WEF Experiences and Best Practices from ASEAN and East Asia

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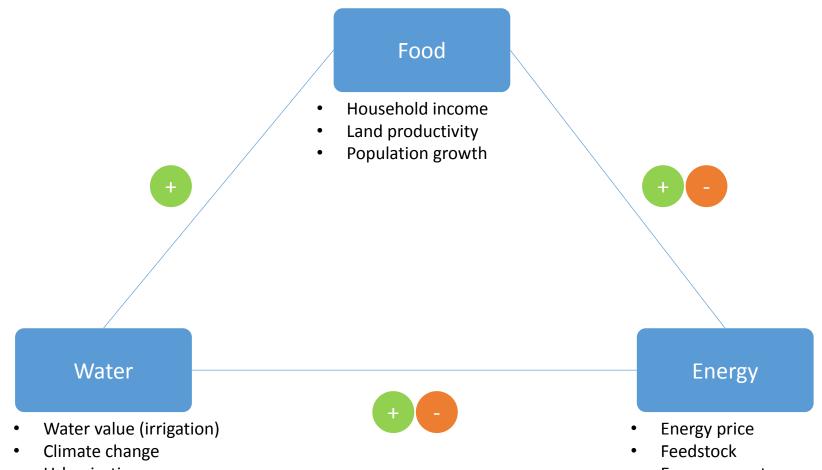


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Key Questions

- What do we know about the complex pervasive inter-connectedness of Water-Food- Energy nexus?
- Where do we see the most promising pathways and actionable items in the near future for policy considerations?
- What are the critical issues for dealing the WEF challenges through SDGs?





• Urbanization

• Energy poverty

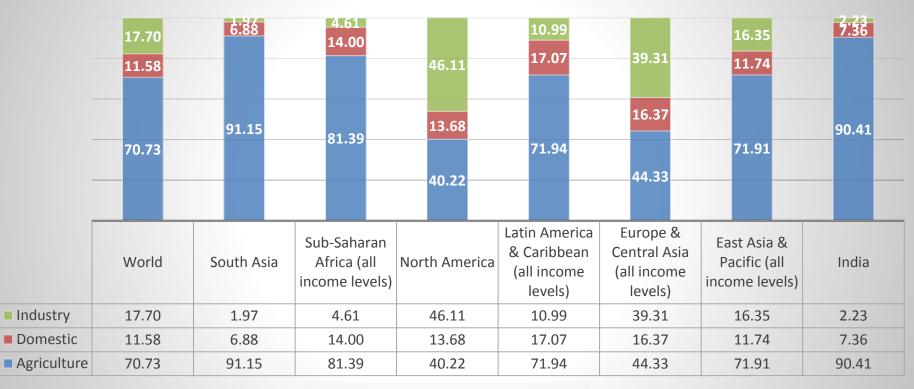
	Energy – water	Water – food	Food – energy
Economic	-	+	+
Environment	+	+	+ -
Social	+	+	+

Interdependency between Water, Energy and Food Security

Use/Production	Energy Production	Water Production	Food Production
Energy Use	LossesInternal UseEtc.	 Pumping Treatment Transportation Heating Etc. 	 Tillage Fertilizer Processing Transport Storage Etc.
Water Use	 Thermoelectric cooling Hydropower Bio-energy Extraction and mining Fuel Production (H2, ethanol, biofuels) Emission controls Etc. 	LossesInternal UseEtc.	 Irrigation Food Processing Preservation Etc.
Food and By- products	• Biofuel	Ground RechargeWater quality etc.	Self-consumptionSeedFertilizer etc.



