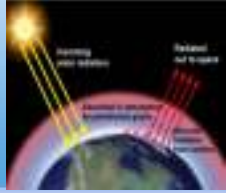


Application of IAEA's Energy Tools in Capacity Building and GHG Mitigation Analysis

Dr. A. Hainoun
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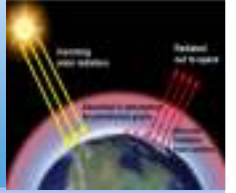


Topics



- **IAEA's Energy Planning Tools: capacity building and application;**
- **Energy Planning Studies: selected cases**
- **GHG Emissions and Mitigation Strategies;**
- **Conclusions.**





Energy planning in Syria

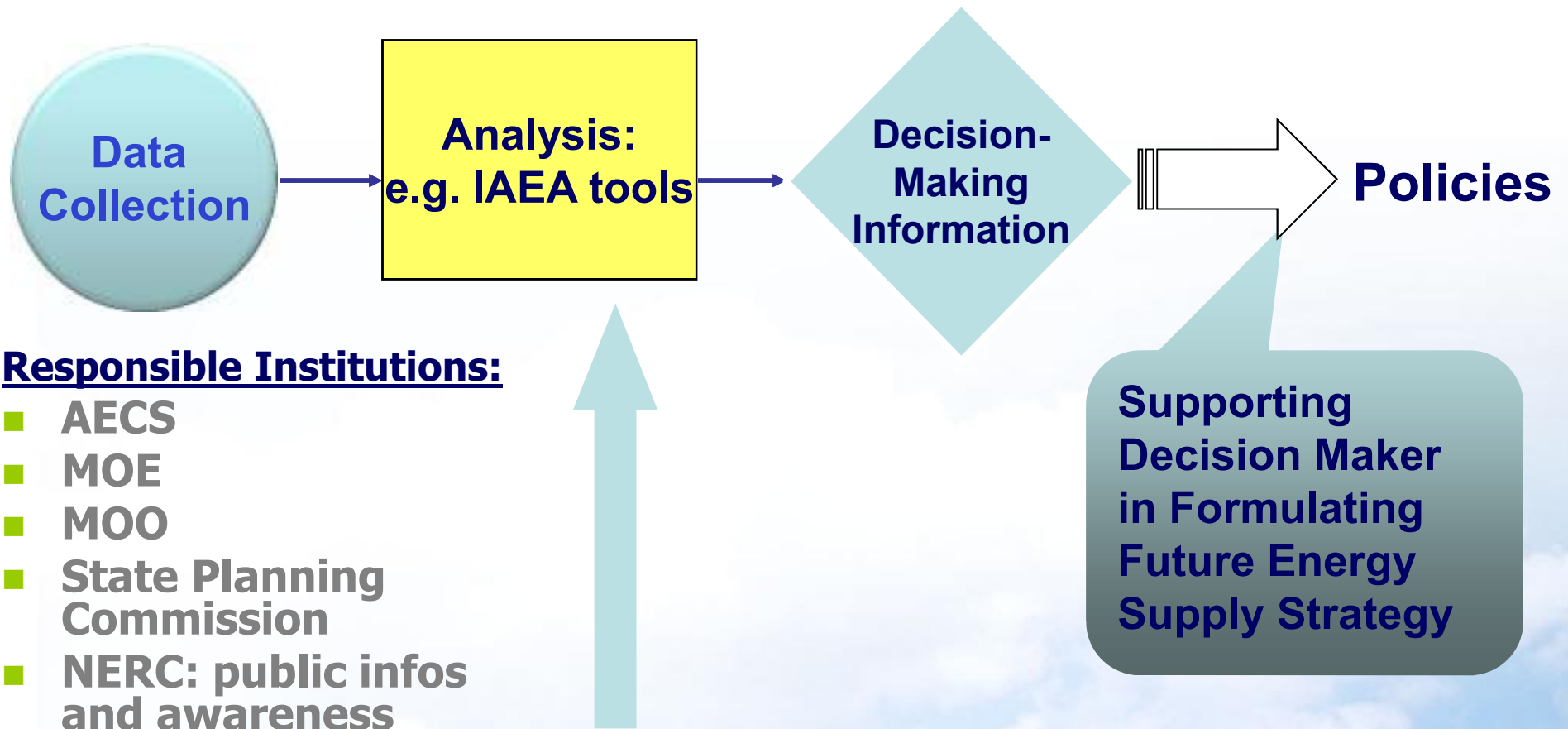
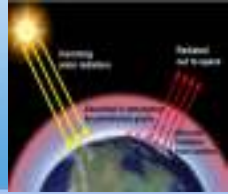
a systematic approach providing comprehensive energy system analysis



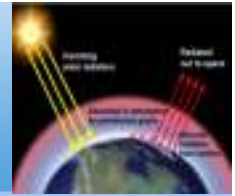
**Identification of optimal energy supply
strategy with respect to sustainable
development and climate change mitigation**



