

Assessing Representative Concentration Pathways for Europe

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Paris Agreement

- The Paris Agreement was adopted in December 2015 and it has been signed by 195 Parties until today. This international agreement on climate change has a long-term goal to hold increase of temperature below 2°C and to pursue efforts to limit it to 1,5°C in the comparison to the pre-industrial level.
- All parties to the UNFCCC shall develop Intended Nationally Determined Contributions (INDCs) for the post-2020 period.
- Once the Paris Agreement is ratified, these INDCs will turn into the Nationally Determined Contributions (NDCs). These countries' reduction plans are the national targets for GHG emissions reduction in the specific period, as well as the strategies for achieving the proposed and submitted goal.
- New or updated NDCs have to be submitted every five years to the UNFCCC secretariat, providing national progress and future targets.
- Until today, 177 Parties have submitted their first NDCs for period 2020-2030.



EU targets

European Union is one of the most ambitious regions regarding the reduction of CO2 emissions in both, short-term and long-term conditions. Thus, by adopting new energy packages as a energy law framework for the EU, but also member countries and countries candidates, EU moves forward in the climate change strategy and detailed planning. Finally, the NDC submitted by the EU is again ambitious, but also realistic, and more than positive for the planet.

2020	2030	2050
<ul style="list-style-type: none"> • 20% cut in greenhouse gas emissions compared to 1990 levels • At least 20% share of renewable energy consumption • 20% increase in energy efficiency • 10% electricity interconnection 	<ul style="list-style-type: none"> • 40% cut in greenhouse gas emissions compared to 1990 levels • At least 27% share of renewable energy consumption • 30% increase in energy efficiency (energy savings compared to the business-as-usual scenario) 	<ul style="list-style-type: none"> • 80-95% cut in greenhouse gas emission compared to 1990 levels, in accordance with the Energy Charter



Representative Concentration Pathways (RCPs)

Climate change research and decision-making scenarios that provide future time-dependent projections of atmospheric GHG concentration are known as Representative Concentration Pathways.

Provide 5-year estimation of anthropogenic CO₂ emissions.

Established on the basis of different radiative forcing that presents a measure of the additional energy taken up by the Earth due to increases in climate change pollution and enhanced greenhouse effect.

4 RCPs officially adopted on international level by the United Nations Framework Convention on Climate Change (UNFCCC):

- 1) RCP 2.6 (**Institution:** PBL Netherlands Environmental Assessment Agency, Netherland; **Model:** IMAGE),
- 2) RCP 4.5 (**Institution:** Pacific Northwest National Laboratory, US; **Model:** GCAM),
- 3) RCP 6 (**Institution:** National Institute for Environmental Studies, Japan; **Model:** AIM), and
- 4) RCP 8.5 (**Institution:** International Institute for Applied System Analysis, Austria; **Model:** MESSAGE).

Our analysis focused on RCP 2.6, RCP 4.5, and additional two scenarios – RCP 1.0 and RCP 2.0