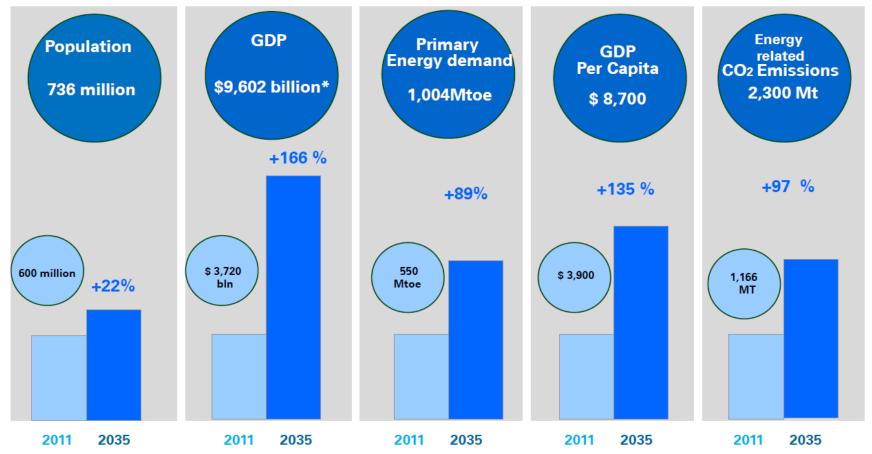
Distribution of Fresh water withdrawal across the sectors



Agriculture Domestic Industry



Present and Future Energy Use in ASEAN





Source: ERIA, 2015

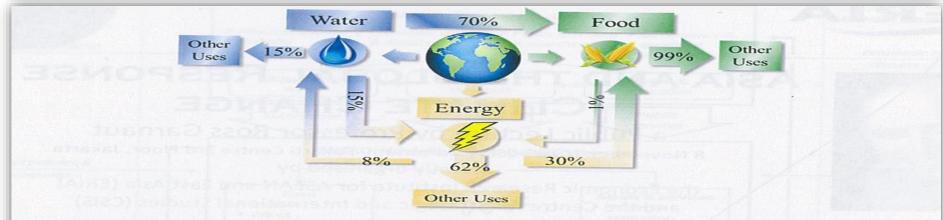
ASEAN Rice Balance Sheet in 2010 (tons)

Country	Initial stocks	Production	Domestic utilization	Imports	Exports
Brunei Darussalam	15,505	869	33,797	32,294	0
Cambodia	128,000	4,590,000	2,927,000	0	1,471,000
Indonesia	1,172,435	40,346,922	38,433,251	186,438	2,897
Lao PDR	30,169	1,820,750	1,764,642	n.a.	n.a.
Malaysia	275,899	1,585,708	2,531,159	1,094,419	n.a.
Myanmar	4,345,208	20,196,456	19,157,000	0	667,000
Philippines	2,638,287	10,737,201	13,163,706	1,638,314	159
Singapore	55,000	n.a.	262,000	280,000	33,000
Thailand	6,251,800	20,899,417	11,267,000	0	8,500,000
Viet Nam	5,680,101	25,282,075	18,327,996	0	5,950,000
ASEAN	20,592,404	125,449,39 7	107,867,55 1	3,231,465	16,624,056



Source: ASEAN Food Security Information System

A summary of the WEF Nexus in ASEAN Context



Water to produce fuels Water for electricity generation Water for heating and cooling

Energy to convey water Energy to heat and cool water Energy to treat water Water to clean water



Water for agriculture Water for food processing Water for livestock Water for cooking