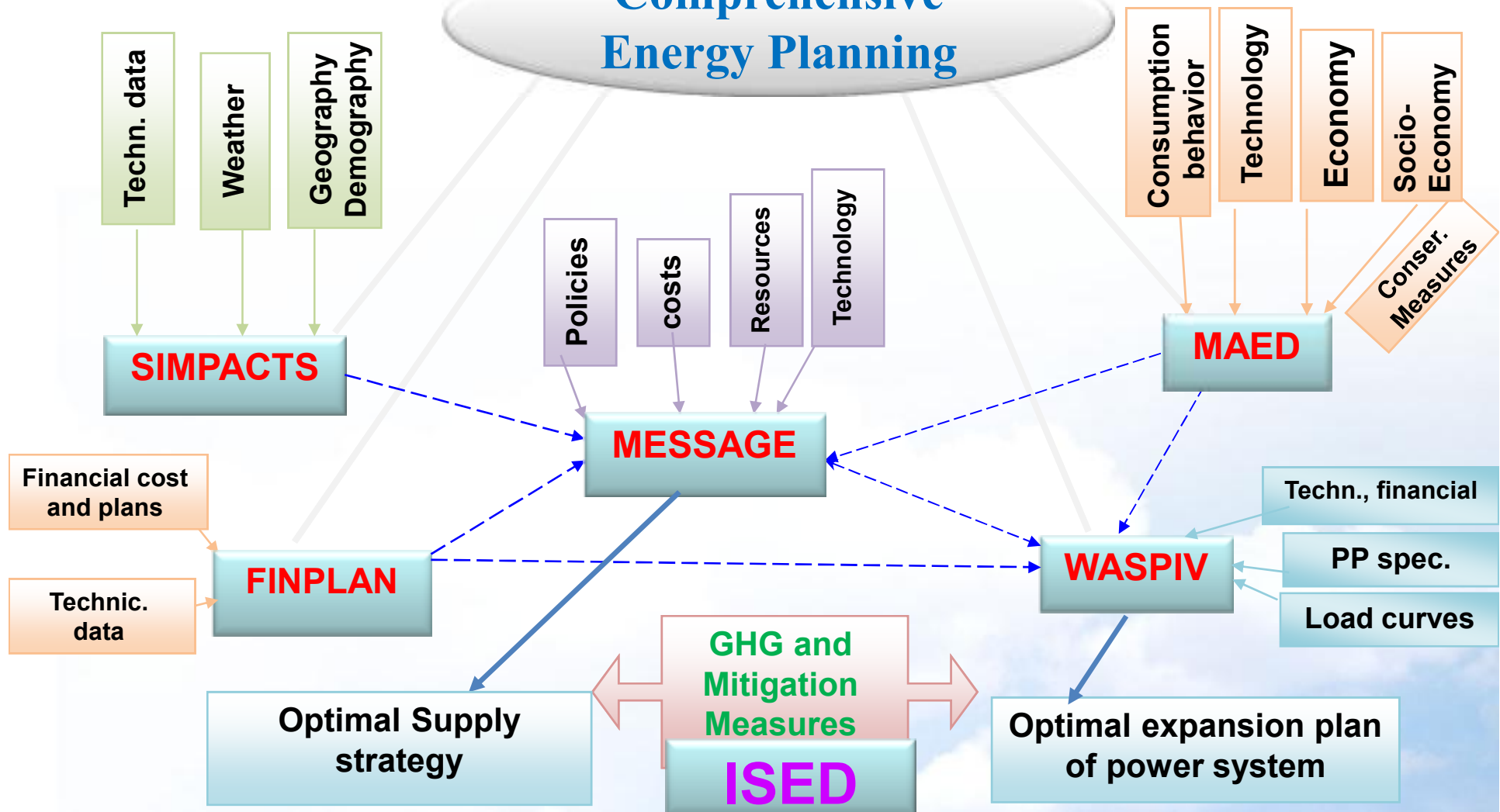
General Approach for Energy Planning



IAEA's Energy Analysis Tools



Comprehensive Energy Planning



Comprehensive Energy System Analysis

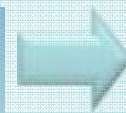
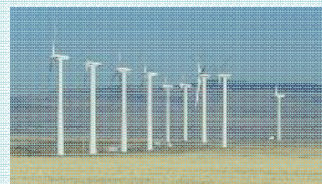
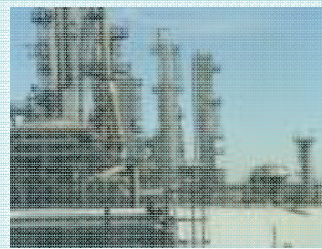
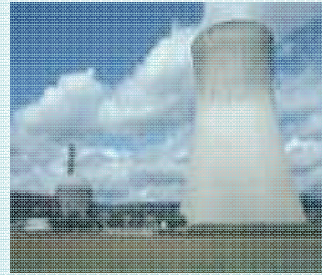
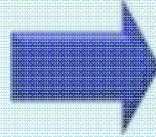
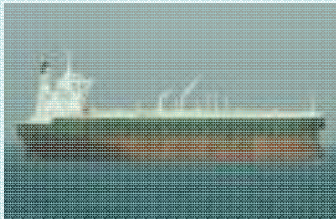
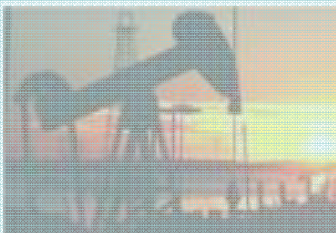


Primary

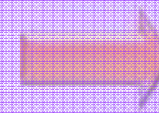
Secondary

Final

Useful



T&D



Extraction,
Import

Conversion and
processing: PP, Refineries

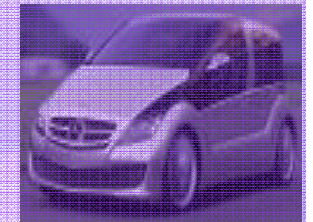
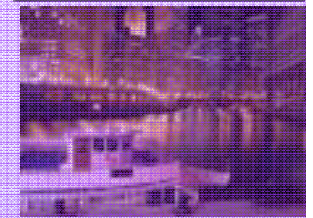
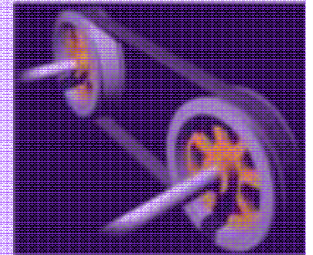
Industry, HH&S,
Trans.

MESSAGE

WASP

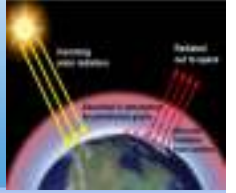
SIMPACT

MAED



The production, distribution and use of energy create pressures on the environment in the household, workplace and city, and at the national, regional and global levels

Capacity Building



Capacity Building for energy assessment

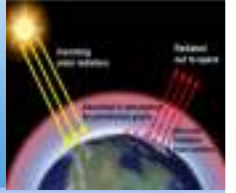
**Information
Dissemination**

**Analytical Tools
and Training**

**Technical Assistance for
National/Regional
Energy Studies**

Supporting decision maker to formulate sustainable long-term energy policy in respect to national/regional conditions.

