

LE DÉVELOPPEMENT DURABLE,
C'EST UN ENGAGEMENT QUI
NOUS CONCERNE TOUS.

Green Supply Chain

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La Passion du Progrès



Pour connaître nos engagements : <http://sustainable.solvay.com>

Solvin Green Supply Chain : Agenda



- Who is Solvin?
- Sustainable approach in Solvay/Solvin
- Sustainability in Solvin SC

Solvin Green Supply Chain : Who are we?



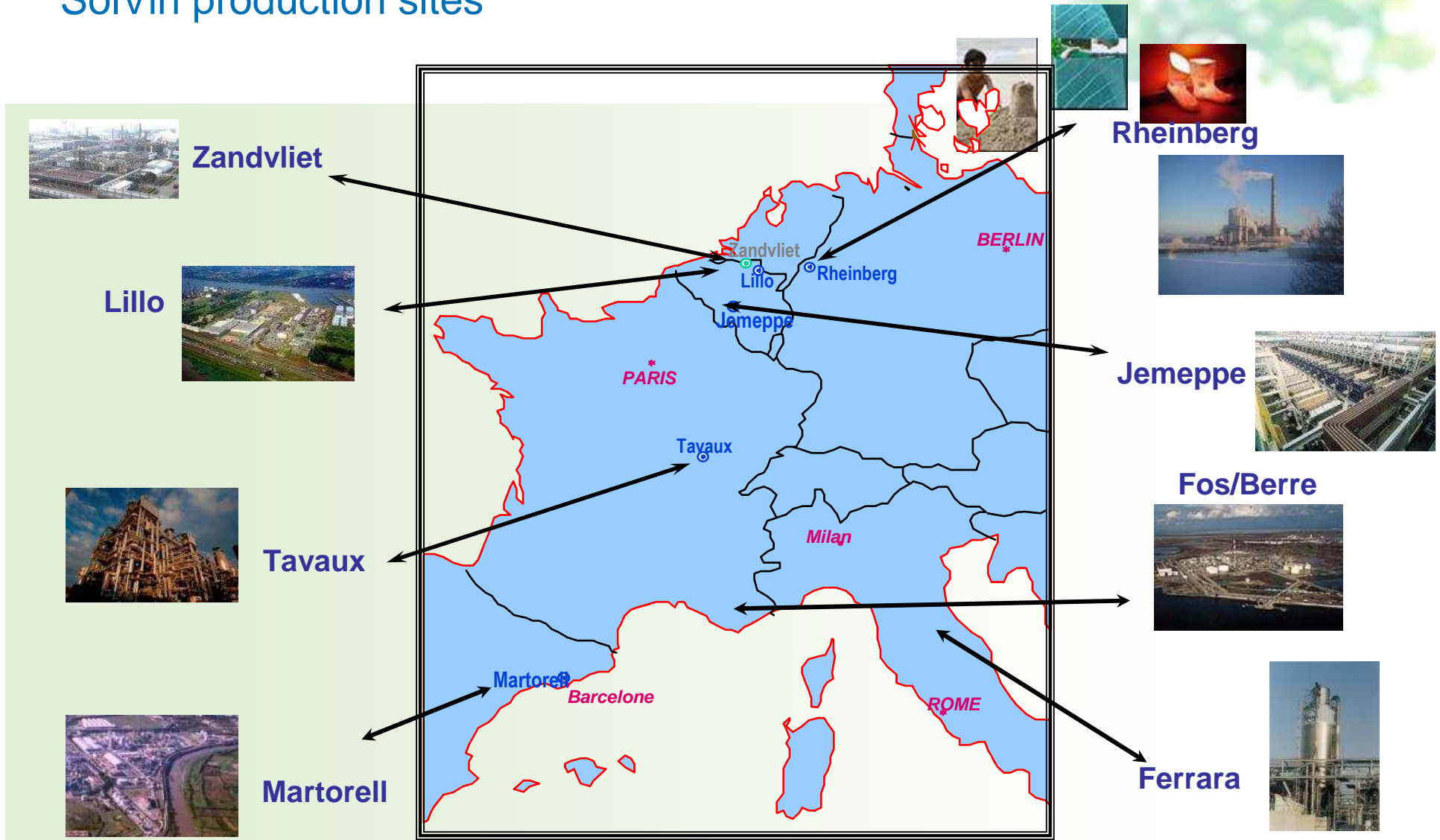
SolVin is a leading European manufacturer of PVC and associated products.

- Foundation : January first 1999 by merging the vinyls activity of BASF and Solvay in Europe
- Ownership : Solvay 75%; BASF AG 25%
- Employees : around 2000
- Products : Cl₂, NaOH, EDC, VCM, PVC-S
PVC-E, VDC, PVDC, PVC Copolymers, R-PVC

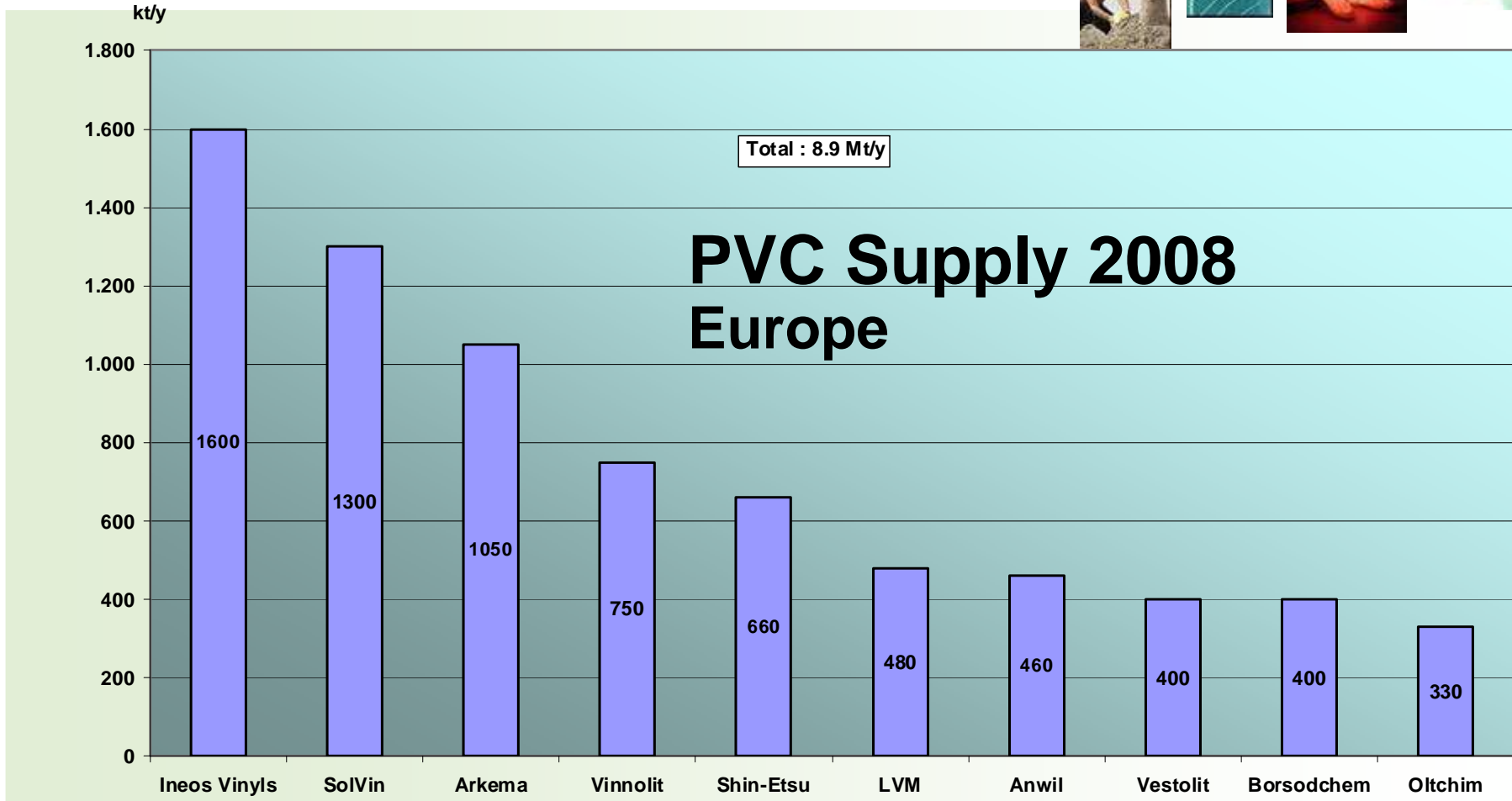
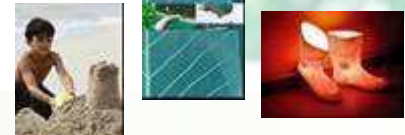