Food for livestock

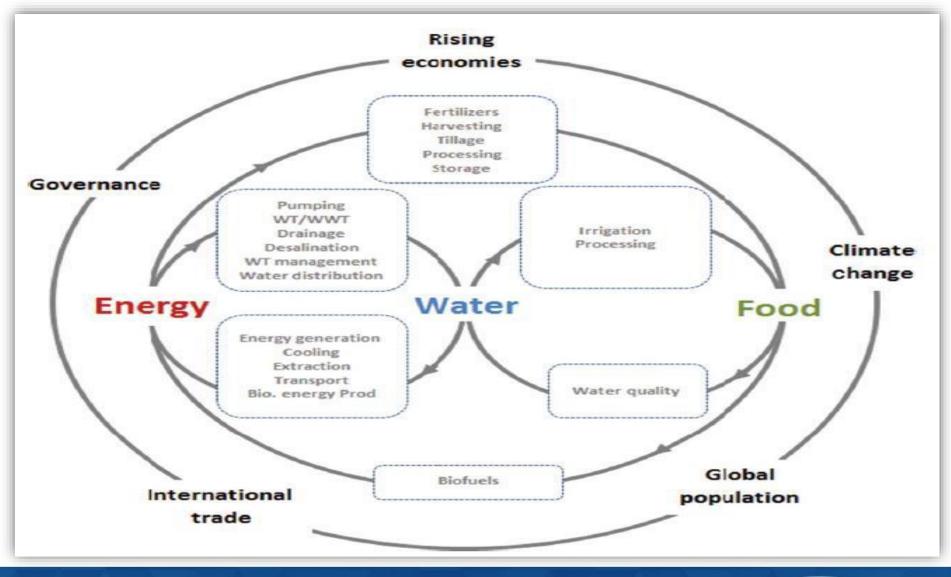
Energy conversion

Energy in fertilizers Energy for farm equipment Energy for food processing Energy for cooking

