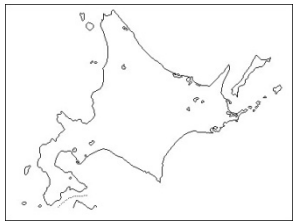
PGC-A Study Group 3
Life Cycle Assessment



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September 26, 2012

Sapporo

Outline

Objectives of the presentation :

- Detail the aim of the SG3 LCA
- Propose an associated work plan
- Identify new members for the SG3 !

Outline:

- Overview of the Life Cycle Assessment approach - Application to the natural gas chain
- Objectives and work plan of the Study Group LCA within PGC-A
- Next steps for 2012 and 2013

Why performing an LCA at IGU ?

Increasing stakeholders expectations

- National or regional regulations
- Civil society, NGOs
- Competitors
- Final users

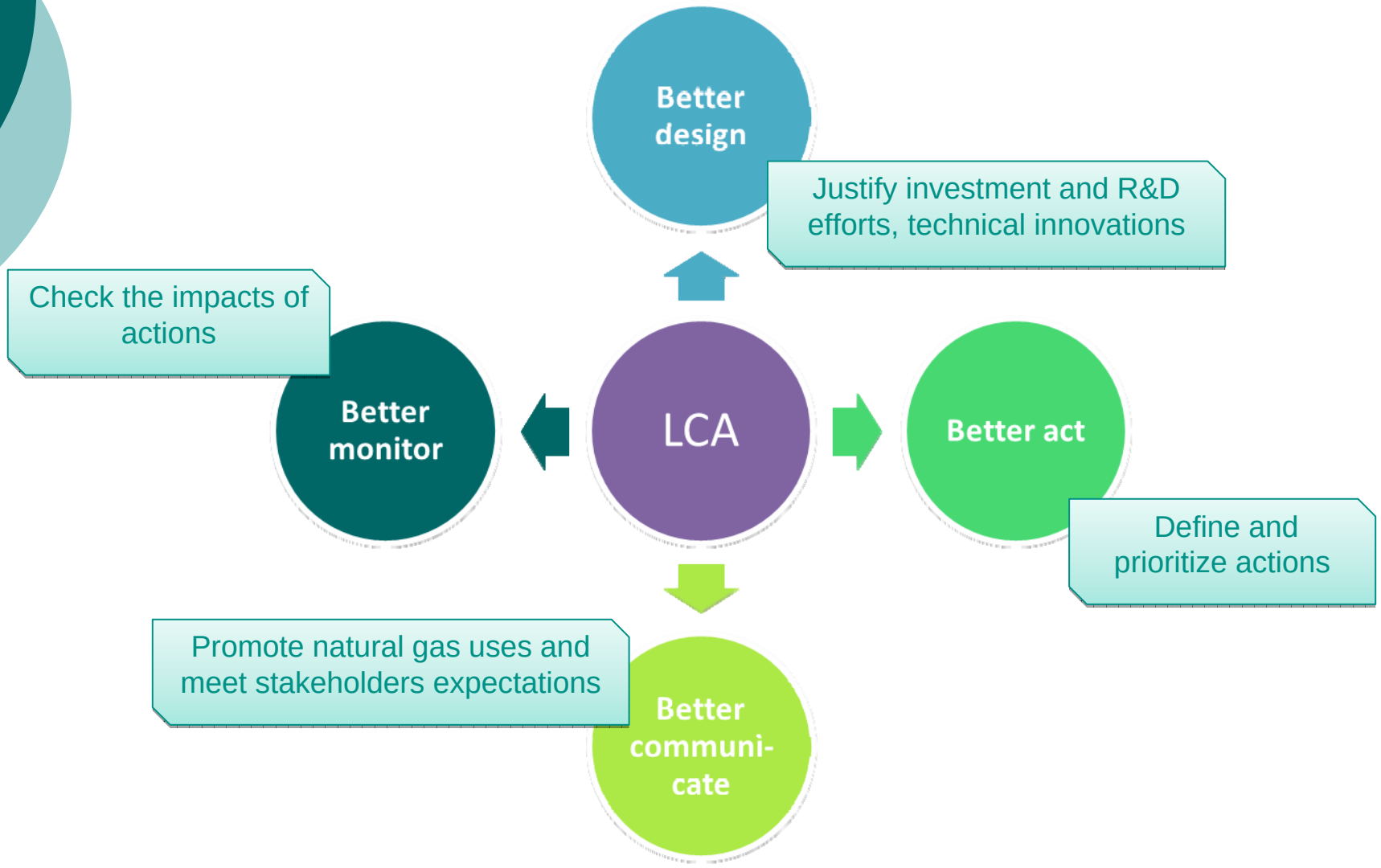
Existing references

- Several LCAs published by academic or consulting bodies
- Data available in generic LCA databases
- No homogeneous work published by the NG industry

IGU is relevant to coordinate such work

Overview of Life Cycle Assessment

Benefits of LCA – Application to the natural gas chain

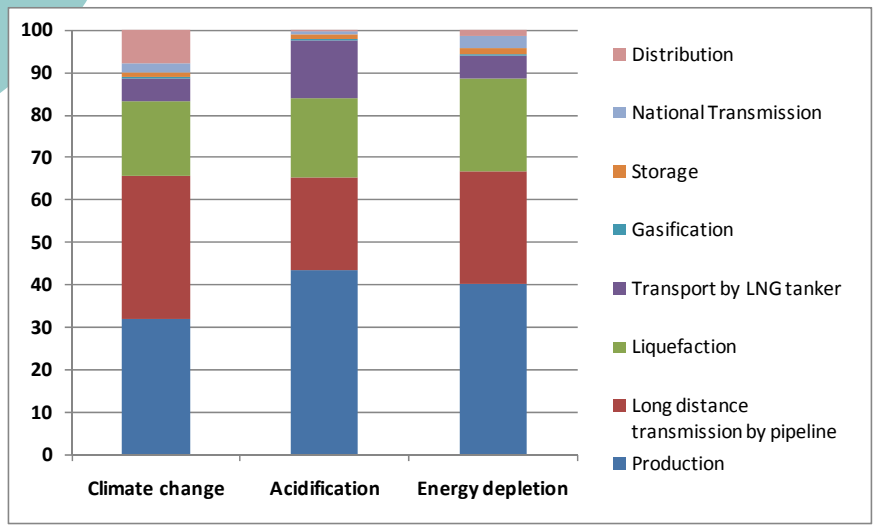


Overview of Life Cycle Assessment

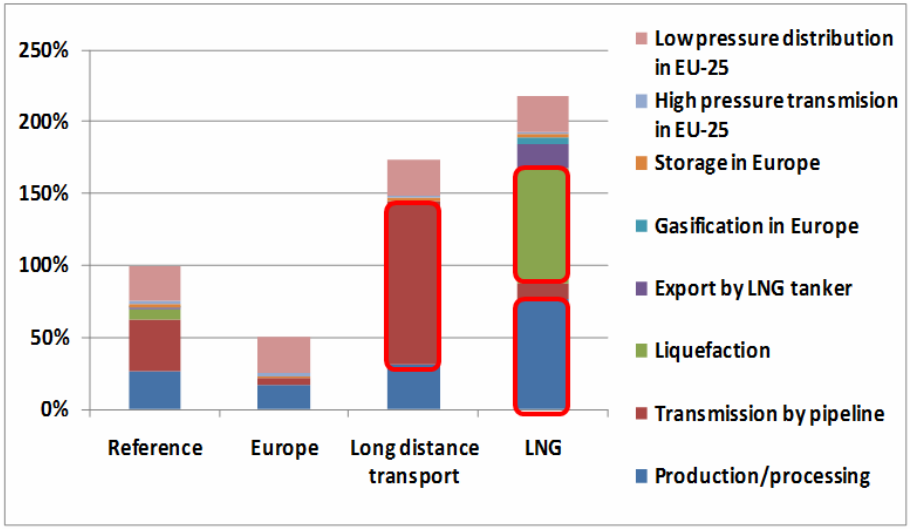
Better act / Better design – Application to the natural gas chain