Solvin Green Supply Chain : Company Profile

SolVin production sites



Solvin Green Supply Chain : Who are we?

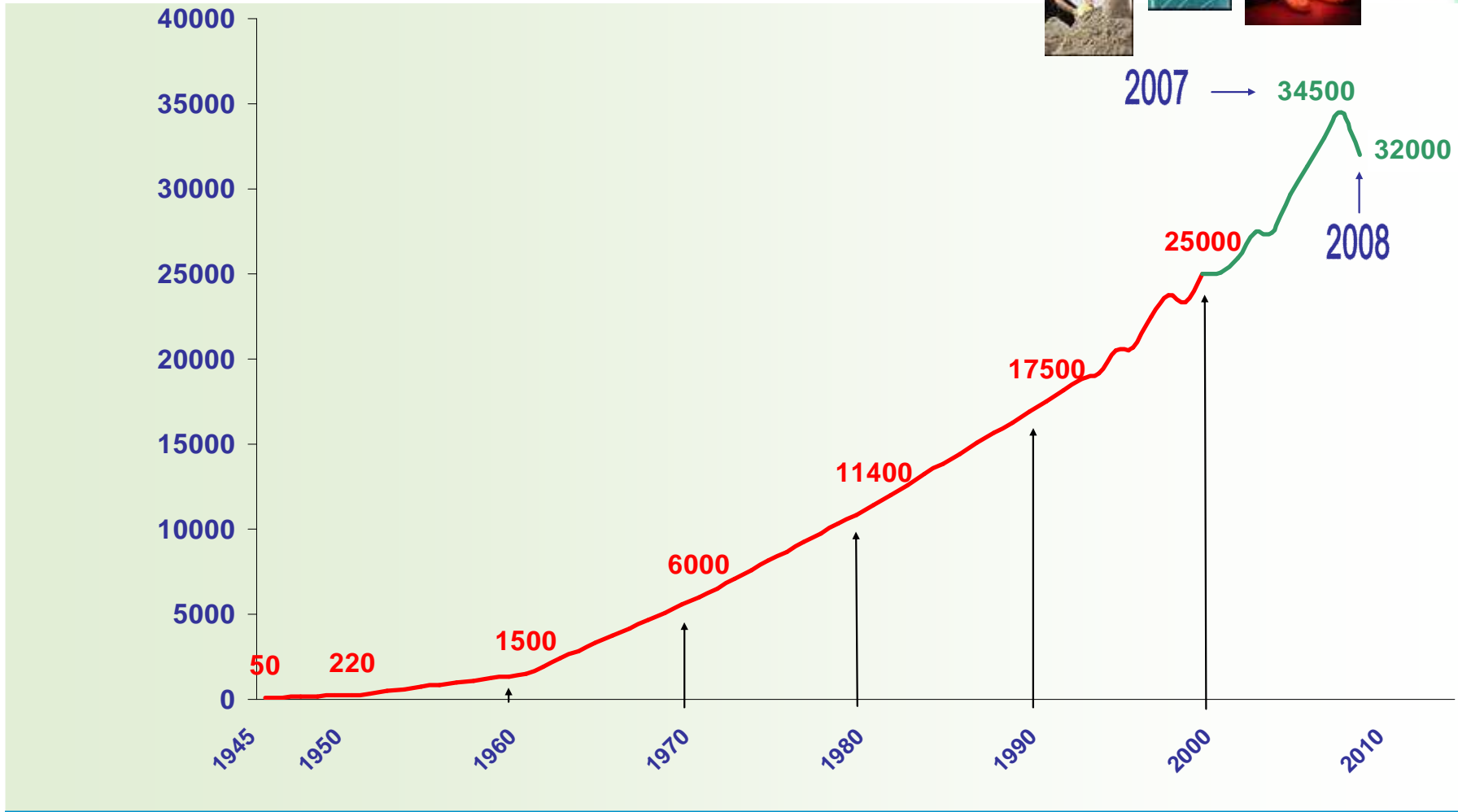
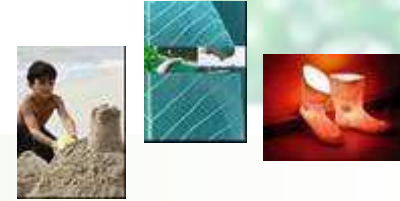


Source: Solvay (Business Intelligence)



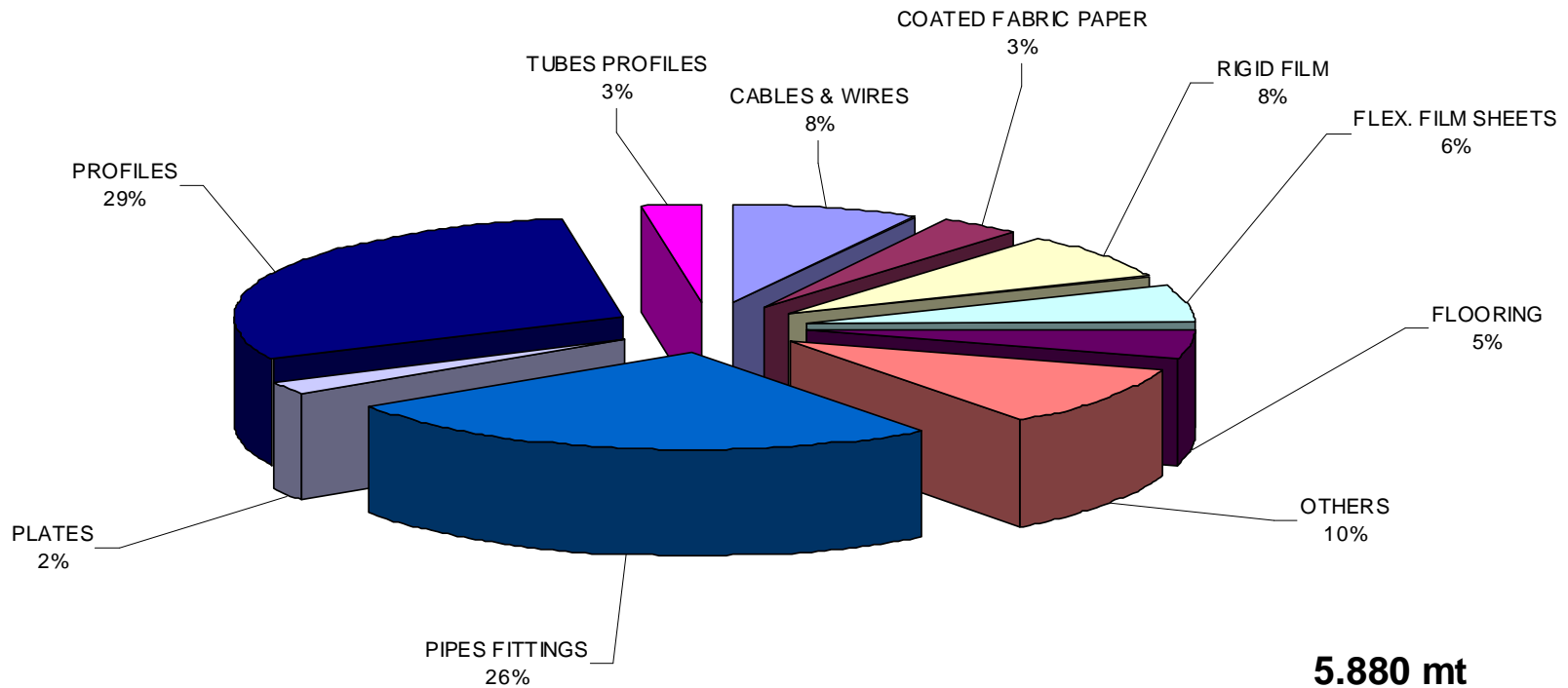
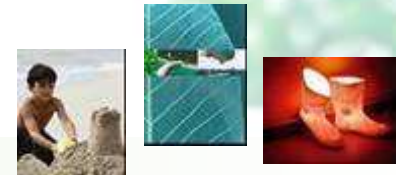
Solvin Green Supply Chain : Who are we?

