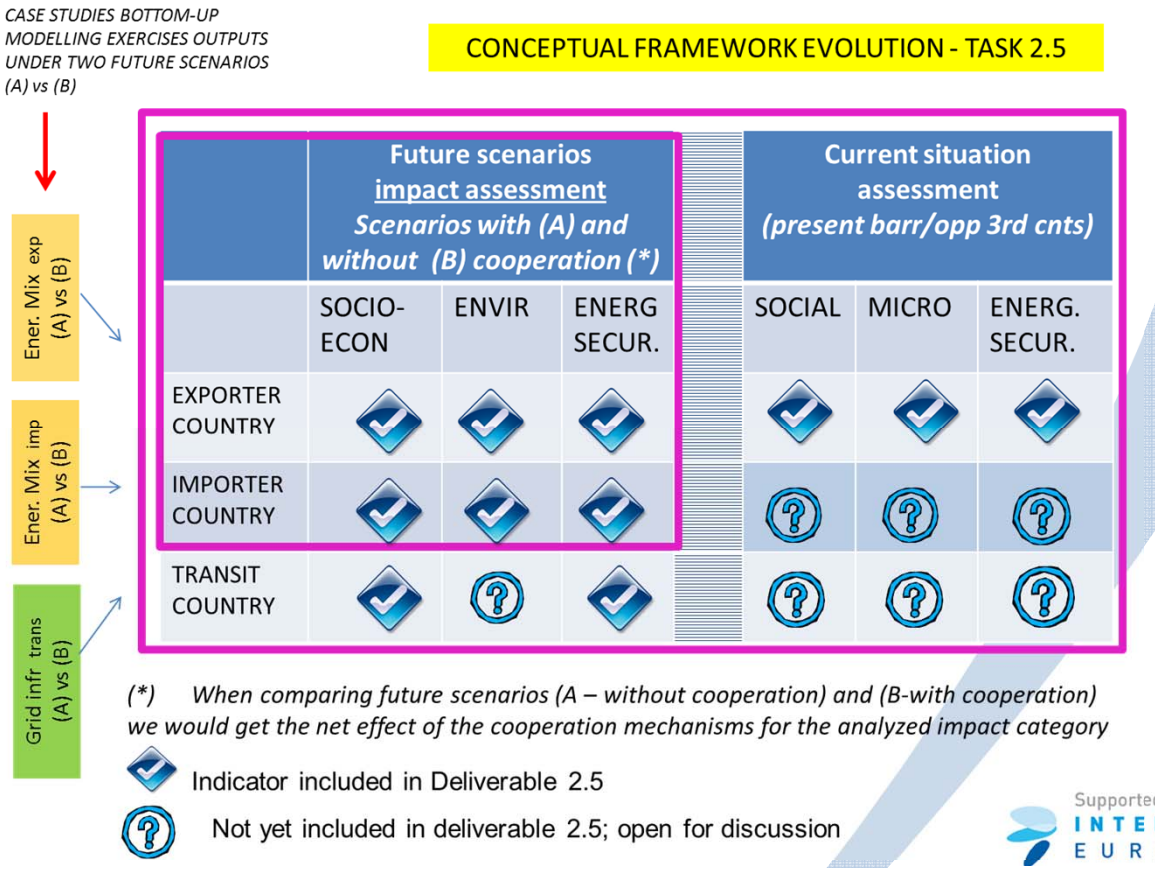
1- What´s the purpose and fit within the project?

According to the Grant Agreement…

- 3.2.6/4.2.6/5.2.6 – Environmental and Socio-economic impact assessment
- *"…based on the RS-PATHWAY deflined in subtask 3.2.5/4.2.5/5.2.5, environmental and socio-economic impact assessment will be conducted in order to estimate the net effect associated to the implmentation of cooperation mechanisms in the region…"*

How does it relate to D 2.5?