Food for biofuels



WATER-ENERGY-FOOD NEXUS WITH EFFECTING INTERNAL AND EXTERNAL PARAMETERS

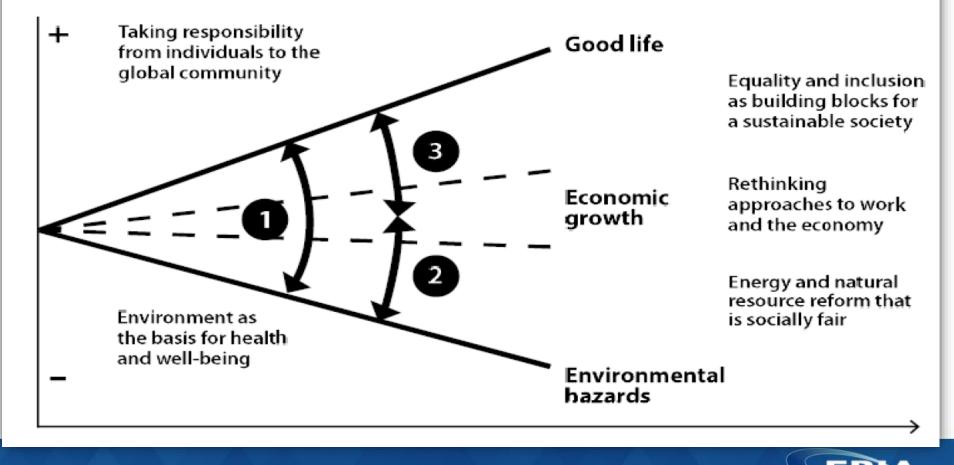




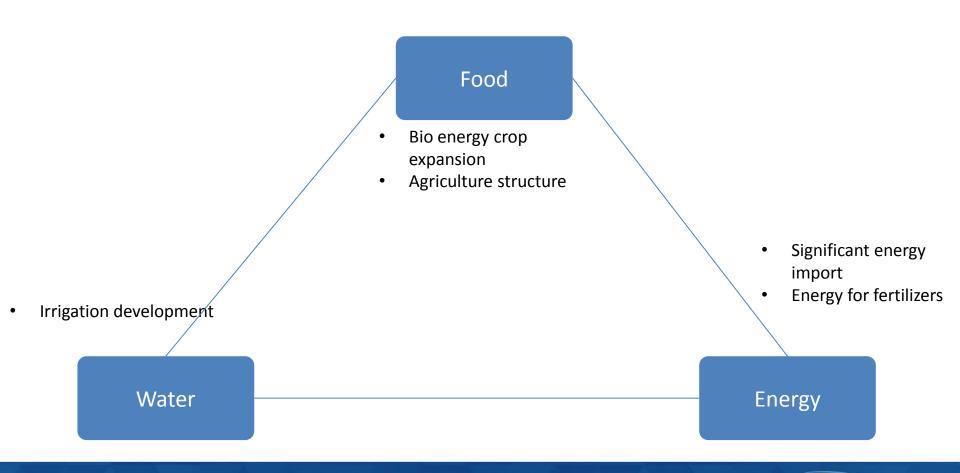
Source: Mohtar et al, 2012

Sustainable Development through WEF Nexus from ASEAN perspective

Key focus areas of sustainable development



Case 1: Key WEF nexus issues for Thailand





Opportunities to improve water, energy and food security

- Thailand's economy is growing but energy production is not sufficient to meet the domestic demand.
- In Lao PDR, the domestic need for energy is relatively low and large scale hydroelectric dams are built to generate revenue by exporting electricity to Thailand. Energy from hydropower in Lao PDR is cheap.
- It provides opportunities for Thailand to maintain a good performance in food production.



Cross-Border Power Grid Interconnection and Energy Trade

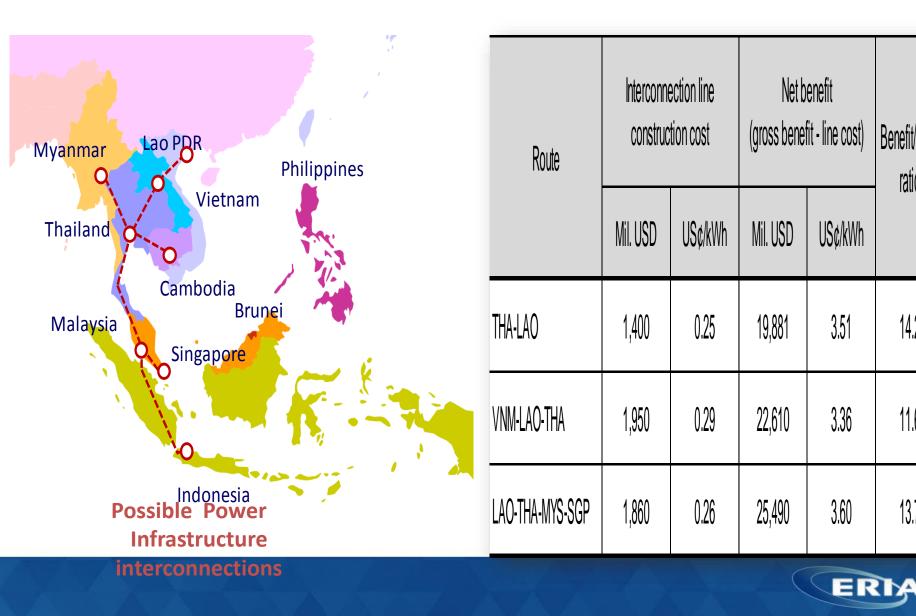
Benefit/Cost

ratio

14.2

11,6

13.7



Source: ERIA, 2013

Why Regional Power-grid Connectivity a game Changer for meeting the WEF nexus?

- Social and environmental benefits coming from economies of scale
- Locational factors that favor cross-border connectivity
- Better management of water-energy-food
- Lower electricity and food price for consumers

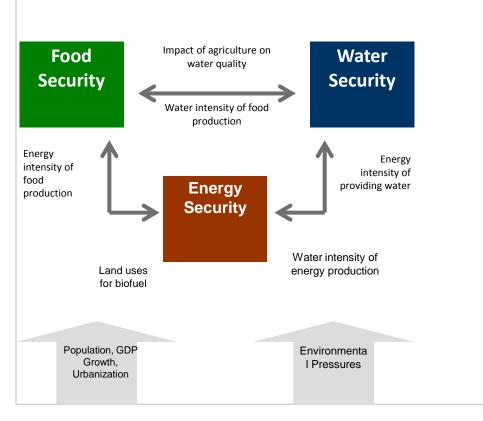


Regional Power Grid Interconnection; Close to Reality?

