Evaluation of green house gas emission from chemical products based on life cycle assessment

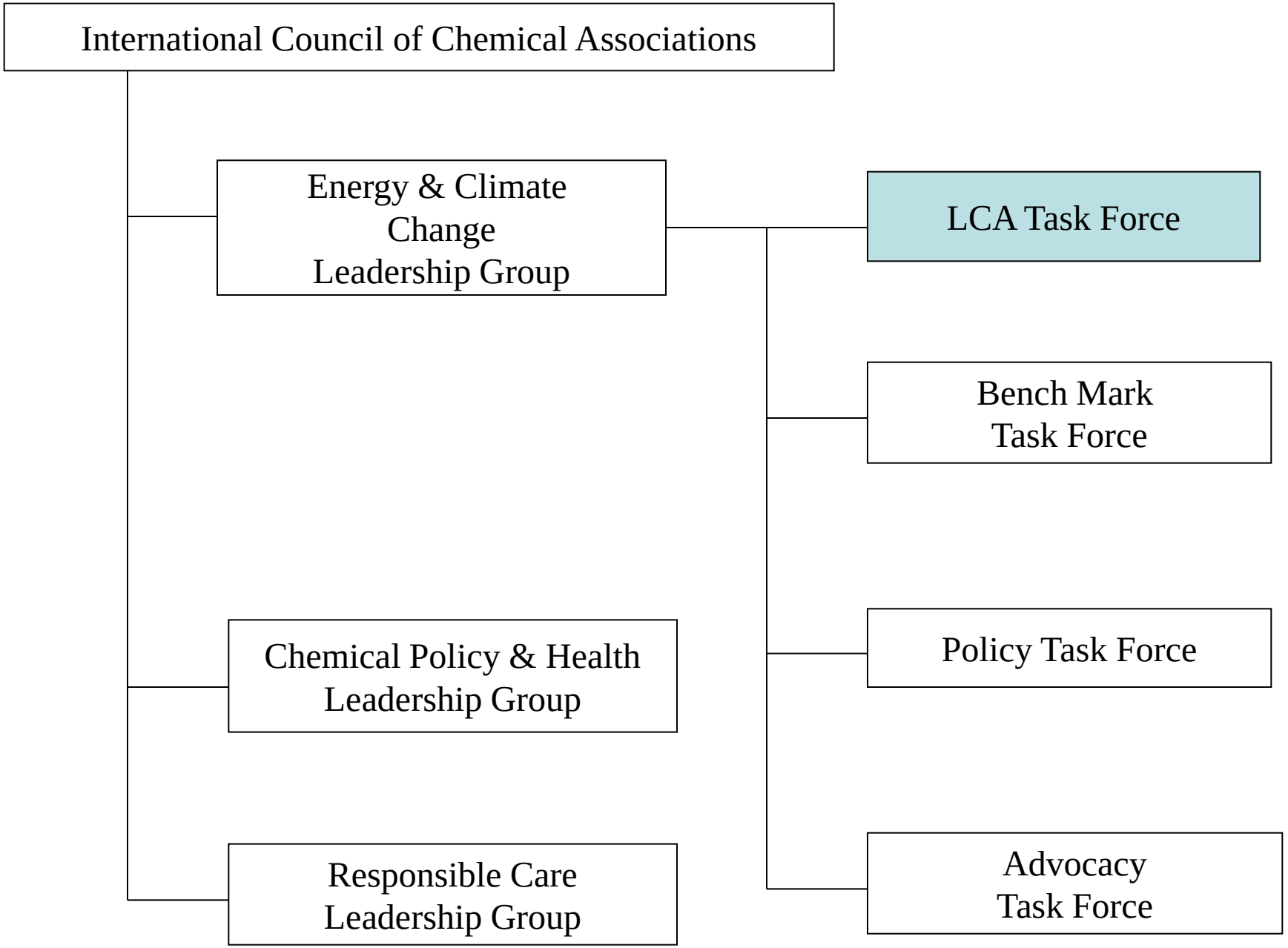
~ Practical use of LCA ~

2009.10.1

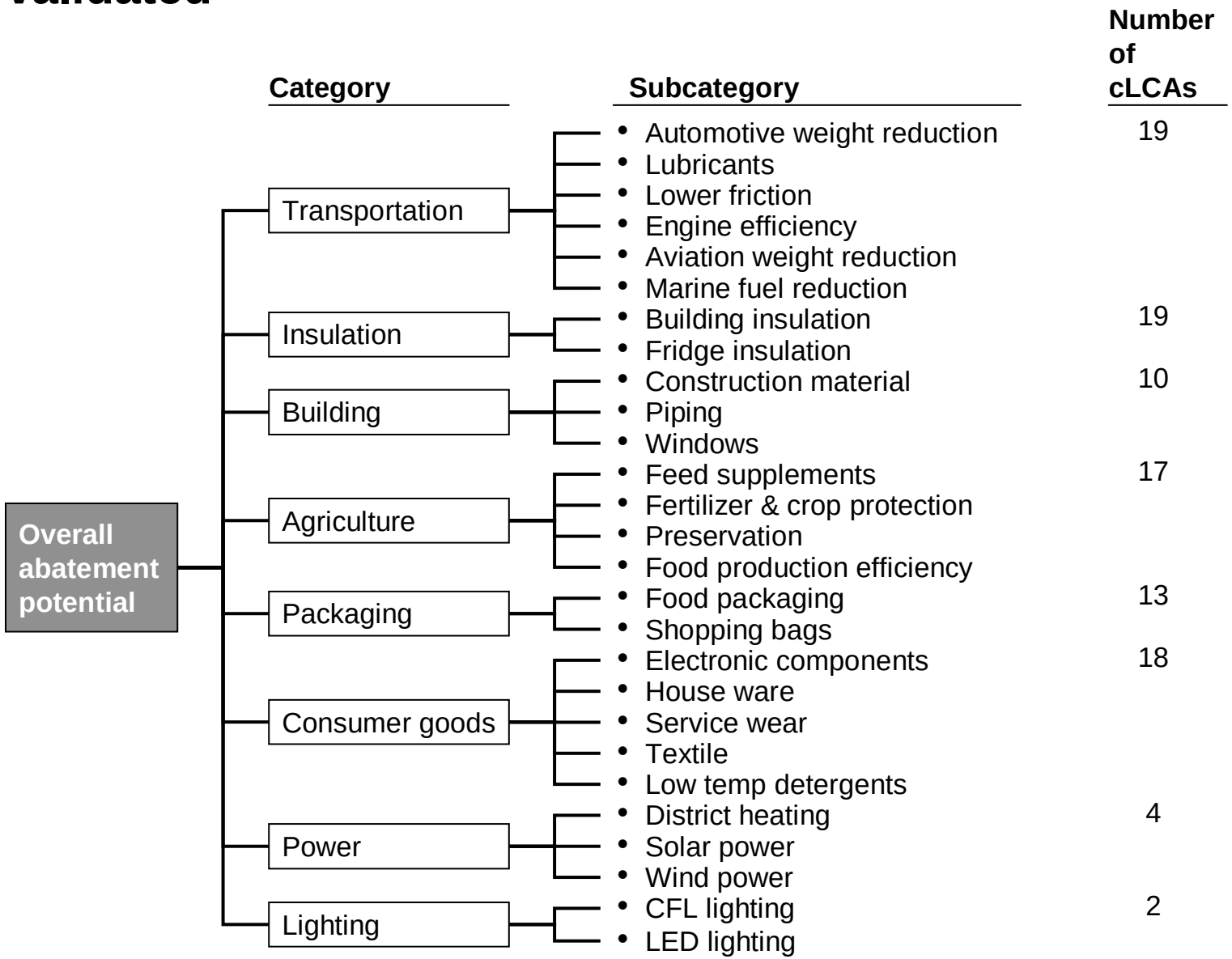
ASAHI KASEI CORPORATION
Junichi Nakahashi

