



Sustainable Ethanol

What is the context?

**End of oil
future for...
for transports?**



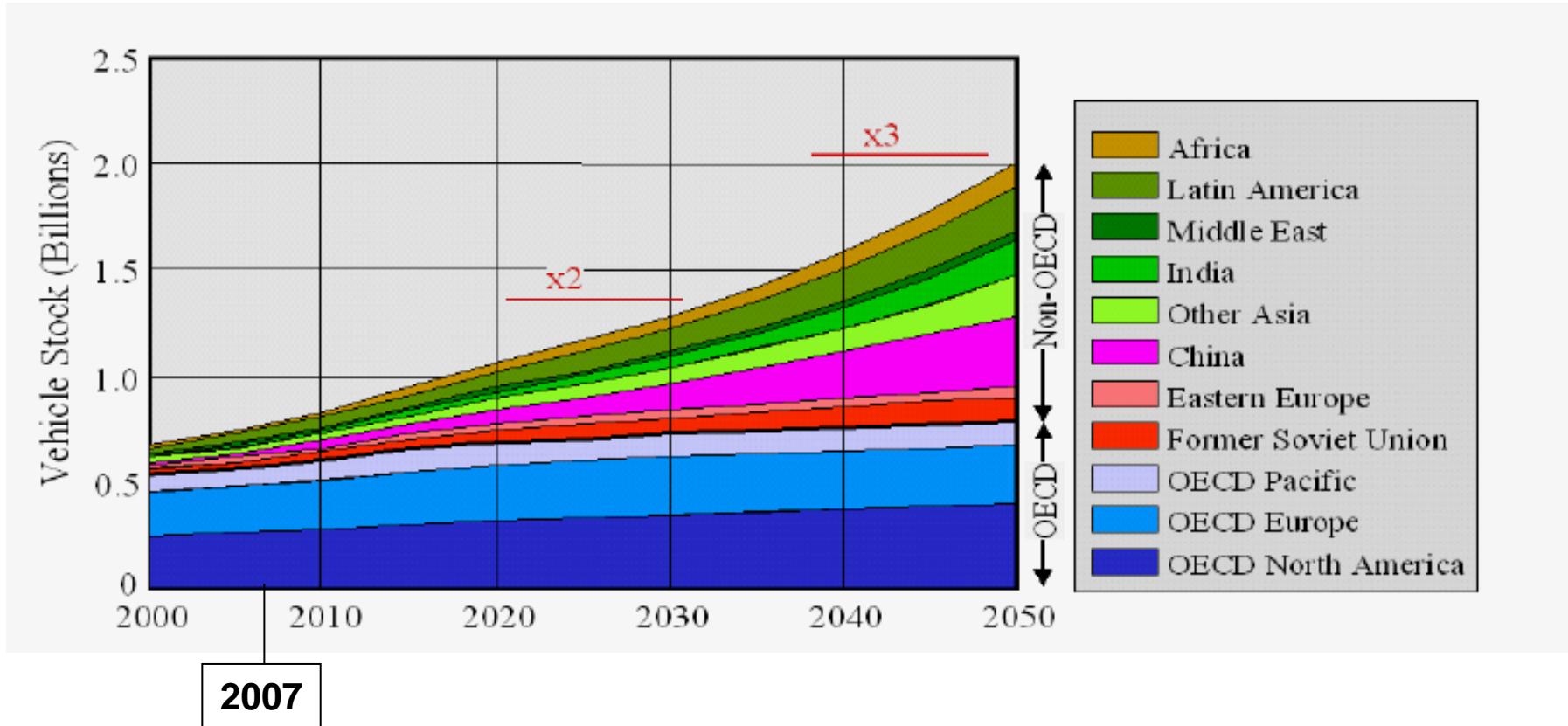
EU report on Security of Supply