- Currently 11 cross border interconnections with capacity of 3,489 MW
- 10 projects with capacity of 7,192 MW ongoing and expected completion 2018/2019
- Beyond 2020, at least 17 cross border interconnections with power capacity of 25,424 MW
- Pilot: Lao-Thailand-Malaysia-Singapore



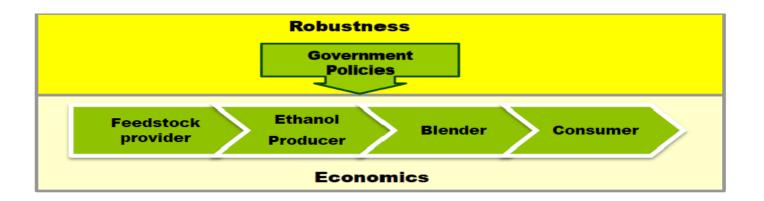
Case 2: Bio-fuel and Food Security Nexus in Indonesia

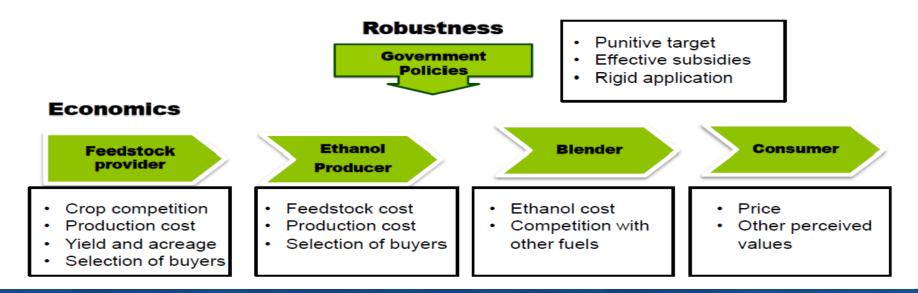


- Crop based bio-fuels are considered as most promising source of renewable and sustainable energy
- The crop based bio-fuel production has direct impact on water, energy and food security
- Clear understanding of sustainability issues could result in better agricultural practices, industrial output and improve the bottom lines.



Do-ability of Bio-fuel Production: Policies





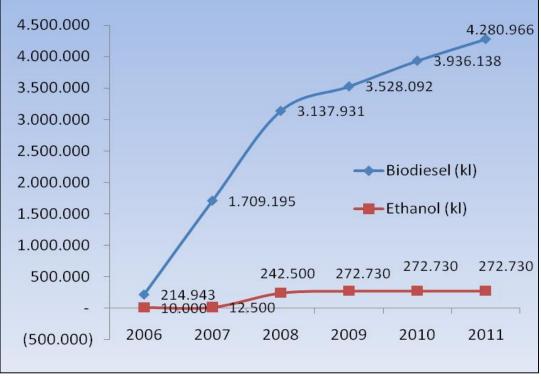


Resultant Biofuel Business Development in Indonesia

Biofuels Producers

- Biodiesel
 - -23 Producers
 - –Raw Materials: Palm Oil
- Ethanol
 - -13 Producers
 - –Raw Materials: Molasses, Cassava