Part I

Evaluation of CO2 emission from chemical products based on life cycle thinking by ICCA


International Council of Chemical Associations
Energy & Climate Change Leadership Group
LCA Task Force
Bench Mark Task Force
Chemical Policy & Health Leadership Group
Policy Task Force
Responsible Care Leadership Group
Advocacy Task Force

cLCAs* cover 8 broad end-use areas and were all externally validated

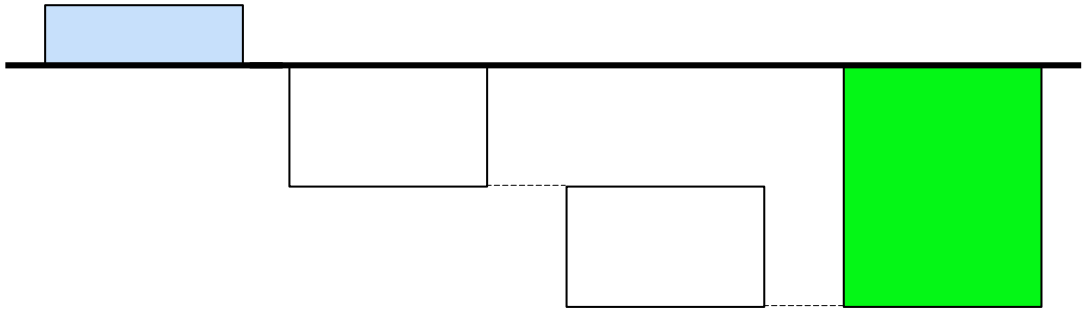


All cLCAs externally reviewed by the Öko Institut

* cLCA = CO_2e life cycle analyses

More than 100 cases evaluated to assess savings from using products of the chemical industry

Calculation scheme to compare the CO_2e emissions from using a chemical industry product with the total avoided CO_2e emissions from not using a non-chemical industry product



Chemical products emissions over life cycle of chemical product

Non-chemical product emissions over life cycle of non-chemical alternative

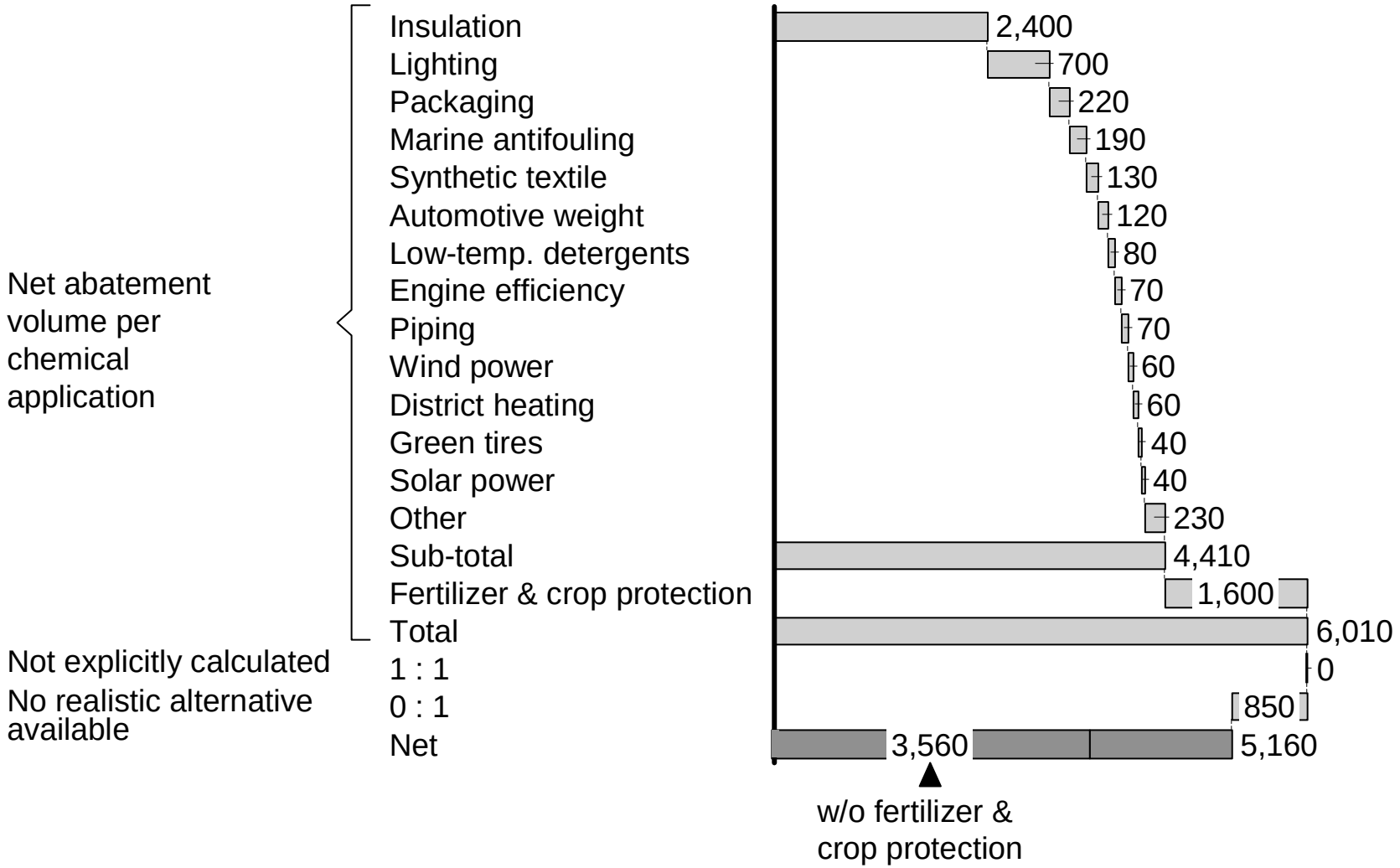
Difference in in-use emissions due to performance difference between chemical and non-chemical product

