SEKAB

Sustainble Ethanol

What is the context?

End of oil

future for…

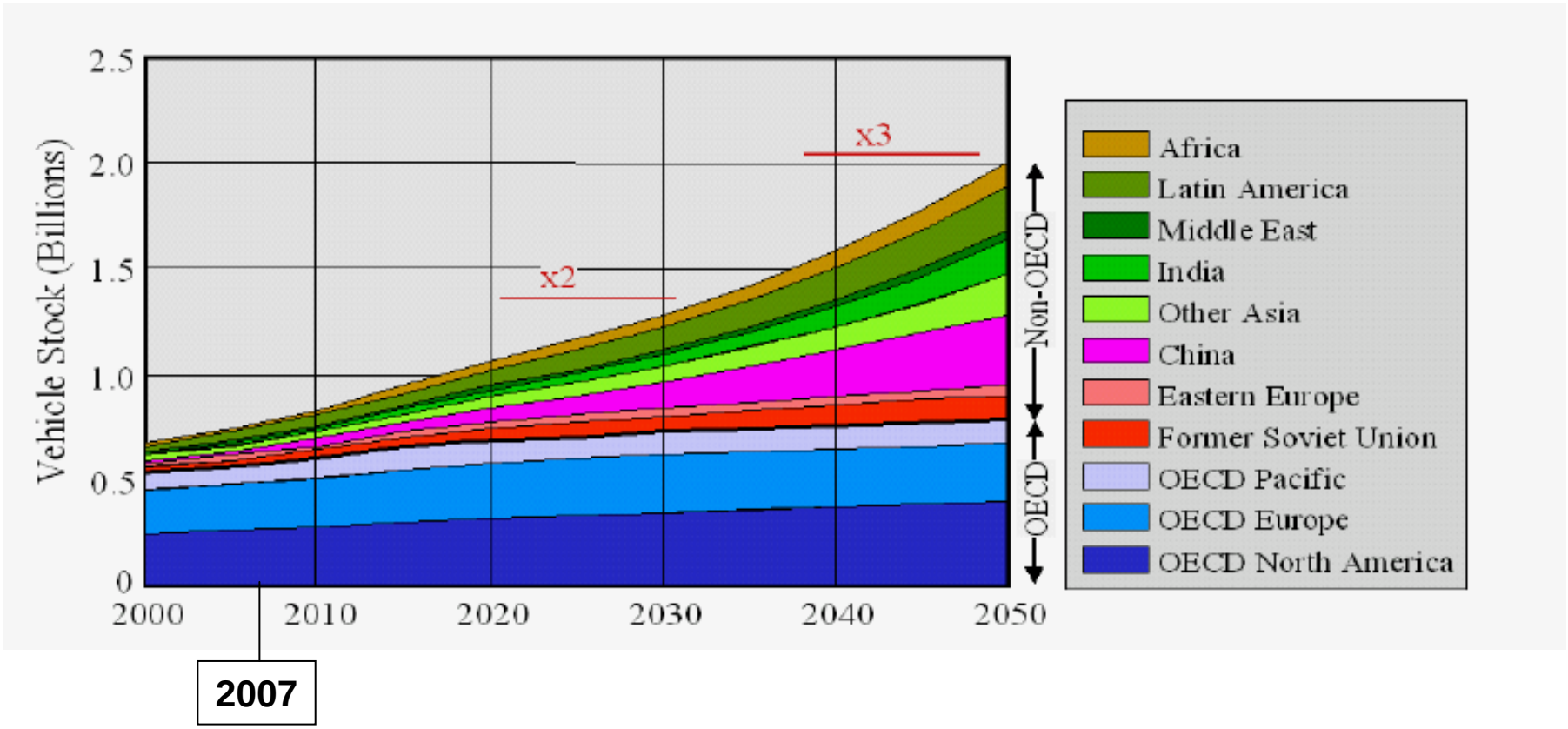
for transports?

EU report on Security of Supply

Dependency on Oil Imports	**70%**
2020 →	**90%!**
Transport sector´s dependency on Oil	**97%!**
Dependency on transports	**Growing**

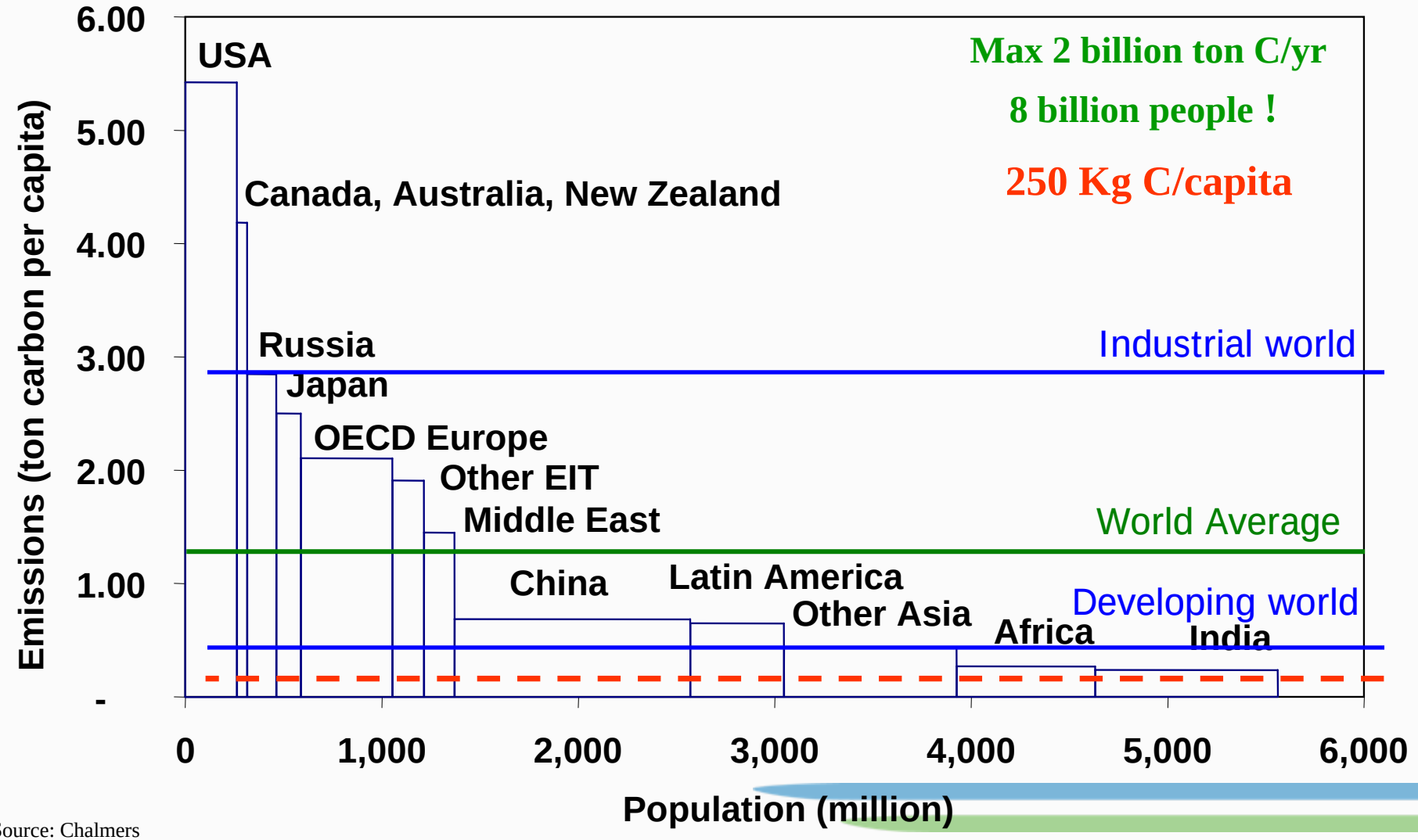
Source: European Commission

Global development of Light-duty Vehicles



Source: WBCSD, 2004a.

Carbon emissions per capita



Source: Chalmers
2004-10-02/LN

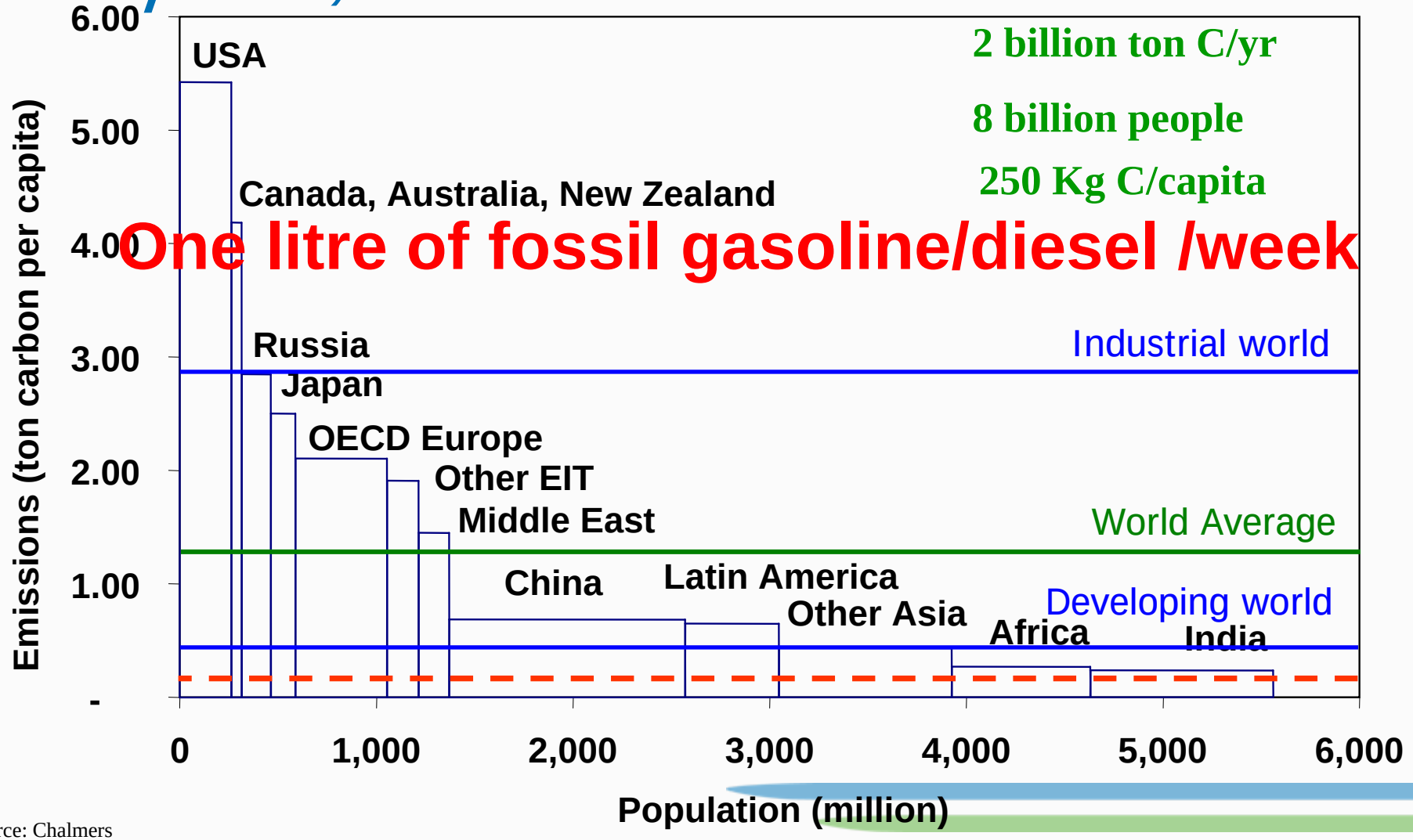
How much Gasoline-Diesel /capita?

- 250 Kg of Carbon/Capita/year …..
- ….equals to 850 Kg of CO2
- Assuming 35% of CO2 emissions from transports (today 22%)
- Leaves 300 Kg of CO2 for transports/capita/year
- 50% is commercial => 150 Kg CO2 for private use
- 150 Kg of CO2 =

60 litres of Gasoline/year

54 litres of Diesel/year

Carbon emissions per capita, 2050



Source: Chalmers
2004-10-02/LN

The challenge!

CO2 & Oil Dependency

80-90% reduction of CO2 to 2050!

Transports needs special attention

Magnitude of a paradigm/system shift

We are not doing enough, fast enough

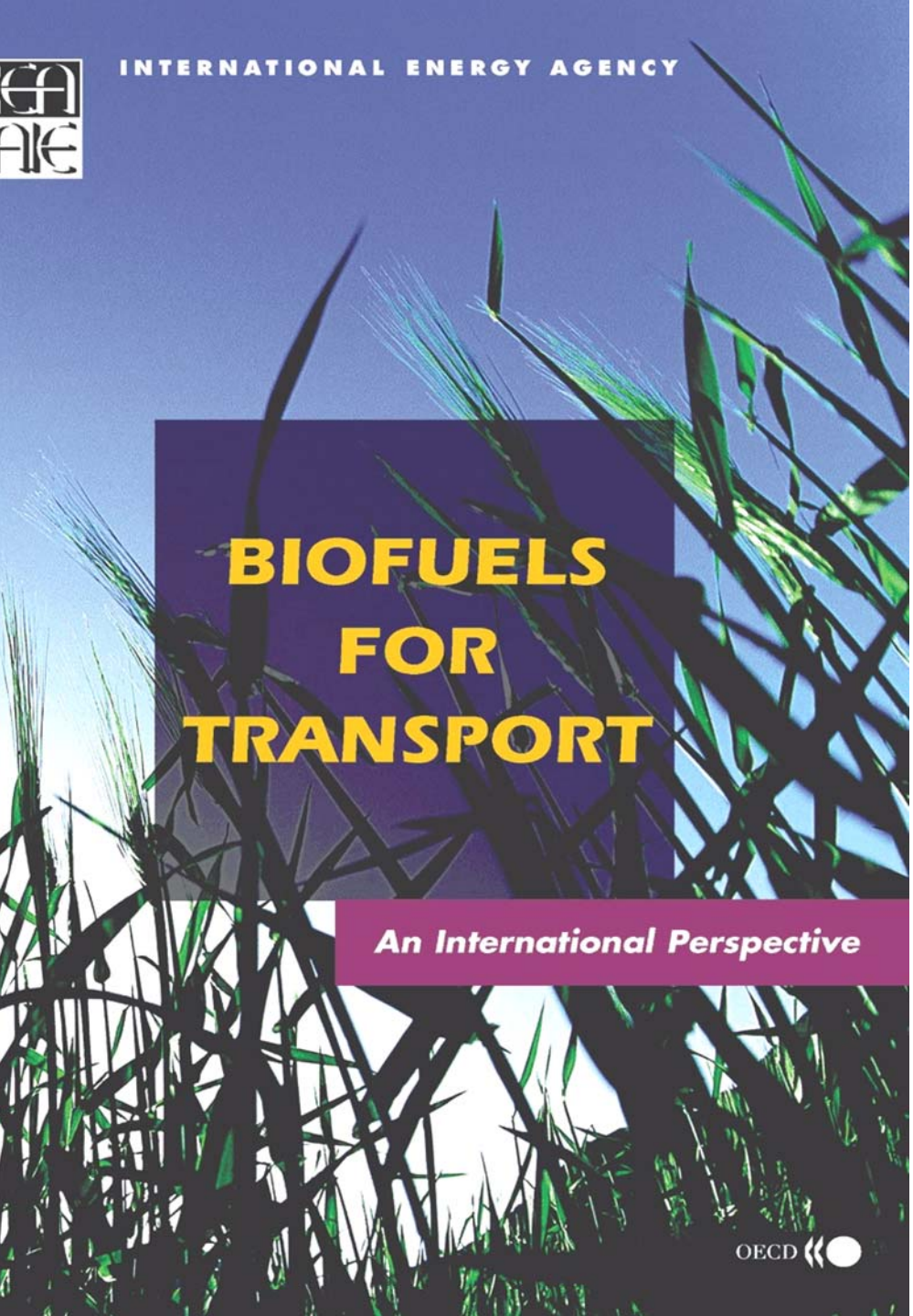
Urgency for serious action!

What to do with transports?