- **Identification of most impacting steps of the supply chain**

Focus on the upstream chain



Comparison of the repartition of GHG emissions along the upstream chains



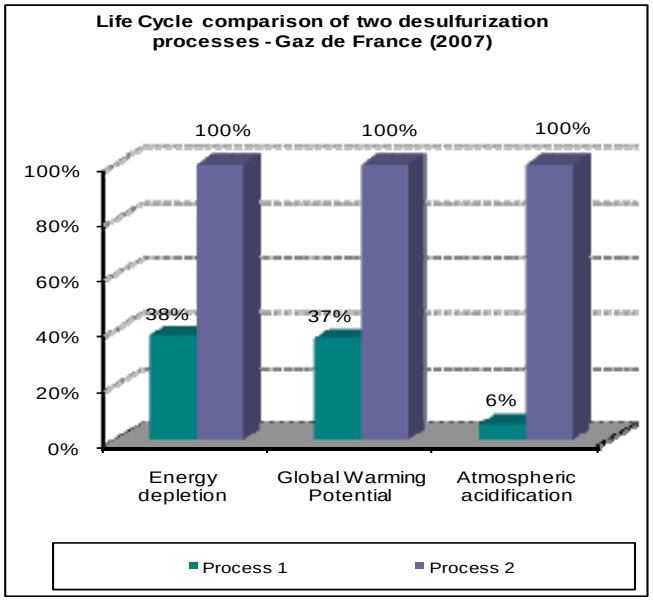
Source: Life Cycle Assessment of the European Natural Gas Chain focused on three environmental impact indicators – A Eurogas-Marcogaz study, 2011

- **Ranking potential improvements**

Overview of Life Cycle Assessment

Better design – Application to the natural gas chain

- **Support Research and Development and investment**
  - Assess potential impacts of new supply chains
  - Evaluate environmental performances of technical innovations



Other examples :
✓Impacts of non conventional gas chains
✓New propulsion systems for LNG tankers,
✓Fugitive emissions reduction on distribution networks.
✓Etc.

Overview of Life Cycle Assessment

Better monitor – Application to the natural gas chain

- **Accounting for environmental impact modifications due to evolutions on the natural gas supply chains**
  - Evolution of the supply mix
  - Observed technical improvements

Examples
✓ Leakage rate of methane at storage facilities in Europe dropped from 0.105% in 2004 to 0.022% in 2010
✓ Influence of the supply mix on the LCA at the European level (Eurogas-Marcogaz study)

Overview of Life Cycle Assessment

Better communicate – Application to the natural gas chain

Promote the environmental performance of natural gas

- Identify impacts where Natural Gas is competitive
- Environmental data influence the choice of energy by final customer
  - It is therefore crucial to deliver scientific and robust information
  - Results can be used to enhance the quality of existing databases
- LCA is a standardized methodology, widely recognised

Meet stakeholders expectations

- Regulation, National and regional authorities : EU energy and climate package, national targets, etc.
- Customers : environmental information, etc.
- NGO and civil society : UN Global Compact, etc

Contribution to the Strategic Guideline of the Triennum

- Advocating for the development of natural gas as a destination fuel for **Sustainable Development**

Study Group LCA within PGC-A

Objectives

- LCA internationally recognised as the relevant tool to assess the potential environmental impacts
- But available LCA databases lack of technical reliability
- An international LCA Study Group would thus be relevant in 3 ways :

1. Data collection

- Framework to collect **industry data** (instead of generic public data)
- Better representativeness
- **Set up an international database** for LCA of the NG chain within IGU

2. LCA of the natural gas chain

- At regional levels
- Applied to specific NG pathways (e.g. LNG, non conventional resources)

3. Support to decision making

- **Continuous improvement** of the environmental performance of natural gas
- **Strategic decisions**, such as to **promote the environmental performances of the natural gas**

IGU is relevant to coordinate such actions at the international level

Study Group LCA within PGC-A

Basis for the study

- A solid basis :
  - IGU study performed in 2006 by CE Delft
  - The work done by SGA-3 on Life Cycle GHG emissions
  - The Marcogaz LCA of the European natural gas chain
    - Includes a critical review that guarantees the quality of the evaluation and results

- Main difficulty : availability of reliable data on the various steps of the natural gas chain and associated technologies

- Implies that members from various regions in the world are involved in the study group !