Dependency on Oil Imports **70%**
2020 → **90%!**

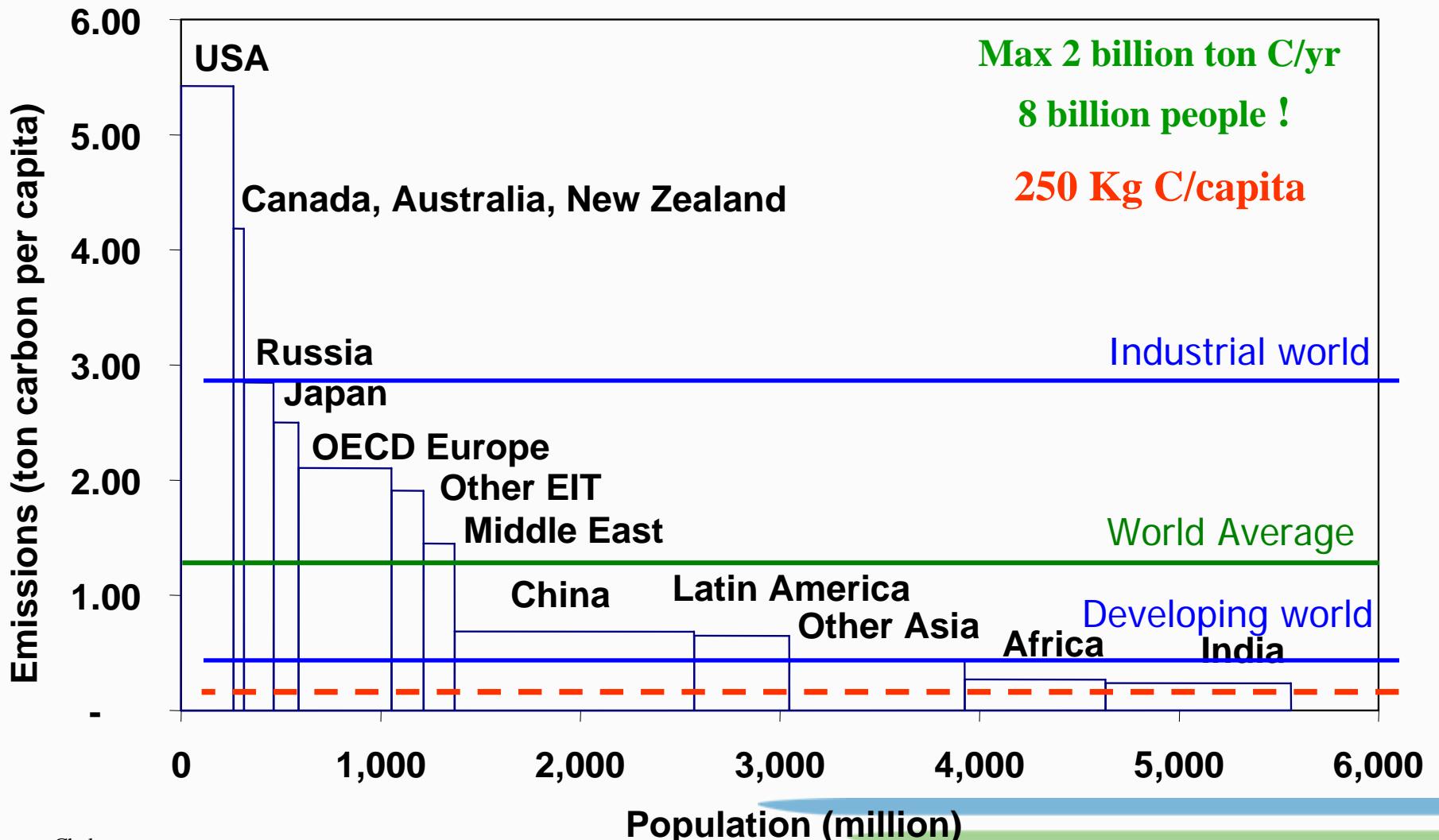
Transport sector's
dependency on Oil **97%!**
Dependency on transports **Growing**