PVC World Market



Solvin Green Supply Chain : Who are we?

EU 27 Consumption of PVC 2009



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Solvay/Solvin
sustainable



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Après la formalisation de la démarche Développement Durable du Groupe en 2007, deux réalisations marquantes ont ponctué l'année 2008:

La première est un engagement du Groupe à réduire ses consommations énergétiques et ses émissions de manière significative.

En 2020, le Groupe s'engage à réduire:

- sa **consommation totale d'énergie** d'au moins **20%**
 - ▶ dans ses productions primaires et procédés
 - ▶ dans ses installations et immeubles (sur base d'audits énergie).

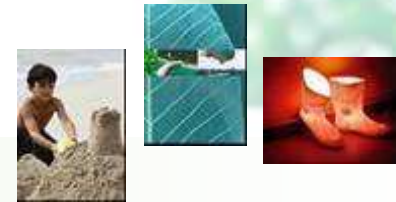
Changed into reduction of CO2 emissions by 20% by 2020

- ses **émissions globales de gaz à effet de serre** (en équivalent CO2) d'au moins **20%**
 - ▶ dont les émissions de la flotte des véhicules de société d'au moins **30%**.
- son **indice d'émissions global dans l'air et dans l'eau** d'au moins **20%**

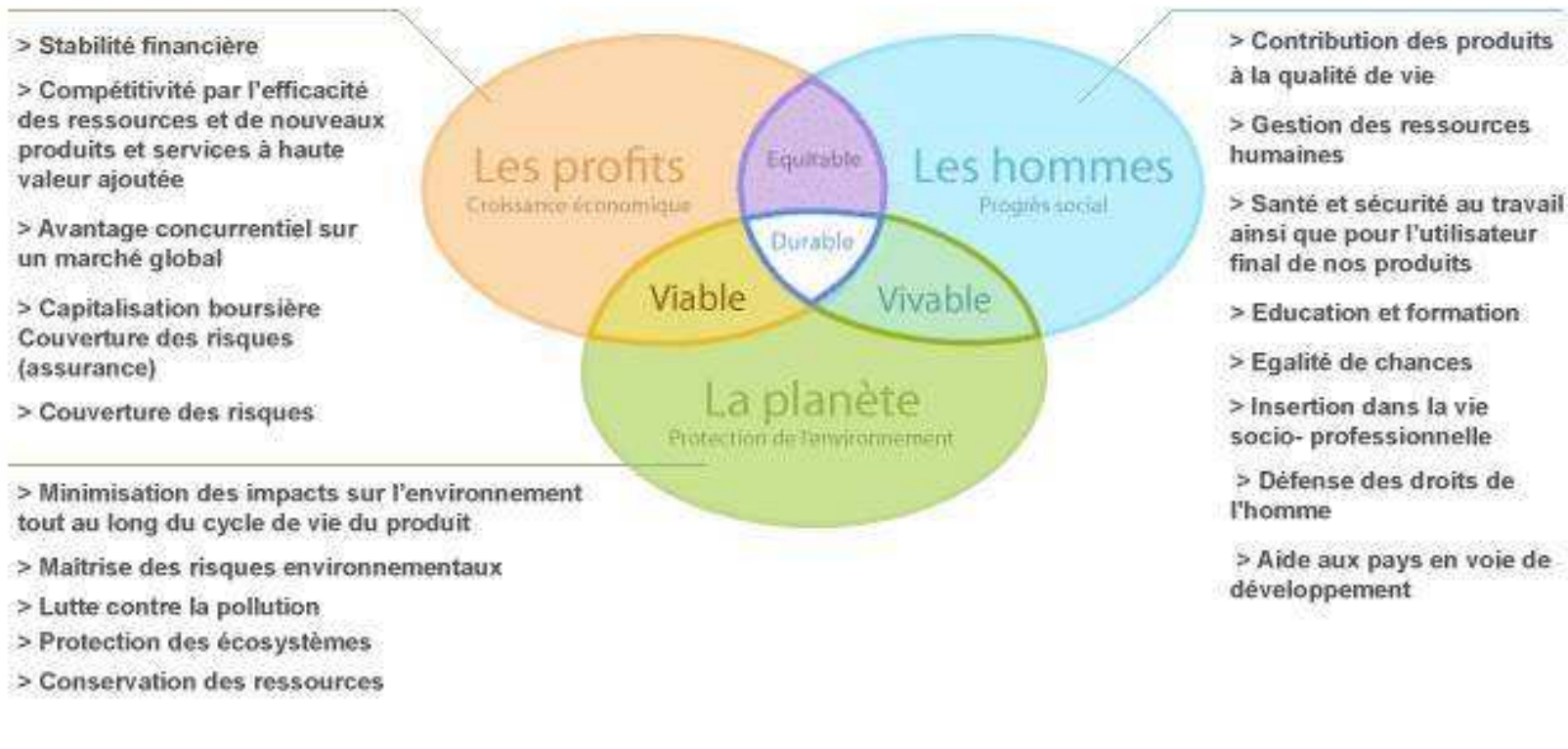
Le Groupe s'est également fixé un objectif ambitieux: atteindre un taux de fréquence des accidents de travail avec arrêt de zéro.

Le document de bilan et de perspective "Pour un Développement Durable, 2008-2012" reprend ces objectifs pour définir au niveau Groupe un ensemble de 107 objectifs, dont **25 objectifs** sont mis en exergue pour leur importance particulière à atteindre aux mêmes horizons 2012 et 2020.