Final results will contribute to build statements on environmental performances of natural gas at regional scales

Study Group LCA within PGC-A

Materials and methods

- Multicriteria assessment including several environmental impacts, among which :
  - Global Warming
  - Non renewable energy depletion
  - Impacts linked to atmospheric pollution
  - **Water footprint**

Increasing interest of the various stakeholders

- All steps included in the assessment
  - From raw material extraction to the final use

- Data used to describe the NG chains
  - Based on technical data available in the NG industry

Study Group LCA within PGC-A

Main data sources for the inventory

Data from gas companies

- Collected with the LCA SG members
- Published in the sustainable developments reports of Companies
- Reporting data

Data from literature on oil&gas industry

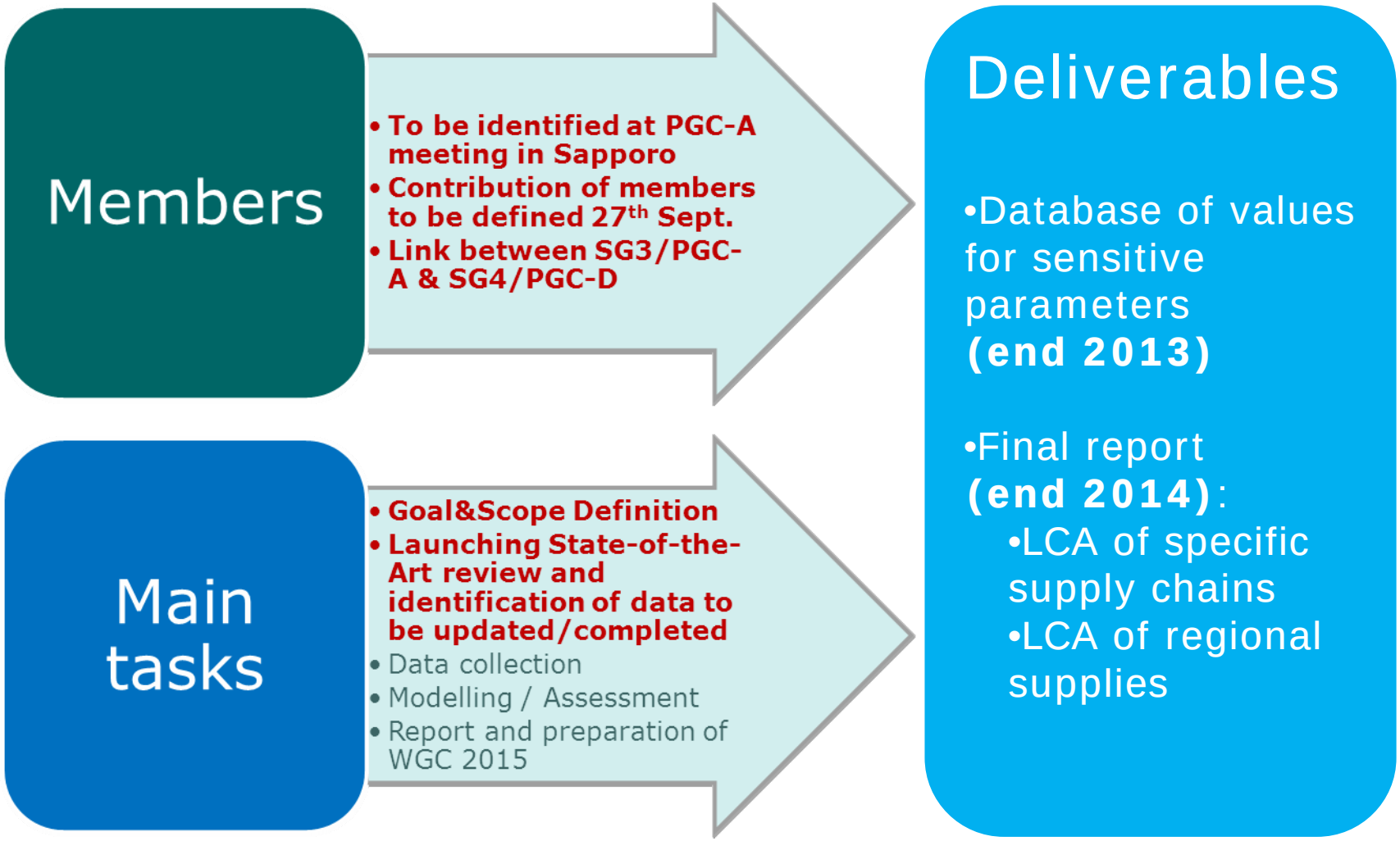
- BP Statistical review
- Wuppertal Institute
- IGU