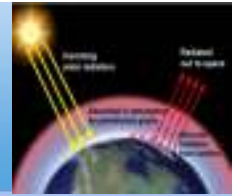




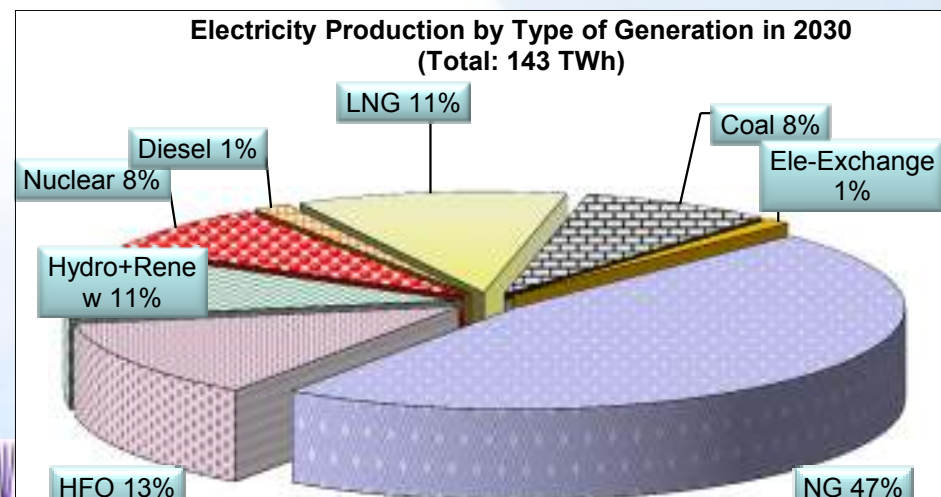
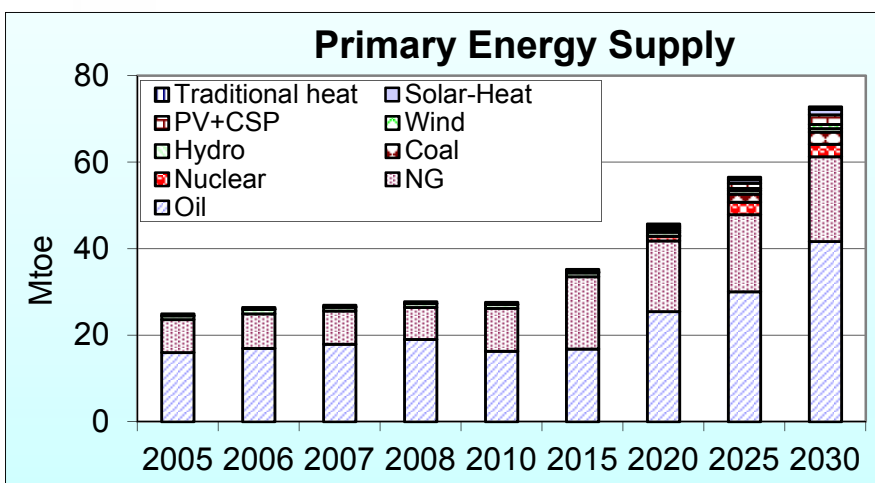
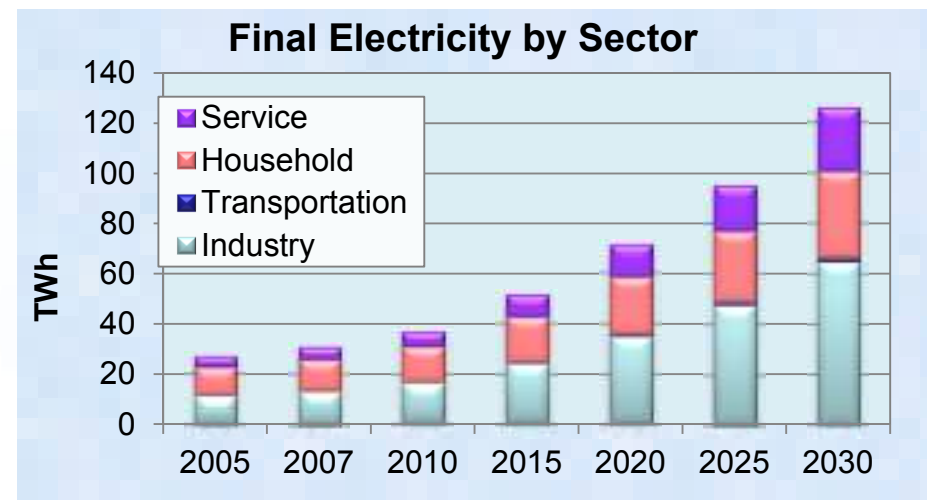
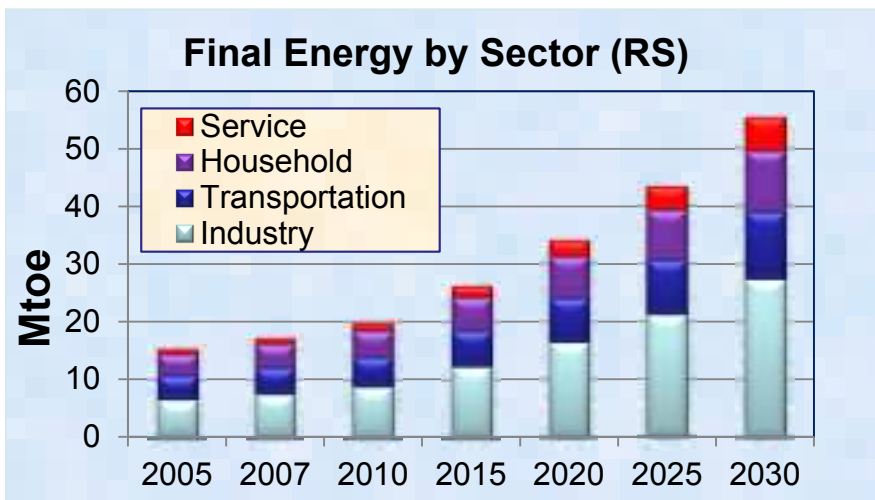
Examples for implemented studies on analyzing energy demand and supply strategies and GHG mitigation options using IAEA tools



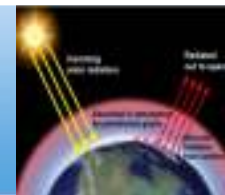
National Energy Studies



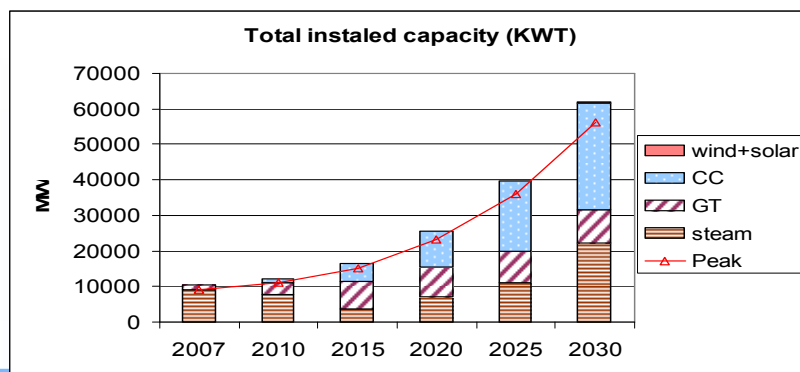
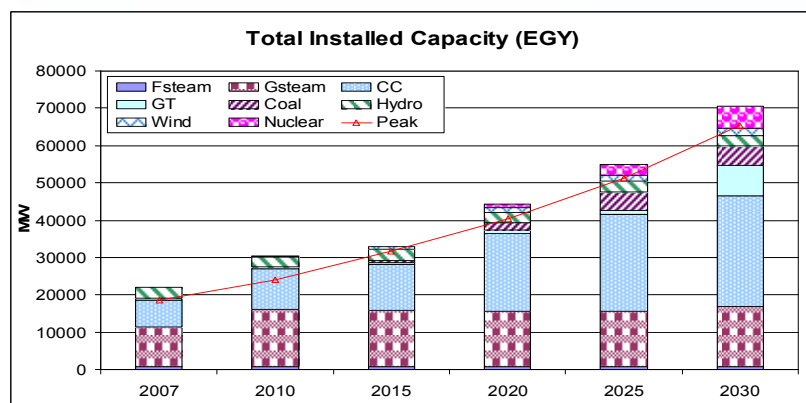
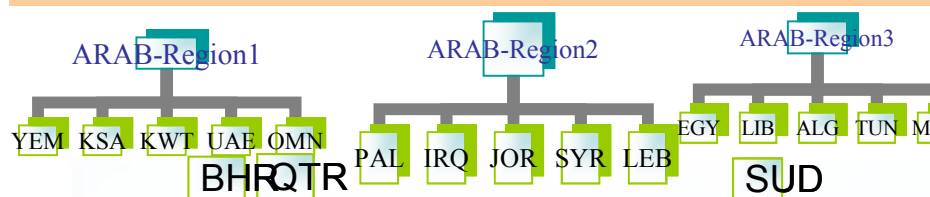
Supporting national decision maker (prime minister council) to formulate optimal energy supply strategy (up to the year 2030)