Gross emissions savings

The main contributors are insulation, fertilizer & crop protection, and lighting

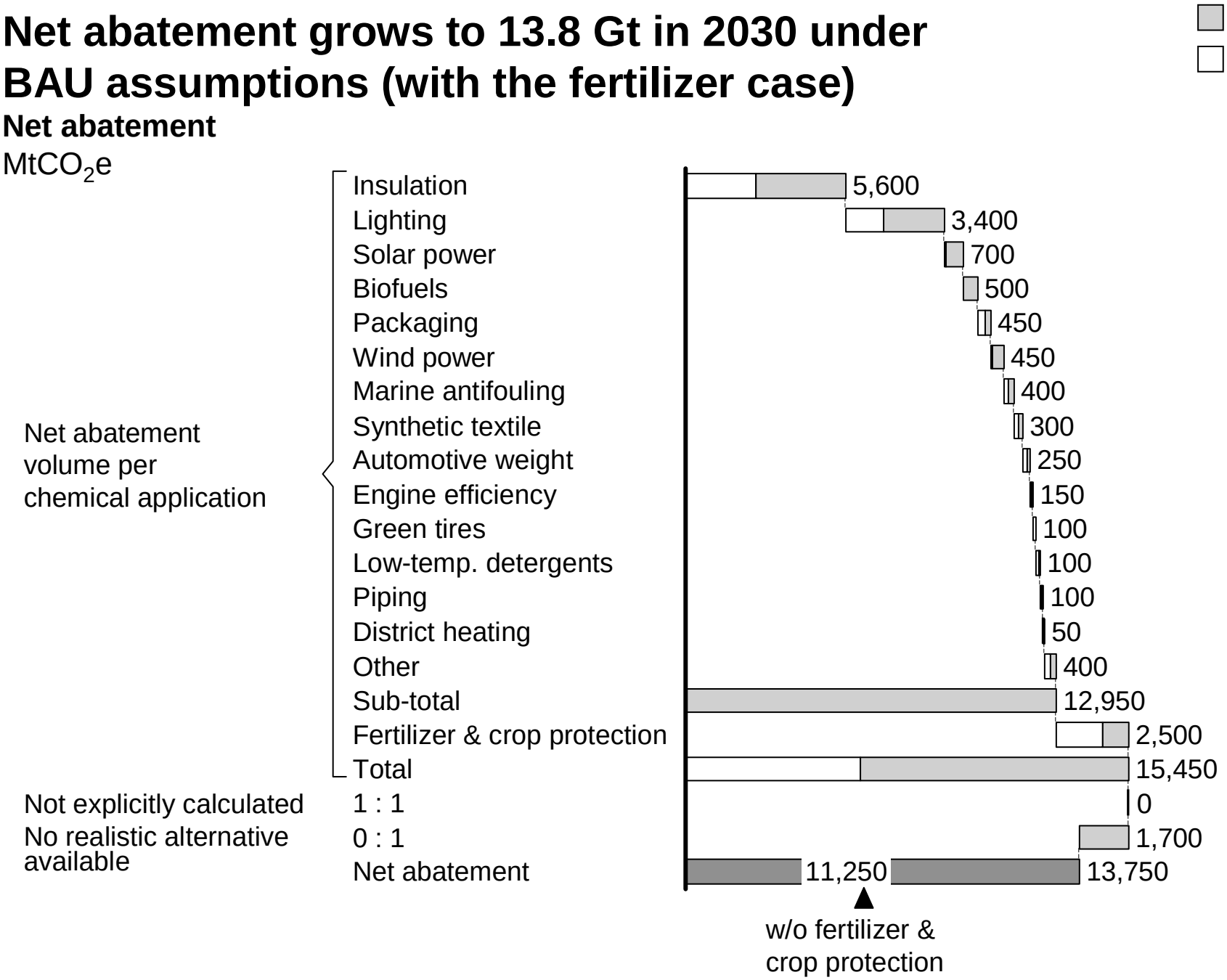
Net abatement 2005

$MtCO_2e$



Source: ICCA/ McKinsey analysis

Net abatement grows to 13.8 Gt in 2030 under BAU assumptions (with the fertilizer case)