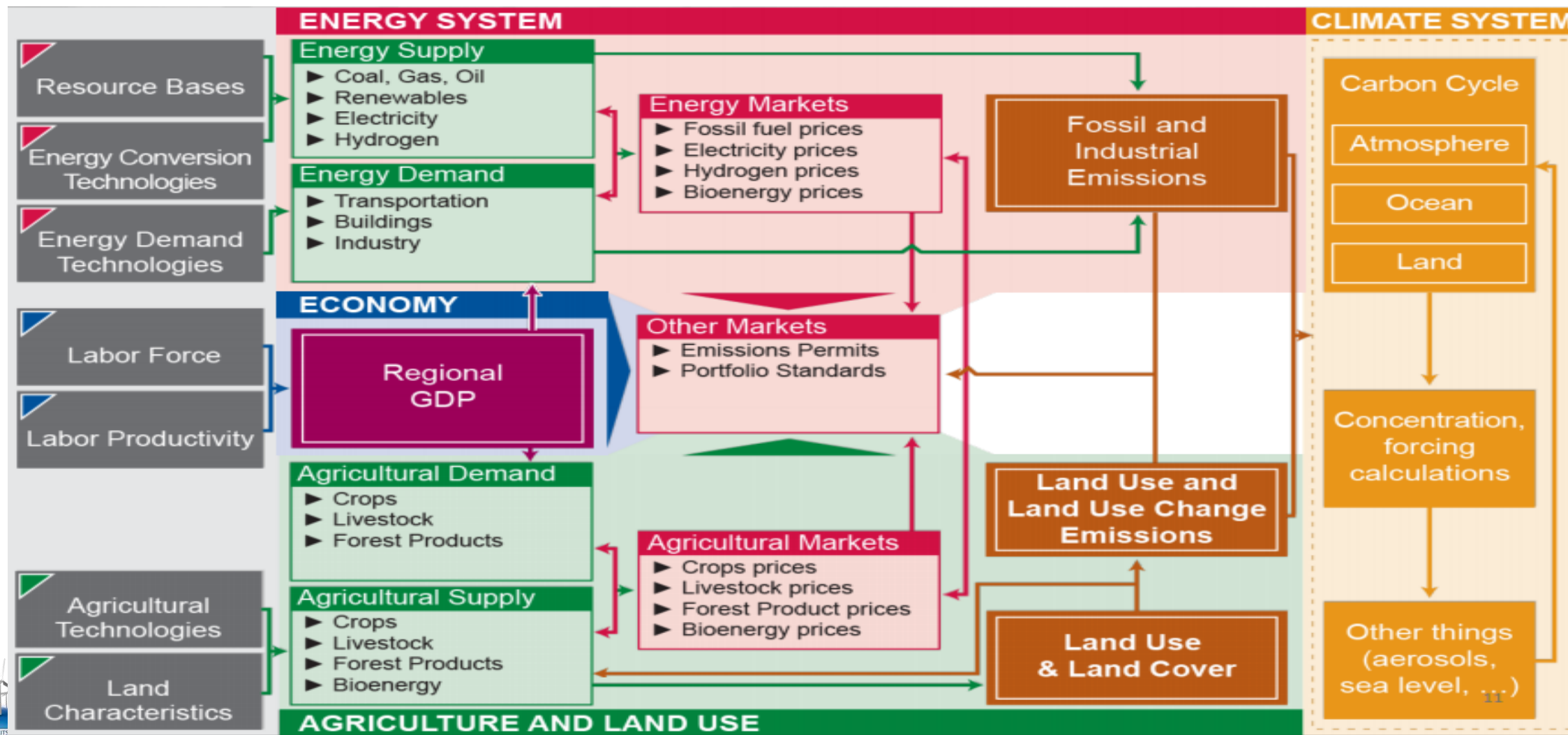


Global Climate Assessment Model (GCAM)

- Global Integrated Assessment Model (IAM) developed by Joint Global Change Research Institute, Pacific Northwest National Laboratory and University of Maryland.
- GCAM links Agriculture and Land-use, Economic, Energy, Water, and Earth/Climate systems.
- 5-year based projections up to the end of the century, starting from 2020, including all pollutants – greenhouse gases, and aerosols and chemically active gases.
- The multi-sector model as GCAM is, provide the availability to explore different scenarios known as “what-if” and climate change policies based on different changes in technology, economy, population, regulations, fuel price, carbon taxes and trading, etc.