Energy Directorate, Arab League



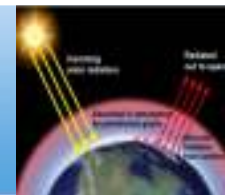
Trend Analysis of Future Optimal Expansion Planes of Electricity Generation Systems for Arab Countries (2007-2030)



		Power (TWh)	Fuel (Mtoe)	Efficiency (%)	Inst. Cap (MW)	Av. Annul. Cap. Addition (MW)
ALG	2007	37	10.4	30	8400	1300
	2030	314	22.4	55	29500	
LYB	2007	25.4	7	31	6500	300
	2030	54	11	43	10000	
EGY	2007	115	20	51	22000	2300
	2030	408	81.7	43	70600	
SYR	2007	39	7.3	42	6250	1200
	2030	148	32.6	42	29300	
IRQ	2007	35.4	8.2	38	11500	3500
	2030	229	43.3	42	85500	
JOR	2007	13	3	38	2390	450
	2030	59	10.7	48	11300	
KSA	2007	191	41	33	36900	4460
	2030	595	141	34	127300	
UAE	2007	76.5	22.4	30	17360	3900
	2030	506	85.8	51	91200	
KUW	2007	44.25	9.65	39	10480	1960
	2030	204	36.77	47	46000	
YEM	2007	5.2	1.5	30	1400	150
	2030	19	3.71	51	3550	



Master Plan: Energy Efficiency and Renewable Energies (MEERE), GTZ+NERC+AECS



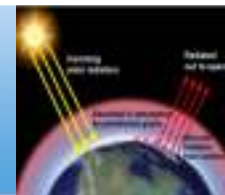
Evaluating the impact of various energy conservation measures and renewable energies –on demand and supply side- on the future development of Syrian energy sector.

Primary energy saving by type of measures (Mtoe)

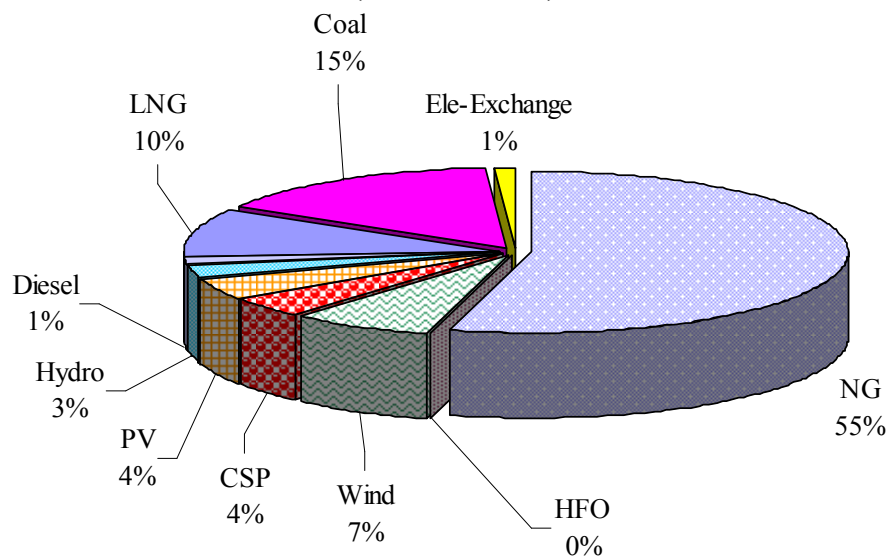
	Conservation and Efficiency Improvement	Substitution by Renewables	Total Saving
2010	0.14	0.04	0.18
2015	3.30	0.48	3.78
2020	6.29	1.59	7.88
2025	10.22	3.14	13.36
2030	14.80	3.81	18.61
Cumulative Saving (2010-2030)	114.6	30.0	144.6



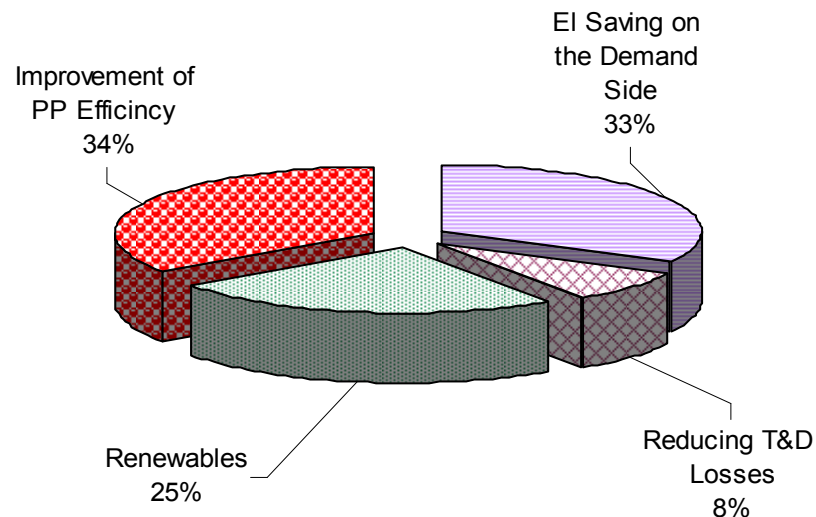
Master Plan: Energy Efficiency and Renewable Energies (MEERE), GTZ+NERC+AECS



**Electricity Production by Type of Generation in 2030, ARES
(Total: 143 TWh)**

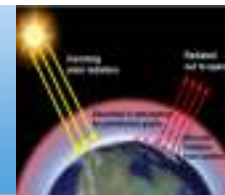


Cumulative Fossil Fuel Saving in the Power Sector during the period 2010-2030 (74 Mtoe)



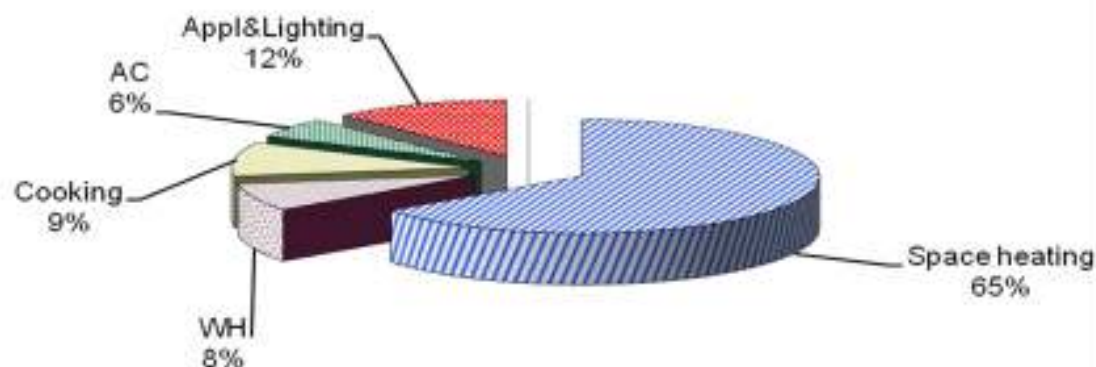
Energy Efficient Building Codes in Syria