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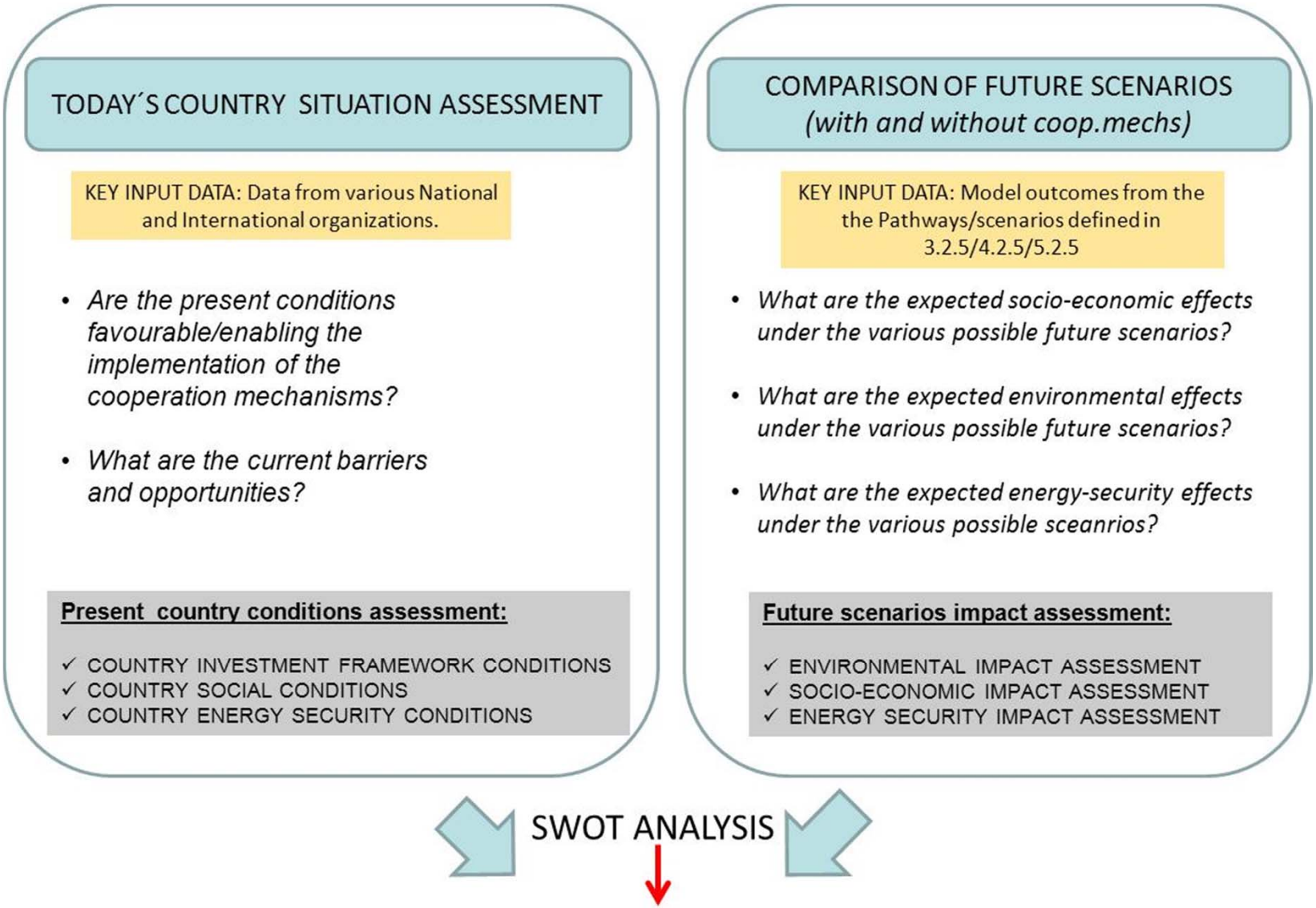
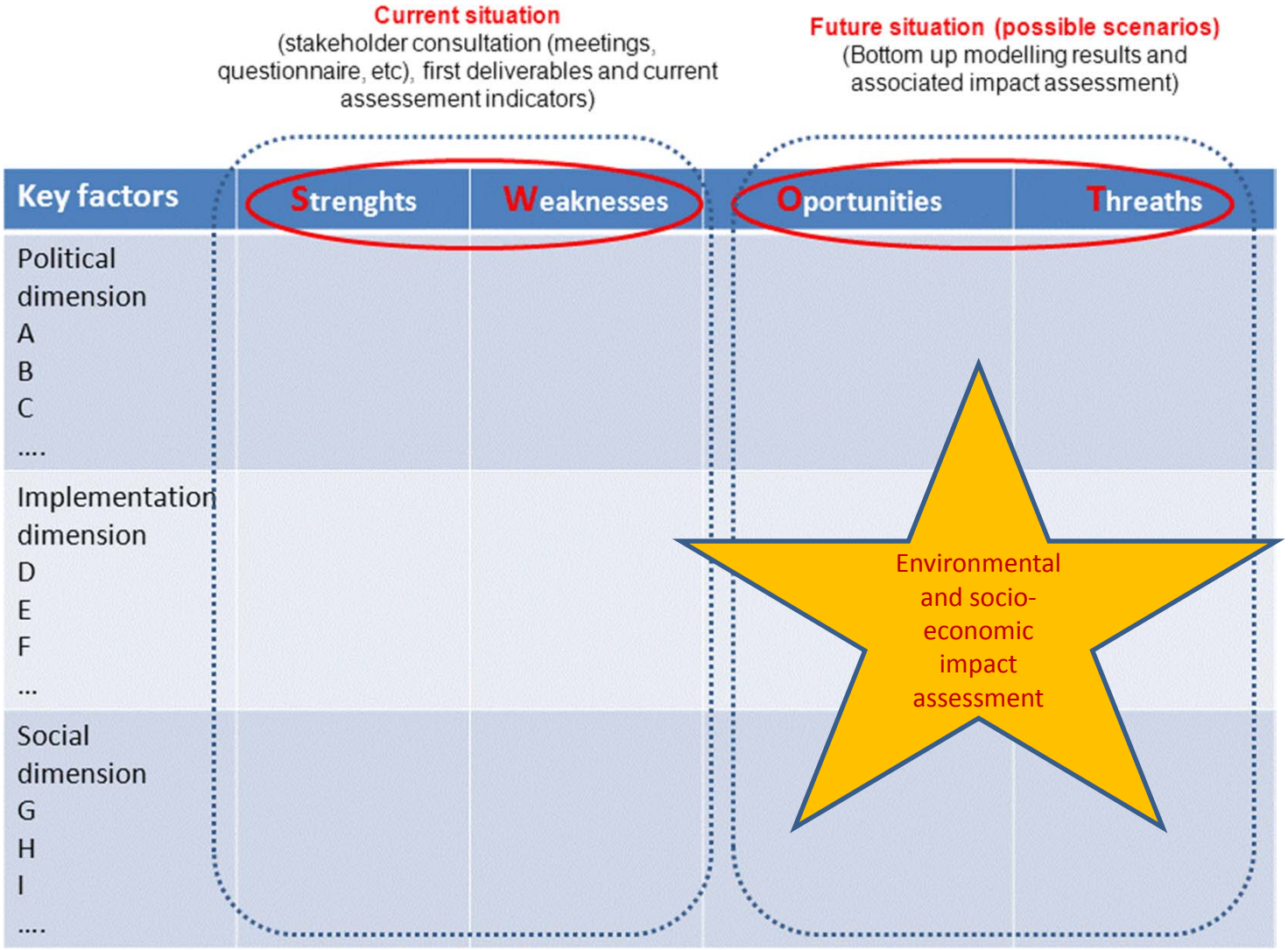