Solvin Green Supply Chain : Solvay Sustainable



■ Perimeter of activity



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Solvin Green Supply Chain



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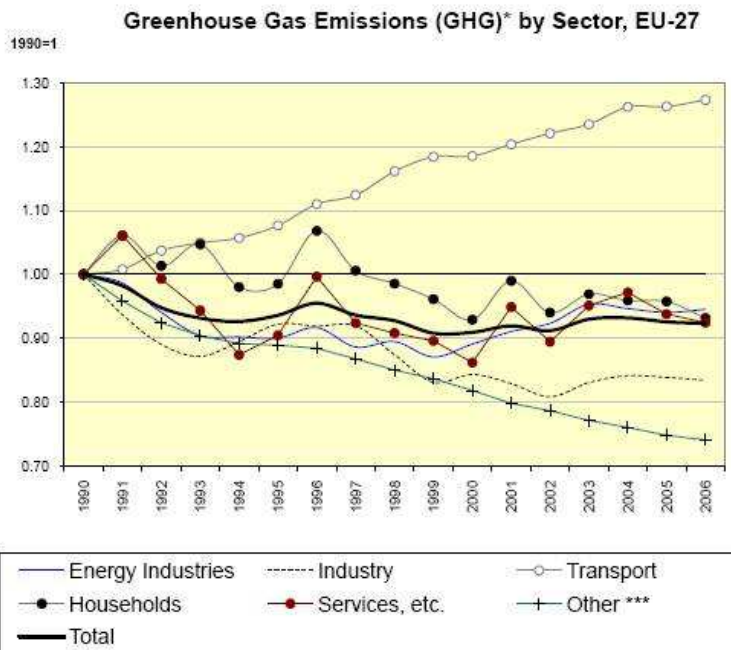


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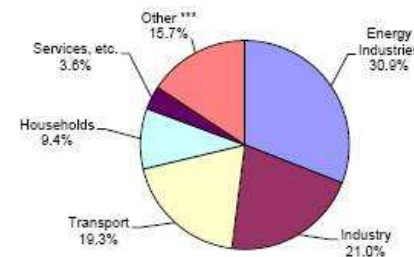
Solvin Green Supply Chain : transport & footprint



Greenhouse Gas Emissions by Sector – EU 27



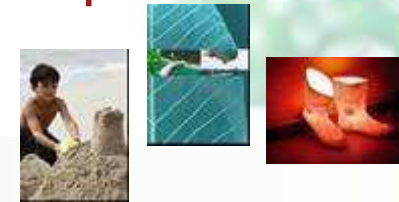
Greenhouse Gas Emissions (GHG)* by Sector, EU-27 (2006)



Source: European Commission

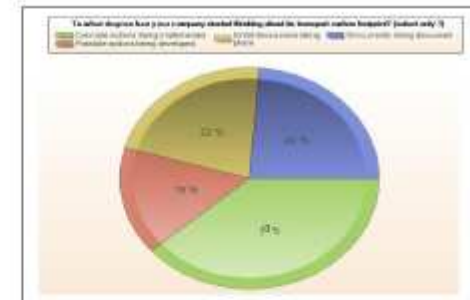
8

Solvin Green Supply Chain : transport & footprint



CO2 Reduction programs

- 53% of LSP's and 27% chemical producers had already started concrete actions
- Main drivers for taking action
 - Corporate image
 - Cost savings
 - Customers
- Current actions:
 - LSP's: practical measures such as driver training, speed limits, new vehicle technology, ...
 - Chemical producers: improve transport efficiency , optimize load plans, increase intermodal transport, better sales forecasts
- Future actions: modernise fleets, more intermodal transport, optimize distribution networks, promote awareness (also of customers)



Solvin Green Supply Chain : transport & footprint



Calculating transport carbon footprint



Why?

- Supply chain design
- Identify reduction opportunities
- Effect of specific measures / investments
- Reporting to customers
- Marketing
- Life cycle analysis
- Legal obligations
- Corporate commitments

You can't manage what you don't know

18

Within Solvin

Stage 1 : evaluate the Solvin
Transport carbon footprint

Stage 2 : analyse possible reductions

Solvin Green Supply Chain : transport & footprint



Measuring transport carbon footprint



Approaches

➤ **Energy based approach (transport companies)**

Calculation based on fuel consumption

$$\text{CO}_2 \text{ emission} = \text{Fuel consumed} \times \text{fuel CO}_2 \text{ emission factor (2.63 kg CO}_2\text{/l diesel)}$$

➤ **Activity based approach (shippers)**

➤ **Top down approach**

$$\text{CO}_2 = \text{Total volume (T)} \times \text{Average distance (km)} \times \text{Average emission factor}^*$$

(* kg CO₂ per Tkm)

➤ **Bottom up approach:**

Calculation based on detailed transactional data

Solvin Green Supply Chain : transport & footprint



Measuring transport carbon footprint

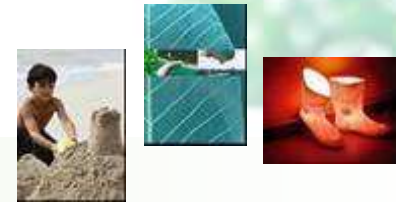
Parameters affecting the choice of emission factors

kg CO2 per Tkm

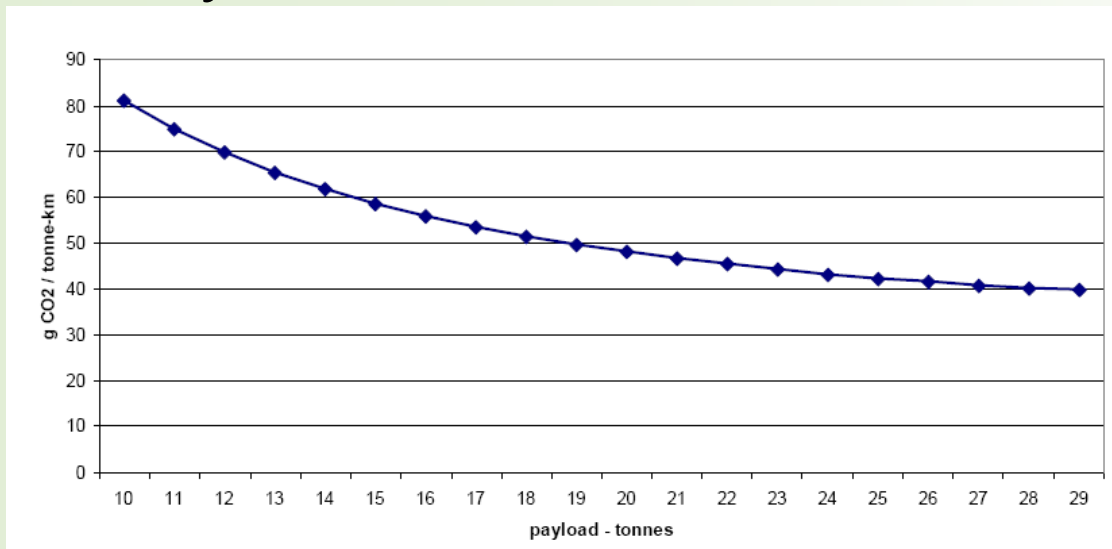
- Vehicle /ship type
- Vehicle emission factor (Euro 1 to 5)
- **Load factor / payload** →
- Empty trips
- Driver behaviour
- Road type (motorway, urban...)
- Road gradient (flat/hilly/ mountainous)
- Barge: upstream/downstream/no stream
- Rail: electricity or diesel / energy mix for electricity production

Objectives sets in
2009 & 2010.

Solvin Green Supply Chain : transport & footprint



■ Payload reduction



BULK	2008	2009	KG
JE	26,28	26,06	-220
RB	24,06	24,26	200
TA	24,78	24,91	130
BE	24,86	24,93	70
MA	24,72	24,84	120
	25,1	25,14	40

Target 2010 : +100 KG

150t/C02

Solvin Green Supply Chain : transport & footprint



Decarbonising chemical transport operations



Most important influencing factors

- Weight/volume of goods transported
- Transport distance
- **Supply Chain structure**
- **Loading factor**
- **Proportion empty running**
- Vehicle capacity (40 / 44 T)
- Transport mode – modal split
- **Energy efficiency of transport (distance travelled per unit of energy)**
- Carbon intensity of energy source

27

Solvin Green Supply Chain : transport & footprint



Siim Kallas , New EC Commissioner for transport

"Decarbonisation is not debatable. We have binding targets for the reduction of emissions by 2020 and we will make the necessary legislative proposals. We will continue the effort to reduce the carbon content of the transport sector, via legislative targets and via the correct internalisation of external cost."