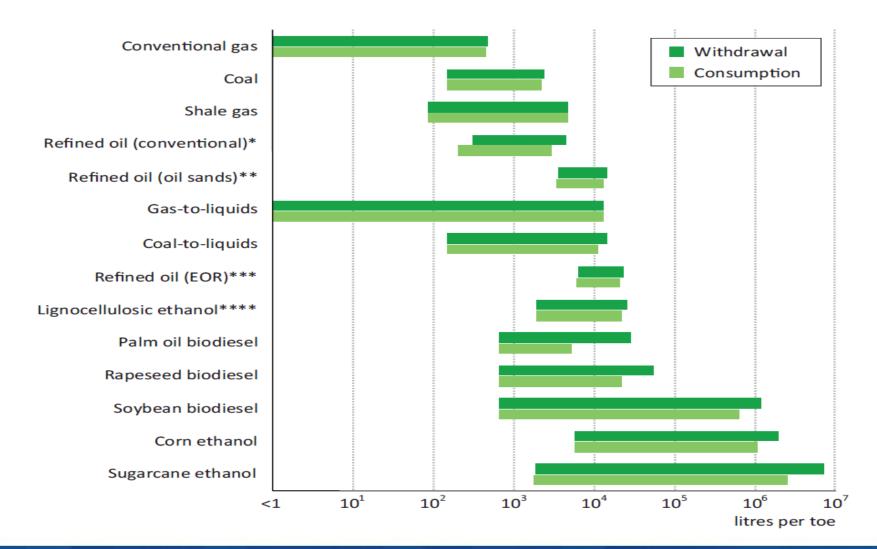
Installed Capacity (kl)



Source, APROBI,(2012)

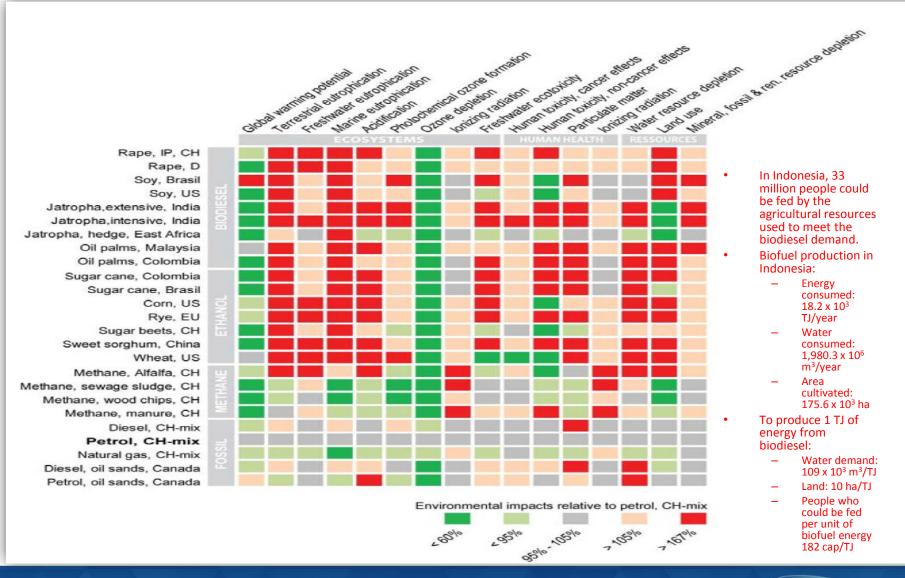


Water Use in Energy Production





Environmental Impact of Energy Production





A Technology Road Map for tackling the challenges with WEF nexus



						0 1	
		25% or more transp Supply from cost-co		Process	Bio Chemical	Thermo-ch	emical
To con	Ability to create new microbes To convert biomass into synethetic hydrocarbons Production of high Performance synthetic jet			Biofuel Type	Enzymic Hydralysis ethanol	Syngas to Fischer Tropsch ethanol	Syngas t ethanol
	fuel, gasolines, diesel fuel Custom designed 2G Biofuels d Bio refinery Tech	Bio-fuel yield (lt/dry t)	110- 300	75 -200	120 -16		
		Energy Content (MJ/I)	21.1	34.4	21.1		
com based ethanol biofuel Biofuel and biobased chemical Production from food crops				Energy yields (GJ/t)	2.3-6.3	2.6-6.9	2.5 – 3.
	io-fuels			Source: IE/	4, 2008		
201 0	202 0	203 0	Time				