GEF+NERC+AECS



Evaluating the impact of energy conservation and efficiency improvement measures on the reduction of GHG emissions of Syrian building sector due to HVAC

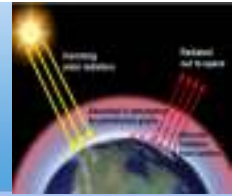
Energy Saving in Building Sector by Consumption Type for EES in 2030 (3.6 Mtoe)



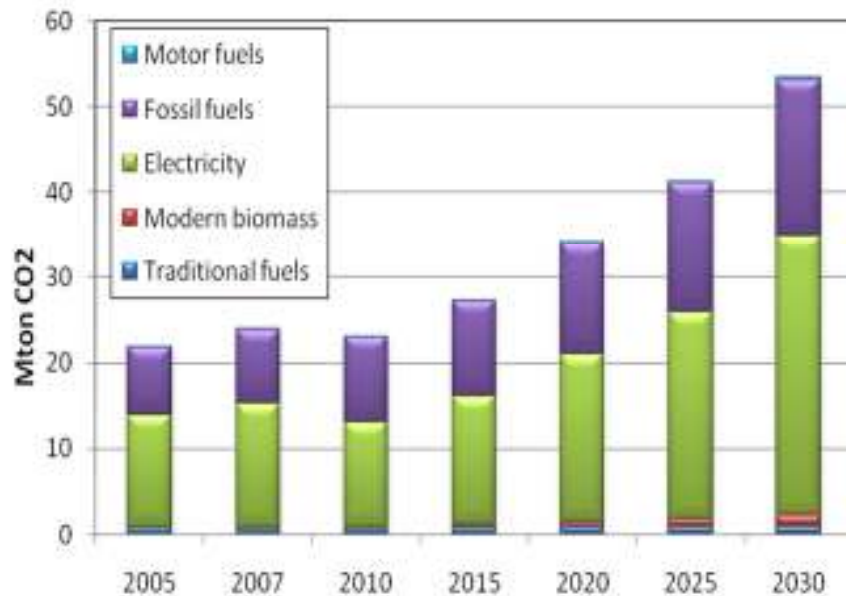
	direct project impacts: 2010- 2015			indirect impact: 2015- 2030		
	Energy Saving (Mtoe)		CO2 Reduction	Energy Saving (Mtoe)		CO2 Reduction
	Electricity	Fossil Fuel	(MtCO2)	Electricity	Fossil Fuel	(MtCO2)
Space Heating	0.008	0.705	0.680	0.193	11.784	20.147
AC	0.085	0		2.099	0	
Ventilation	0.005	0	1.973	0.121	0	32.997
TOTAL	0.098	0.705	2.654	2.413	11.784	53.143

Energy Efficient Building Codes in Syria

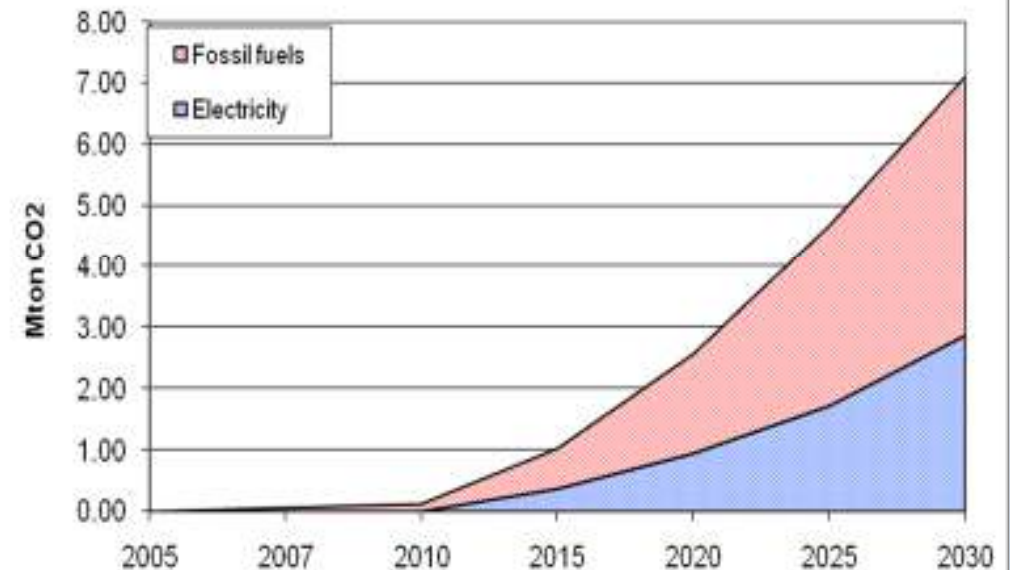
GEF+NERC+AECS



CO₂ Emission of Building Sector for EES



CO₂ Reduction in Building Sector for BEPS (Mton on CO₂)



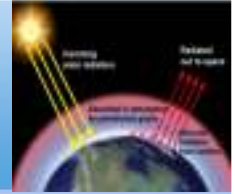
Development of grid emission factor for Syrian electric generation system

	2005	2007	2010	2015	2020	2025	2030
Grid Emission Factor (tCO ₂ /GWh)	642.86	640.77	471.58	478.32	511.66	529.76	583.23