Global Climate Assessment Model (GCAM) - 2

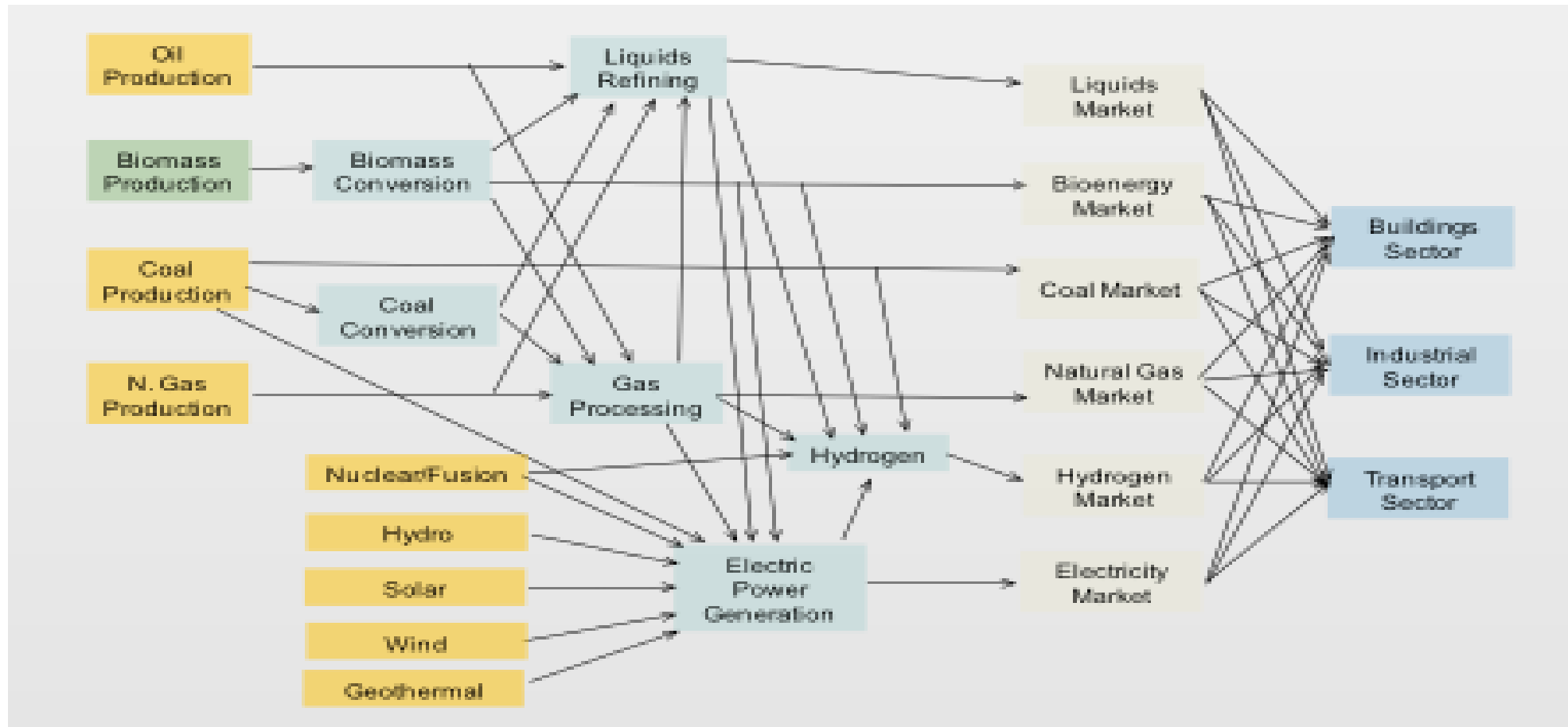


GCAM regions

World's settled continents	Continent's region in the GCAM	Single countries in the GCAM
I. Africa	<ol style="list-style-type: none"> 1. Africa Eastern 2. Africa Northern 3. Africa Southern 4. Africa Western 	<ol style="list-style-type: none"> 1. South Africa
II. Asia	<ol style="list-style-type: none"> 1. Central Asia 2. Middle East 3. South Asia 4. Southeast Asia 	<ol style="list-style-type: none"> 1. China 2. India 3. Japan 4. Pakistan 5. South Korea 6. Taiwan 7. Indonesia
III. Australia	<ol style="list-style-type: none"> 1. Australia NZ 	
IV. Europe	<ol style="list-style-type: none"> 1. EU-12 2. EU-15 3. Europe Eastern 4. Europe Non-EU 5. European Free Trade Association 	<ol style="list-style-type: none"> 1. Russia
V. North America	<ol style="list-style-type: none"> 1. Central America and Caribbean 	<ol style="list-style-type: none"> 1. USA 2. Canada 3. Mexico
VI. South America	<ol style="list-style-type: none"> 1. South America Northern 2. South America Southern 	<ol style="list-style-type: none"> 1. Argentina 2. Brazil 3. Colombia