Global development of Light-duty Vehicles



Carbon emissions per capita



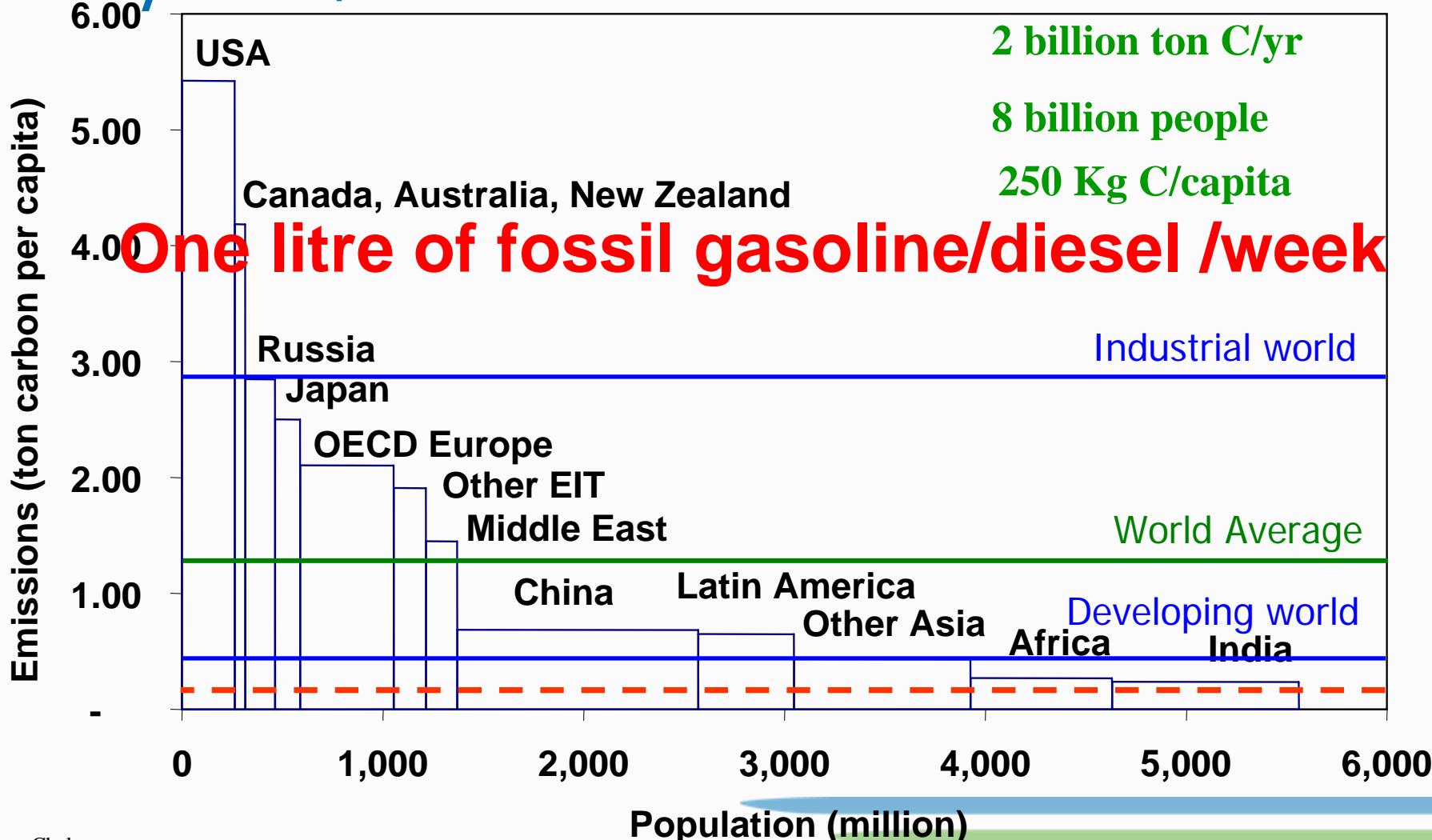
How much Gasoline-Diesel /capita?

- 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



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 CO₂

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



*What role for
BioFuels?*



A photograph of tall green grass blades against a clear blue sky, serving as the background for the book cover.

**BIOFUELS
FOR
TRANSPORT**

An International Perspective

OECD The OECD logo, which consists of a circle with a horizontal line through it.

*BioFuels
for Transport:
A Global
Perspective*

OECD/IEA

www.iea.org/books

A series of three horizontal swooshes in blue, green, and dark grey/black colors, positioned at the bottom of the page.

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 CO₂ “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 than world market priced gasoline. Negative CO₂ mitigation cost

World Biofuels Markets
Brussels, March 7, 2007



CONFIDENTIAL

Beyond the Hype – Perspectives on Growth in the Biofuels Industry

Jens Riese
McKinsey & Company

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Enough biofeedstock to replace 50% of fuel