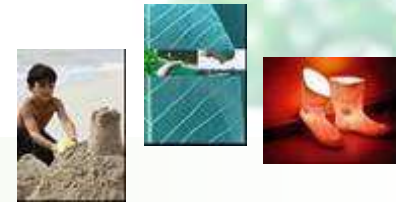


Connie Hedegaard, New EC Commissioner for climate change:

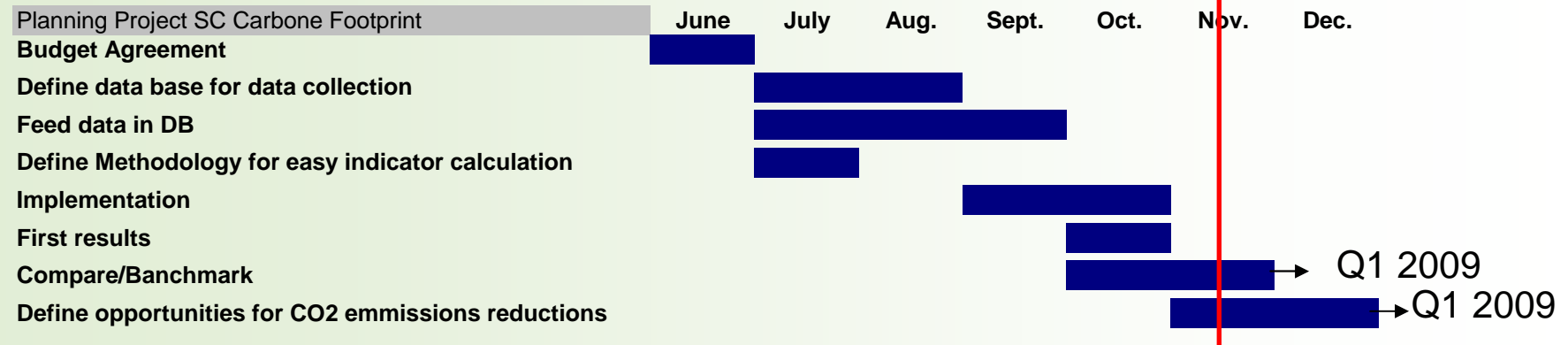
"The continued growth in carbon emissions from transport is currently offsetting efforts made in other areas. I will table a comprehensive legislative package on climate change and transport during my mandate. One of my first initiatives will be to introduce legislation on cutting CO2 emissions from lorries."



Solvin Green Supply Chain : solvin calculation model



- Project to evaluate the SC CO2 footprint.
- Step I: transport
- Indicator : tCO2e/t.km
- Support: Climact



Solvin Green Supply Chain : solvin calculation model

■ Calculation Process :Basics

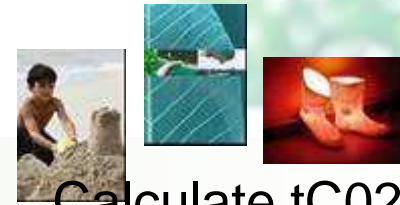
Query

The screenshot shows a software interface with multiple input fields and buttons. Fields include 'Company Code', 'Calendar Year/Month', 'Product Hierarchy', 'Forward agent', 'Ship to party', 'Sold to party', 'Incoterms', 'Material', 'Plant', 'TPI Planning Pt', 'Shipment type', 'kind of leg', 'Country of shipping point', and 'Country key of destination'. Each field has a search icon and a 'To' field. Buttons at the bottom include 'Execute', 'Check', and 'Cancel'.



Define Roads

- Origin
- Destination
- Transport Means
- Country
- Km by leg



Calculate tCO2/t.km

Mode	fact em (tCO2e/unit)	unit
ROAD	0,001217313	km
RAIL		t.km
SEA	3,88667E-05	t.km
PIPE		0 t.km
MAIL		0 t.km
AIR	0,00209	t.km
	0	0

RAIL tCO2/t.km

France	7,50E-06
Russian Feder.	2,26E-05
Serbia	2,26E-05
Europe	2,26E-05
Germany	3,20E-05
Austria	1,26E-05
Belgium	1,86E-05
Denmark	3,78E-05
Spain	3,45E-05
Finland	2,01E-05
Greece	4,45E-05
Ireland	5,82E-05
Italy	2,91E-05
Luxembourg	2,53E-05
Norway	8,22E-06
The Netherlands	3,04E-05
Portugal	4,44E-05
United Kingdom	4,12E-05
Sweden	4,28E-06
Switzerland	3,64E-06
Poland	4,57E-05
Hungary	2,35E-05

- All transports
- PVC/VC/EDC/Salt(fromJe)
- FOB included

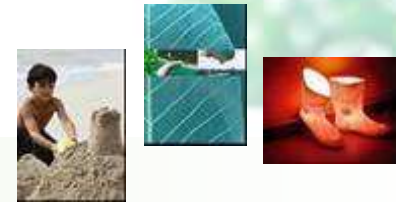
Solvin Green Supply Chain : solvin calculation model



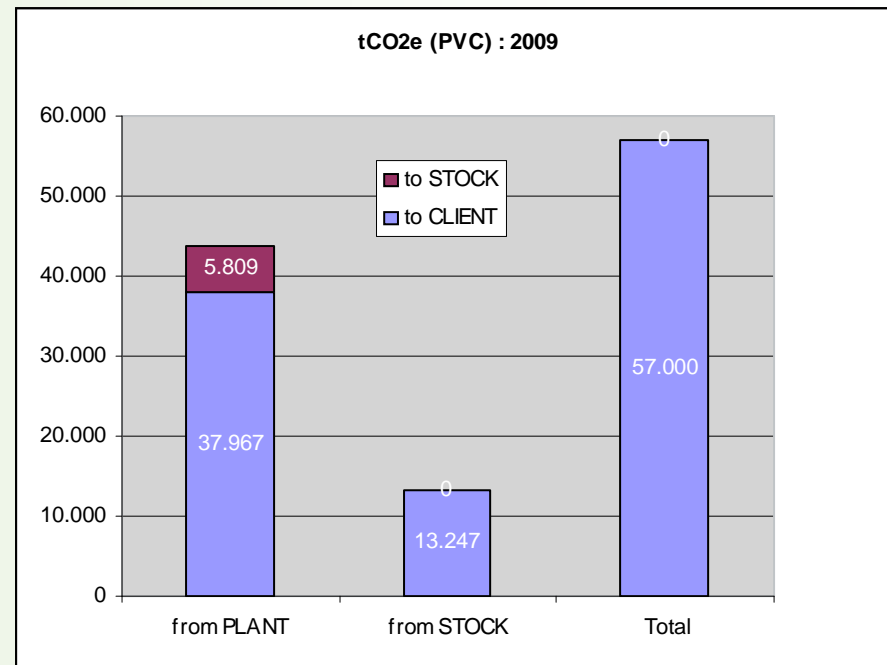
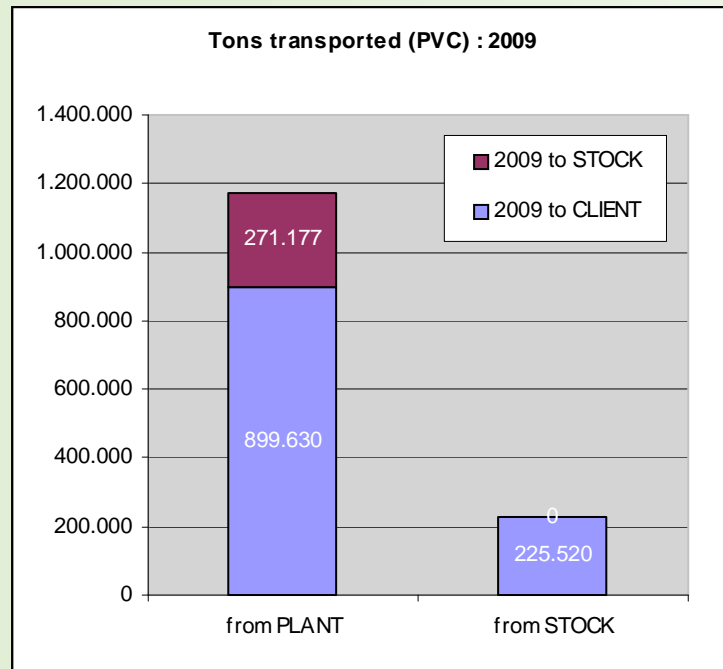
■ Exemple of a road in system

