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The COMET methodology to analyse the most cost effective CO₂ transport and storage infrastructure in TIMES

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COMET project introduction

- COMET - Integrated infrastructure for CO₂ transport and storage in the west Mediterranean (Spain, Portugal and Morocco) is an EU FP7 project.
- COMET aims at identifying and assessing the most cost effective infrastructure that will be able to serve the West Mediterranean area, considering:
 - the time and spatial aspects of the development of the energy sector and other industrial activities in Spain, Portugal, Morocco
 - the location, capacity and availability of potential CO₂ storage geological formations
 - the transport modes matching the sources and sinks for a CCS network infrastructure as part of an international climate cooperation policy.

Location and quantification of CO₂ emissions from the sources

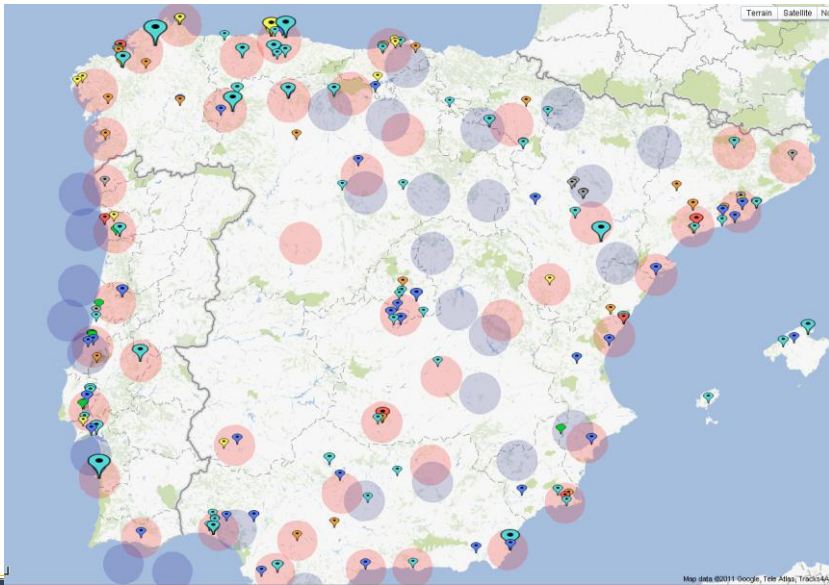
The project contributes to:

- **Identify and characterize the main current CO₂ sources (>100 kt/yr) in Portugal, Spain and Morocco**, including:
 - Usual information needed for energy modelling (fuel consumption, lifetime, etc.)
 - Useful data for GIS analysis
- **Assess future CO₂ sources**, based on:
 - Current and future development plans of the countries
 - Expected locations of the energy and industrial plants, if defined
 - Different scenarios, represented by TIMES models
- **Example:**
 - Spain: more than 230 sources, with 190 sources > 100 kt
 - Portugal: 32 emission sources > 100 kt

Locations and storage capacity of the sink regions

- The project contributes to identify and evaluate capacities in a harmonized way for potential storage sites of the Iberian Peninsula and Morocco with a special focus on trans boundary off-shore sites.
- The sites are qualified through different criteria:
 - proximity to the sources,
 - geological settings (type of field, depth, permeability, porosity, cap rock, capacity, injection capacity, etc)
 - economic characteristics

Emissions sources and clusters - GIS representation



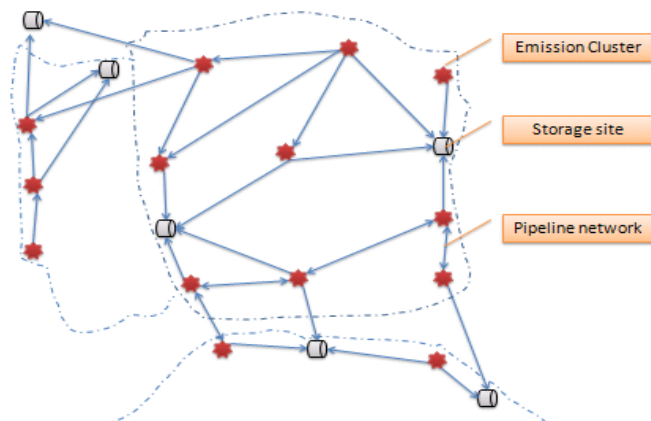
Analysis of the most cost effective CO₂ transport and storage infrastructure within TIMES

- The proposed methodological framework uses a multi-regional model built with TIMES including:
 - ES, PT, MA and
 - COMET transport model (Cluster Regions model) to produce the most cost effective CO₂ transport and storage infrastructure from 2005-2050, based on different scenarios.
 - The COMET model represents all the information:
 - including localization, costs, efficiency, extra energy consumption etc.
- related to CCS, in other words:
- emission sources (by cluster), capture, purification, transport (satellite lines and trunk lines), sinks.

Analysis of the most cost effective CO₂ transport and storage infrastructure within TIMES

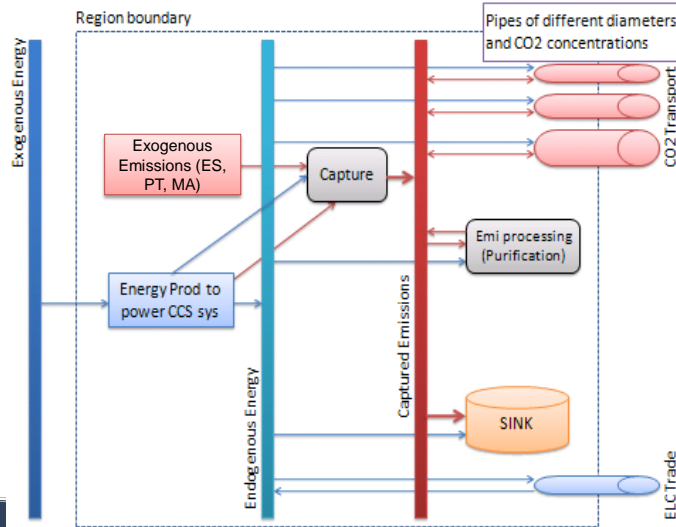
Overview of COMET model.