INCREMENTAL FEEDSTOCK POTENTIAL 2020*,

Million tons

Wheat/corn

200

Sugarcane

800

Agricultural residues

1,000

Energy crops

1,000

Forestry

900

Total

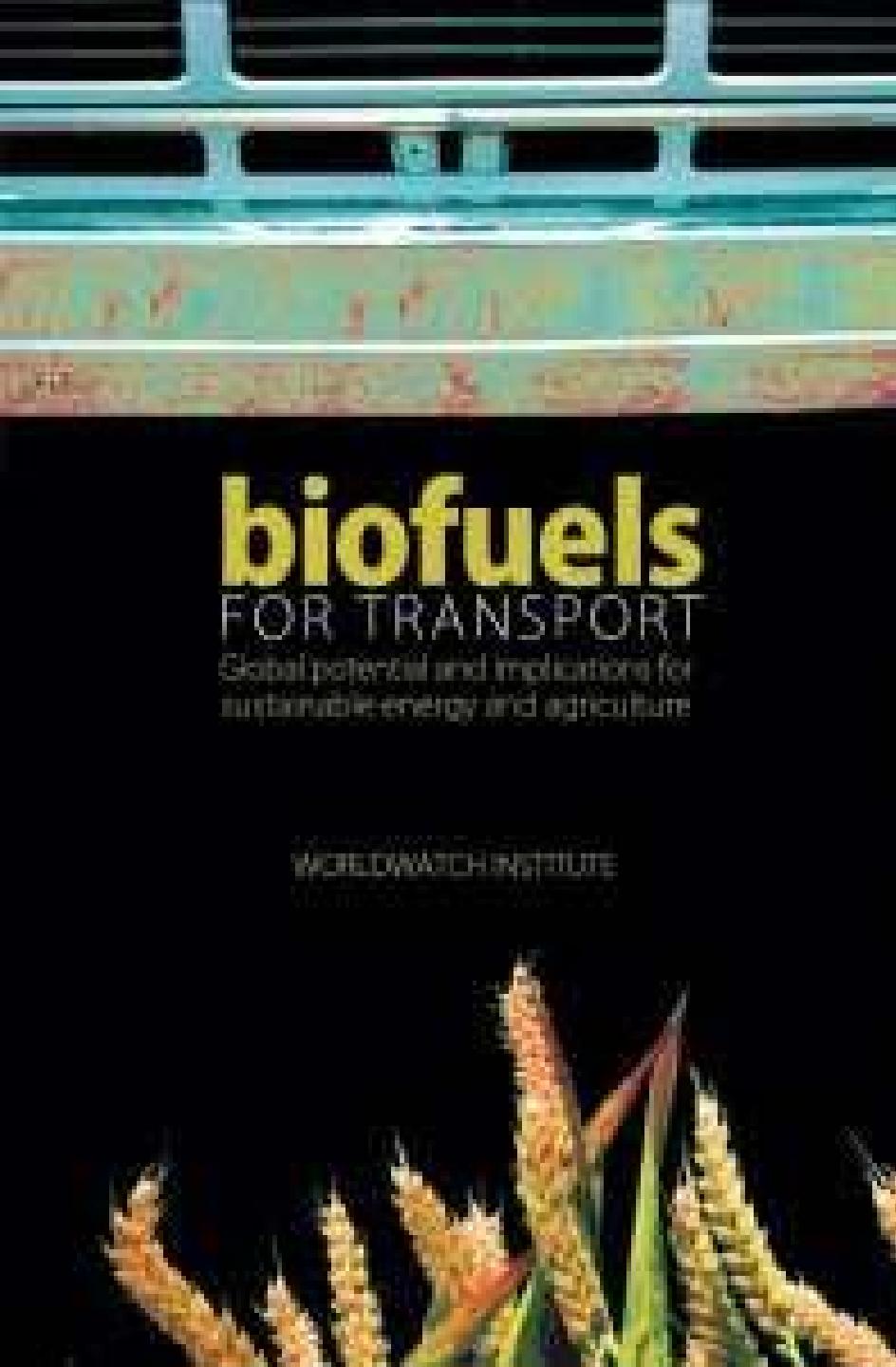
3,900

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

Enough for 360
billion gallons

* Wheat, corn, and sugarcane include total amount for biofuels available, cellulosic feedstock only incremental amount
Source: FAPRI, FAOSTAT, expert interviews, McKinsey analysis





biofuels

FOR TRANSPORT

Global potential and implications for
sustainable energy and agriculture

WORLDWATCH INSTITUTE
GLOBAL POLICY RESEARCH



Biofuels for
Transport:
Global Potential
and Implications for
Energy and Agriculture.