TODAY´S COUNTRY SITUATION ASSESSMENT
KEY INPUT DATA: Data from various National and International organizations.
• Are the present conditions favourable/enabling the implementation of the cooperation mechanisms?
• What are the current barriers and opportunities?
Present country conditions assessment:
✓ COUNTRY INVESTMENT FRAMEWORK CONDITIONS
✓ COUNTRY SOCIAL CONDITIONS
✓ COUNTRY ENERGY SECURITY CONDITIONS
COMPARISON OF FUTURE SCENARIOS (with and without coop.mechs)
KEY INPUT DATA: Model outcomes from the the Pathways/scenarios defined in 3.2.5/4.2.5/5.2.5
• What are the expected socio-economic effects under the various possible future scenarios?
• What are the expected environmental effects under the various possible future scenarios?
• What are the expected energy-security effects under the various possible sceanrios?
Future scenarios impact assessment:
✓ ENVIRONMENTAL IMPACT ASSESSMENT
✓ SOCIO-ECONOMIC IMPACT ASSESSMENT
✓ ENERGY SECURITY IMPACT ASSESSMENT
SWOT ANALYSIS
POLICY RECOMMENDATIONS: What are the required accompanying measures (if needed) required to enable a mutually beneficial outcome from the use of the cooperation mechanisms?