Each emission cluster or storage site (itself possibly a cluster of storage sites) is a “region”. A region can have both as well.



Analysis of the most cost effective CO2 transport and storage infrastructure within TIMES

A typical region of COMET, including a cluster of emissions and storage site . A region of COMET could include only a cluster of emission, or only a storage site



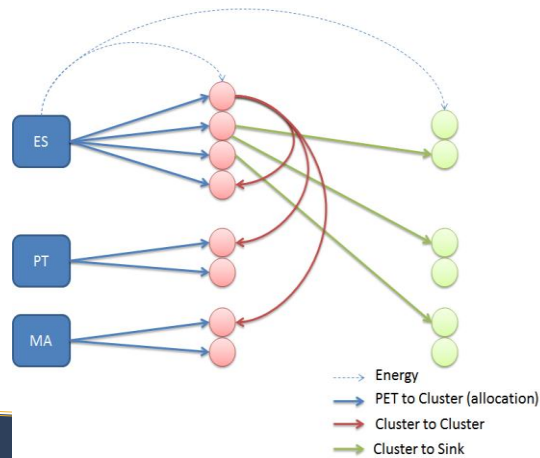
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Analysis of the most cost effective CO2 transport and storage infrastructure within TIMES

- The approach is as follows
 - Regions: ES, PT, MA, 45 emission clusters and 40 sink regions
 - Processes in the "COMET model": capture, purify, transport and store
 - Commodities: emissions by fuel and sector, captured and purified

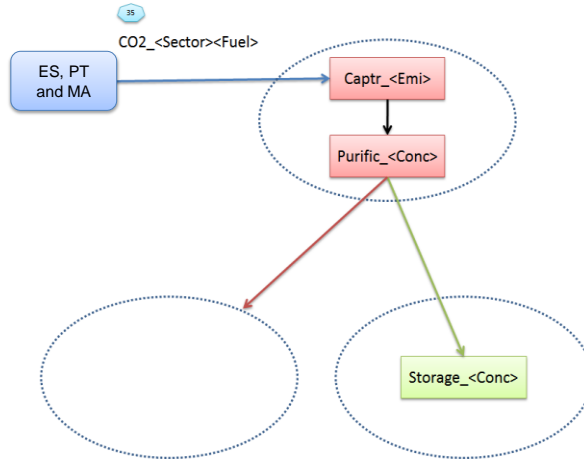


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- Spain, Portugal and Morocco regions (3-Country Model) exchange energy with clusters and/or sinks in the COMET model. In the COMET model is possible to deliver CO₂ from cluster to cluster or from cluster to sink.



Analysis of the most cost effective CO₂ transport and storage infrastructure within TIMES

- The 3-country model is generating CO₂ commodities depending on sector and fuel. This commodity is:
 - captured in the COMET module
 - purified through technologies that combines the 35 emission streams into a few concentrations
 - suitable for transportation and storage
- Changes in The 3-country model:
 - Create CO₂ <Sector><Fuel>;
 - Turn off original emissions for the covered sectors;
 - New emissions allocated to clusters;
 - Share controlled with base year information;
 - Emissions bounded to 0 in the 3-country model
- Emission clusters:
 - CO₂<Sector><Fuel> arrives from the 3-country model PET regions;
 - Capture technologies described by fuel consumption, investment and variable costs;

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- Transportation and storage
 - Create links based on cut-off distances;
 - ❖ Cluster to cluster
 - ❖ Cluster to sink
 - “Placeholder” Costs (proportional to distance)

The 3-Country model + COMET module are running altogether producing the most effective CO₂ transport and storage infrastructure.

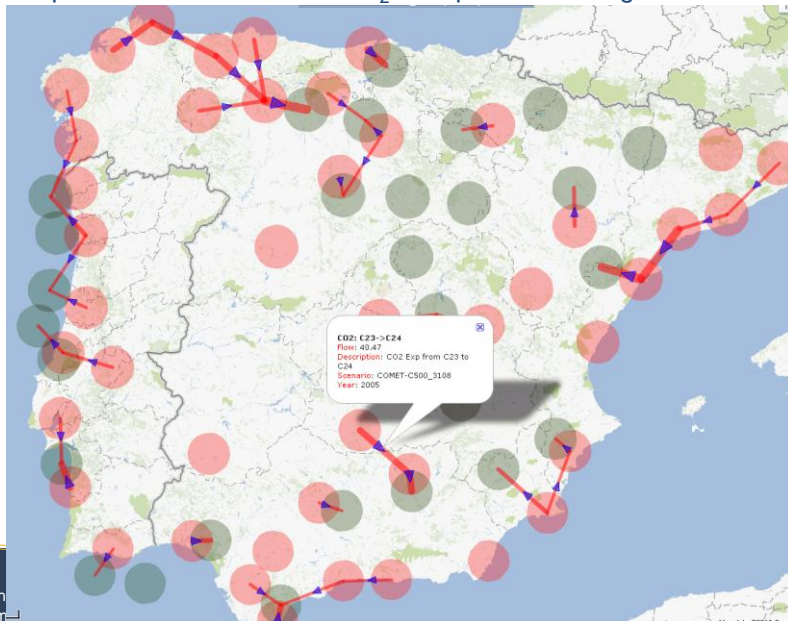
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Example of the most effective CO₂ transport and storage infrastructure



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THANK YOU!

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