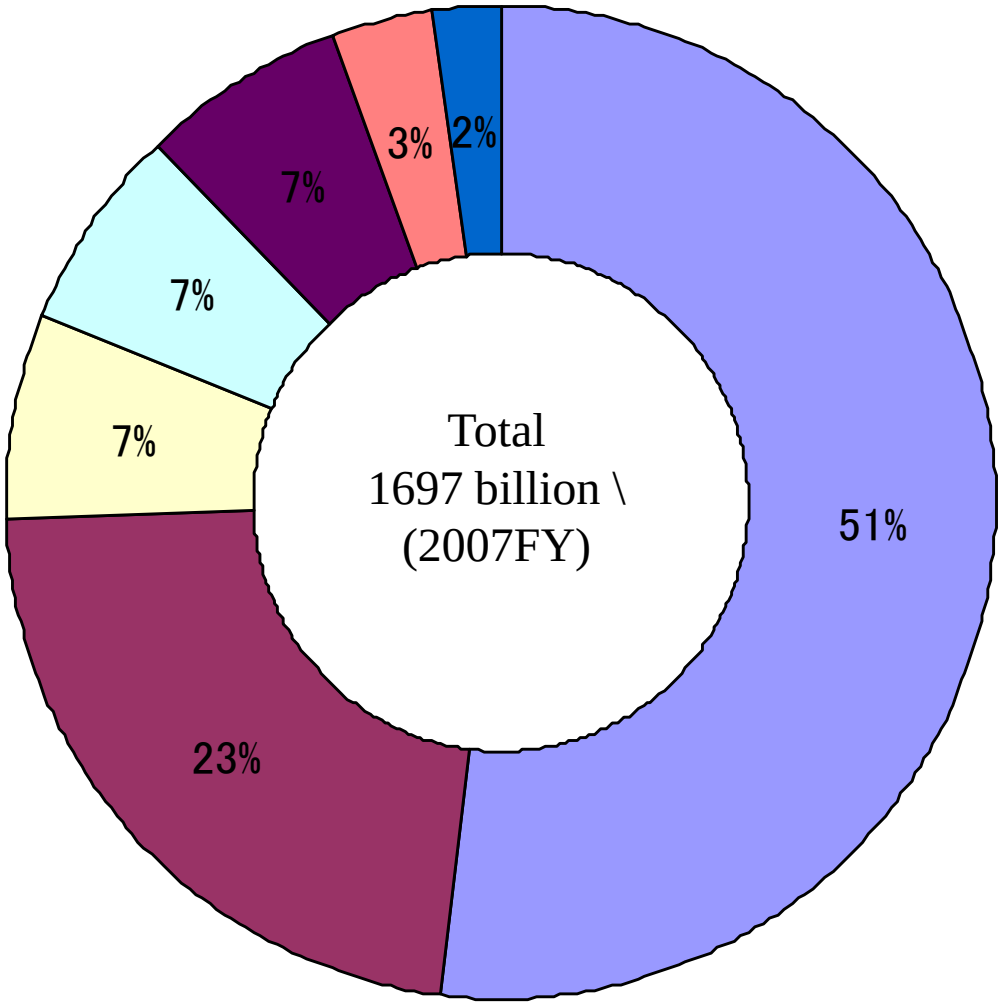


Source: ICCA/ McKinsey analysis

Part II

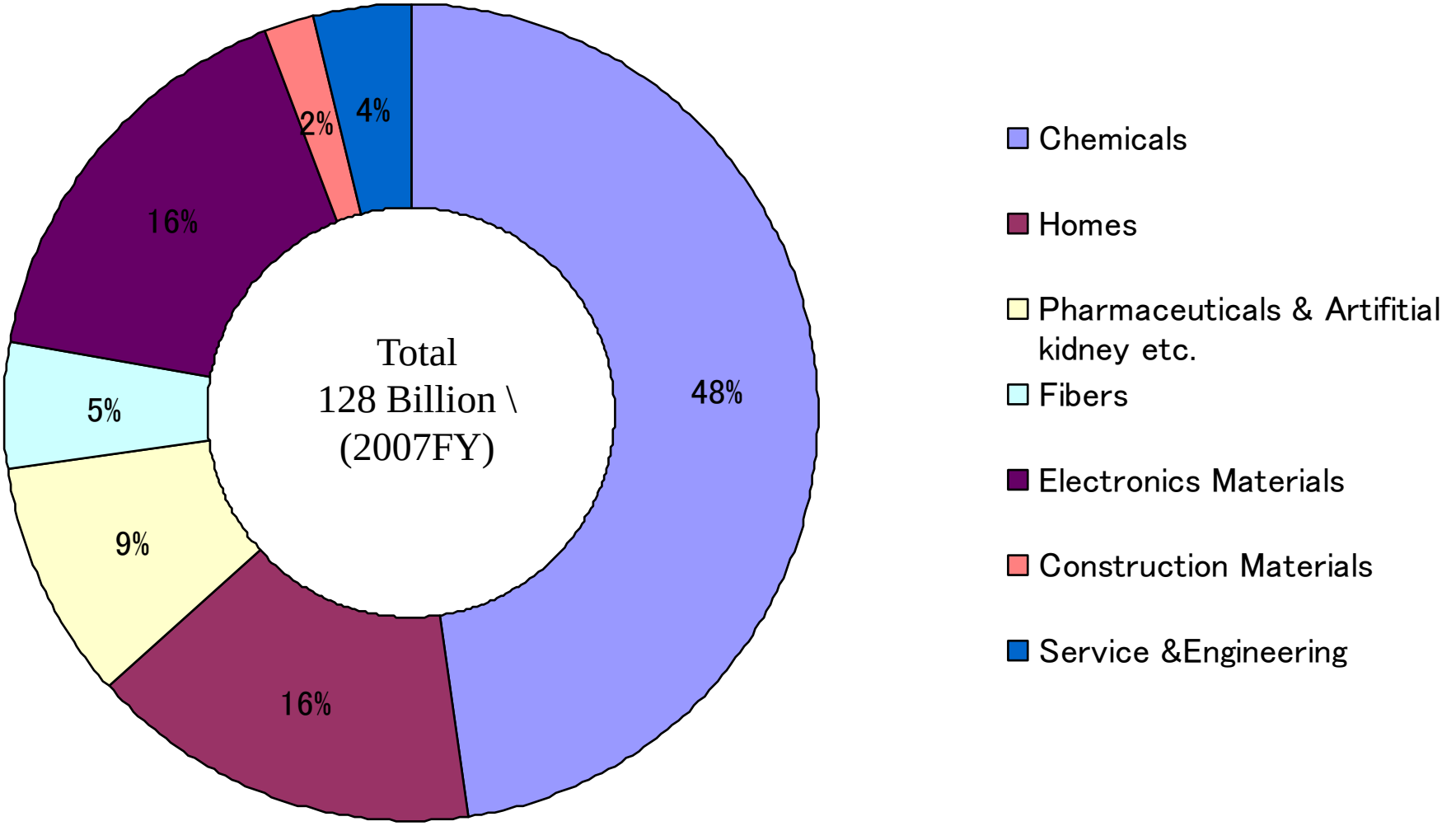
Evaluation of CO2 emission from chemical products of ASAHI KASEI Corporation based on life cycle thinking