Oil Dependency & Fossil CO_2

1. Curb the growth for transports, decoupling
2. Increase energy efficiency, dramatically
3. Large systems shift towards renewable fuels

What role for BioFuels?



BioFuels for Transport: A Global Perspective

OECD/IEA

www.iea.org/books

Three key messages OECD/IEA

- **Biomass potential**
  - Global potential for biomass can be sufficient for >2/3 of current global demand for transport energy
- **CO2 reduction**
  - Cellulose based ethanol and synthesis gas has the potential to reduce 90-100% of fossil CO_2 “Well-to-Wheel” .
  - Sugarcane based ethanol provides already 85% net CO2 reduction
- **Cost efficient**
  - Cellulose based ethanol and synthesis gas can be as cost efficient as any other major alternative to mitigate fossil CO2.
  - Sugarcane based ethanol is already cheaper then world market priced gasoline. Negative CO2 mitigation cost

McKinsey&Company

World Biofuels Markets
Brussels, March 7, 2007

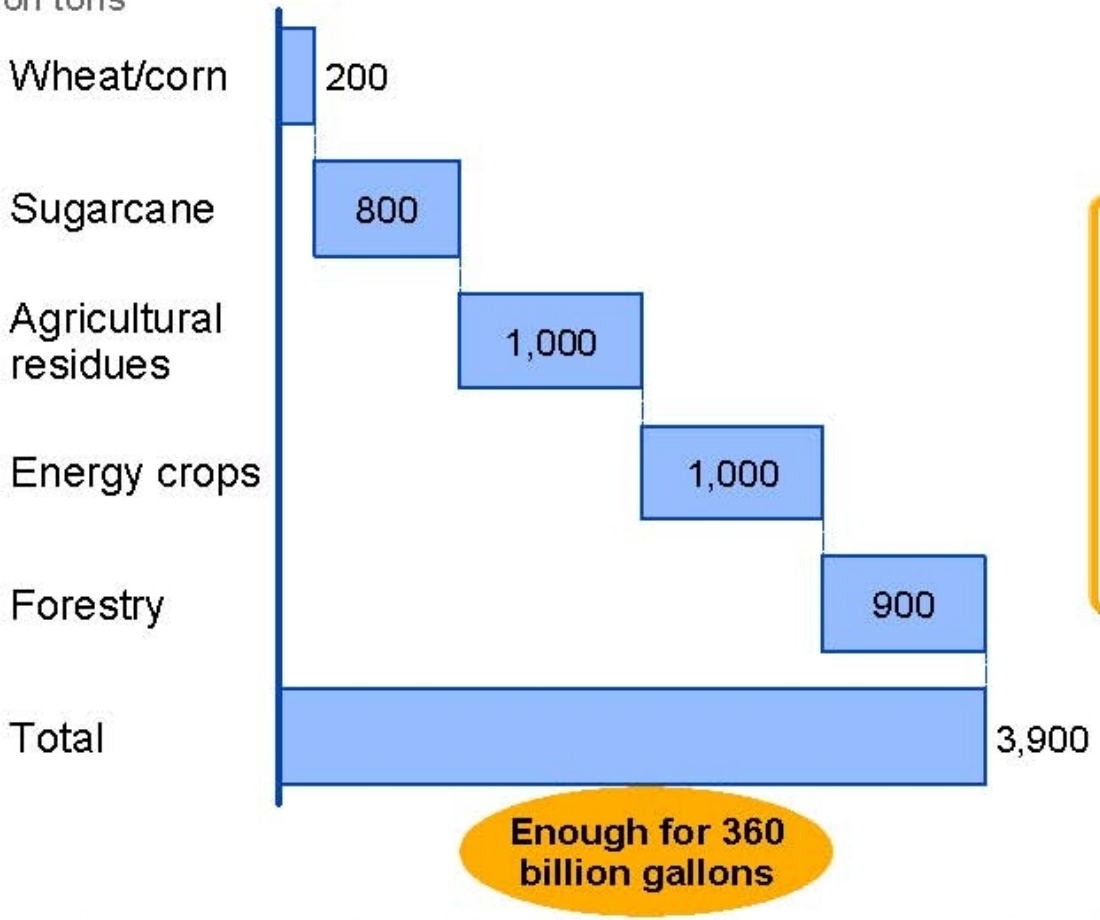
CONFIDENTIAL

Beyond the Hype – Perspectives on Growth in the Biofuels Industry

Jens Riese
McKinsey & Company

Enough biofeedstock to replace 50% of fuel

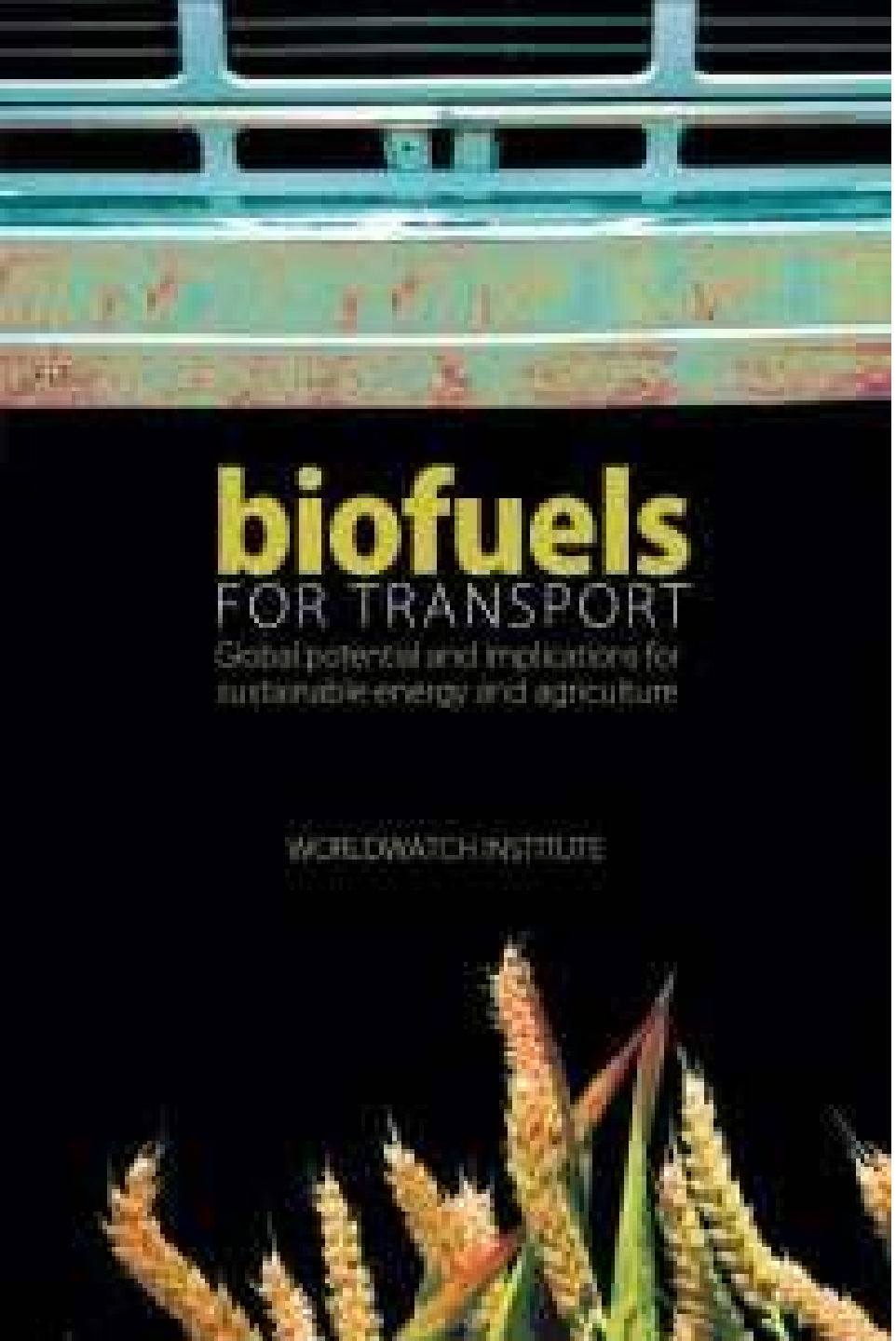
INCREMENTAL FEEDSTOCK POTENTIAL 2020*,
Million tons



- Moderate agricultural yield increase
- Food/feed demand first
- No cutting of rain forest

* Wheat, corn, and sugarcane include total amount for biofuels available, cellulosic feedstock only incremental amount

Source: FAPRI, FAOSTAT, expert interviews, McKinsey analysis



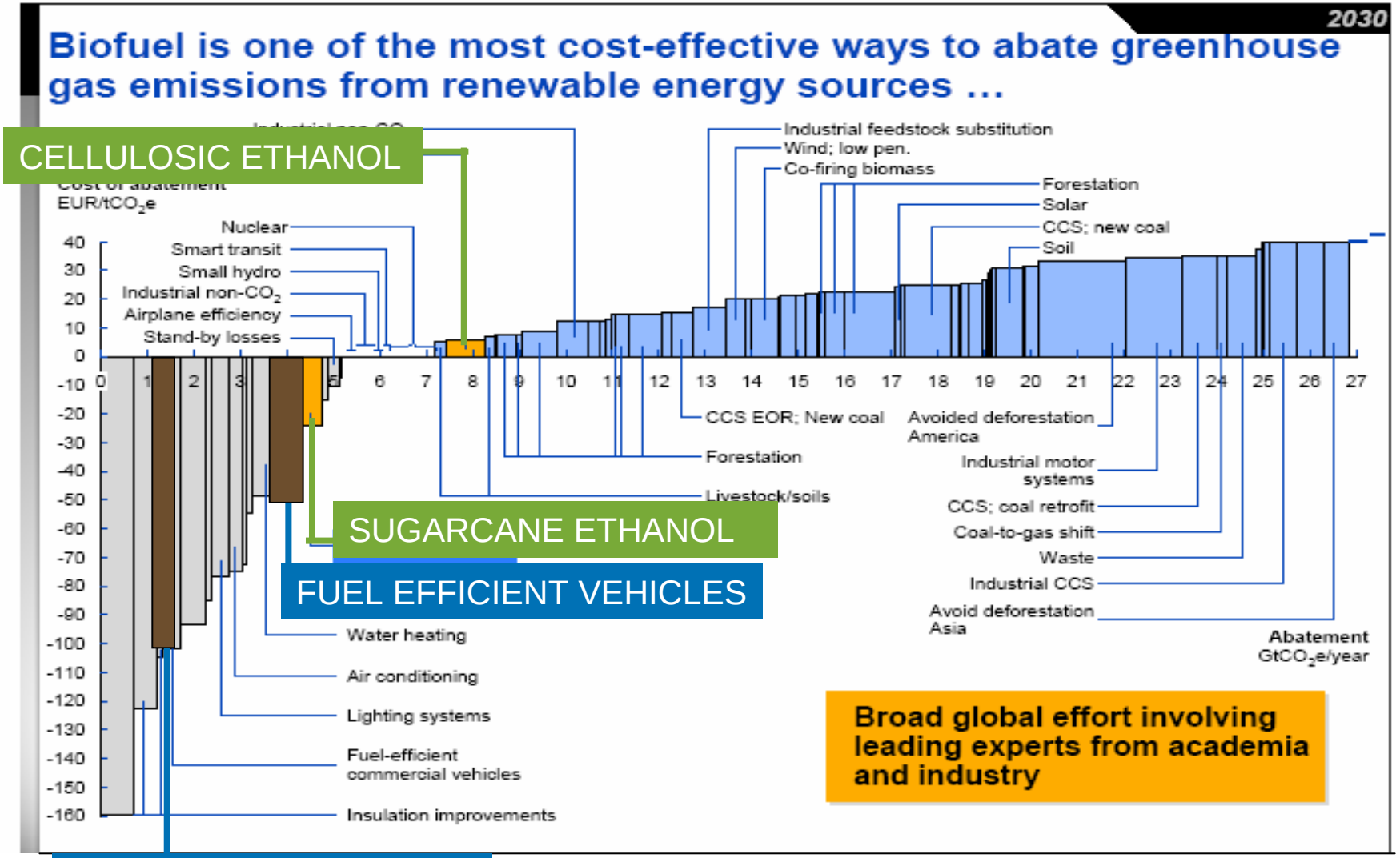
WORLDWATCH INSTITUTE
Vision for a Sustainable World

Biofuels for Transport:

Global Potential and Implications for Energy and Agriculture.

www.worldwatch.org

McKinsey/Vattenfall study

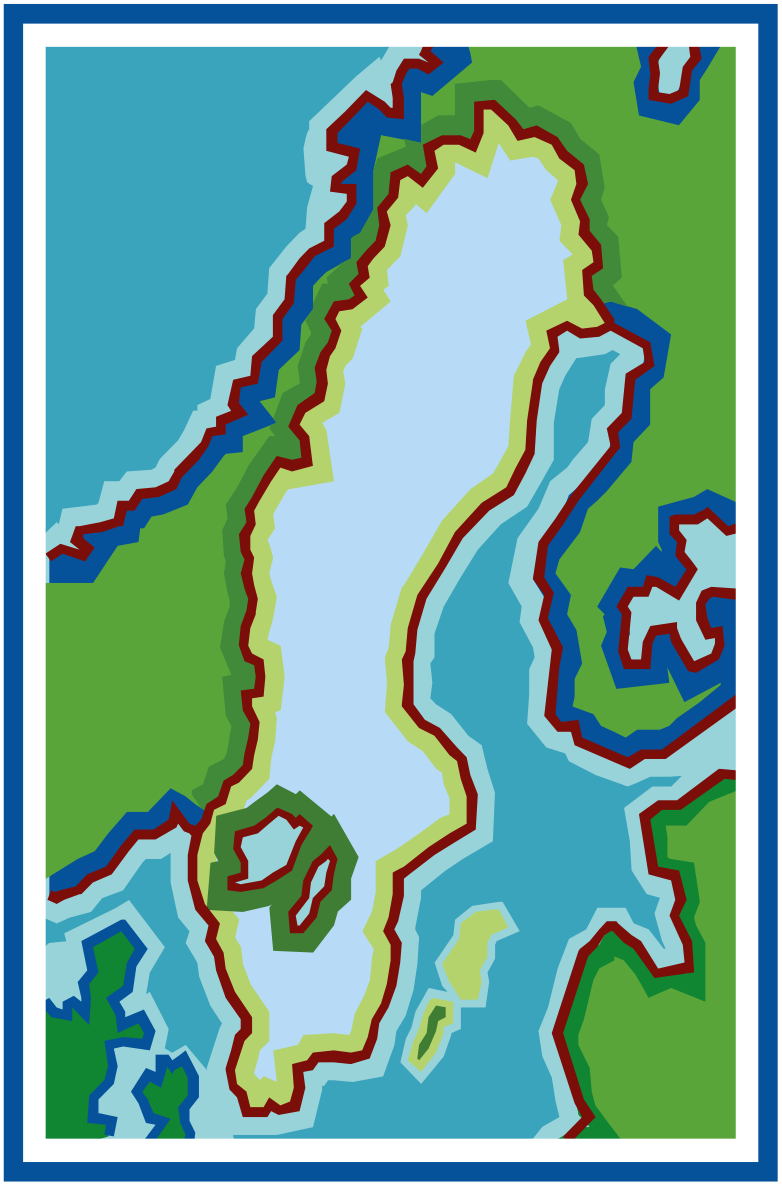


How do we develop large scale systems of

energy efficient vehicles using

Sustainable BioFuels?

BioAlcohol Fuel Foundation



Sweden

A biofuel nation

Sweden shall be free from oil dependency by 2020!

Primeminister Göran Persson
November 5, 2005

BAFF
BioAlcohol Fuel Foundation

Sweden year ?