Other LCAs made by non-gas companies

- LCA Database : ecoinvent
- Paul Scherrer Institut
- LBST

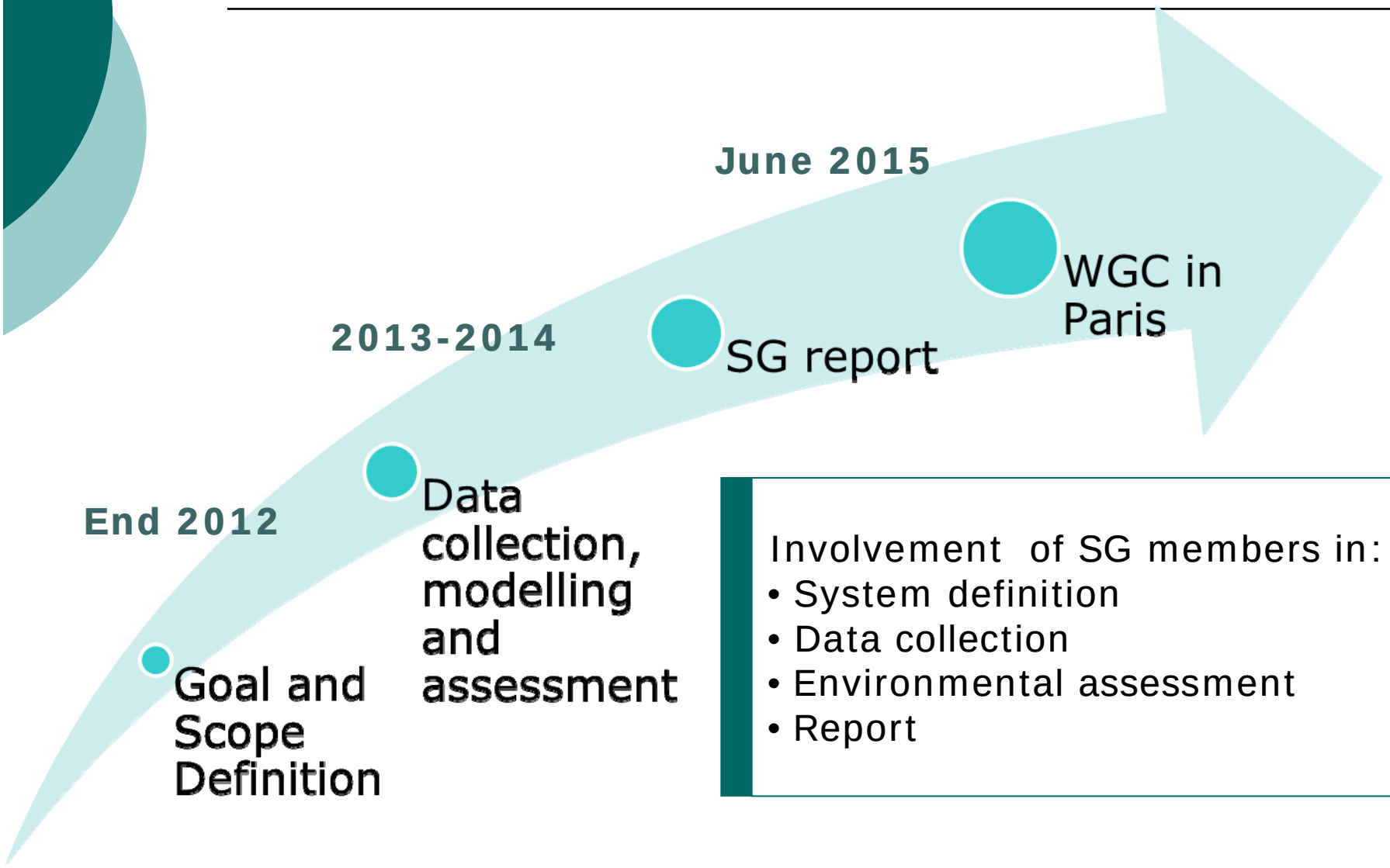
Work plan for the Study Group « LCA »