ASAHI KASEI CORPORATION - Net Sales -

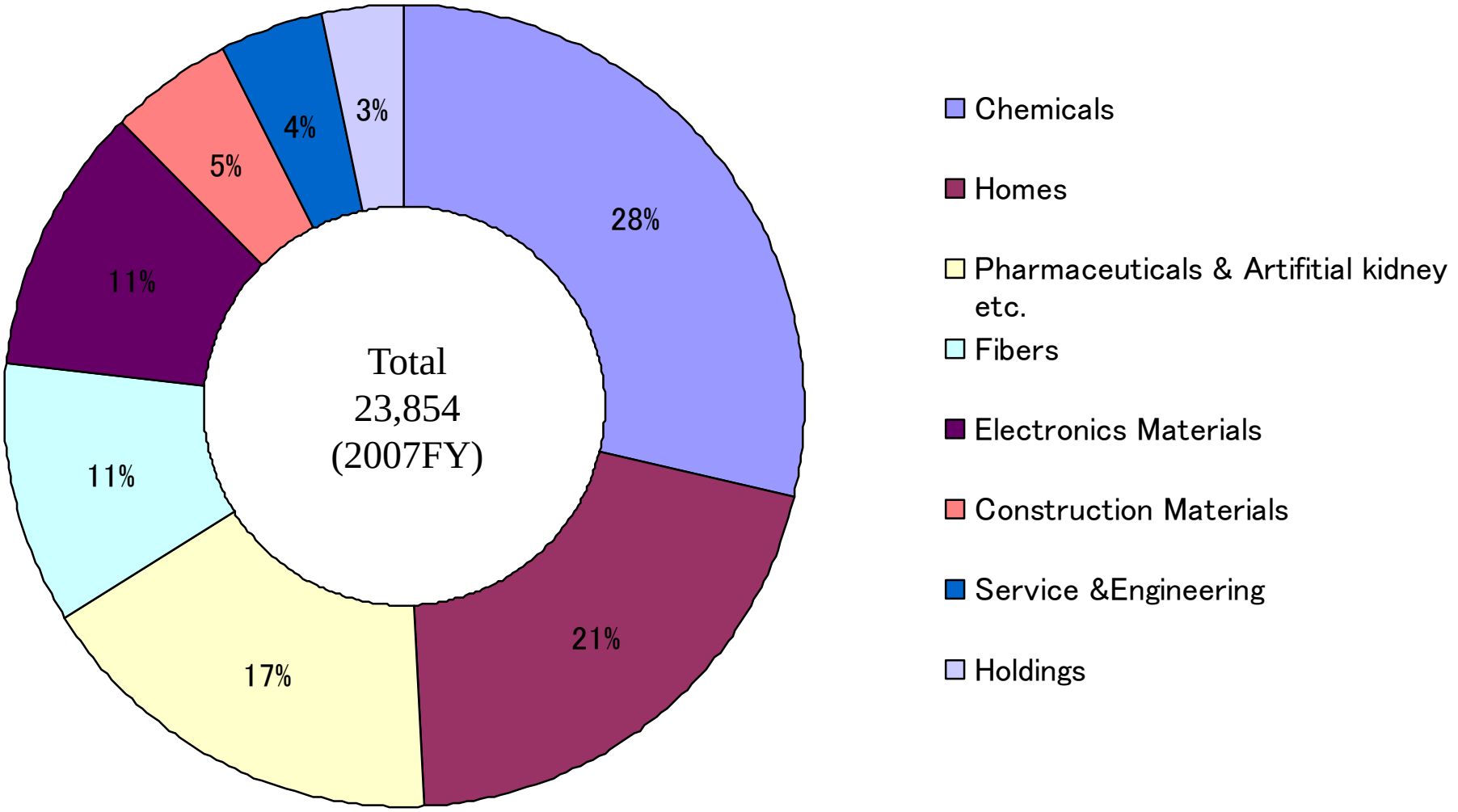


- Chemicals
- Homes
- Pharmaceuticals & Artifitial kidney etc.
- Fibers
- Electronics Materials
- Construction Materials
- Service &Engineering