- 5 million cars
- 1600 liter/year

→ 8 Million m3 ethanol/year

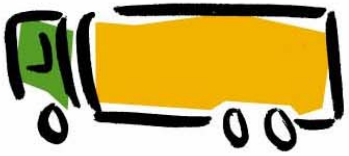
Grain	2000l/ha	~~4.000.000 ha~~
Sugarcane	8000l/ha	~~1.000.000 ha~~
+ Sugarcane + cellulose bagass	12000l/ha	650.000 ha
+ Todays hybrids	0,7l/10km	450.000 ha
+ Plug-in hybrids	0,3l/10km	200.000 ha

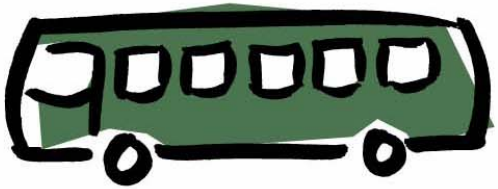
Ethanol

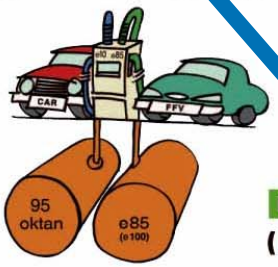
– pathway towards sustainability

Future transmission systems
(dehydratated ethanol)

e100	*Fuelcells*	100 %
e85 e100	*Plug In Hybrids*	85, 100 %
e85 e100	*Hybrids*	85, 100 %







Gasoline engines
(dehydrated ethanol)

e85 e100	*Optimised FlexiFuel*	100 %
e85	*FlexiFuel*	85 %
e5 e25	*Low blends*	5-25 %

Diesel engines
(Hydrated ethanol incl. water)

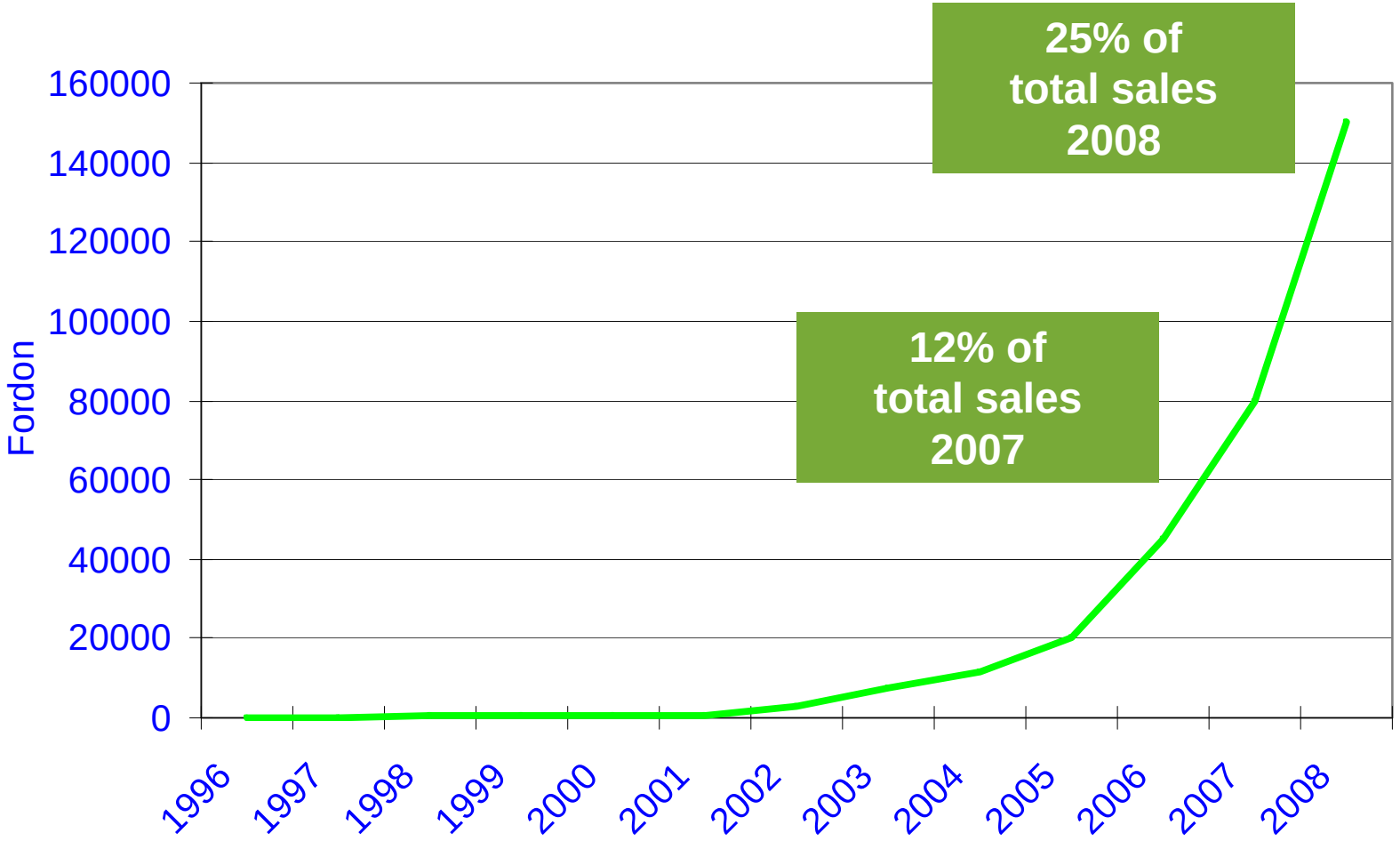
e95	*Ethanol*	95 % with additive
e10	*Low blends*	5-10 %

SOURCE: BAFF

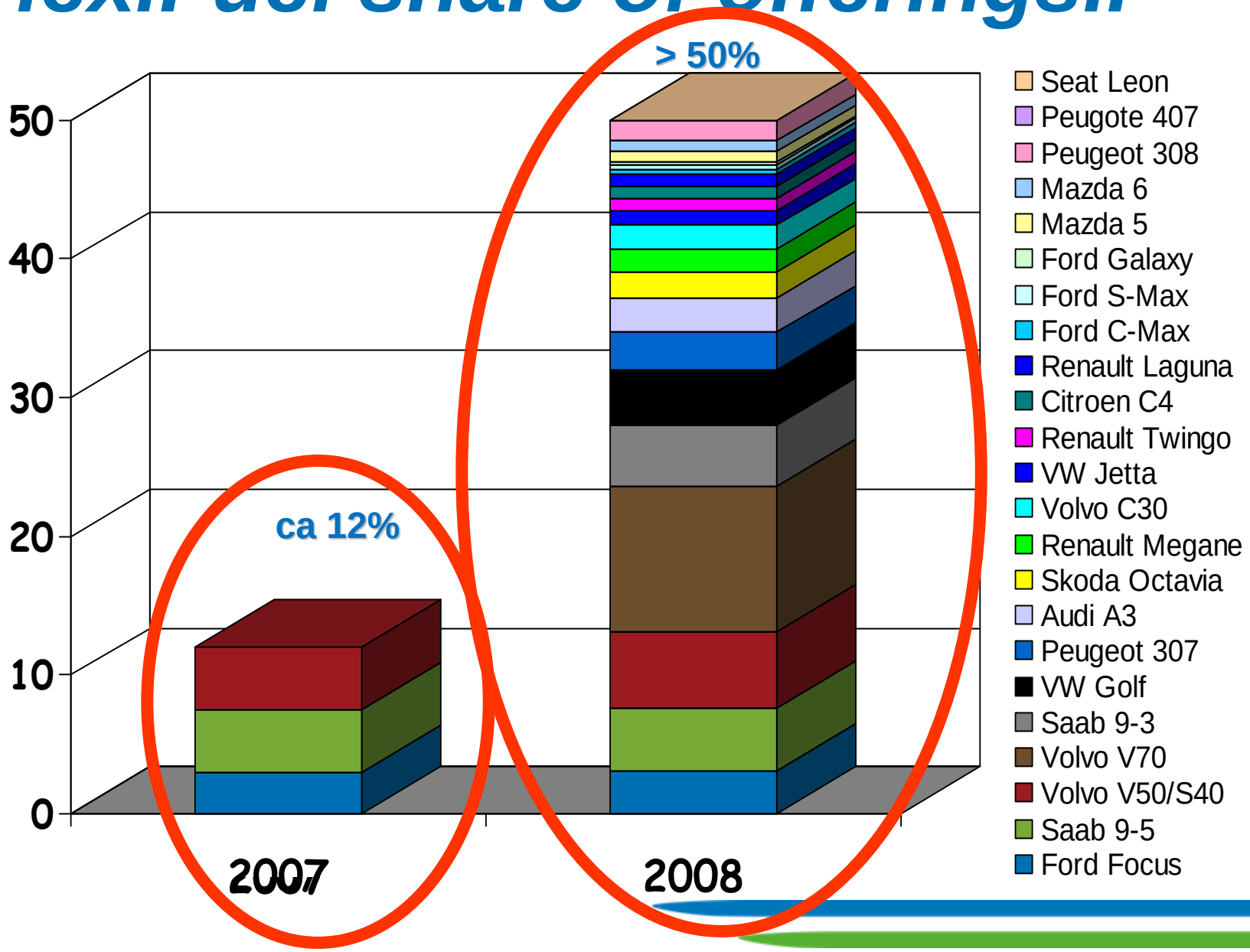
041008/F4-1

FlexiFuel in Sweden

35% of total sales 2009



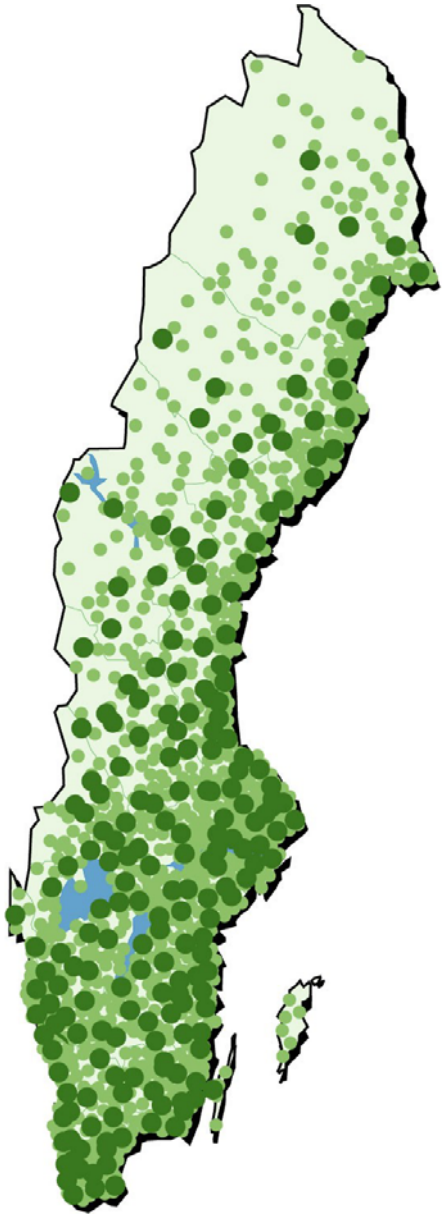
FlexiFuel share of offerings..

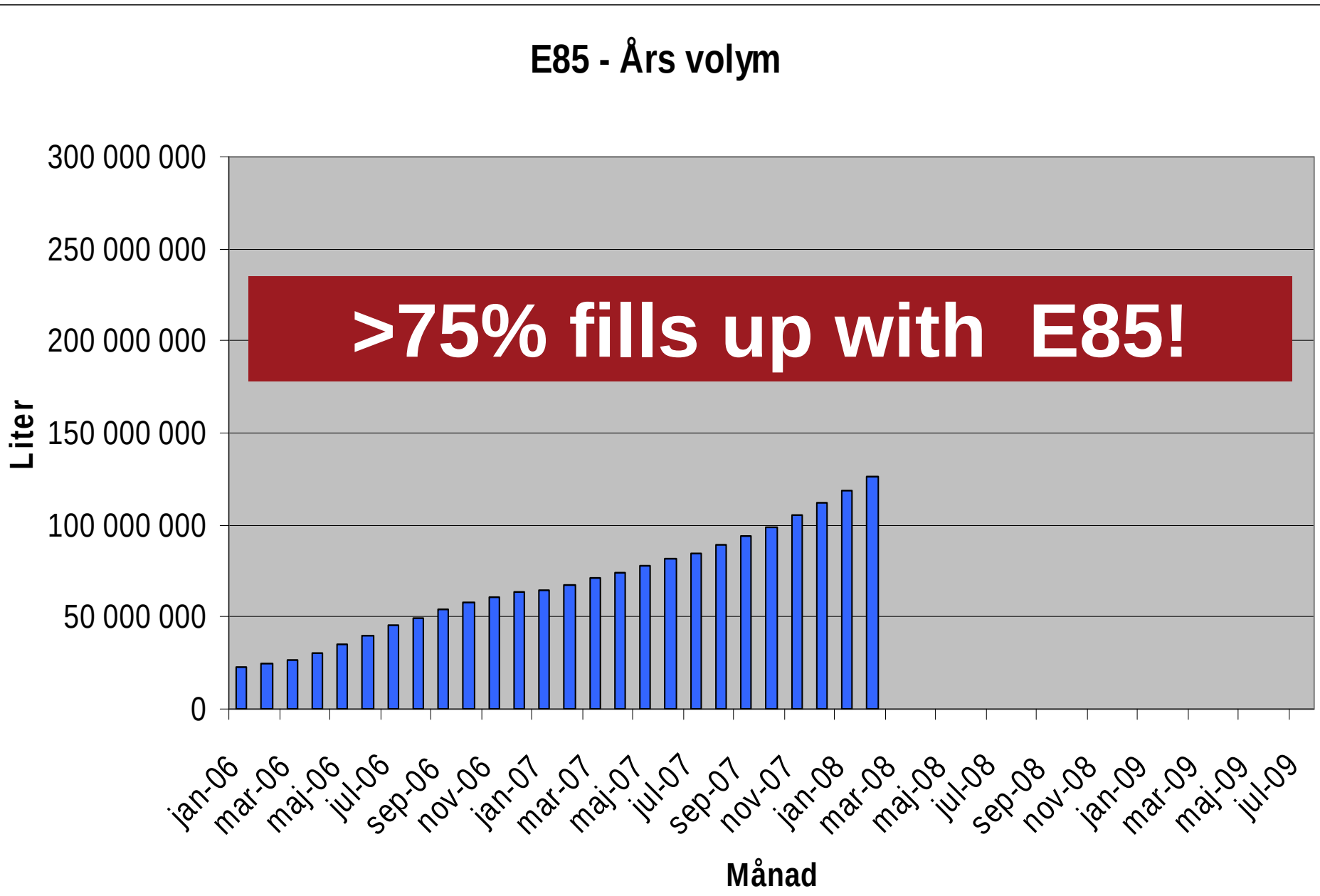


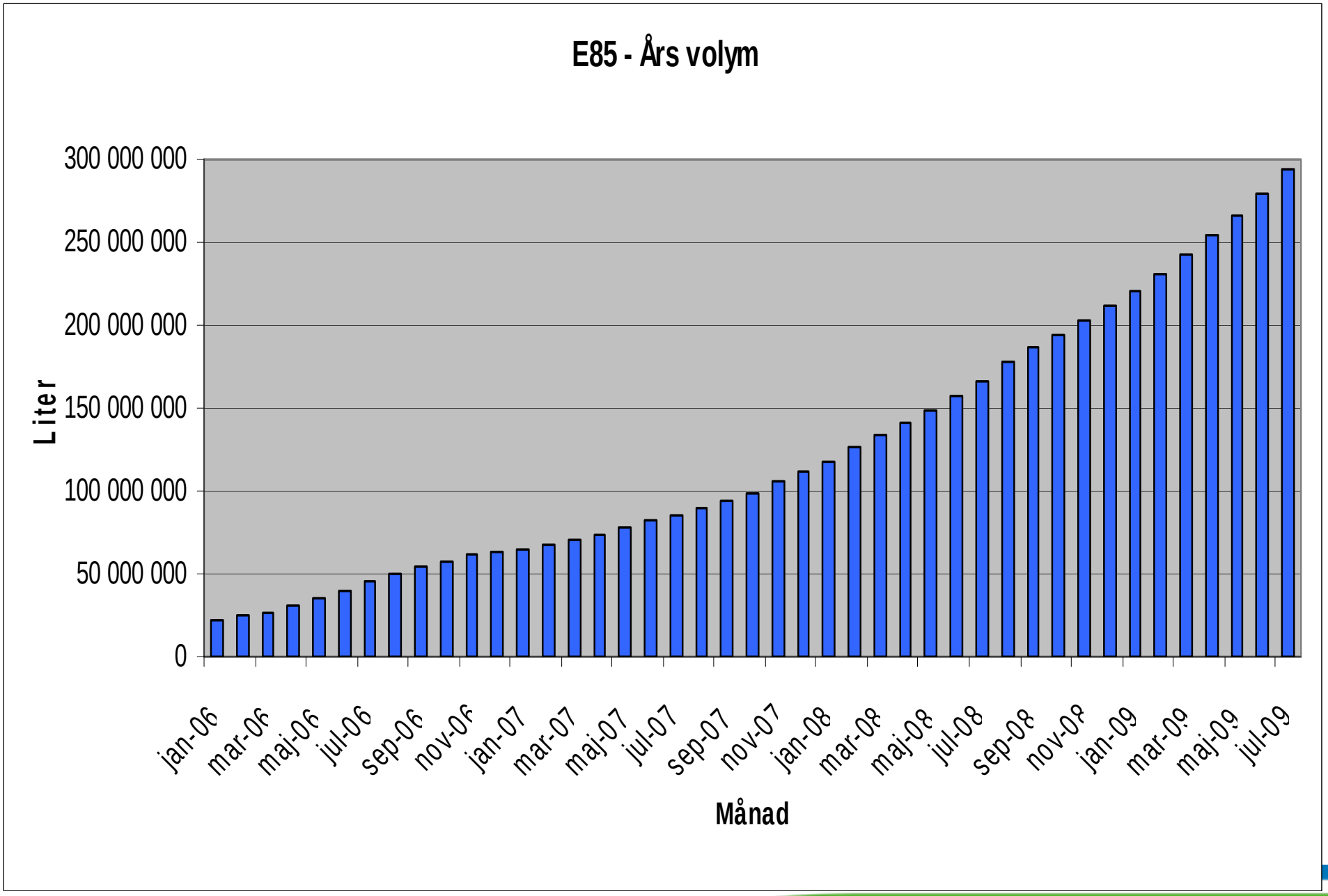
A dynamic development

It took ten years to open the first 100 filling stations with E85.