Road Number	28	
Shipment type	Road standard	
Shipping conditions	Multimodal Cont 40'	→ Cust. collect.(road)
Plant frm deliv.item	HISL-ES /KATOEN CONSTANTI	Cust.col.cont 40'
Country shipp.point	Spain	Inland water
Ship-to party	PLASTICOS IMA, S.A.	Mail & Parcel
Postal Code	29300	Multimodal
Location	ARCHIDONA	Multimodal Cont 30'
Country of destination	Spain	Multimodal Cont 40'
origin-destination	HISL-ES /KATOEN CONSTANTISpainARCHIDONA	Rail "rapilège"
Distance SAP	0	Rail ("full train")
Real distance	2064,8	Rail (single waggon)
leg1_Trans Mean	Road	Road
leg1_km	0	Road (part load)
leg1_country	Spain	Road -> Sea ctn 20ft
leg1_destination	TERMINAL-RAIL	Road -> Sea ctn 40ft
leg2_Trans Mean	rail	Road container 30ft
leg2_km	1812	Road container 40ft
leg2_country	Spain	
leg2_destination	El Huigeron	
leg3_Trans Mean	Road	
leg3_km	252,8	
leg3_country	Spain	
leg3_destination	ARCHIDONA	

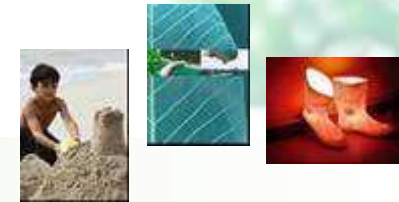
Solvin Green Supply Chain : solvin calculation model



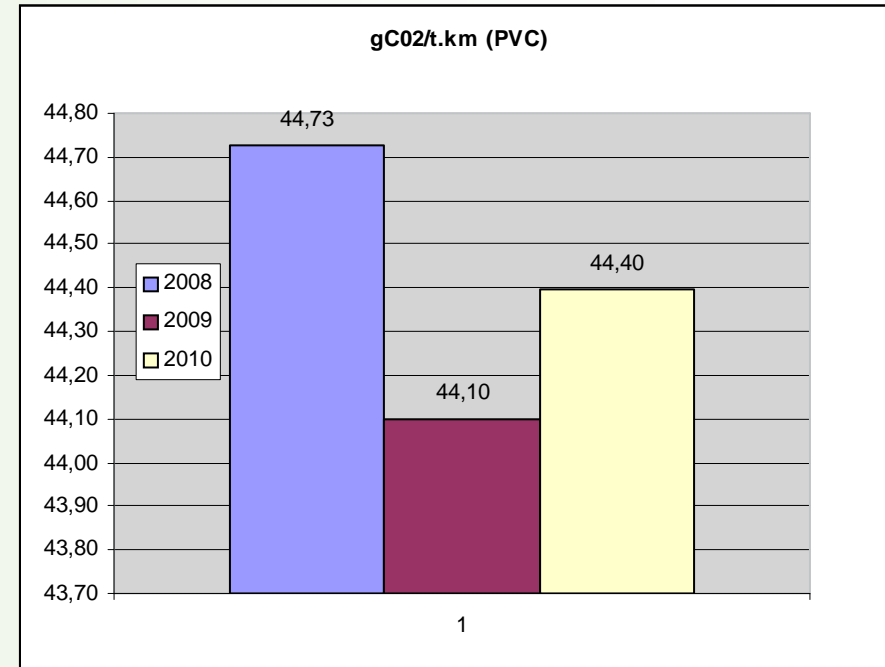
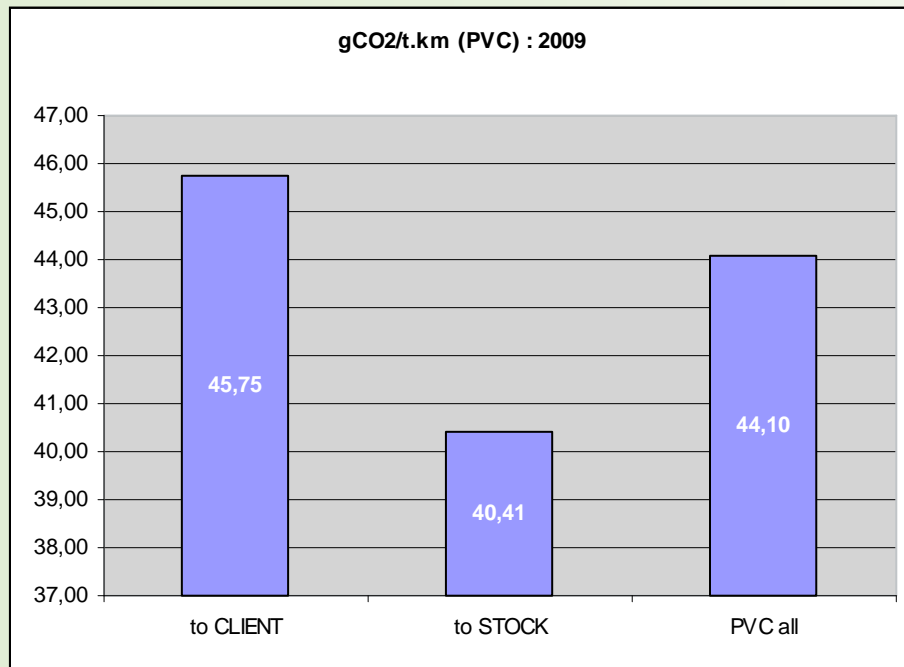
■ Some results & transport footprint scorecard



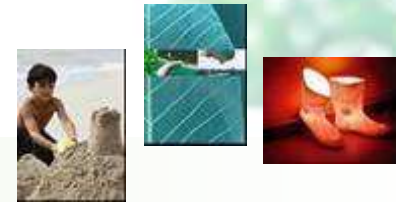
Solvin Green Supply Chain : solvin calculation model