SWOT ANALYSIS

Assessment of the current situation as conducive to implement RES projects under Coop. Mechs.

Internal: Factors within the existing situation
External: Factors with the possibility to change the current situation



2- What are we going to consider?

- **Outcomes from the bottom-up modelling exercises where we have 2 or 3 scenarios** *(i.e: BAU, National RES targets, RES Cooperation/Exports)*
  - (Green-X and Hireps, and outcomes from DLR modelling exercises)
- **Qualitative information which will complement the indicators such as:**

  - Socio-economic: Local content policies and other industrial policies
  - Environmental: Society´s environmental concerns to prioritize
  - Macro-economic indicators and experts opinions (FDI, Trade Balance, etc)

- **Quantitative indicators** (as described in D 2.5 – see next slides)
  - Data bases: Eco-Invent, Gemis, EuroObsrv-Er, WIOT project, other…

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PROPOSED INDICATORS TO ASSESS FUTURE SCENARIOS (IMPACT ASSESSMENT)

CATEGORY	INDICATOR	DESCRIPTION and RELEVANCE	REQUIRED DATA	SOURCES OF INFORMATION
SOCIO-ECONOMIC	**Direct expenditures associated to RES deployment**	Captures the direct economic activity (Capex & Opex)	-RES Projects related expenditures. -Share of expenditures incurred in third countries under any analysed scenario	-Green-X and Hireps model expenditures data and activity data -Stakeholder and Industry information regarding the local content of the value chain.
	Total (direct and indirect) economic activity associated to RES deployment (*)	*Captures the total economic activity (direct and indirect).*	*- RES Project related expenditures associated to the use of the cooperation mechanisms.* *-Share of expenditures incurred in third countries.* *-Multiplier effect associated to the different RES technologies.*	*-Green-X and Hireps model expenditures data under the various analysed scenarios.* *-Stakeholder information regarding the local content of the value chain.* *-RES Multiplier Effects reference values from the literature.*
	Direct job creation ***Indirect job creation (*)***	Estimate of the new jobs created within the RES sector. Desirable for countries´ governments and civil society.	-RES Project related expenditures. -RES activity (MW and MWh) -Share of expenditures incurred in third countries along the value chain. -Direct employment figures along the RES value chain.	-Green-X and Hireps model expenditures data and activity data under the various analysed scenarios. -Stakeholder information regarding the local content of the value chain. -Stakeholder information regarding the local content of the value chain. -Direct Employment factors from the literature
	Effects on the balance of trade	Estimate of the potential effects on the balance of trade due to additional revenues from electricity exports or/and fossil fuel imports savings. Desirable for countries´ governments	-Energy mix under various scenarios. -Future expected fossil fuel prices.	-Green-X and Hireps model expenditures data and activity data under the various analysed scenarios. -Expected future fossil fuel energy prices from literature (IEA, World Bank, IMF, etc) -Information about the current balance of trade situation as well as other macro-economic variables (National Sources).
	RES support expenditures	Estimation of the required system costs	-Support expenditure needed to compensate for the higher RES generation costs	-Green X
	Foreign Direct investments(*)	*Captures the foreign direct investment flows to third countries due to cooperation mechanisms*	*-RES Project related expenditures (€).* *-Potential future supply of domestic banking markets and investors.* *-Investment/Ownership partnerships.*	*- Green-X and Hireps model expenditures data and activity data under the various analysed scenarios.* *- Qualitative information from stakeholders (national and international financing institutions, investors, etc).*