The last 100 stations opened in the past three months.



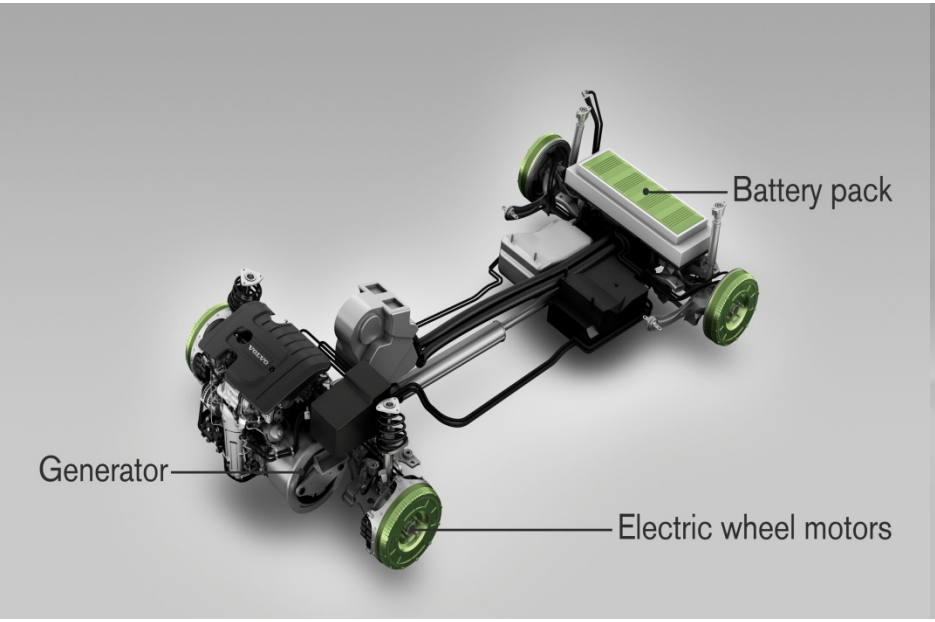

E85 - Års volym
>75% fills up with E85!
Liter
300 000 000
250 000 000
200 000 000
150 000 000
100 000 000
50 000 000
0
jan-06
mar-06
maj-06
jul-06
sep-06
nov-06
jan-07
mar-07
maj-07
jul-07
sep-07
nov-07
jan-08
mar-08
maj-08
jul-08
sep-08
nov-08
jan-09
mar-09
maj-09
jul-09
Månad

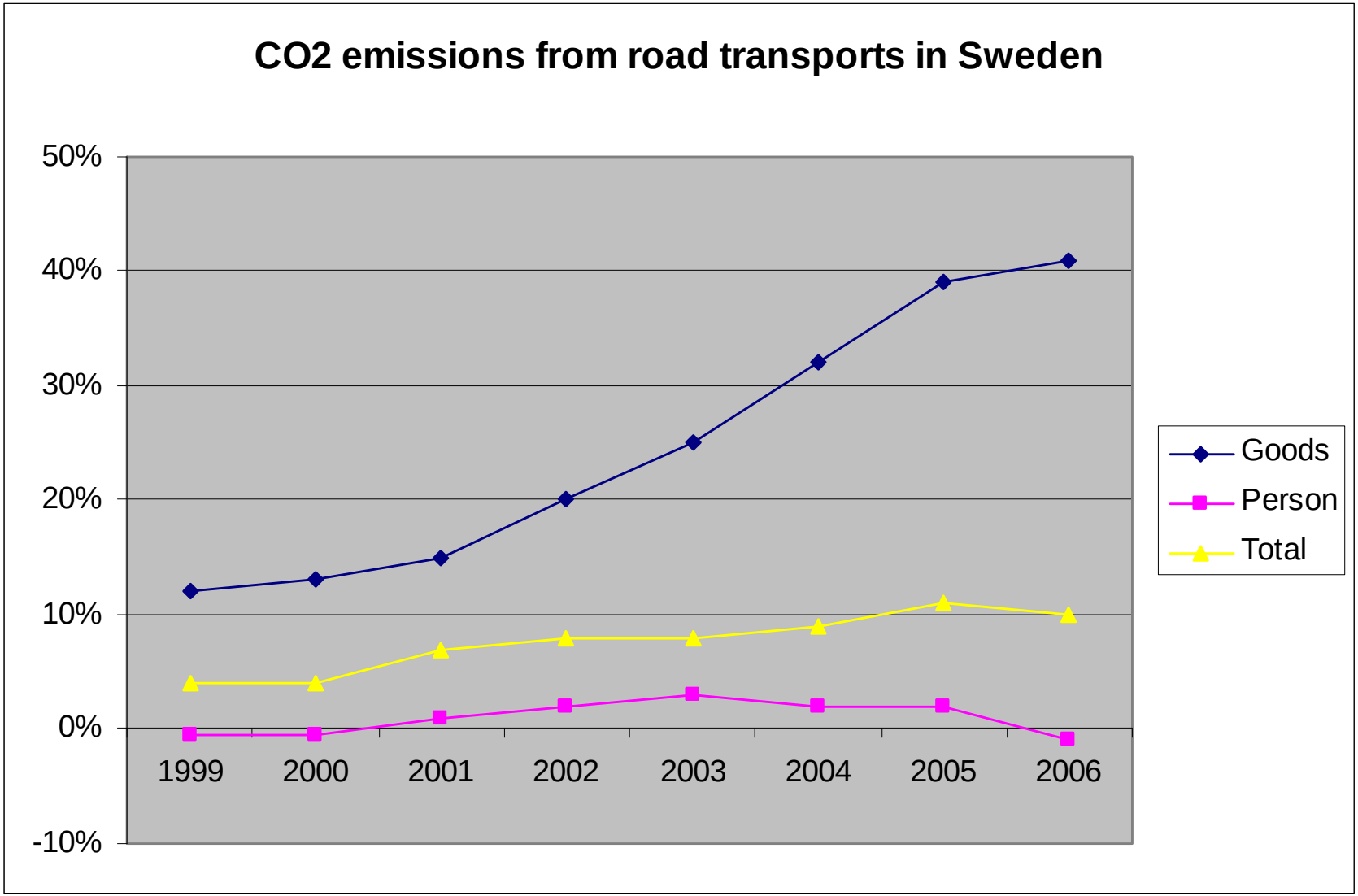

E85 - Års volym
300 000 000
250 000 000
200 000 000
150 000 000
100 000 000
50 000 000
0
Liter
jan-06
mar-06
maj-06
jul-06
sep-06
nov-06
jan-07
mar-07
maj-07
jul-07
sep-07
nov-07
jan-08
mar-08
maj-08
jul-08
sep-08
nov-08
jan-09
mar-09
maj-09
jul-09
Månad

World´s First E100 Hybrid (Plug In)

Volvo "ReCharge Concept"

Limited range on electricity +
FlexiFuel engine for BioEthanol





Compared to emissions in 1990

Goods = 4,0 Mtons

Person = 13,0 Mtons

Source: SIKA

From1986, Stockholm: no new purchases of diesel buses

Euro 5 and EEV ethanol

9-litre diesel engine
Scania EGR
270 hp, 1200 Nm

Thermal efficiency
Ethanol up to 43%
Diesel up to 44%

Proven technology
600 buses sold since 1989

Up to 90% CO_2-saving

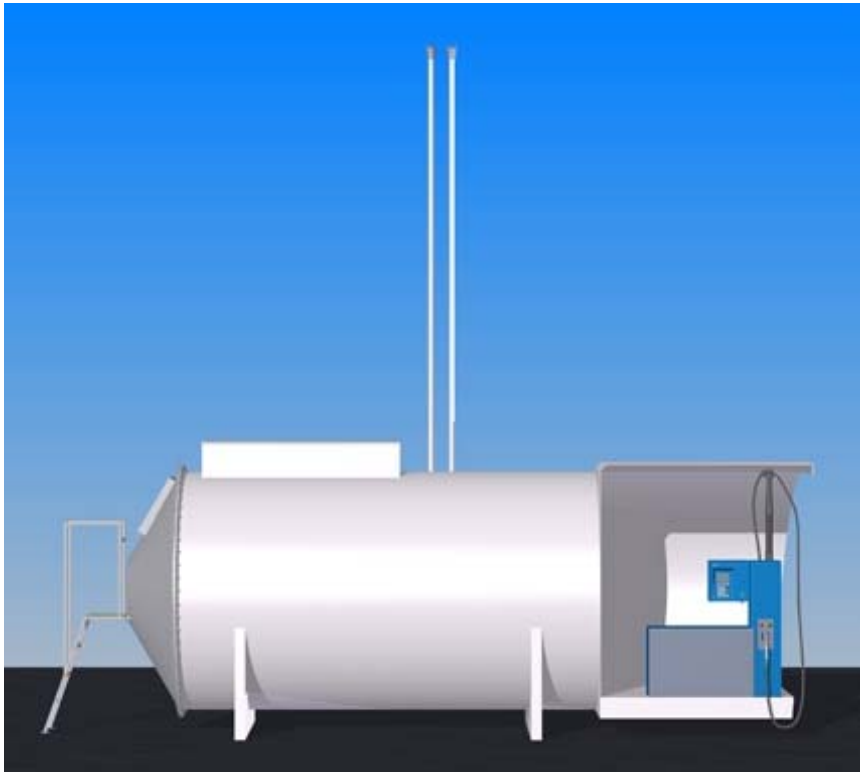
Buses and trucks on 95% ethanol

Electric Hybrid on BioEthanol
10 buses in 2008

Ethanol for heavy vehicles

Infrastructure

Phase 1

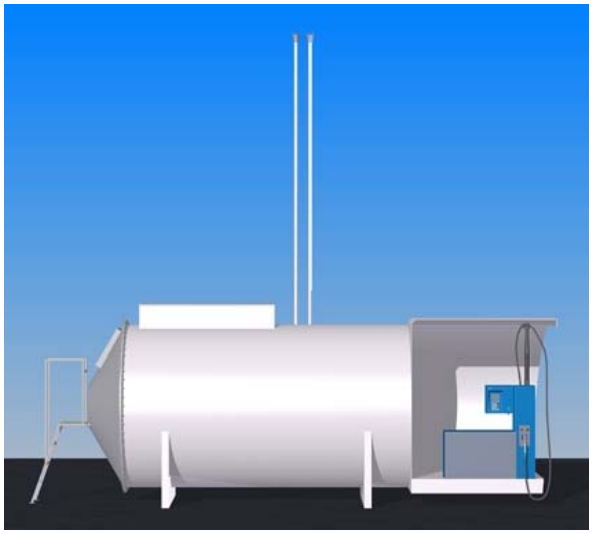


SEKAB

Energimyndigheten

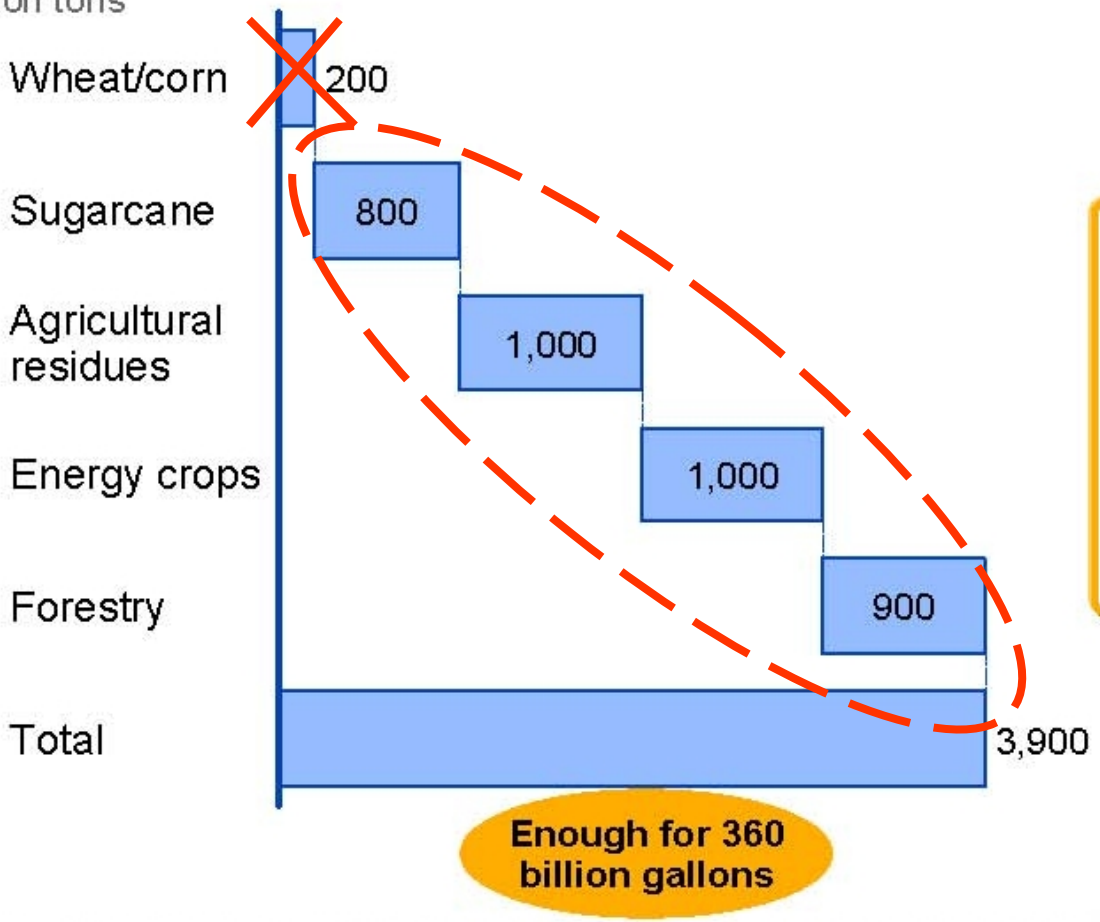
Infrastructure England

Stage 1



Enough biofeedstock to replace 50% of fuel

INCREMENTAL FEEDSTOCK POTENTIAL 2020*,
Million tons



- Moderate agricultural yield increase
- Food/feed demand first
- No cutting of rain forest