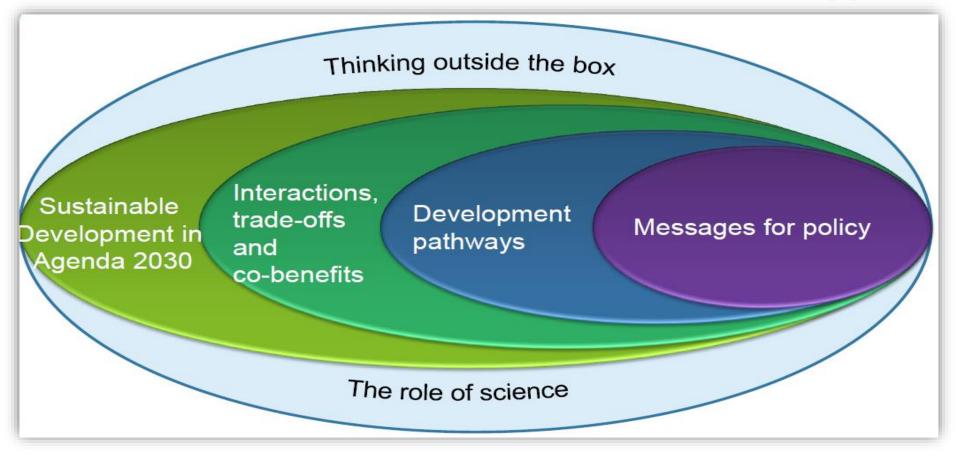


Sustainable Bio-energy Policy in Indonesia: Close to Realities?

- Accelerate successful commercialization of breakthrough biofuel technologies to facilitate the transition from the laboratory to market place
- Develop a globally competitive investment environment through improve regulatory process, streamline standards, trade and tax policy reforms, and venture capital action plans tailored to supply and demand potentials at regional level.
- Establish a strong and coordinated biomass supply chain at national and sub-regional levels
- Support investment in research and development to build foundations of a strong bio-based economy in the region.

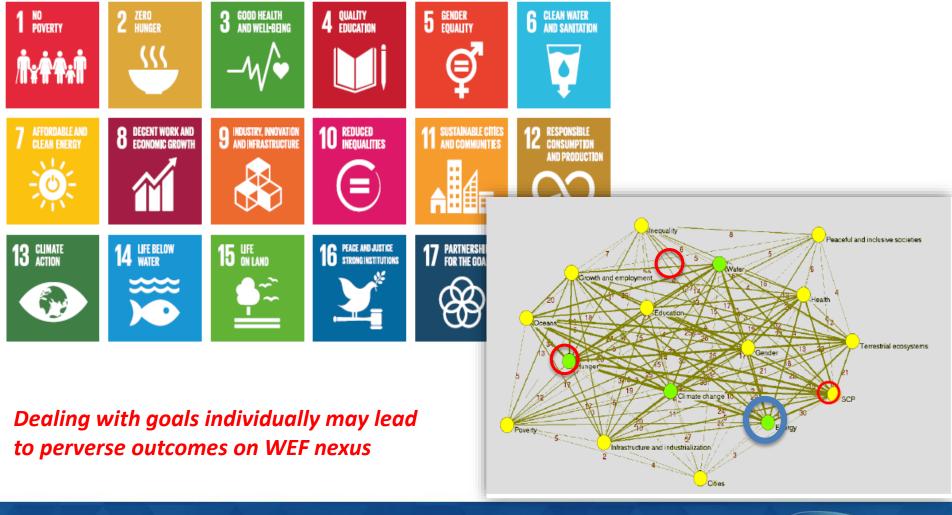


SDG and WEF nexus: Thinking outside the Box on the role of Science and Technology



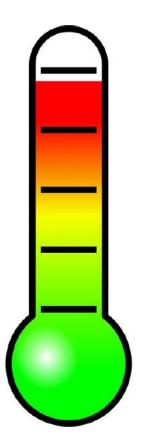


17 SDGS and Inter-connectness of WEF





The Strength of Interaction



Food security and health

Policy coherence is one of the targets of SDGs

Goal 7 and associated targets need to be integrated

Land resource use and energy infrastructure



Challenges in all Countries: How to deal with inter-linkages in practice

- Water, Energy and Food policy makers work in silos
- How to have quick and easy matchmaking with the most obvious targets?
- Much of the knowledge on interactions is to be updated.
- How to avoid the use of preconceptions?