2012-2015 Triennum and focus on 2012



Work plan for the Study Group « LCA »

Planning for the triennum



Involvement of SG members in:

- System definition
- Data collection
- Environmental assessment
- Report

Back-up

Work plan for the Study Group « LCA »

Deliverables and potential members

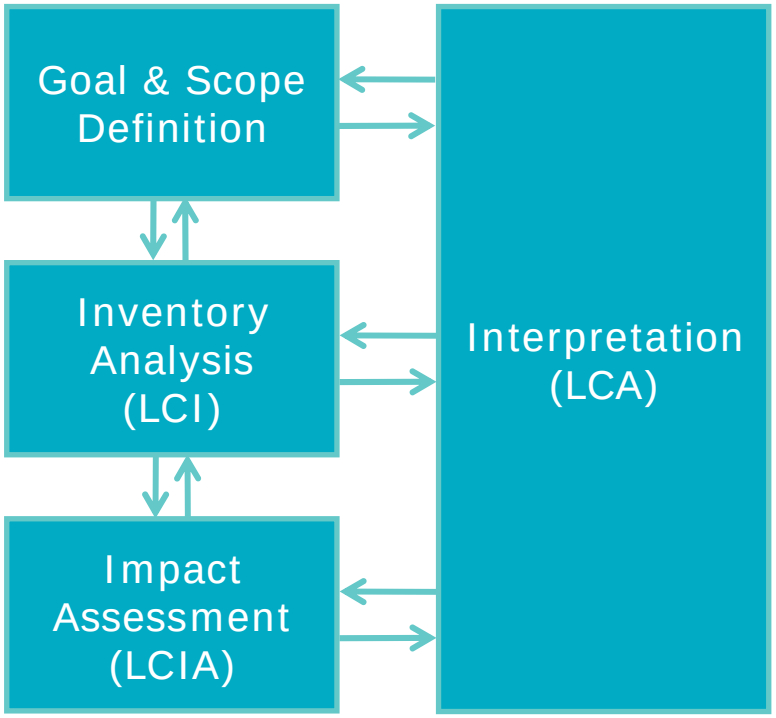
Marcogaz study can be used as **a basis**
But **needs to be adapted and completed to the scope** of the IGU deliverable :
→ Study Group agreement on the methodology
→ Collection of complementary data (in particular outside Europe)

Deliverables for 2015 (reports)	Potential members
1. **Database** of industrial data on the NG chain	**Marcogaz members :** DVGW, Enagas, Open Grid Europe, Synergrid, GDF SUEZ
2. **LCA of specific NG chains** such as : - Unconventional gas - LNG chain	**Other members :** American Gas Association Representatives from Asia
3. **LCA of regional NG supplies** Focused on 3 main areas : North America, South-Eastern Asia, European Union	

Link with SGD 4 – PGCD

Overview of Life Cycle Assessment

A standardized approach



Source: ISO 14040:2006, Figure 1 – Stages of an LCA (reproduced)

- Standardized approach
  - ISO standards ISO 14040 and 14044
- 'Cradle to grave' assessment of the environmental impact
  - of Products/Processes/Services,
  - as well as Organizations (businesses/local and regional authorities).
- Multi-criteria environmental evaluation methodology of which Global Warming Potential is only a part