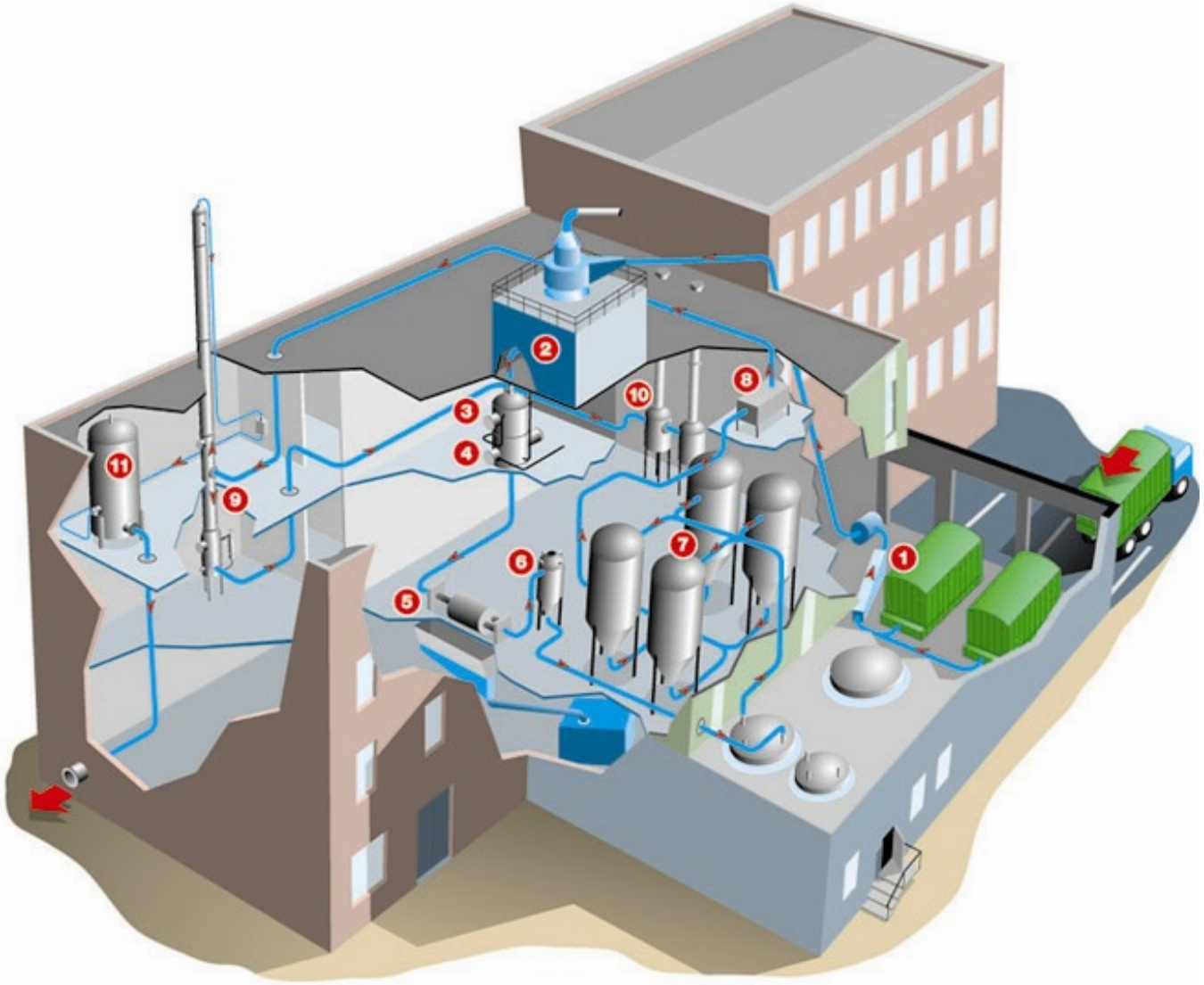
* Wheat, corn, and sugarcane include total amount for biofuels available, cellulosic feedstock only incremental amount

Source: FAPRI, FAOSTAT, expert interviews, McKinsey analysis

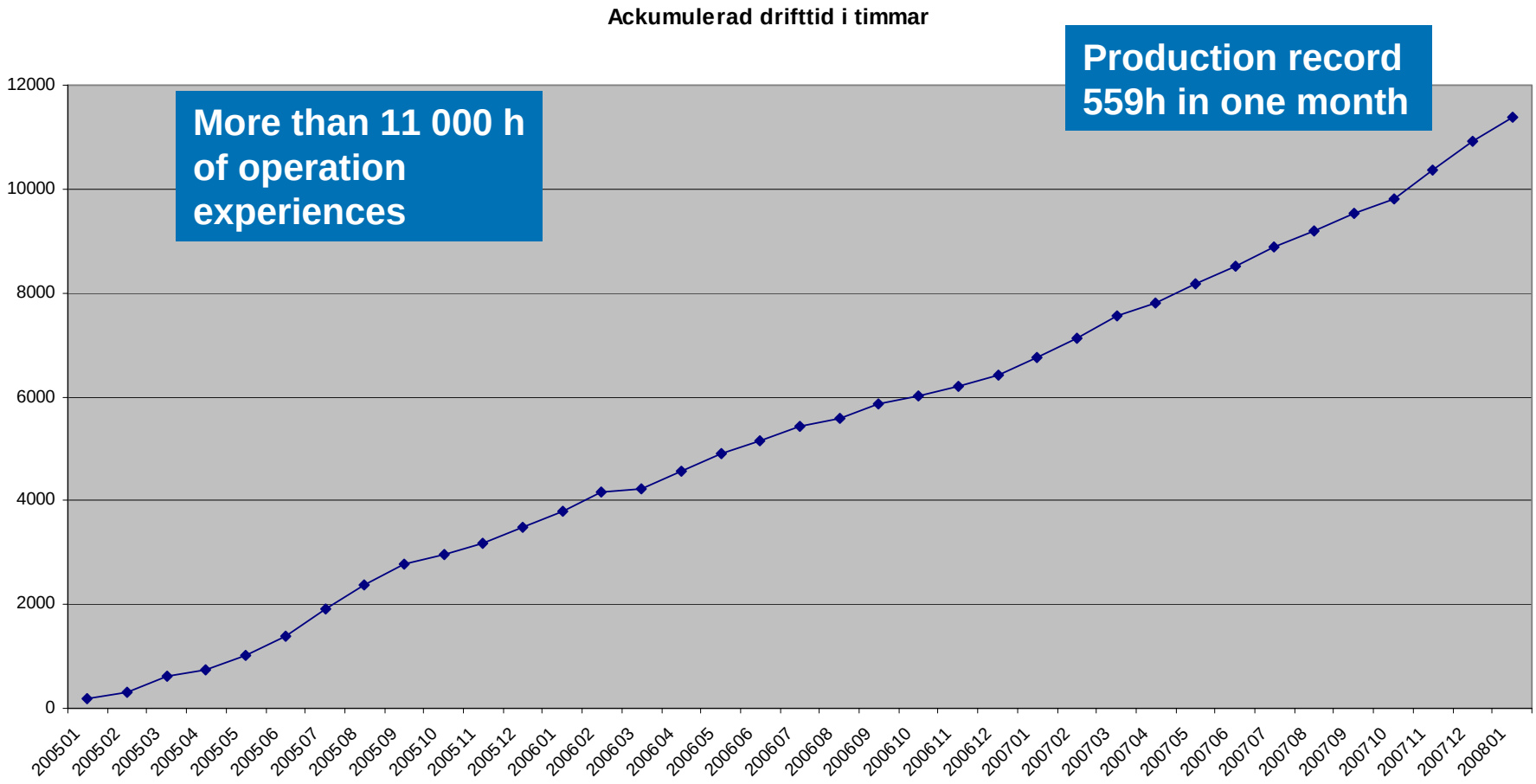
McKinsey 2007

Ethanol pilote plant

Energimyndigheten

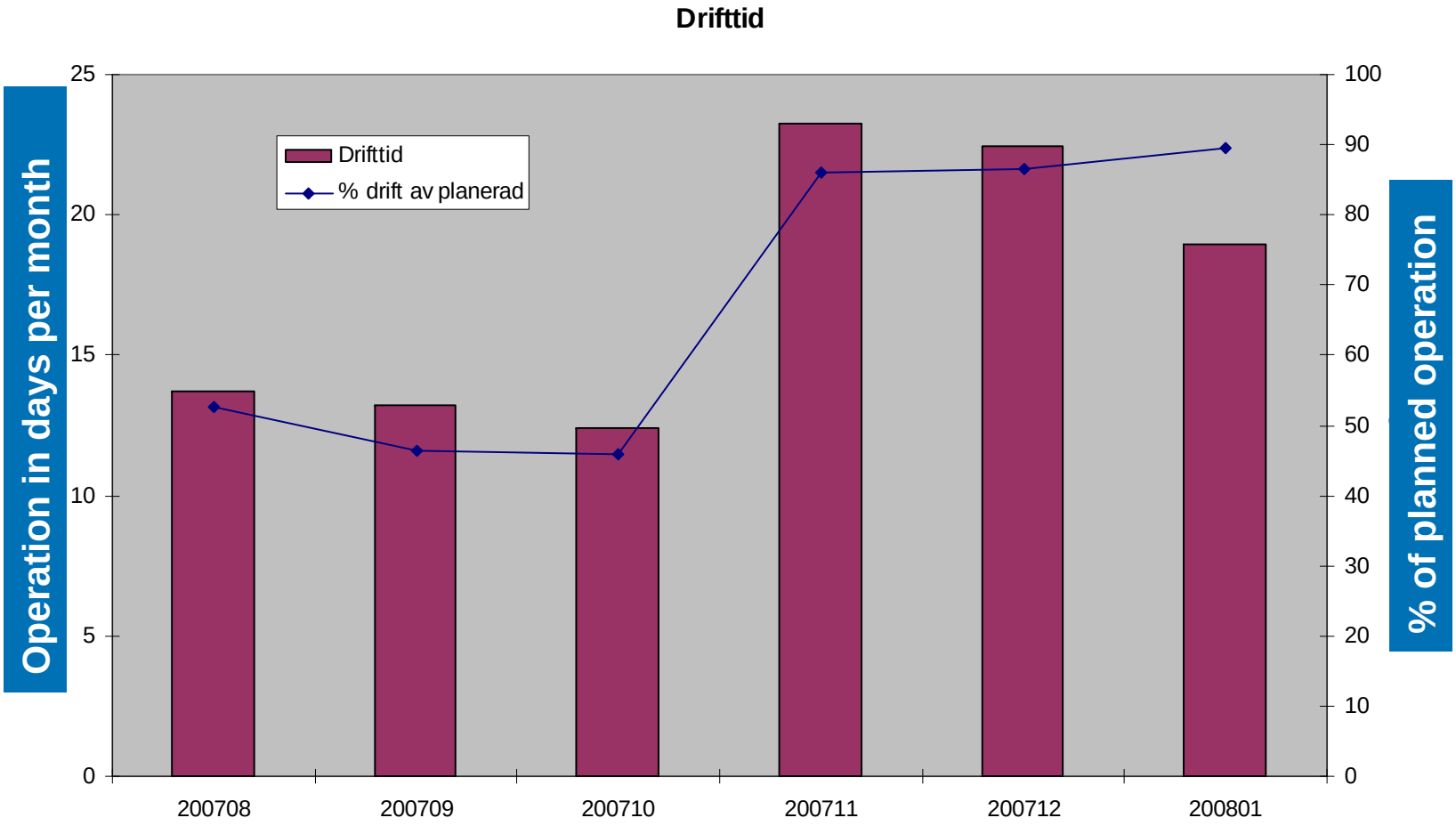

1
2
3
4
5
6
7
8
9
10
11

Total Accumulated Operating Hours Jan 2008



Development is biggest when it feels toughest!

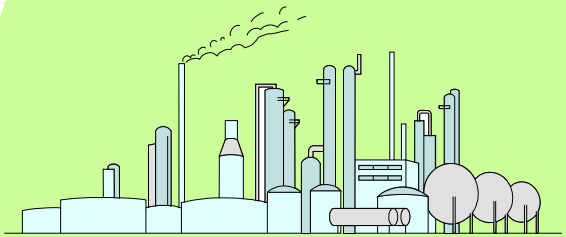
Operating efficiency in pilot plant



Energy balance in a BioRefinery integration with CHP

Woodchips[1)]

Ethanol factory/ CHP



Ethanol

Solid biofuels

Biogas

Total efficiency 75- 80 %

El/heat

Process energy & losses 20-25 %

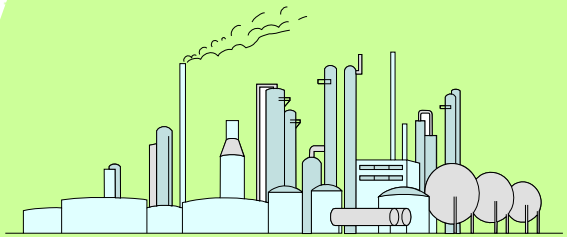
[1)] Based on soft wood

Energy balance for ethanol production from bagasse

Bagasse
(100 % DS)

Ethanol plant
- bagasse cellulose

Integrated with CHP plant



Ethanol

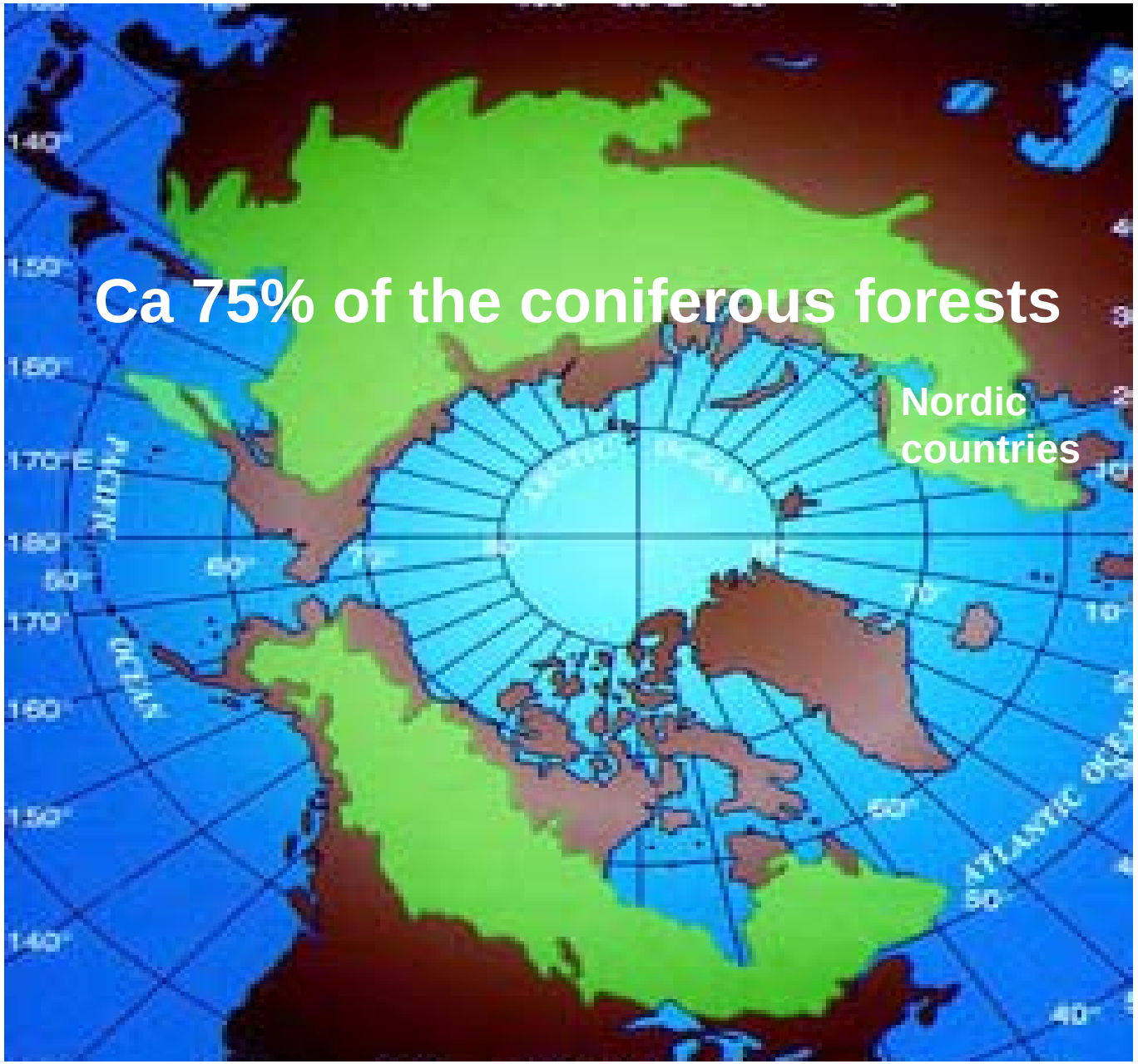
Solid fuels

Biogas

Heat/ power
Alt. sold as solid fuel or refined

Energy losses
(including process energy for ethanol plant)