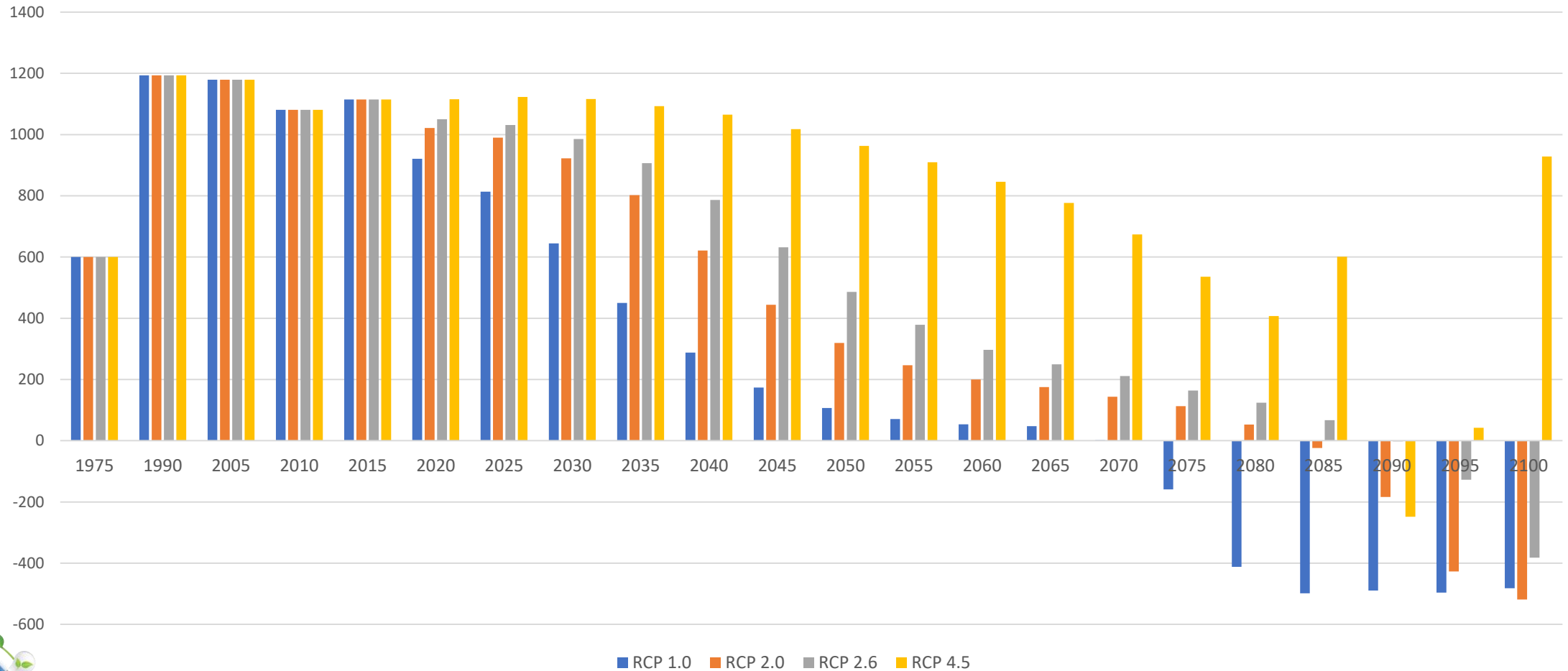


GCAM energy system