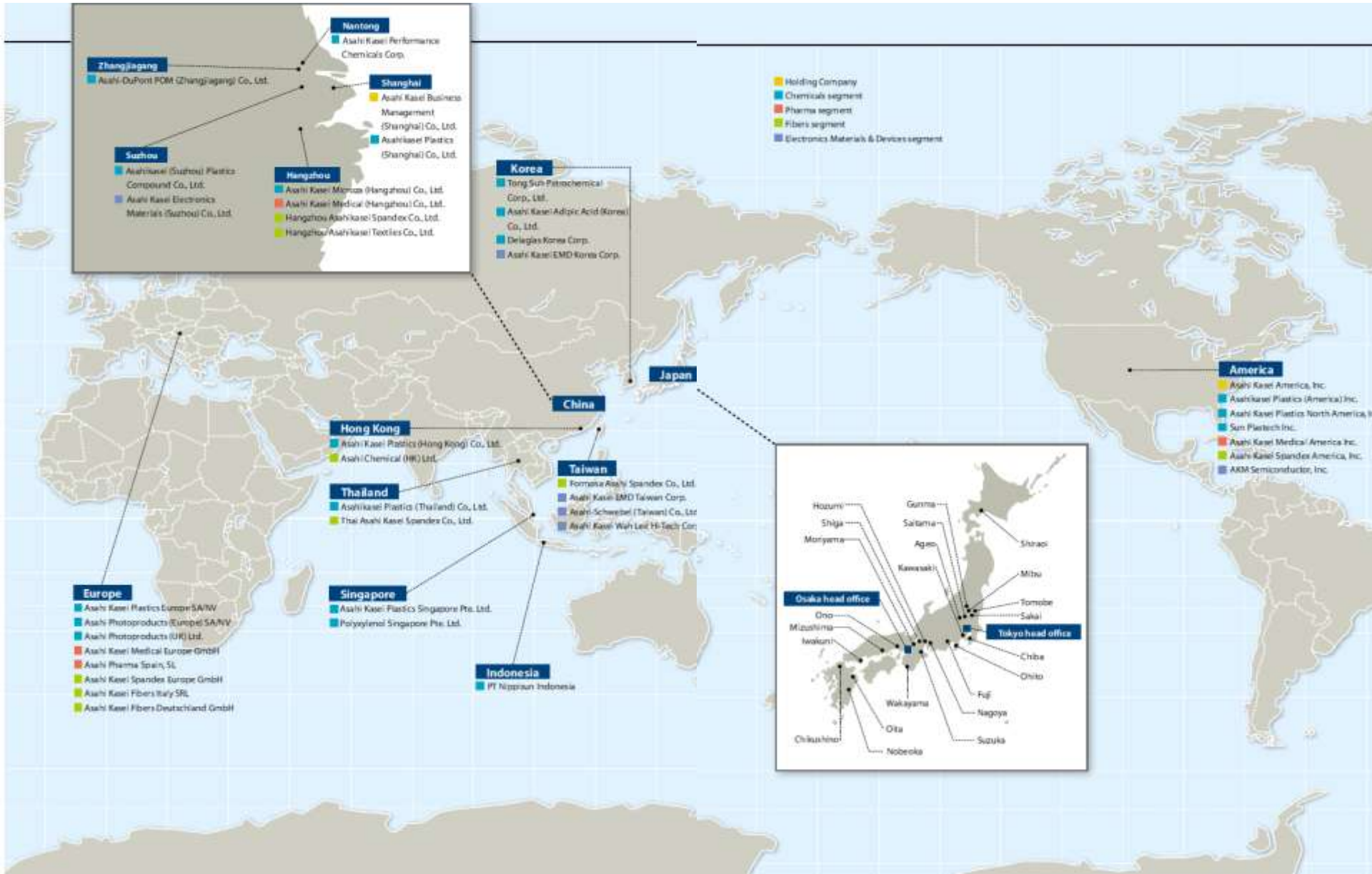
ASAHI KASEI CORPORATION - Operating Profit -



ASAHI KASEI CORPORATION - Employee -

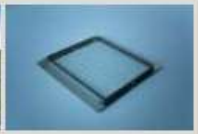


ASAHI KASEI CORPORATION Group



Holding Company

ASAHI KASEI CORPORATION

Segments, Core Operating Companies	Businesses/Products		
Chemicals ASAHI KASEI CHEMICALS	 Chemicals & derivative products	 Polymer products	 Specialty products
Homes ASAHI KASEI HOMES	 Hebel Haus™ unit homes	 Hebel Maison™ apartments	 Condominiums
Pharma ASAHI KASEI PHARMA	 Pharmaceuticals	 APS™ polysulfone-membrane dialyzers	 Planova™ virus removal filters
Fibers ASAHI KASEI FIBERS	 Roica™ elastic polyurethane filament	 Bemberg™ regenerated cellulose	 Lamous™ artificial suede
Electronics Materials & Devices ASAHI KASEI EMD	 LSIs	 Sunfort™ dry film photoresist	 Photomask pellicles
Construction Materials ASAHI KASEI CONSTRUCTION MATERIALS	 Hebel® autoclaved lightweight concrete (ALC)	 Eazet™ piling system	 Neoma™ high-performance foam insulation
Services, Engineering and Others	 Engineering	 Personnel staffing and placement	

ION EXCHANGE MEMBRANE for ELECTROLYSIS

Electrolysis Plant

Ion Exchange Membrane

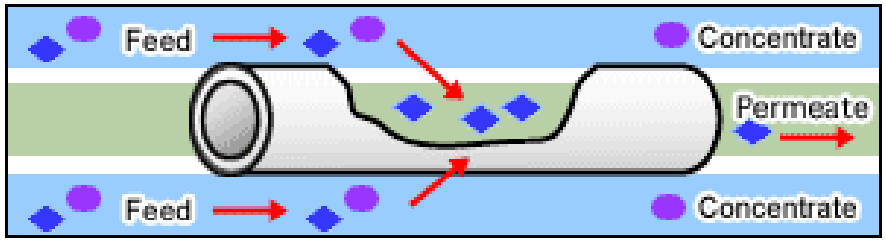
$$2NaCl + 2H_2O \longrightarrow 2NaOH + Cl_2 + H_2$$

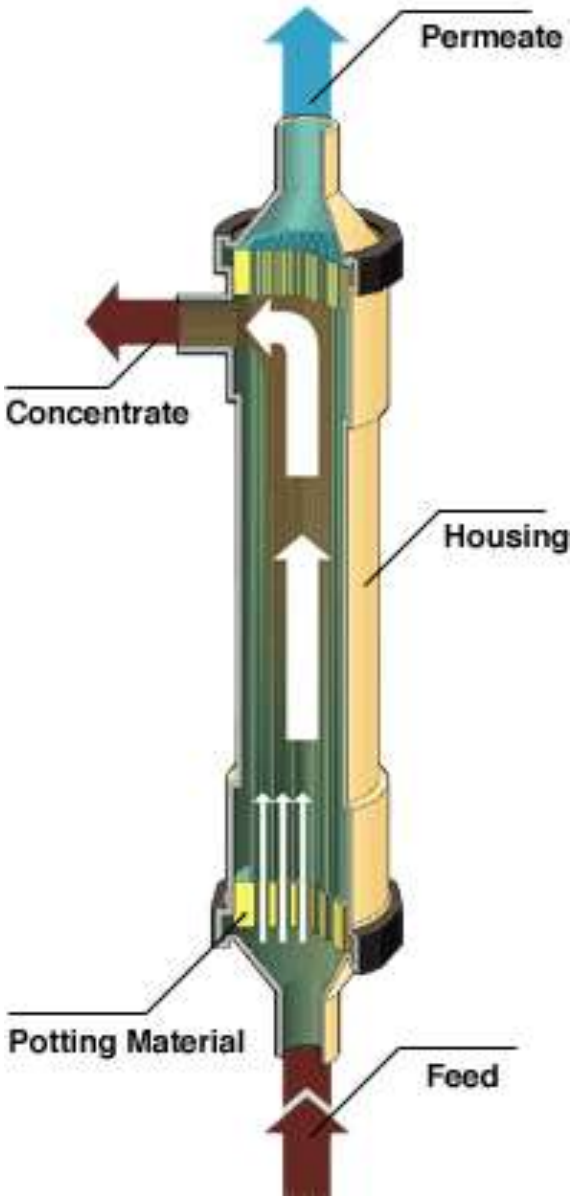
Life cycle CO2 reduction of Ion exchange compared to Diaphragm and Mercury
~ comparison of electrolysis processes for NaOH manufacturing ~