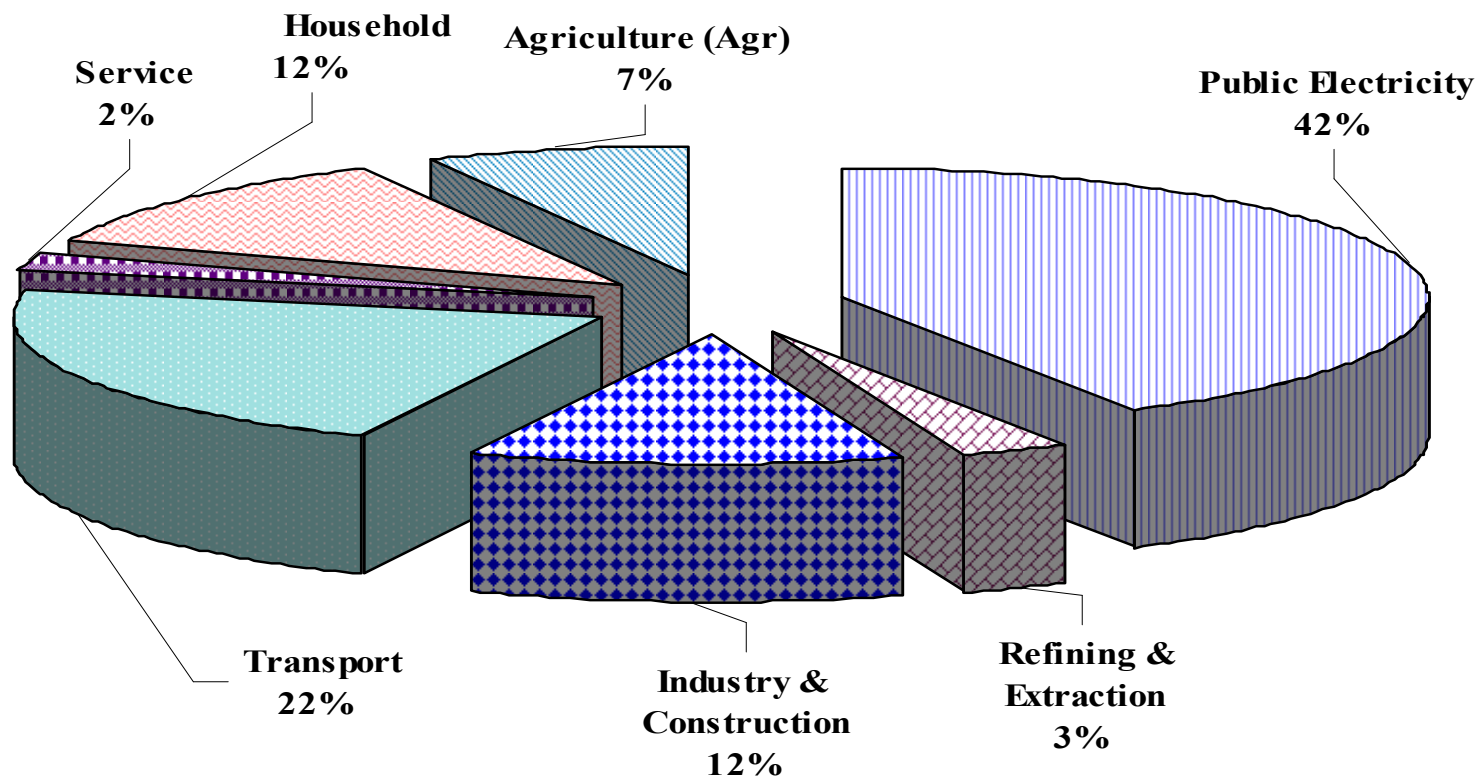
GHG Mitigation of Energy Sector

INC: UNDP+AECS

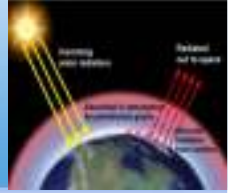


GHG Inventory Calculation According to IPCC, Adaptation Measures to Lessen Climate Variability and Change Impacts

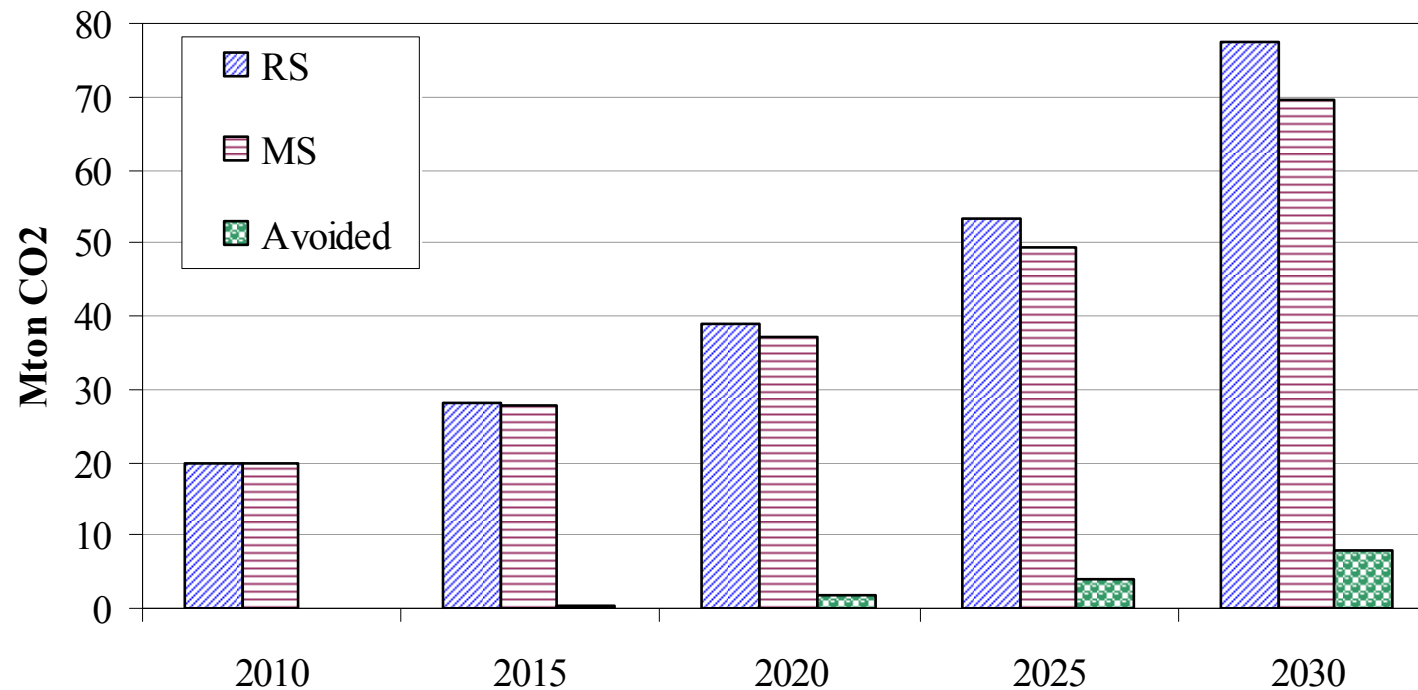
Total CO₂ Emissions by Sector in 2008 (60.42Mton)



CO2 Mitigation of Power Sector



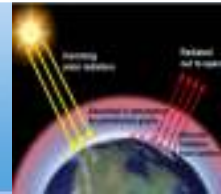
GHG Emissions for RS and MS Scenarios



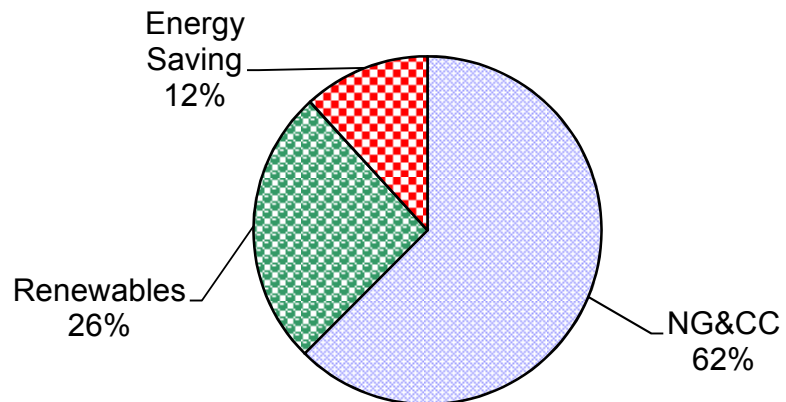
Cumulative CO2 emissions reduction 2005-2030: ca. 200 Mt