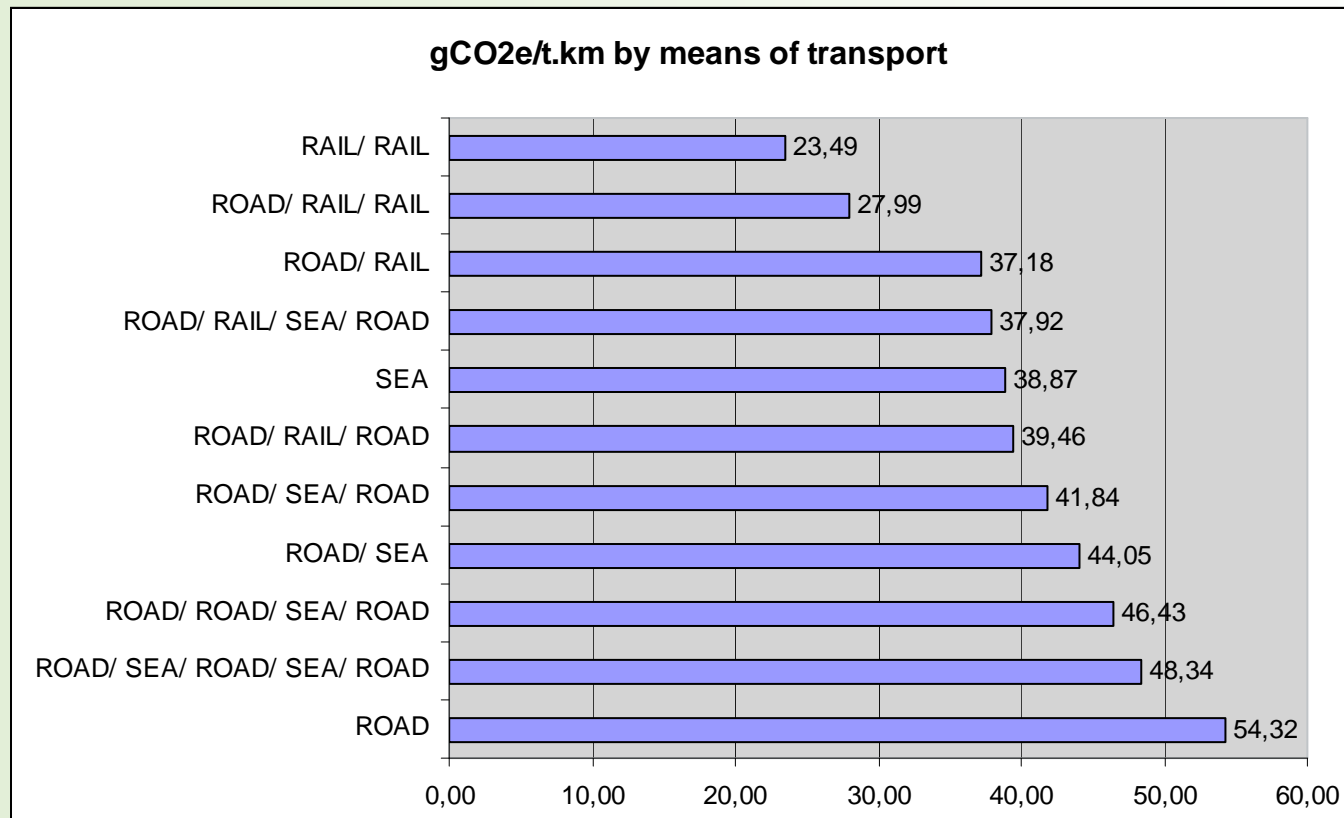
- Some results & transport footprint scorecard