Process	Ion exchange	Diaphragm	Mercury
Raw Material	NaCl aq.	NaCl aq.	NaCl aq.
Product	NaOH, Cl2, H2	NaOH, Cl2, H2	NaOH, Cl2, H2
Electrolysis Energy	+	++	++
CO2 emission	+	++	++

Filtration module containing hollow fiber membrane (Microza)

Applications
- filtration of water for drinking
  conventional technology is sand filtration
- filtration of water for injection
  conventional technology is distillation
- filtration of drain water from the plant of silica colloid
  conventional technology is distillation

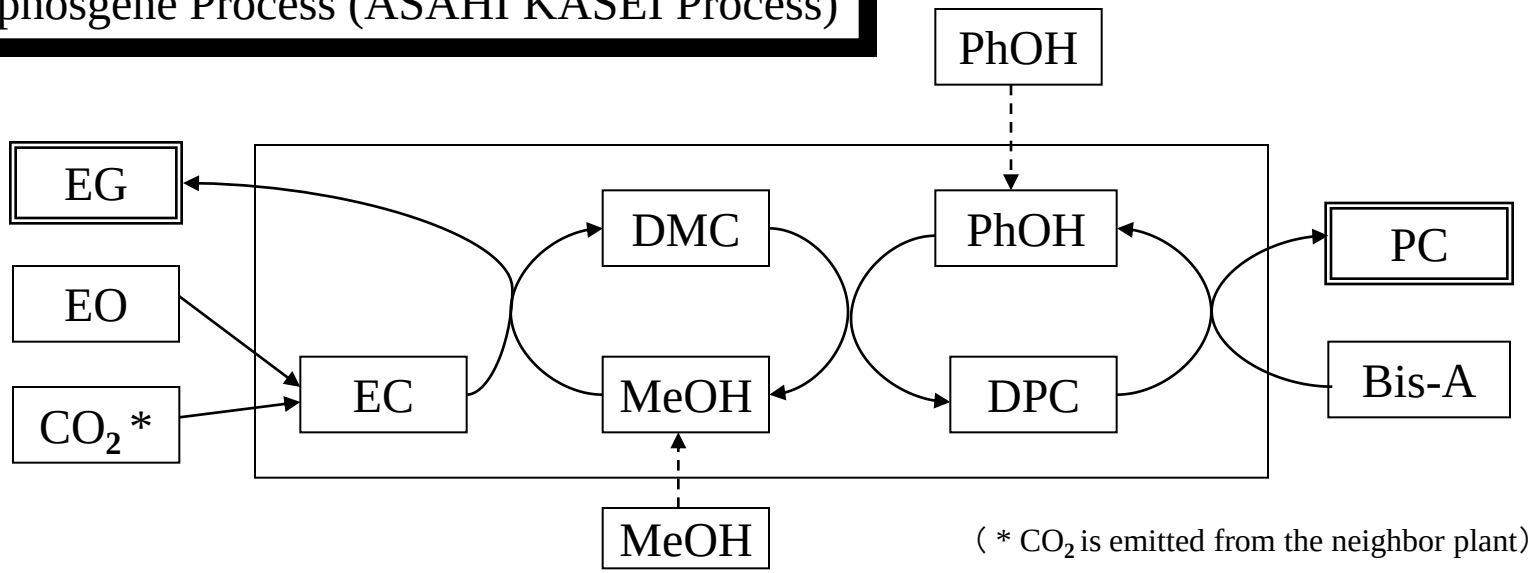




Life cycle CO2 reduction of Microza® compared to conventional technology

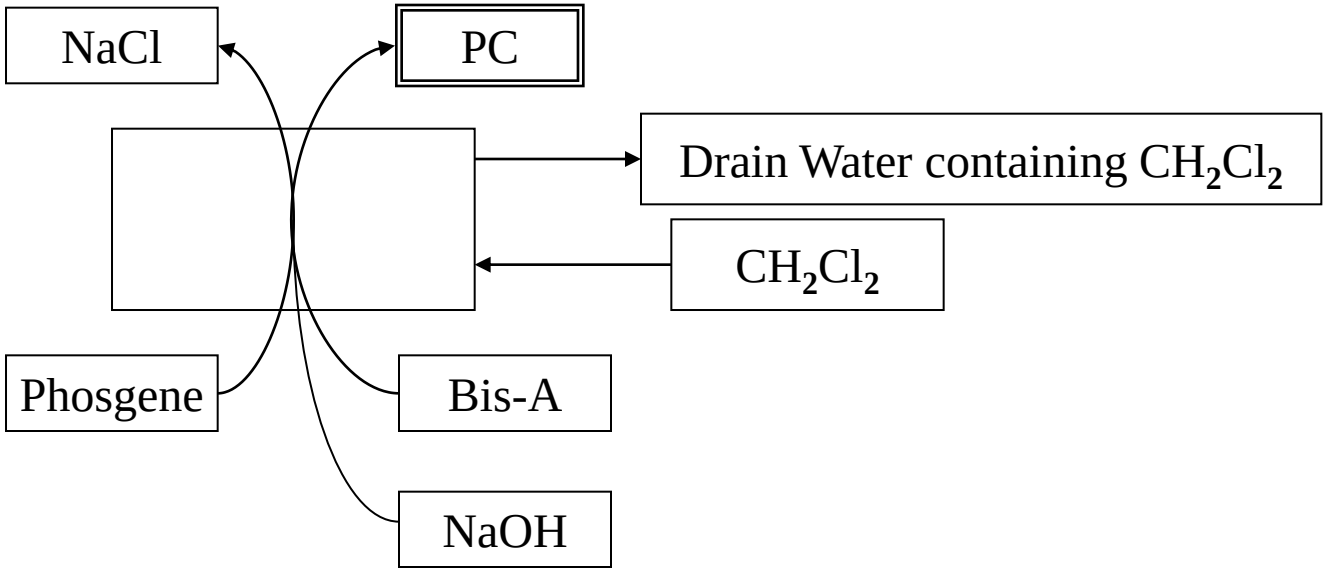
Application	Microza®		conventional	
	process energy	CO2 emission	process energy	CO2 emission
Filtration of water for injection	+	+	+++++	+++++
Filtration of drain water from silica colloid plant	+	+	+++++	+++++