Study Group LCA within PGC-A

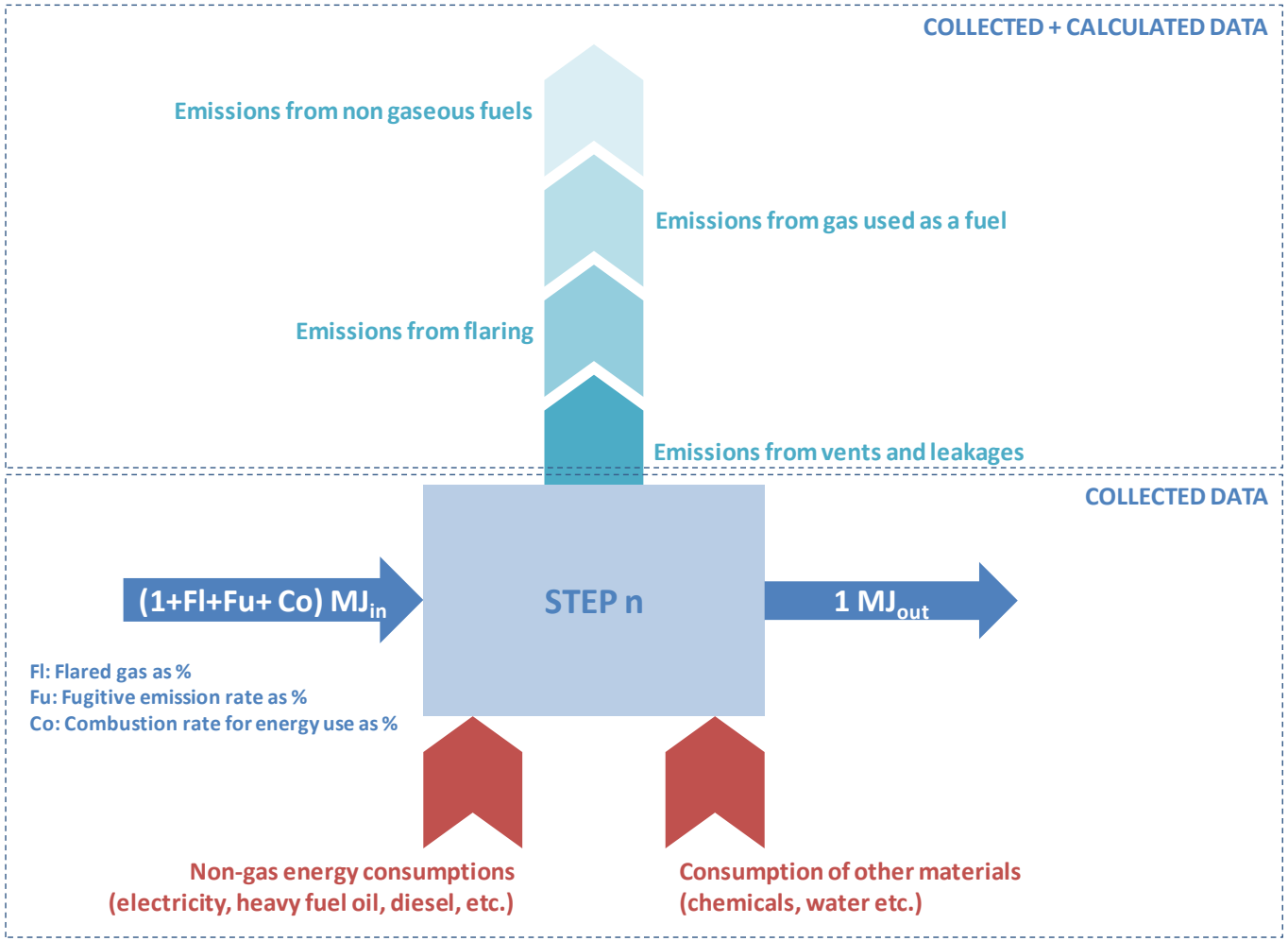
Proposal for the Goal & Scope

- Focus on :
  - Detailed results for the upstream chains (« by MJ of gas distributed »)
  - 1 end use of natural gas, electricity generation (CCGT)
- Geographical representativeness : 3 main supply schemes
  - North America,
  - Asia,
  - Western Europe.
- Methodology chosen for the assessment
  - Life Cycle Assessment, as described by ISO 14040 & 44
- General organisation for the study