Energy efficiency
~80 %


Ca 75% of the coniferous forests
Nordic countries

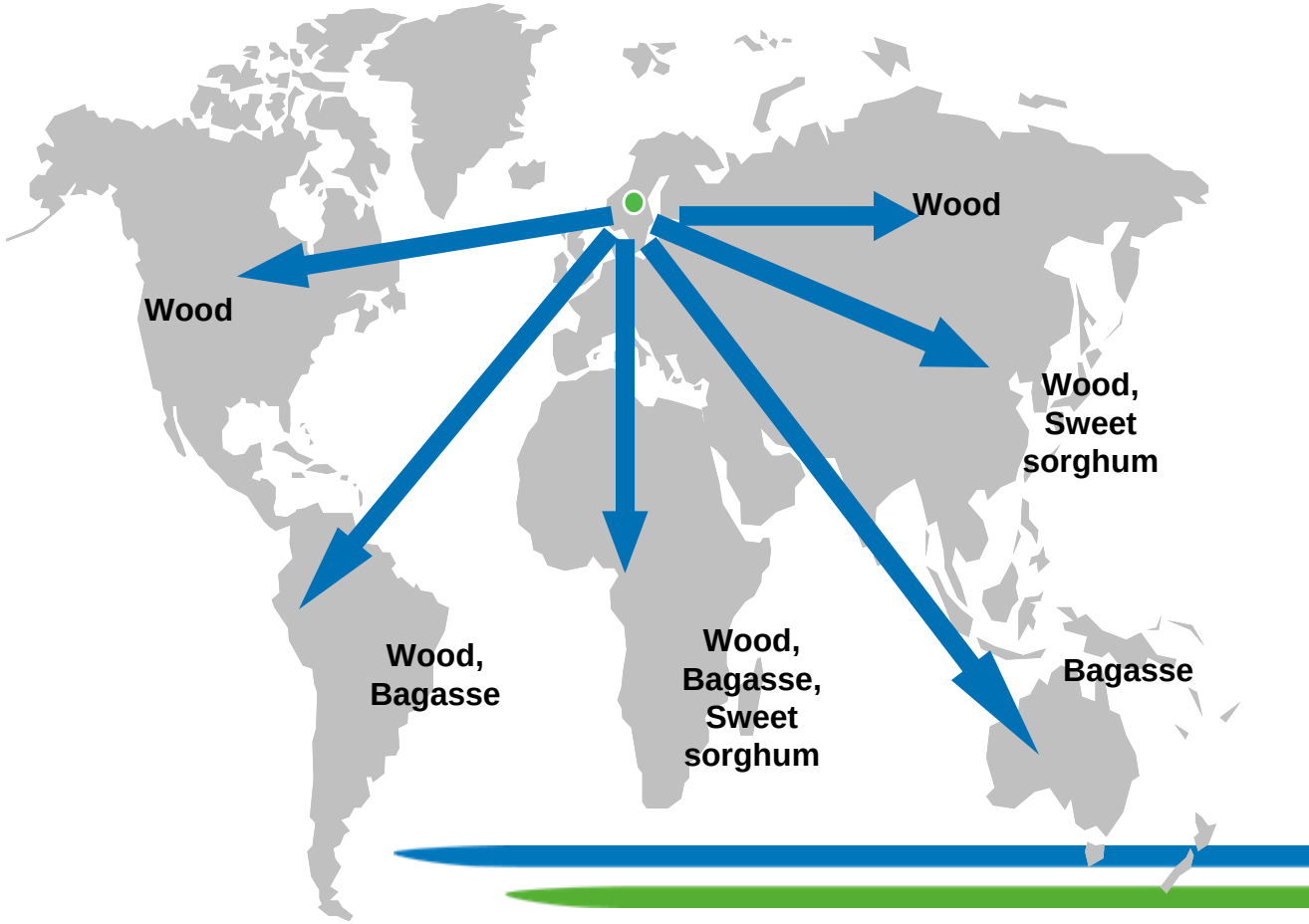
Percent of Boreal forests

Canada	Russia	USA (Alaska)	Norway	Finland	Sweden
22	73	> 1	5		

Feedstock **+ cellulose**	*Litre ethanol per ha/year*	
Corn	3.000	
+ stover	+1.500	**4.500**
Wheat	2.000	
+ straw	+1.000	**3.000**
Sugarcane	8.000	
+ bagasse	+4.000	**12.000**

SEKAB will market and deliver the cellulose technology worldwide

Different locations and feedstock requires different technical- and business solutions.

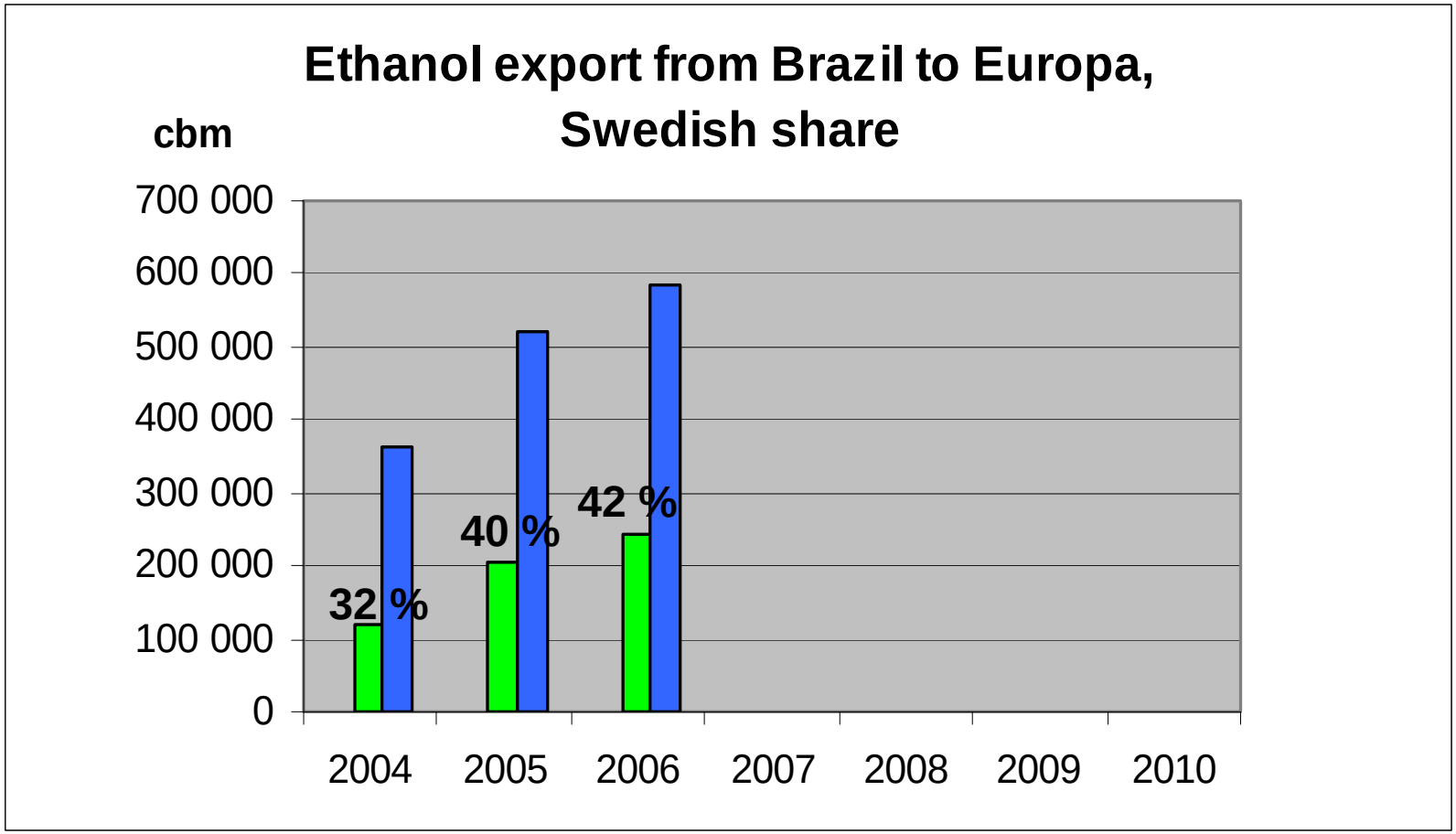


GRAIN → SUGAR CANE → CELLULOSE BIOMASS

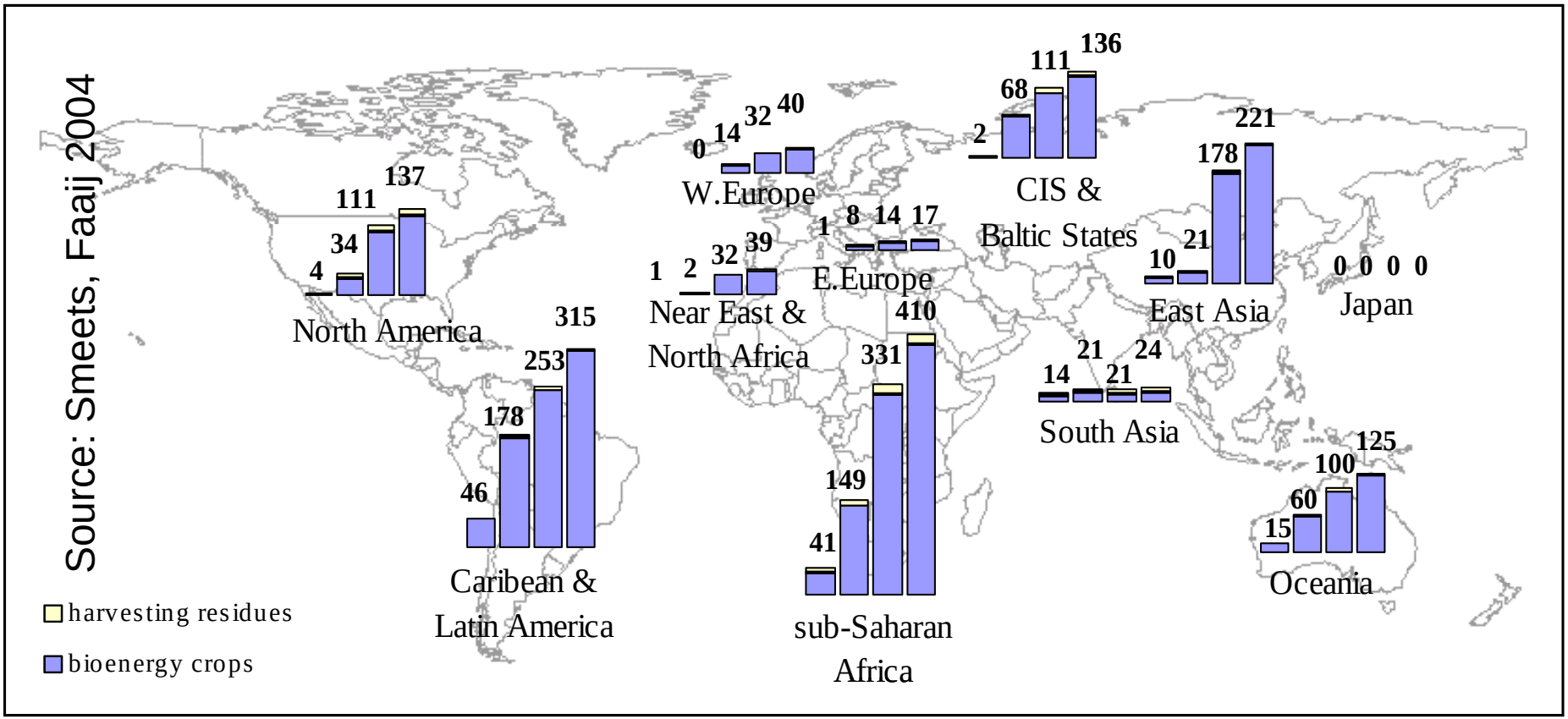
Cellulose Industrial Development Plant **START 2011**

Sugarcane **Today**

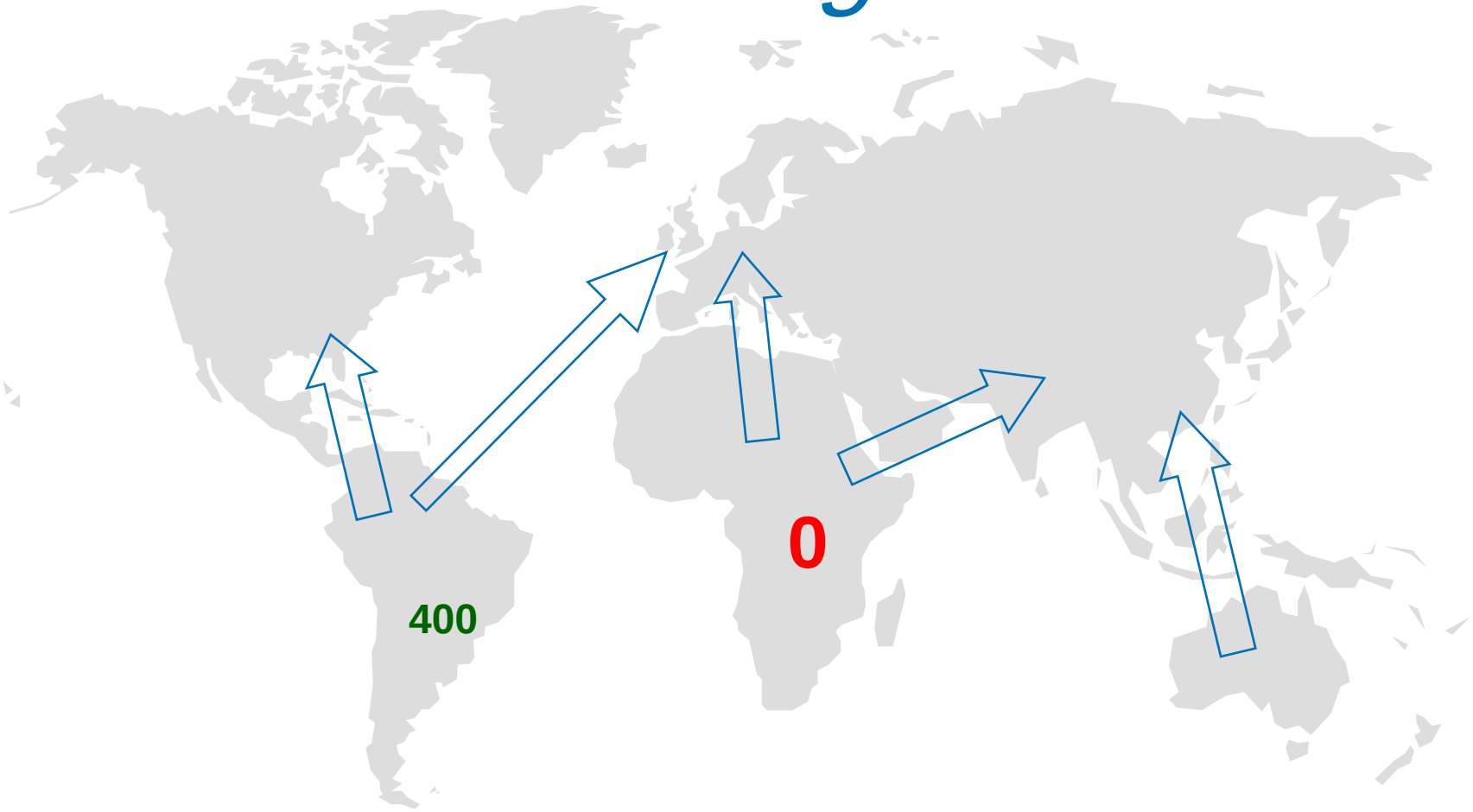
Sugarcane ethanol, a driver!