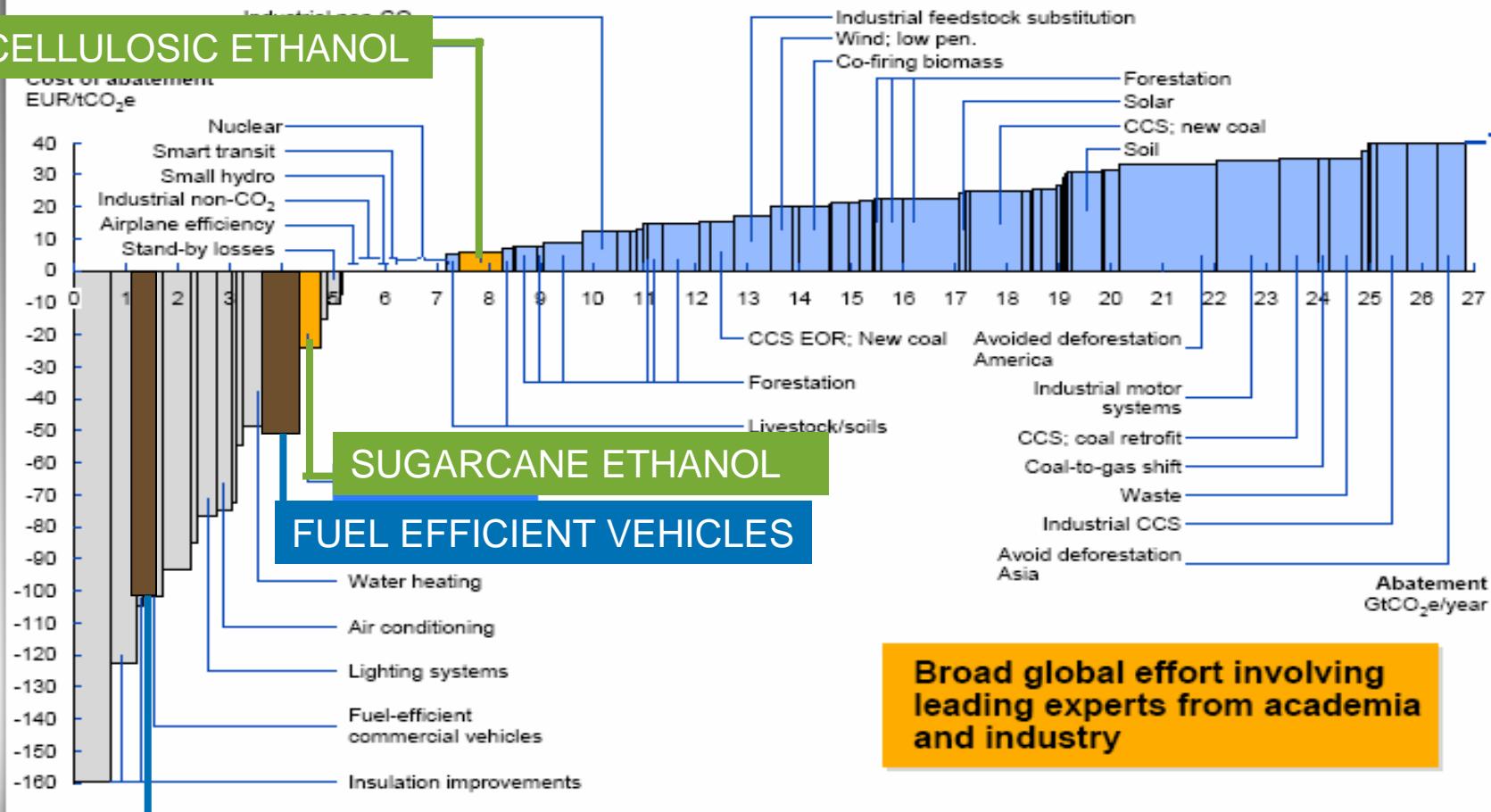
www.worldwatch.org

McKinsey/Vattenfall study

2030

Biofuel is one of the most cost-effective ways to abate greenhouse gas emissions from renewable energy sources ...