** Depending on data availability*

SOCIO-ECONOMIC IMPACT ASSESSMENT - INDICATORS

Indicator	REQUIRED DATA	
Direct expenditures associated to RES deployment (Capex&Opex)	Model outcomes	
Total (direct and indirect) economic activity associated to RES deployment * Increase in GDP	Model outcomes Capex+Opex Multiplier effects % Local content	
Direct job creation (and indirect job creation *)	Model outcomes Direct empl figures % local content Employment factors	
Effects on the balance of trade	Account for changes in the B.T due to changes in (itechnology imports (i) fossil fuel imports, (ii) additional revenue from RES exports	
RES support expenditures	From the Green-X model	What about NA?
Foreign direct investments (*)	Capex data Historical FDI figures Experts opinions	

Scenarios	S1 - Low	S2 - High	S3 - Moderate
Share of domestic component in production [%]	10	90	50
Share of domestic component in production [%]	20	90	60
Share of domestic component in production [%]	40	100	80

	PROPOSED INDICATORS TO ASSESS FUTURE SCENARIOS (IMPACT ASSESSMENT)			
	INDICATOR	DESCRIPTION and RELEVANCE	REQUIRED DATA	SOURCES OF INFORMATION
ENVIRONMENTAL	**Kg CO_2 equivalent**	Captures the potential effects on **climate change**. Relevant to assess the impact on CO_2 reduction commitments	-Electricity mix under any analysed scenario - Specific emission factors	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby and Ecoinvent)
	CTU h	Captures the potential effects on **Human toxicity** - Relevant to measure other potential local environmental impacts	-Electricity mix under any analysed scenario Phases of the energy technologies life cycles Pollutant inventories in the different phases of the energy technologies life cycle	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby and Ecoinvent)
	Kg PM 2.5 equivalent	Captures the potential effects in **Particulate matter** - Relevant for local environmental impacts	- Electricity mix under any analysed scenario - Phases of the energy technologies life cycles that take place - Pollutant inventories in the different phases of the energy technologies life cycle	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby and Ecoinvent)
	Molc H+ equivalent	Captures the potential effects on **Acidification** - Relevant for local environmental impacts	- Electricity mix under any analysed scenario -Phases of the energy technologies life cycles -Pollutant inventories in the different phases of the energy technologies life cycle	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby and Ecoinvent)
	Kg P equivalent	Captures the potential effects on **Eutrophication** - Relevant to measure other potential local environmental impacts	- Electricity mix under any analysed scenario -Phases of the energy technologies life cycles -Pollutant inventories in the different phases of the energy technologies life cycle	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby and Ecoinvent)
	Kg C deficit	Captures the potential effects on **Land use** - New renewable project might affect the soil quality	- Electricity mix under any analysed scenario - Phases of the energy technologies life cycles - Land use effects of the different phases of the energy technologies life cycle	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby and Ecoinvent)
	m^3 water consumption	Captures the potential effects on **Water resource depletion** - Whenever there is a regional/national problem related to water scarcity	- Electricity mix under any analysed scenario -Phases of the energy technologies life cycles -Water consumption of the different phases of the energy technologies life cycle	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby and Ecoinvent)
	Kg SB eq.	Captures the potential effects on **Resource depletio**n - Countries want to avoid overexploitation of national resources	- Electricity mix under any analysed scenario - Phases of the energy technologies life cycles - Resource use of the different phases of the energy technologies life cycle	-Green-X and Hireps model results regarding energy shares -Scientific life cycle related databases (Gaby & Ecoinvent)