BioEnergi Potential 2050
Different scenarios



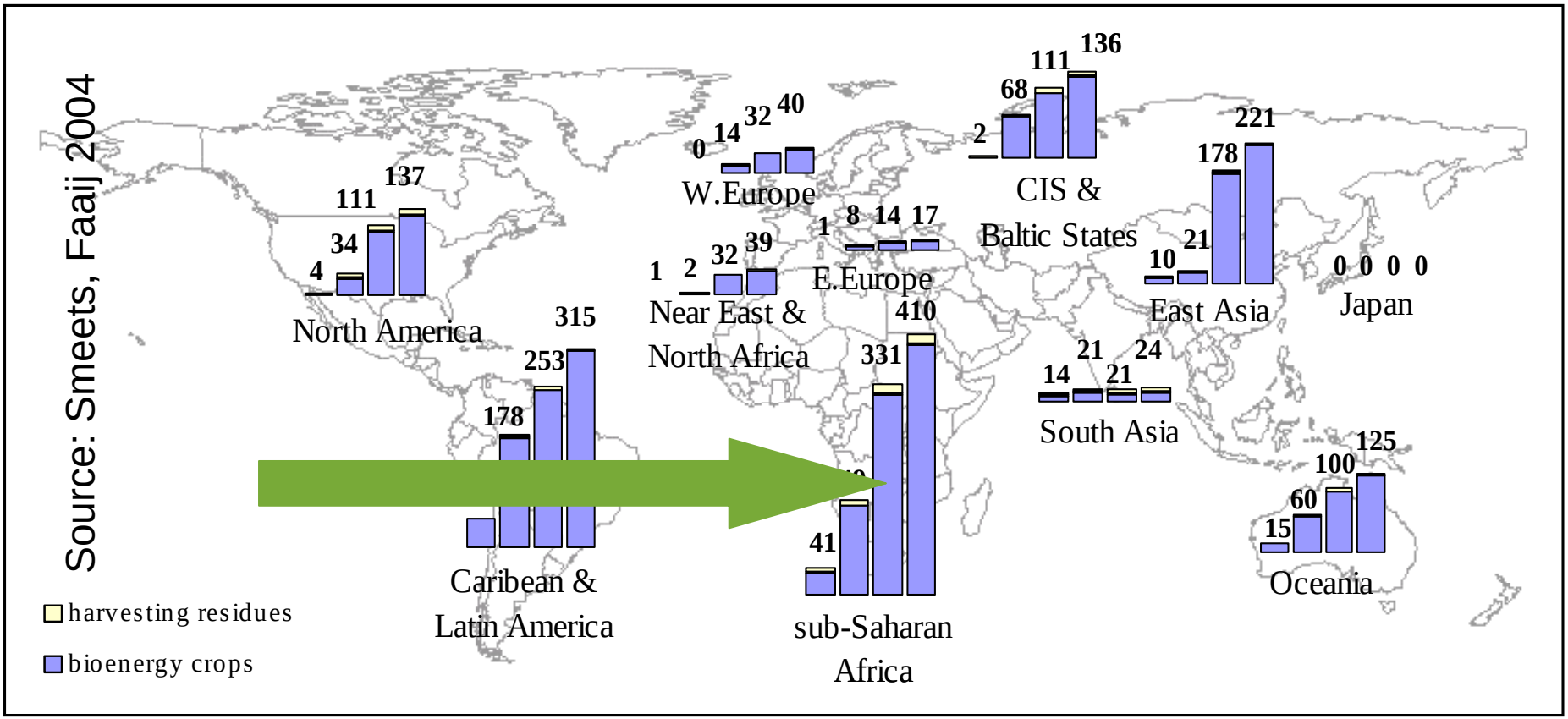
Ethanol trading



Comprehensive strategy

- **Green & Efficient Vehicles**
- **Cellulose based BioFuels**
- **AID → Trade**

BioEnergi Potential 2050
Different scenarios



Africa :

- **Highest vulnerability for expensive oil**
- **Contributed least to Climate change**
- **To pay the highest price for climate change**

+ Best natural conditions, photosynthesis

+ Surplus land with water

+ Gigantic need for social- & economical development

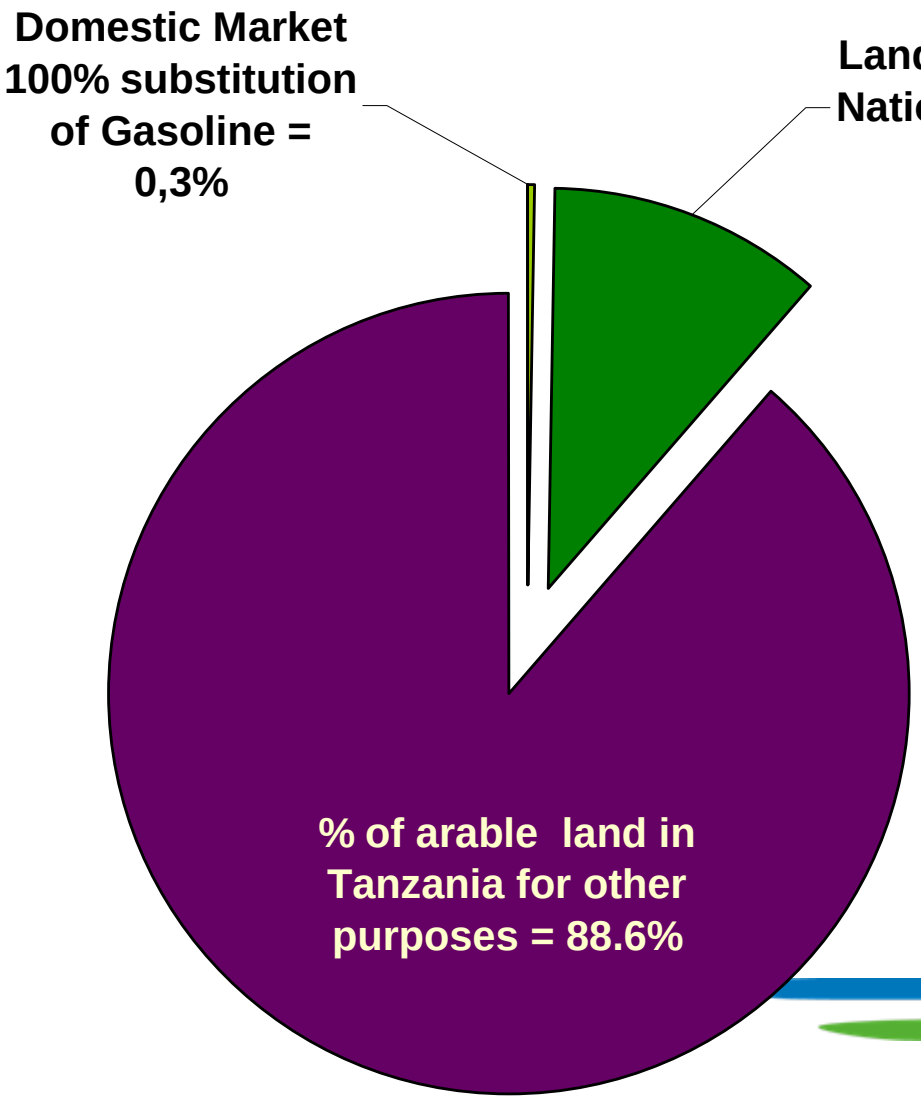
+ Available labour force

+ Potential platform for large scale exports

TANZANIA

MOZAMBIQUE

Substituting 100% of domestic gasoline and diesel would take 1-2% of arable land!*



- Assumptions:

20% of the country as arable land

Productivity is 8,000 Lts/hectare.year

National platform = 2,000,000 hectares

Challenge!

It has to be done with sustainable practices!

Ecologically & Socially

A great opportunity for global impact!

The world 2050

- 1,5 Billion cars
- 1600 liter/year

→ 2400 Million m3 ethanol/year

Grain	2000l/ha	1.200.000.000 ha
Sugarcane	8000l/ha	300.000.000 ha
+ Sugarcane + cellulose bagass	12000l/ha	200.000.000 ha
+ Todays hybrids	0,7l/10km	140.000.000 ha
+ Plug-in hybrids	0,3l/10km	60.000.000 ha

The world 2050

- 1,5 Billion cars
- 1600 liter/year

→ 700 Million m3 ethanol/year

Grain	2000l/ha	1.200.000.000 ha
Sugarcane	8000l/ha	300.000.000 ha
+ Sugarcane + cellulose bagass	12000l/ha	200.000.000 ha
+ Todays hybrids	0,7l/10km	140.000.000 ha
+ Plug-in hybrids	0,3l/10km	60.000.000 ha


APRIL 7, 2008
Joe Klein: How Al Gore Could Save The Democrats
Hillary Clinton On Why She Won't Quit
R.E.M. Rises from The Dead
TIME
The Clean Energy Myth
BY MICHAEL GRUNWALD
Politicians and Big Business are pushing biofuels like corn-based ethanol as alternatives to oil. All they're really doing is driving up food prices and making global warming worse—and you're paying for it

DN.Motor

Kinesiska framtidsbilar. SIDAN 2

Fullt ös med bilar från förr. I BACKSPEGELN

LÖRDAG 15 DECEMBER 2007 DAGENS NYHETER

Ford Focus i modernare form. SIDORNA 6–7

Tanke-ställaren

Det går åt stora mängder råvaror för att tanka en miljöbil med etanol. I en Volvo V50 Flexifuel motsvarar det 120 kilo vete, eller 240 limpor bröd. Eller ett halvt ton sockerrör. "Skrämmande, vi kan inte använda våra livsmedel som drivmedel", säger bagaren Peter Fritzdorf. Sidorna 4–5

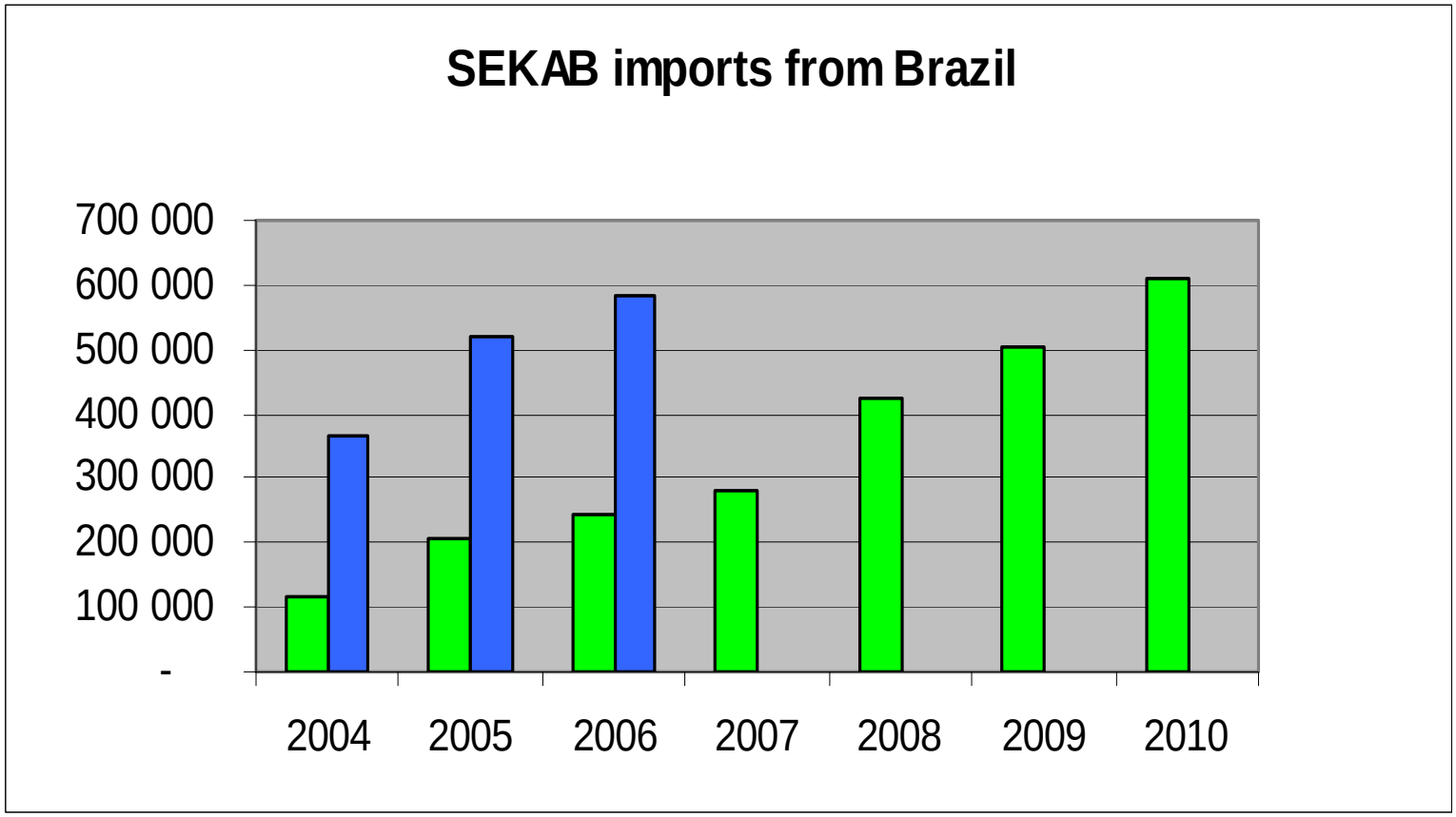
Hjälp oss göra rätt miljöval

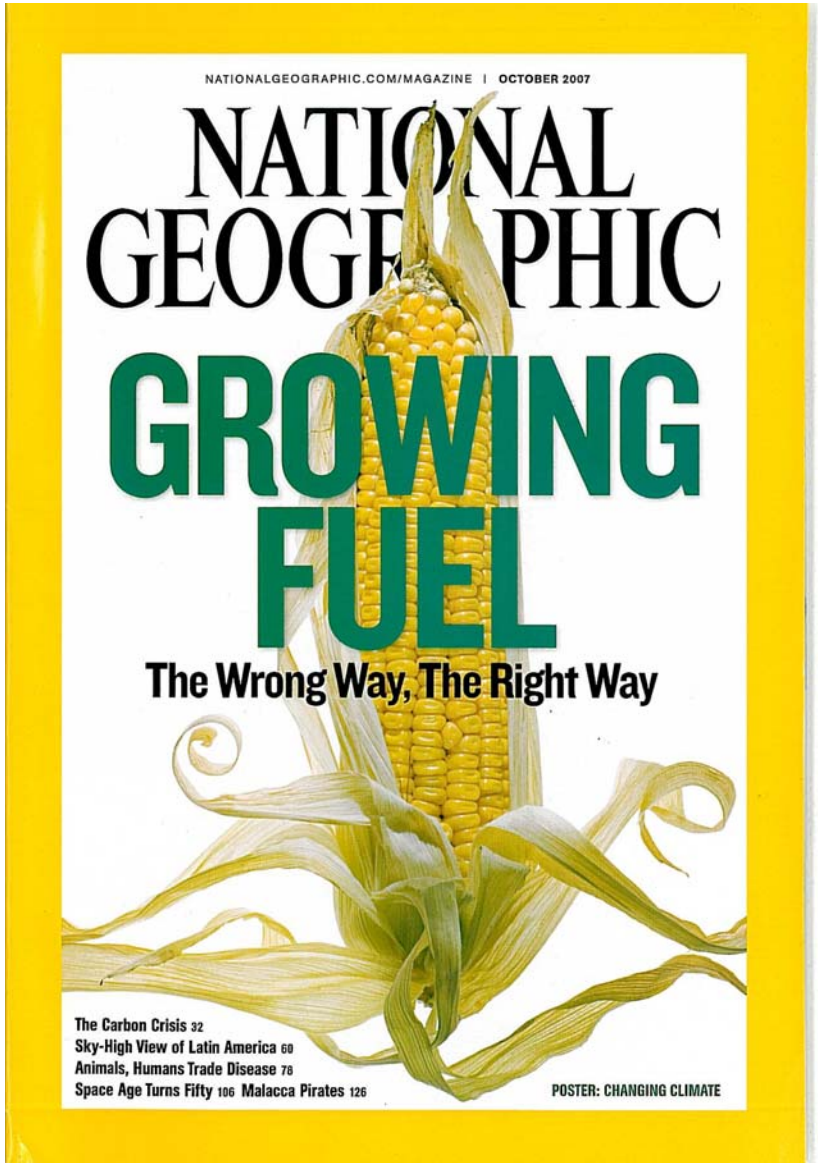
KRÖNIKA

LASSE SWÄRD

15 december 2007

Sustainble ethanol is the next challenge!