Non-phosgene Process (ASAHI KASEI Process)



（ * CO_2 is emitted from the neighbor plant）

Phosgene Process (Conventional Process)



Life cycle CO2 reduction of non-phosgene process compared to phosgene process

Non-phosgene Process

Raw Material	CO2 emission
CO2	–
Ethylene oxide	0 *
Bisphenol A	+
Total	T1

Product	Polycarbonate Ethylene glycol

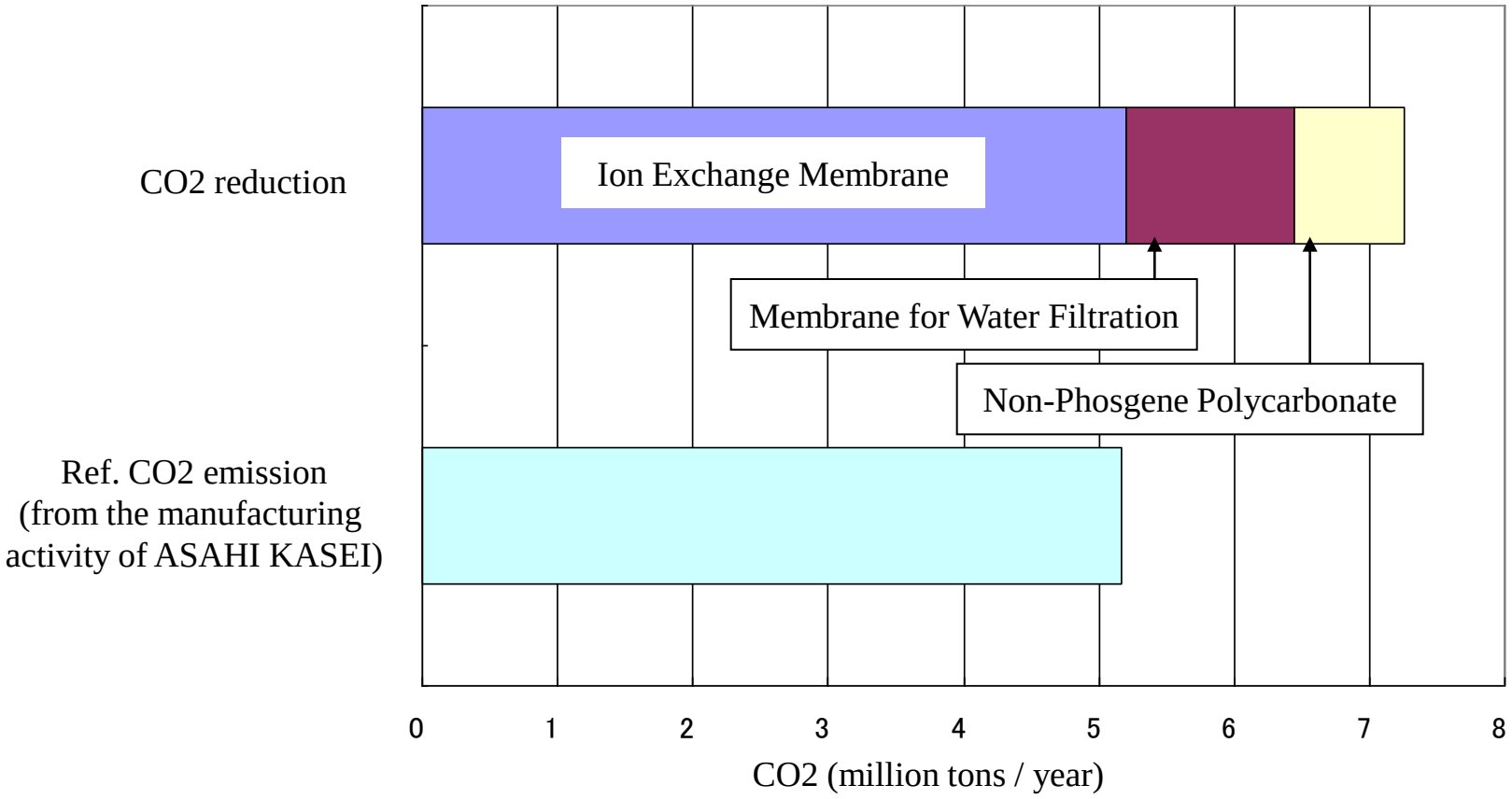
* cancelled because ethylene glycol is sold as product

Phosgene Process

Raw Material	CO2 emission
Phosgene	+
NaOH	+
Bisphenol A	+
Total	T2

Product	Polycarbonate

CO2 emission T1 < T2



Life cycle CO2 reduction of ASAHI KASEI products

Conclusion

~ Part I ~

1. The worldwide LCA study on chemical products by ICCA showed the GHG emission in mining, producing, processing and disposal was one third the size of the GHG reduction in use.

~ Part II ~

2. In ASAHI KASEI Corp., an ion exchange membrane, a membrane for water filtration and polycarbonate made from chemical materials other than phosgene are the products which reduce CO2 emission in use phase.
3. The GHG reduction during the use phase of these three products alone was larger than the GHG emission of all products of the corporation combined.

~ Part I, II ~

4. Expanding sales of chemical products which reduce GHG emission during use can contribute to the overall reduction of GHG emission through their life cycle.

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