2- Impact assessment team and distribution of work for the environmental and socio-economic impact assessment

TEAM: CIEMAT, JOANNEUM, UNDP

NORTH AFRICA: CIEMAT, UNDP

WESTERN BALKANS: JR, UNDP

TURKEY: CIEMAT, JR, UNDP

1) Agree on framework, assumptions, databases, etc…to be able to compare
2) Share knowledge and data
3)

END

PRIORITIZATION OF ENVIRONMENTAL IMPACT CATEGORIES BY TECHNOLOGY

	CSP	Wind	Hydro	Biomass
Climate change	I	I	I	I
Cumulative Energy Demand	I	I	I	I
Human toxicity	II	II	II	I
Particulate matter	II	II	II	I
Acidification	II	II	II	I[a]
Eutrophication	II	II	II	I[a]
Land Use	I	I	I	I
Water Resource Depletaion	I	II	II	II
Resource depletion	I	I	II	II

a- relevant for energy crops

(I) High relevance: The indicator will be included in the analysis.
(II) Medium relevance: The indicator should be included in the analysis if possible.

PRIORITIZATION OF ENVIRONMENTAL IMPACT CATEGORIES BY REGION/COUNTRY

	NORTH AFRICA	WEST BALKANS	TURKEY
Climate change			
Cumulative Energy Demand			
Human toxicity			
Particulate matter			
Acidification			
Eutrophication			
Land Use			
Water Resource Depletaion			
Resource depletion			

Stakeholder consultation

FINAL CHOICE OF ENVIRONMENTAL IMPACT CATEGORIES AND INDICATORS

PROPOSED INDICATORS TO ASSESS FUTURE SCENARIOS (IMPACT ASSESSMENT)

	INDICATOR	INTENDED USE and RELEVANCE	REQUIRED DATA	SOURCES OF INFORMATION
ENERGY SECURITY IN EUROPE	**Import capacity vs. European/import country available back-up generation**	-Assess the vulnerability to import disruptions. Describes how likely Europe/importing country is vulnerable to coercion, or if it is likely to be able to restore system after disruption	-Import capacity -European available back-up generation	-Import capacity from Hireps model -Energy System National data -Stakeholder consultation and international reports
	Lost exporter revenues (disruption times electricity price times disruption duration) divided by exporter GDP	Describes the credibility of a threat: if costs are high to the exporter, it is less likely to pursue sanctions	-Estimated possible disruptions (export capacity at peak) -Estimated future electricity price -Estimated future GDP export. co	-Stakeholder/expert consultation -Electricity prices from the Hireps -Literature -IEA World Energy Outlook reports
	Number and size of import points relative to import country´s/European peakload	Assess the European vulnerability to critical infrastructure failure	-Number of import points in Europe -Size of import points in Europe	-Hireps model -Related literature
	-Diversity of fuels in power sector & -Diversity of suppliers for electricity/fuels for electricity	Assess the European vulnerability to yet unknown threats	-European electricity energy mix (fuels) -European imports countries mix (number of countries exporting electricity to Europe)	-Hireps model
	Share of intermittent generation in European/import country´s power mix (relative to peakload)	Assess the intermittency risks	-European electricity mix -Share of intermittent generation within the European energy mix	-Hireps model
ENERGY SECURITY 3rd COUNTRIES	**Number and size of power stations larger than 100 MW**	Assessment of risk of infrastructure (power station) failure	-Number of power stations larger than 100 MW in the exporter country	-Hi reps model -Related literature -Stakeholders/experts consultation
	Lost exporter revenues (exports times electricity price times disruption duration) divided by exporter GDP	Assessment of embargo vulnerability (export dependence)	-Estimated possible disruptions (export capacity at peak) -Estimated future electricity price -Estimated future GDP export. country	-Hireps model outputs -Stakeholder/experts consultation -National various sources (to get a value for the future estimated GDP).
	Diversity of exported fuels & diversity of import countries	Assess the Third countries vulnerability to yet unknown threats	-Third countries´ exports mix (fuels) -Third countries´ exports portfolio (number of countries importing electricity from that third country)	-Hireps model (exports/imports data from the model in terms of fuels and countries)
	Interconnectors to Europe and/or to North African neighbors (relative to peakload)	Assessment of difficulties to meet peakload (this capacity can be used to import power to cover domestic peaks)	-Number and size of interconnections from that third country to Europe	-Hireps model
	Export generation capacity (relative to peakload)	Assessment of difficulties to meet peakload (this capacity can be used to cover domestic peaks)	-Third country export generation capacity. -Third country peakload	-Hireps model