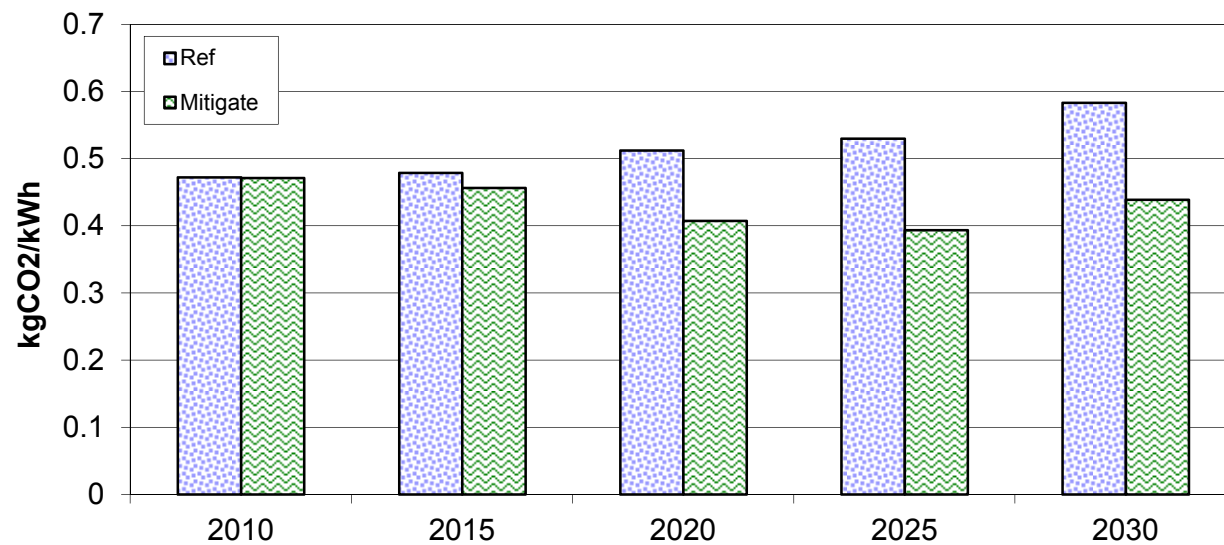
CO2 Mitigation of Power Sector



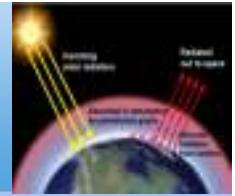
CO2 Reduction in 2030 (23.6 Mton)



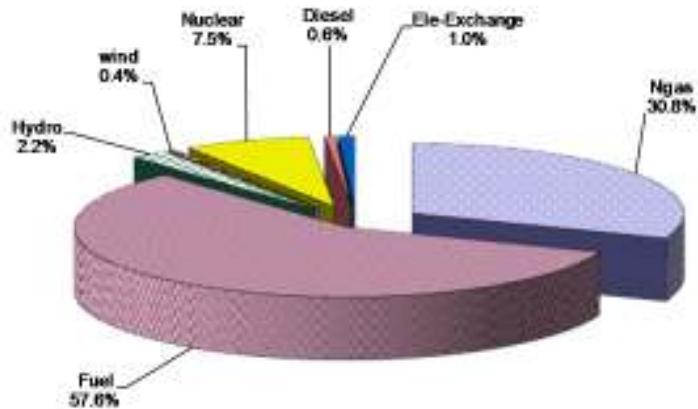
Specific Emission (kgCO₂/kWh)



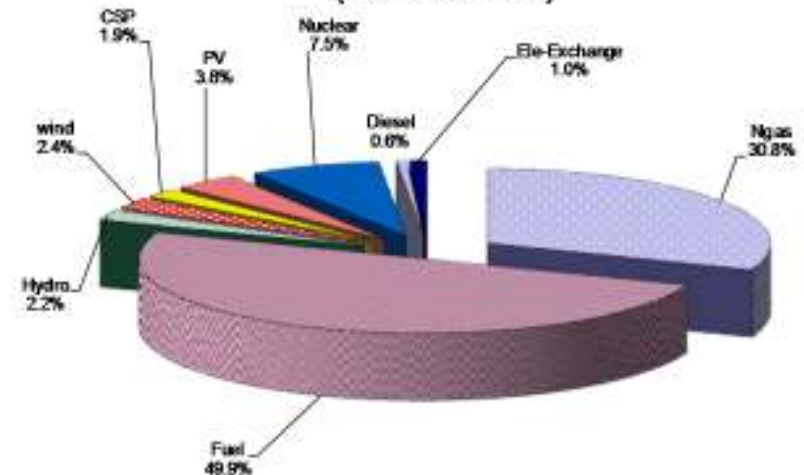
CO2 Mitigation of Power Sector



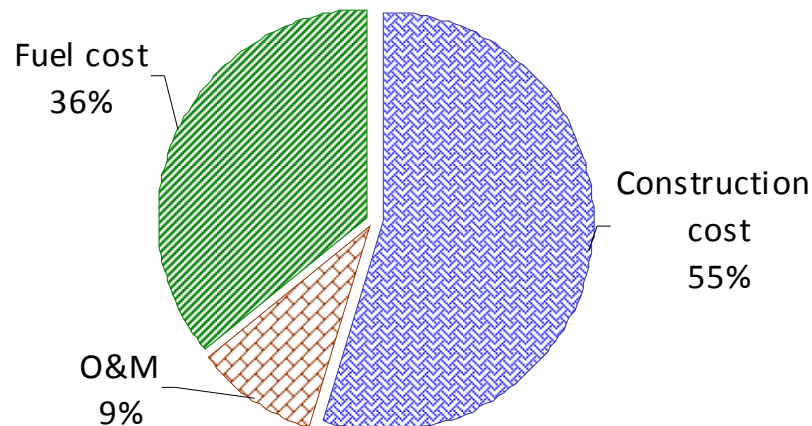
Electricity Production by Type of Generation in 2030
(Total: 148 TWh)