1. Identify the available information in the literature, e.g.
   - US EPA report on the GHG reporting for the oil & gas industry
   - Japan Gas Association study on LNG efficiency in liquefaction plants in Qatar
2. Perform a LCA with the available data for the 3 identified regions
   - Data collection focused on sensitive parameters
   - Review and update of the main sensitive parameters by SG members

Study Group LCA within PGC-A

Data to collect at each step



Modelling of the natural gas chain

Comparison with the actual gas chain

Challenge

- Description of the whole natural gas chain with a LCA model,
  - including Countries specificities,
  - and various technologies used at each step.

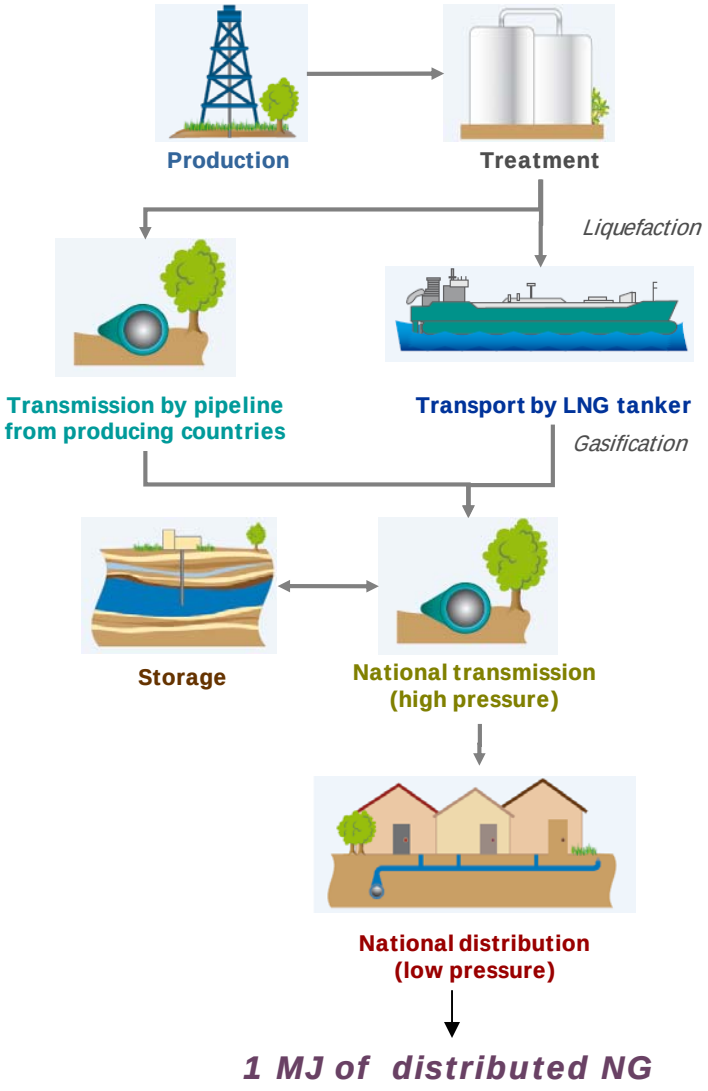
Modelling

- For each step
  - generic model,
  - parameters,
  - adaptation to the available data.

Simplifications

- Infrastructure construction and dismantling excluded
- Evaluation on a steady state basis: no consideration of transition emissions and/or leakages (completion of a well, starting a liquefaction plant ...)
- Analogies for some countries due to a lack of specific data

Steps of the natural gas chain modeled



Strategic vision 2012-2015; the 4 pillars