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Map the interactions between Sustainable Development Goals

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Nilsson et al (Nature 534, 16.6.2016)



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Main consideration in applying the scale

GOALS SCORING

The influence of one Sustainable Development Goal or target on another can be summarized with this simple scale.

- Reversibility
- Bi/one directional
- Strength
- Certainty
- Timeline
- Spatial scale

Interaction	Name	Explanation	Example		
+3	Indivisible	Inextricably linked to the achievement of another goal.	Ending all forms of discrimination against women and girls is indivisible from ensuring women's full and effective participation and equal opportunities for leadership.		
+2	Reinforcing	Aids the achievement of another goal.	Providing access to electricity reinforces water-pumping and irrigation systems. Strengthening the capacity to adapt to climate-related hazards reduces losses caused by disasters.		
+1	Enabling	Creates conditions that further another goal.	Providing electricity access in rural homes enables education, because it makes it possible to do homework at night with electric lighting.		
0	Consistent	No significant positive or negative interactions.	Ensuring education for all does not interact significantly with infrastructure development or conservation of ocean ecosystems.		
-1	Constraining	Limits options on another goal.	Improved water efficiency can constrain agricultural irrigation. Reducing climate change can constrain the options for energy access.		
-2	Counteracting	Clashes with another goal.	Boosting consumption for growth can counteract waste reduction and climate mitigation.		
-3	Cancelling	Makes it impossible to reach another goal.	Fully ensuring public transparency and democratic accountability cannot be combined with national-security goals. Full protection of natural reserves excludes public access for recreation.		



Is the interaction among SDGs reversible or not?

Potentially reversible

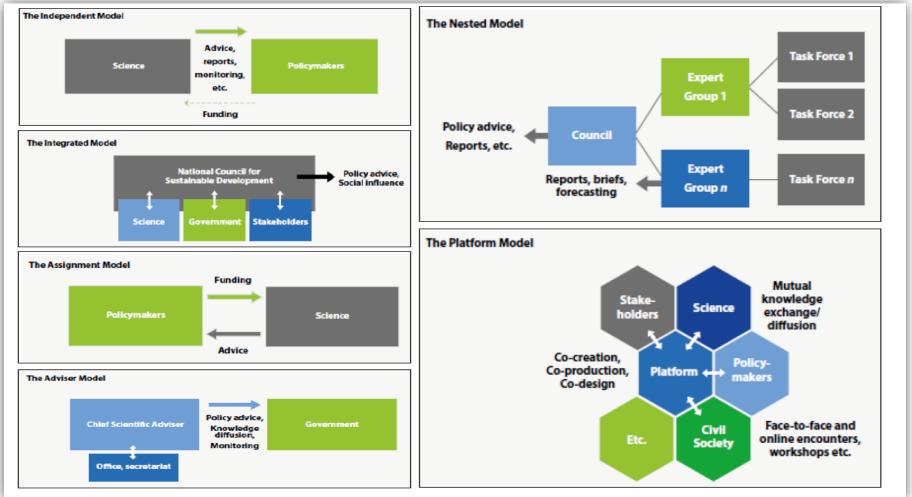
 Converting land use from agriculture to biofuel production (goal 7) counteracting food security (goal 2) and Poverty reduction (goal 1).

Potentially irreversible

 Lack of action on climate change (goal 13) and clean water and sanitation (goal 6)



How certain or uncertain are the interactions : We need new STP Interface Models on WEF





Moving Foreword

- Guidance on the state of WEF nexus
- Provide successful lessons learned, while focusing on challenges, address and emerging issues and highlight the actions to be completed, from a S&T perspective
- An integrated STP approach on SDGs to examine policy options
- with a view of to sustaining the balance between SDGs 7, 6, 2 and 13