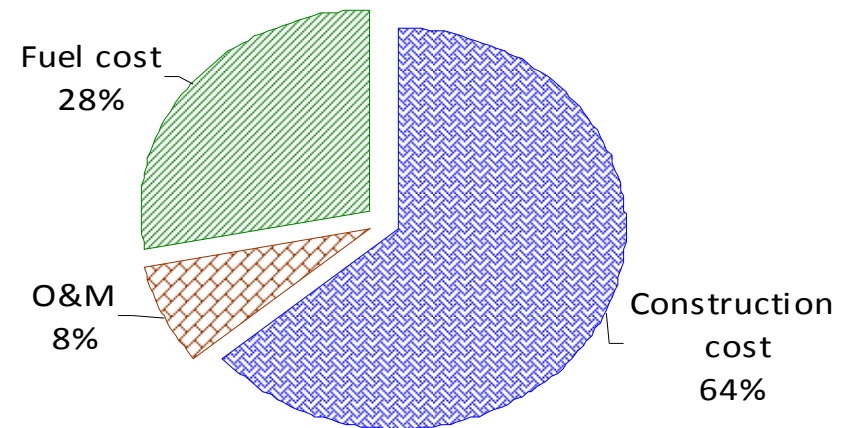
Electricity Production by Type of Generation in 2030
(Total: 148 TWh)



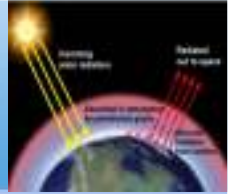
Cumulative total discounted cost for RS
(Total cost: 45 Billion US\$)



Cumulative total discounted cost for MS
(total cost: 48 Billion US\$)



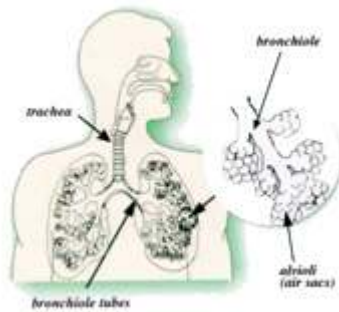
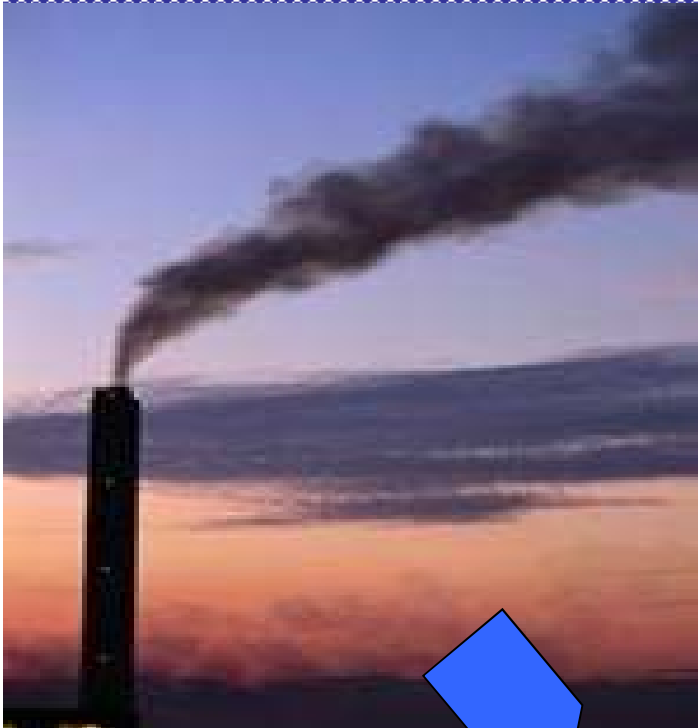
Environmental Impacts and Health Damage



Environmental impacts affect Atmosphere, Water and Land at national, regional and global levels.

Atmosphere= Air Quality, Climate Change

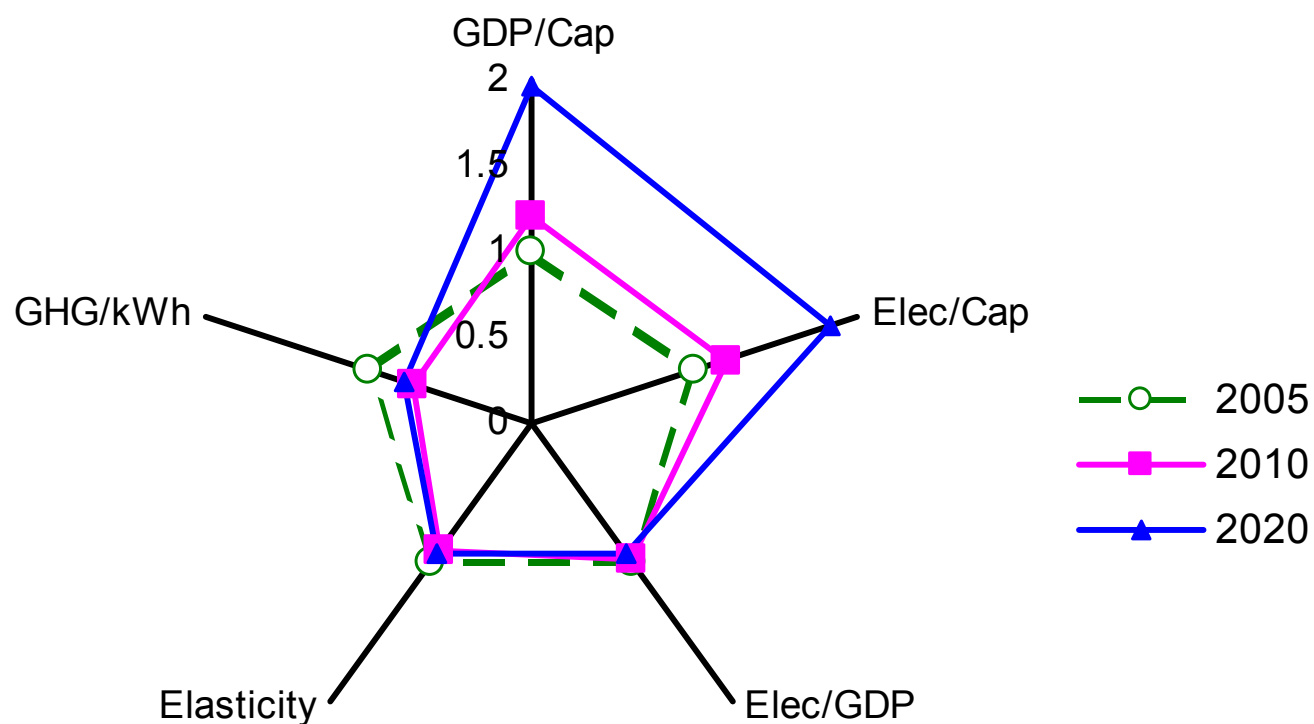
- **Air Quality:** air pollutants of SO_x, NO_x, PM → human health damage
- **GHG:** changing the climate for the worse



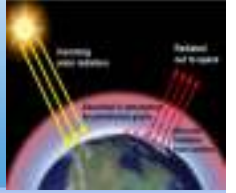
Main Sustainability Trend, Syria



ISED



Conclusions



- IAEA's tools are very useful approach for energy planning and assessing GHG mitigation of energy sector;
- Syrian experience with IAEA's tools have been disseminated to support further countries and applications;
- Power sector is the main GHG contributor in Syria,
- Energy saving, conservation and renewables are the main mitigation measures.