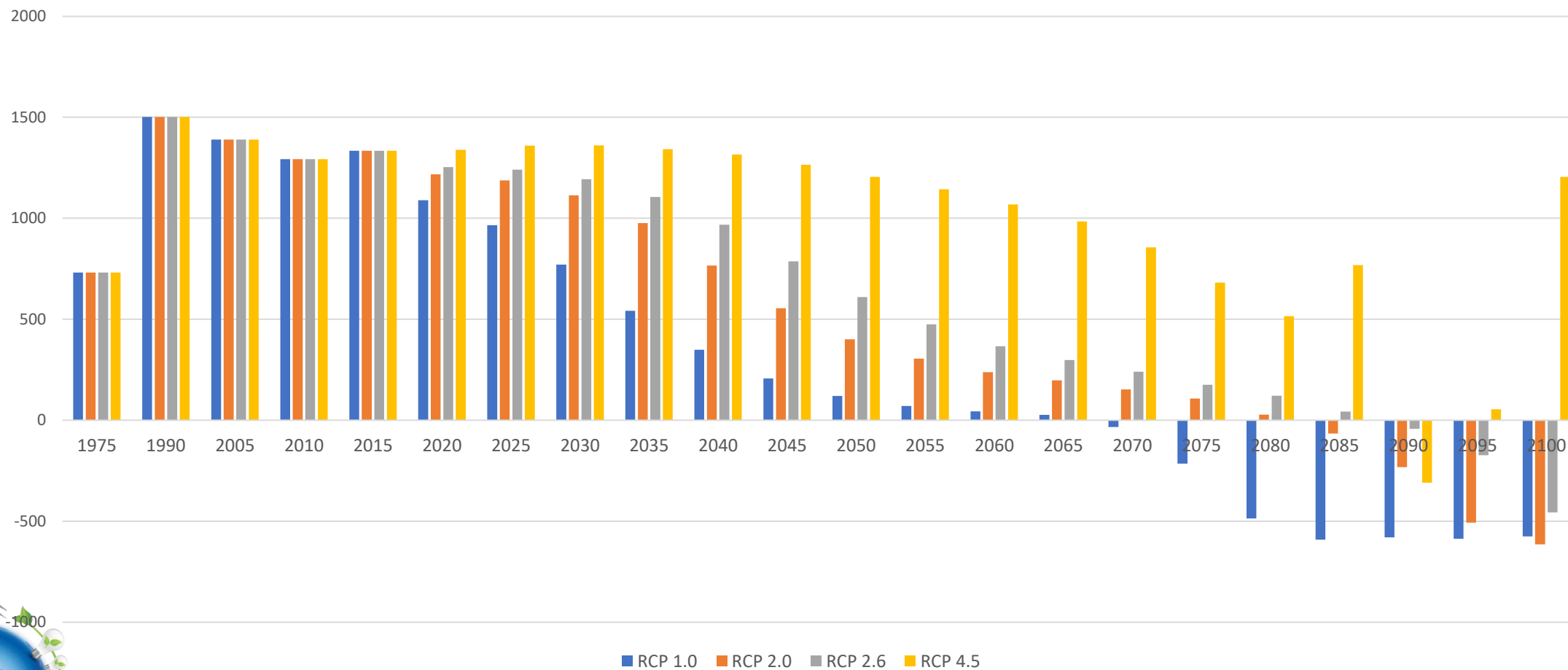
Future trends for Europe

EU CO2 emissions (MTC)