Solvin Green Supply Chain : solvin calculation model

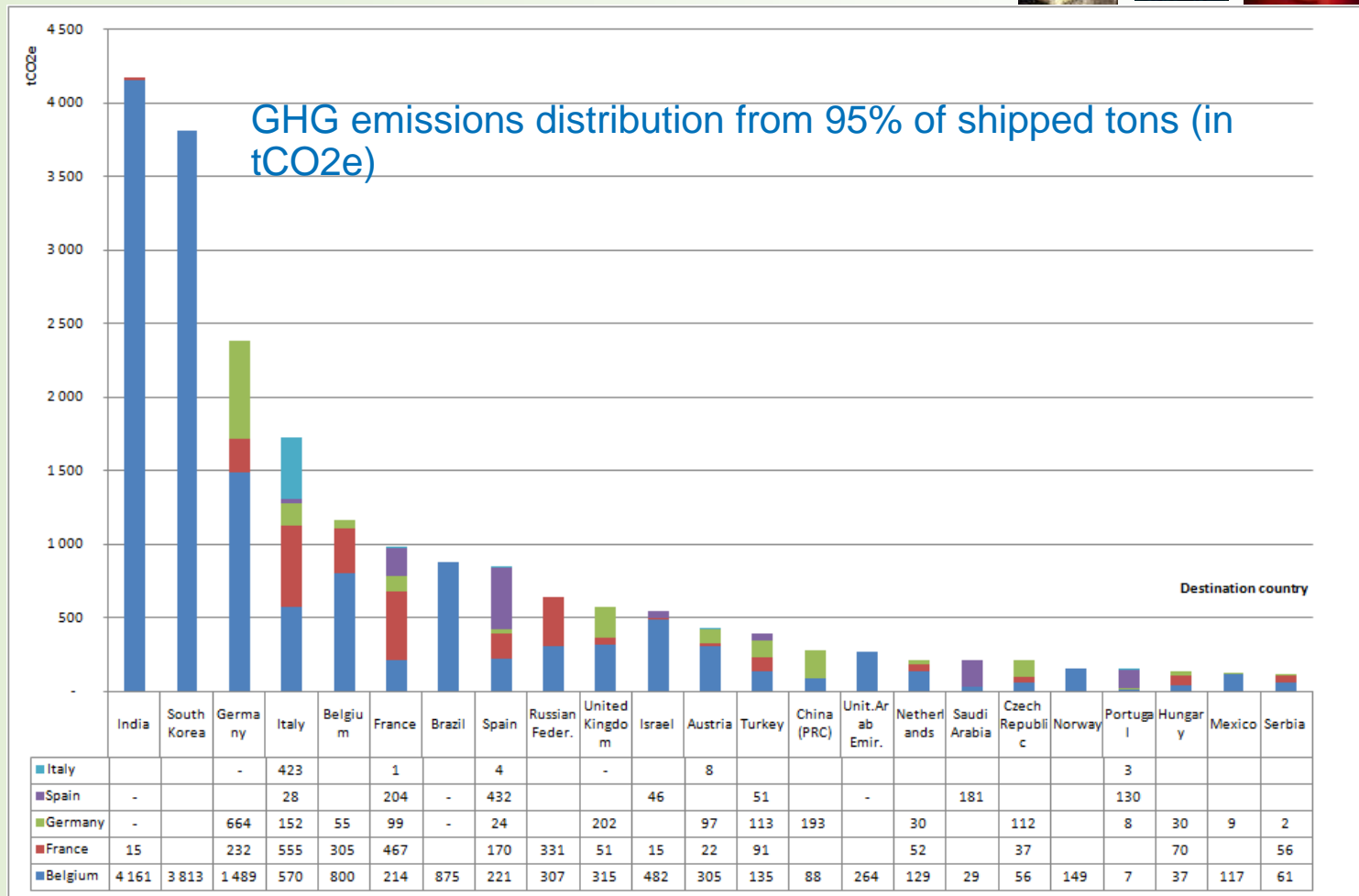


■ Some results & transport footprint scorecard



Solvin Green Supply Chain : solvin calculation model

- Some results & transport footprint scorecard



Solvin Green Supply Chain : solvin calculation model



Transported Tons: 654 tons

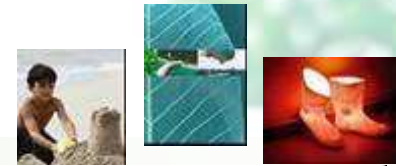
From Plants to Clients: 398 tons

From Plants to Stocks: 178 tons

From Stocks to Clients: 77 tons



Solvin Green Supply Chain : solvin calculation model



GHG emissions: 21.3 tCO₂e

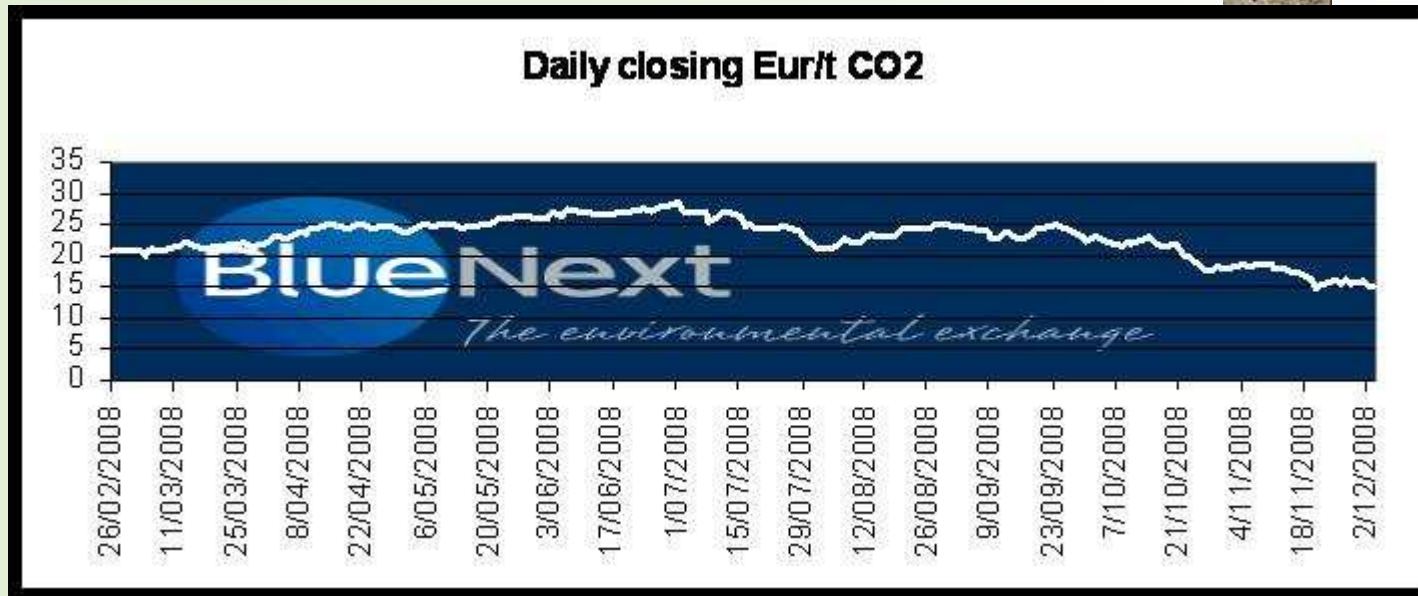
From Plants to Clients: 16.9 tCO₂e

From Plants to Stocks: 2. tCO₂e

From Stocks to Clients: 2.5 tCO₂e



Solvin Green Supply Chain : solvin calculation model



1,5eur/t PVC

Average Transport cost PVC-S = 51eur/t (2008)

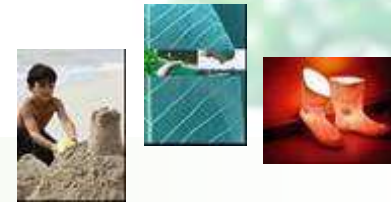
Solvin Green Supply Chain : solvin calculation model



Experience

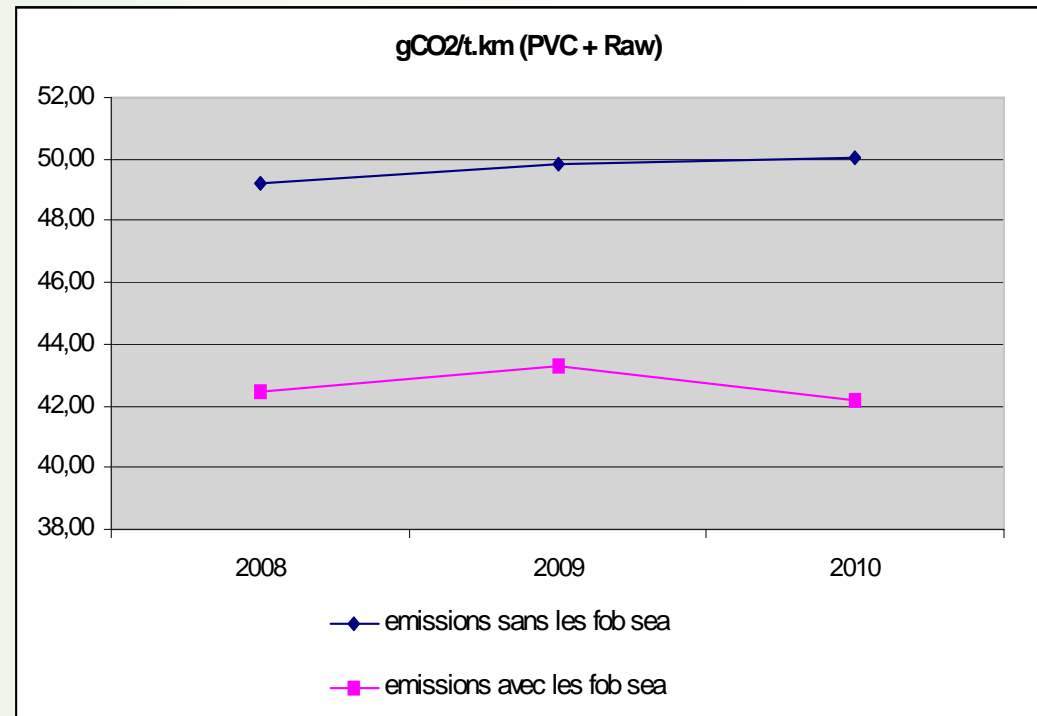
- Excellent model but accuracy costs resources
- Calculation doc. becomes too heavy.
- Multiple references of CO2 emissions exist in the literature.

Solvin Green Supply Chain : solvin calculation model

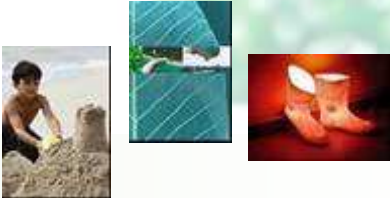


Tool for CO2 emissions with Solvay.

- Common approach for all businesses of Solvay
- Solvin is the most advanced in the calculation approach
- Common approach excluding FCA/FOB (under discussion)
- Returns out of analysis



Solvin Green Supply Chain : solvin calculation model



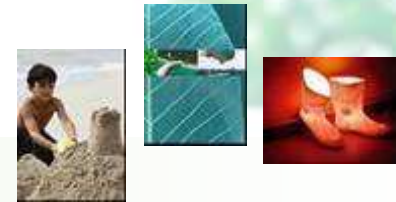
Integration of the emissions in our decision tool

		Criteria Weight
Crit 1	Tariffs (+ Cost of change)	38,87%
Crit 2	Contamination risc	11,62%
Crit 3	Product deterioration	11,62%
Crit 4	Italian speaking drivers	4,77%
Crit 5	Back up solution(s)	6,60%
Crit 6	Control of the chain	2,73%
Crit 7	Price not volume related	8,51%
Crit 8	Flexibility execution capacity	6,40%
Crit 9	Communication : italian team with Ferrara CLS	3,18%
Crit 10	CO2 reduction program	4,71%

Chosen distribution plan : 700t/y
 Rail: 1036 km : 912t/y
 Road: 1036 km : 2569t/y

Transport mode	gCO2/Tkm
Road transport	62
Rail transport	22
Barge transport	31
Short sea	16
Deep sea tanker	5
Deep sea container	8
Intermodal road / rail	26
Intermodal road / barge	34
Intermodal road / short sea	21
Pipelines	5
Airfreight	602

Solvin Green Supply Chain : solvin calculation model



Liner in PVC



- Liner can be used for min 1 year
- Will be used for same product
- Liner can be repaired
- Will have a second live via Vinyloop

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