BioFuels are very controversial

- Can be done Wrong!
- Can be done Right
- Difference between BioFuels & BioFuels
- Difference between Operators & Operators

Swedish Brazilian

Sustainable Ethanol Initiative

The Background

Etanolens Slavar

24 juni 2007

’Nästan en tredjedel av den etanolen vi förbrukar importeras från Brasilien där etanol framställs av sockerrör.
GP:s Henrik Jönsson och Anders Kristensson gav sig ut i hettan på de brasilianska fälten. De möttes av pressade ackordsarbetare som för hand hugger tolv ton sockerrör om dagen.’

SvD

Bakom ren etanol finns en SMUTSIG produktion

9 december 2007

’I den koleldade fabriken norr om São Paulo bränns etanol i gryningen. Bredvid vaknar sockerrörsarbetarna till en ny slitsam dag på fälten.’

The Result

- Challenge of trust for products and suppliers
- Risk for reduced support for further government supported development
- Risk of loosing momentum for market and R&D
- EU regulations earliest at 2010-2012!
- Swedish market can’t wait –
- We need sustainable ethanol today!

Main Purpose

Main purpose of the initiative:

- Enlighten about the difference between Right way and the Wrong way.
- Strengthen or rebuild consumer and societal trust
- Move more Brazilian producers towards more sustainable production and thereby rapidly increase supply of “verified sustainable ethanol”
- Use Sweden as an international example.
- “If we can do it, other countries can do it!”

The Initiative

- Provide supply of sustainable ethanol for the E85 & E95 market until EU regulations or other measures are in place

  This will regain consumer trust in the fuel and vehicles using the fuel.

- Embrace and support the ongoing process in Brazil towards more sustainable and verifiable production

  This will result in larger supply of easy accessible volumes of sustainable ethanol at competitive prices.

- Influence and accelerate the EU process for sustainability criteria

  A working model for sustainability in Sweden will likely inspire a similar process in other European countries.

The Initiative so far

- A bilateral agreement between Sweden and Brazil to accelerate the process towards sustainable BioFuels.
- An agreement between BAFF (BioAlcohol Fuel Foundation) and UNICA
  - To drive a process that will move the entire industry in Brazil towards more sustainable production
  - To support the introduction and inform the Swedish and European market of the merits and potentials with sustainable sugarcane ethanol.
- A commercial agreement between SEKAB and progressive producers in Brazil
  - Joint process developing the criteria
  - Commitment to request and supply sustainable ethanol that is verifiable and traceable during the bridge period until there is an established procedure on the market.

To complete the Initiative

- A commercial agreement between SEKAB and partnering oil companies and other end users. All have been invited!
  - Supply the end users with sustainable ethanol for E85 & E95

- A public information initiative
  - To communicate the bilateral actions Swedish and Brazilian industry actors have taken in conjunction with local oil companies to assure consumer trust in E85 and E95.

The Communication Campaign

”Sverige går före. Branschen tar täten.”

- Conference:
  - Political perspective
  - Industry organisations
  - Brazilian producers and EU distributors
  - Vehicle manufacturers
  - NGO:s
  - Researches in BioFuel systems development
- Media advertising campaign
- Website – The Sustainable Ethanol Initiative

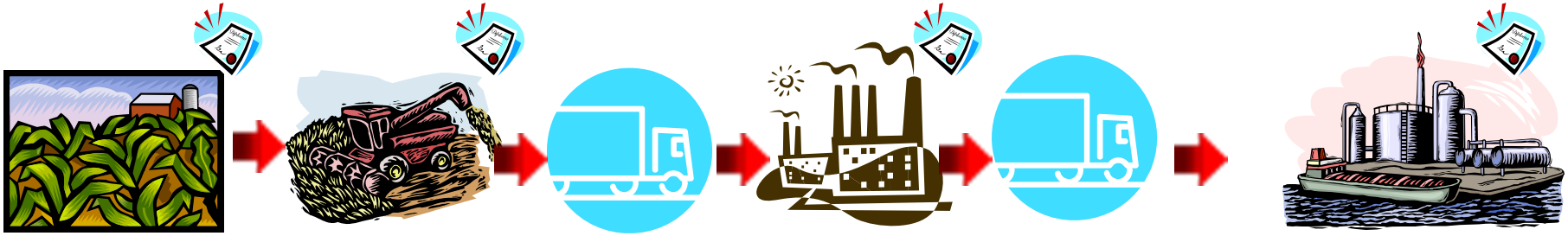
Sustainability criteria

- Net reduction of fossil CO2
- Mechanical harvesting
- Labor rights
- Child labor
- Environmental protection program
- Rain forest

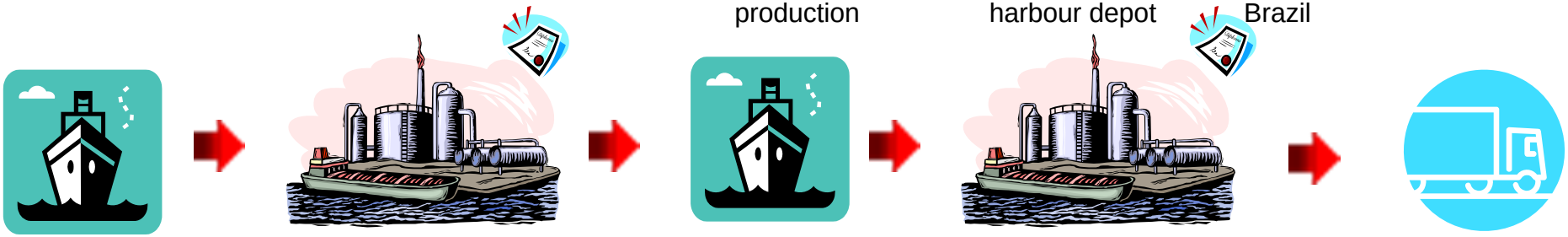
Verification & Traceability

- Monitoring and verification of the criteria's shall be done through audits by an independent third party
- Non compliance
  - Minor Non Compliance
  - Major Non Compliance
    - Reasons for braking of purchasing contract?
- Full traceability of all physical flows

Ethanol Chain of Logistics



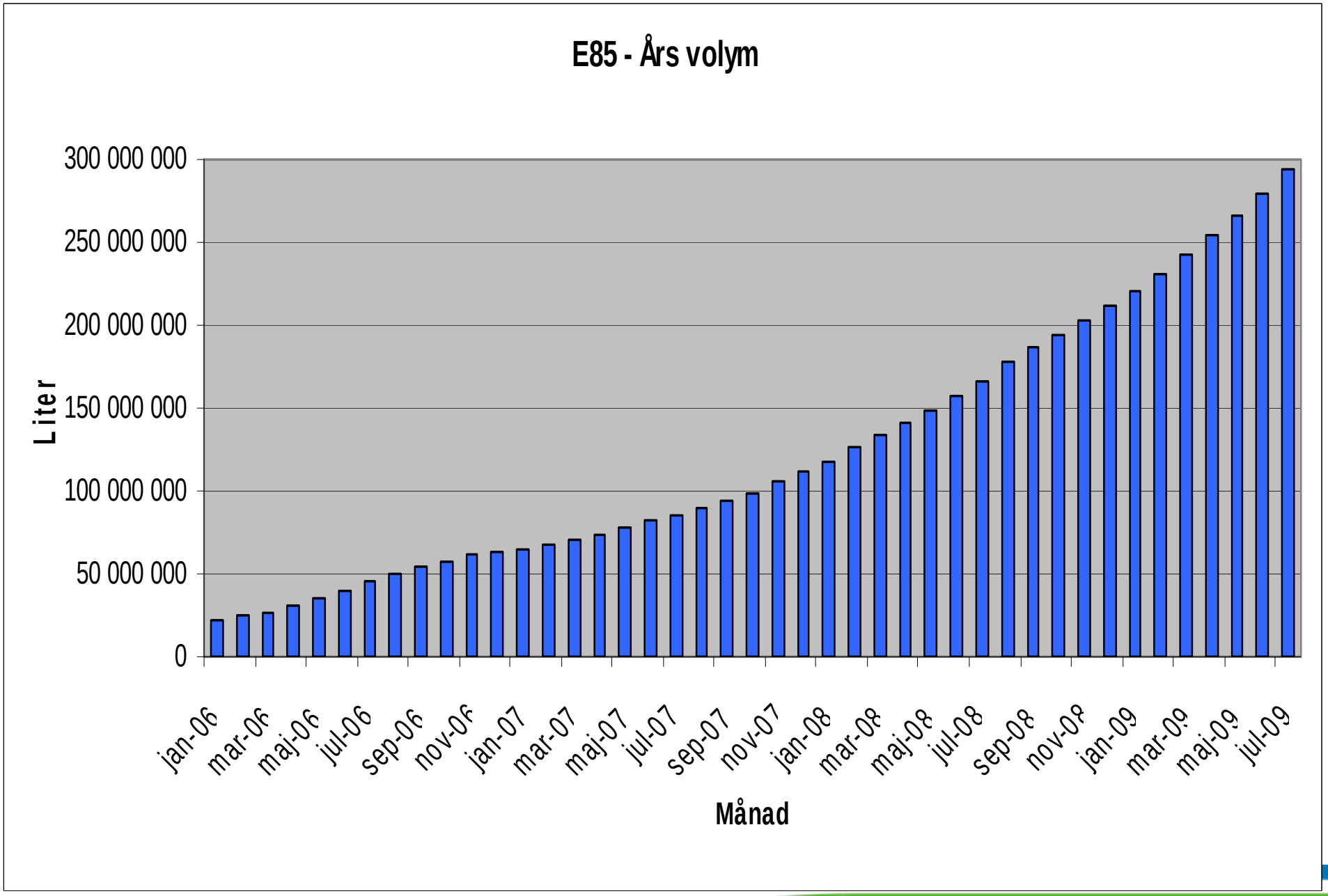
Sugarcane field | Harvesting | Transport to factory | Ethanol and energy production | Transport to harbour depot | Harbour depot in Brazil

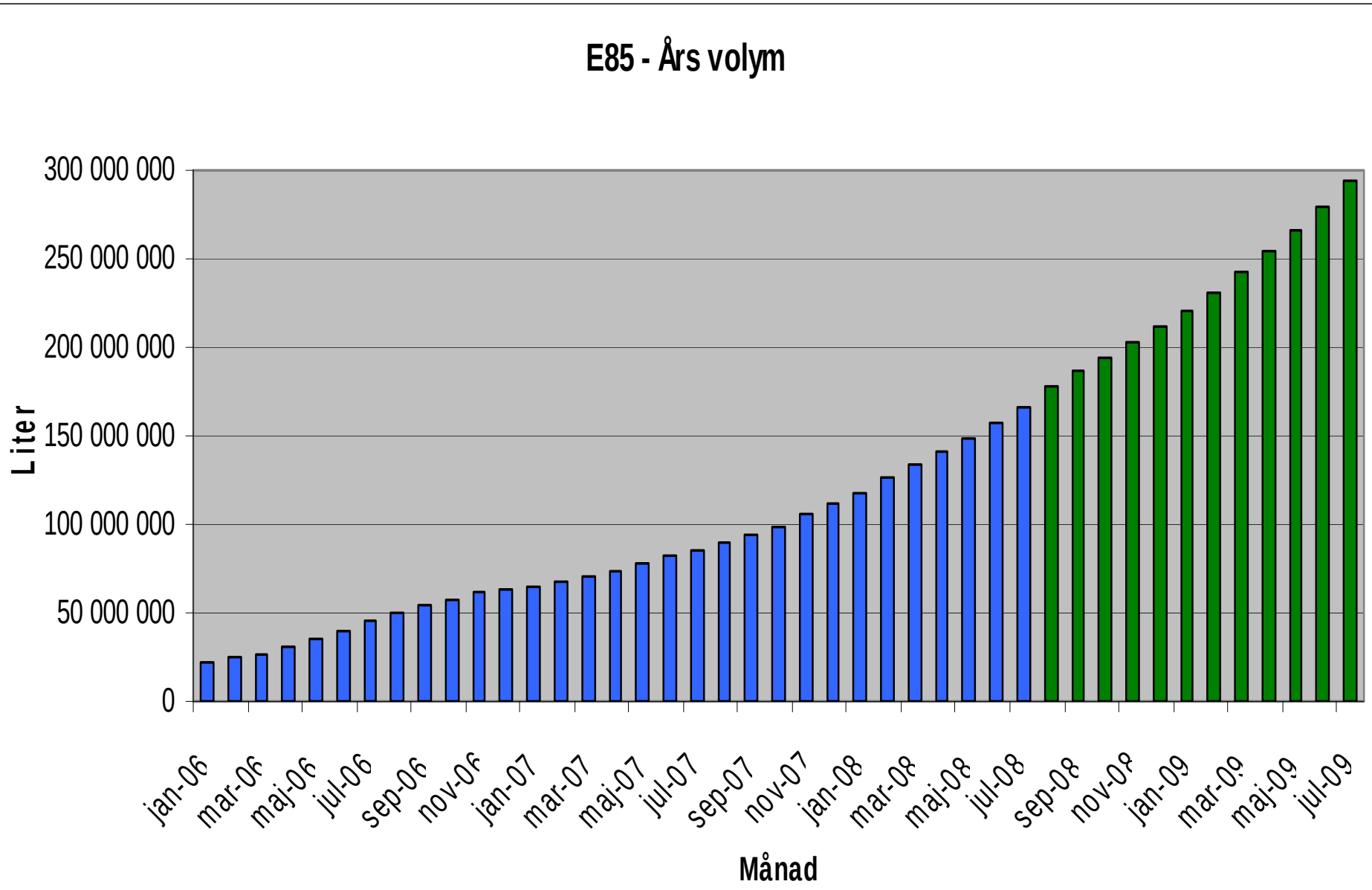


Transport to Europe | Reloading in Europe depot | Transport to Sweden | Sweden depot | Transport to outlet

Verified Sustainability Criteria's

Traceability through the entire Chain of Logistics


E85 - Års volym
300 000 000
250 000 000
200 000 000
150 000 000
100 000 000
50 000 000
0
Liter
jan-06
mar-06
maj-06
jul-06
sep-06
nov-06
jan-07
mar-07
maj-07
jul-07
sep-07
nov-07
jan-08
mar-08
maj-08
jul-08
sep-08
nov-08
jan-09
mar-09
maj-09
jul-09
Månad


E85 - Års volym
300 000 000
250 000 000
200 000 000
150 000 000
100 000 000
50 000 000
0
Liter
jan-06
mar-06
maj-06
jul-06
sep-06
nov-06
jan-07
mar-07
maj-07
jul-07
sep-07
nov-07
jan-08
mar-08
maj-08
jul-08
sep-08
nov-08
jan-09
mar-09
maj-09
jul-09
Månad

Biggest threat to humanity,
is not the evil of the bad ones.

It is the passivity of the good ones!

Martin Luther King

Thank You!