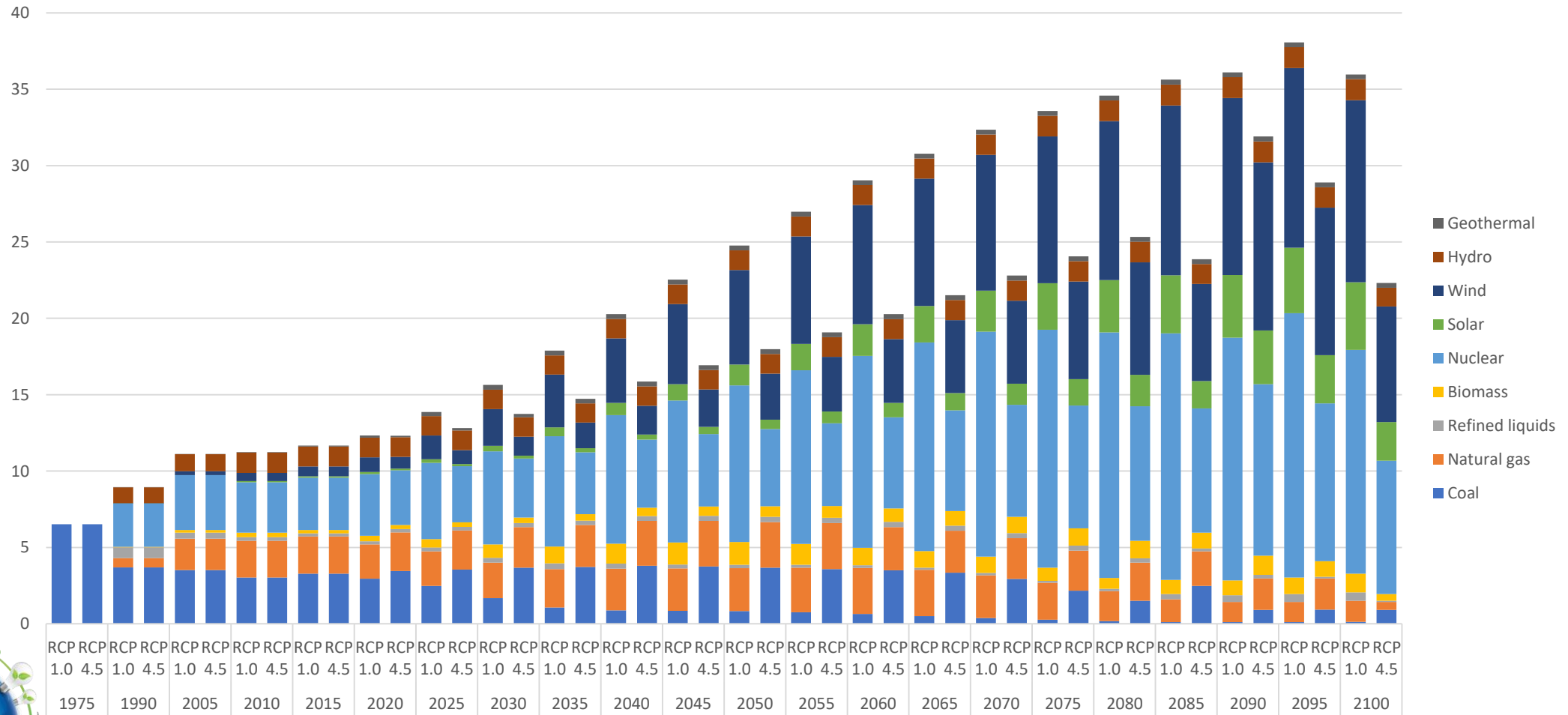
Future trends for Europe - 2

Europe CO2 emissions (MTC)



Electricity future trends in EU

Electricity generation structure (EJ)



Conclusions

- Analyzed Representative Concentration Pathways have showed that the CO2 emissions reduction for European Union will be achieved if the reformations in the energy sector will be manifested similarly as the RCP 1.0 presented.
- According to the RCP 1.0, EU will achieve:
 - 1) 23% cut in greenhouse gases emissions by 2020, compared to the 1990 level
 - 2) 46% cut in GHG emissions by 2030, compared to the 1990 level
 - 3) 91% cut in GHG emissions by 2050, compared to the 1990 level
- Following the same pathway, European Union will successfully complete its target proposed by the NDC submission in 2015, that is at least 40% domestic reduction in GHG by 2030 compared to the 1990 level on the EU level.
- All other presented RPCs do not seem positive compared to the EU targets, although some of them are close such as RCP 2.0 (15% by 2020, 23% by 2030, and 74% by 2050). RCP 2.6 and 4.5 could be seen as a pessimistic, but also they might be real projections of the future.



Global Change Assessment Model (GCAM) download:

<http://www.globalchange.umd.edu/models/gcam/download/>

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