Current situation
(stakeholder consultation (meetings, questionnaire, etc), first deliverables and current assessement indicators)

Future situation (possible scenarios)
(Bottom up modelling results and associated impact assessment)

Key factors	Strenghts	Weaknesses	Oportunities	Threaths
Political dimension A B C ….				
Implementation dimension D E F …				
Social dimension G H I ….				

PROPOSED INDICATORS TO ASSESS CURRENT SITUATION IN THIRD COUNTRIES

CATEGORY	INDICATOR	DEFINITION and RELEVANCE FOR THE COOPERATION MECHANISMS	SOURCES OF INFORMATION
INVESTMENT FRAMEWORK / COUNTRY RISK PROFILE	**OECD country risk Rating**	Captures the country credit risk profile with a Country Risk Assessment Model (CRAM) and it also includes a qualitative assessment by integrating political risk and other risk factors from OECD experts. Third countries´ risk is relevant as it may increase the financial costs.	OECD Website
	Ease of doing business rank	Captures the effect on business (especially small and medium-size domestic firms) produced by the business regulation and the protection of property rights in a country.	Doing Business Website – The world Bank Group
	Foreign equity ownership index in the electricity sector	Captures the possibility to have foreign ownership of companies in the electricity sector and also involves strong laws protecting investor interests.	Investing Across Borders Website – The World Bank Group (covering 81 countries)
SOCIAL	**Social Hotspot Database index for the energy sector**	Accounts for the existing social risk (social hotspots) in the energy sector in terms of: labour rights and decent work, health and safety, human rights and governance.This information is relevant to identify areas of social interest which deserve special attention when further deploying renewable energies. This is relevant for both third countries civil society as well as for European civil society	Social Hotspot Database Portal
	Energy development index	Accounts for the country´s human development related to several energy issues. This is relevant for NA countries as RES deployment could potentially have some relevant human development impacts.	International Energy Agency
	Rate of electricity transmission and distribution losses	Captures the quality of electrical infrastructures and networks for electrical transmission and distribution. The implementation of the cooperation mechanisms could improve this situation by driving improvements in the existing network.	World Energy Council Website-Enerdata
ENERGY SECURITY	**Energy demand growth (e.g. Last 5 years)**	Insufficient generation capacity (stress). If demand grows fast, the risk is higher that the capacity will not be sufficient	-National and international data sources.
	Ratio of demand growth (energy demand and energy infrastructure investments)	Insufficient capacity generation (stress). If demand grows fast, the risk is higher that the capacity will not be sufficient	-National and international data sources.
	Age of each techn fleet separately.	If the fleet is old, it will need to be replaced - the higher the need, the more difficult it is.	-National sources
	How much gas/oil production is used in the domestic electricity sector?	Export losses.The less of the domestic gas/oil used for power generation, the more is free for exports. A high share for domestic consumption also holds the risk that the government will reroute gas/oil from domestic to foreign markets, potentially causing shortages at home	-Stakeholders/experts consultation