CELLULOSIC ETHANOL



FUEL EFFICIENT
COMMERCIAL VEHICLES

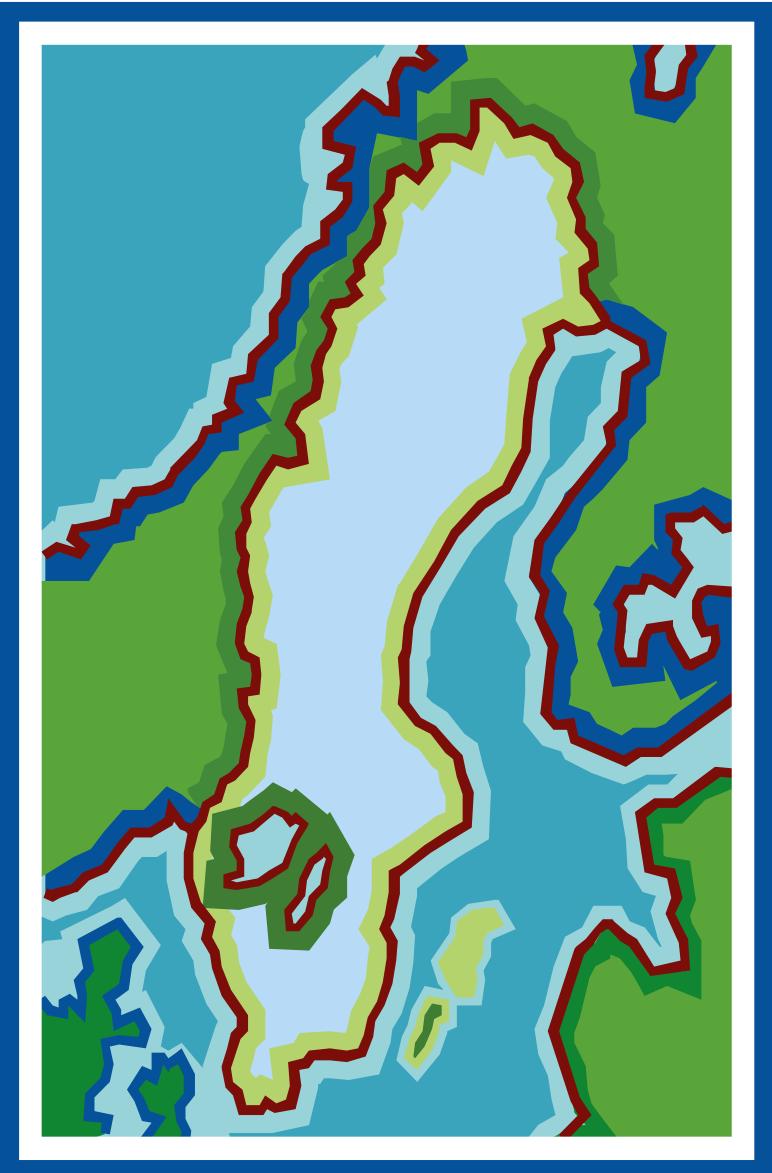
Broad global effort involving
leading experts from academia
and industry

How do we develop
large scale systems of

**energy efficient vehicles using
Sustainable BioFuels?**







Sweden

A biofuel nation

Sweden shall be
free from oil
dependency by
2020!

Primeminister Göran Persson
November 5, 2005

Sweden year ?

- 5 million cars
- 1600 liter/year



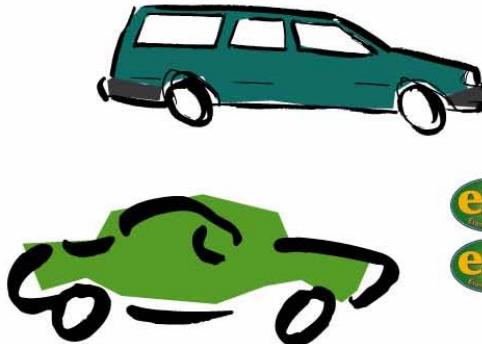
8 Million m³ ethanol/year

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



Gasoline engines (dehydrated ethanol)

- | | | |
|-----|---------------------|--------|
| e85 | Optimised FlexiFuel | 100 % |
| e85 | FlexiFuel | 85 % |
| e5 | Low blends | 5-25 % |

SOURCE: BAFF

041008/F4-1

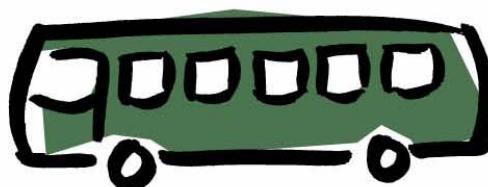
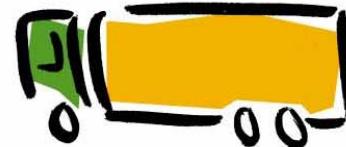
Future transmission systems (dehydrated ethanol)

- | | |
|-----------------|-----------|
| Fuelcells | 100 % |
| Plus In Hybrids | 85, 100 % |
| Hybrids | 85-100 % |



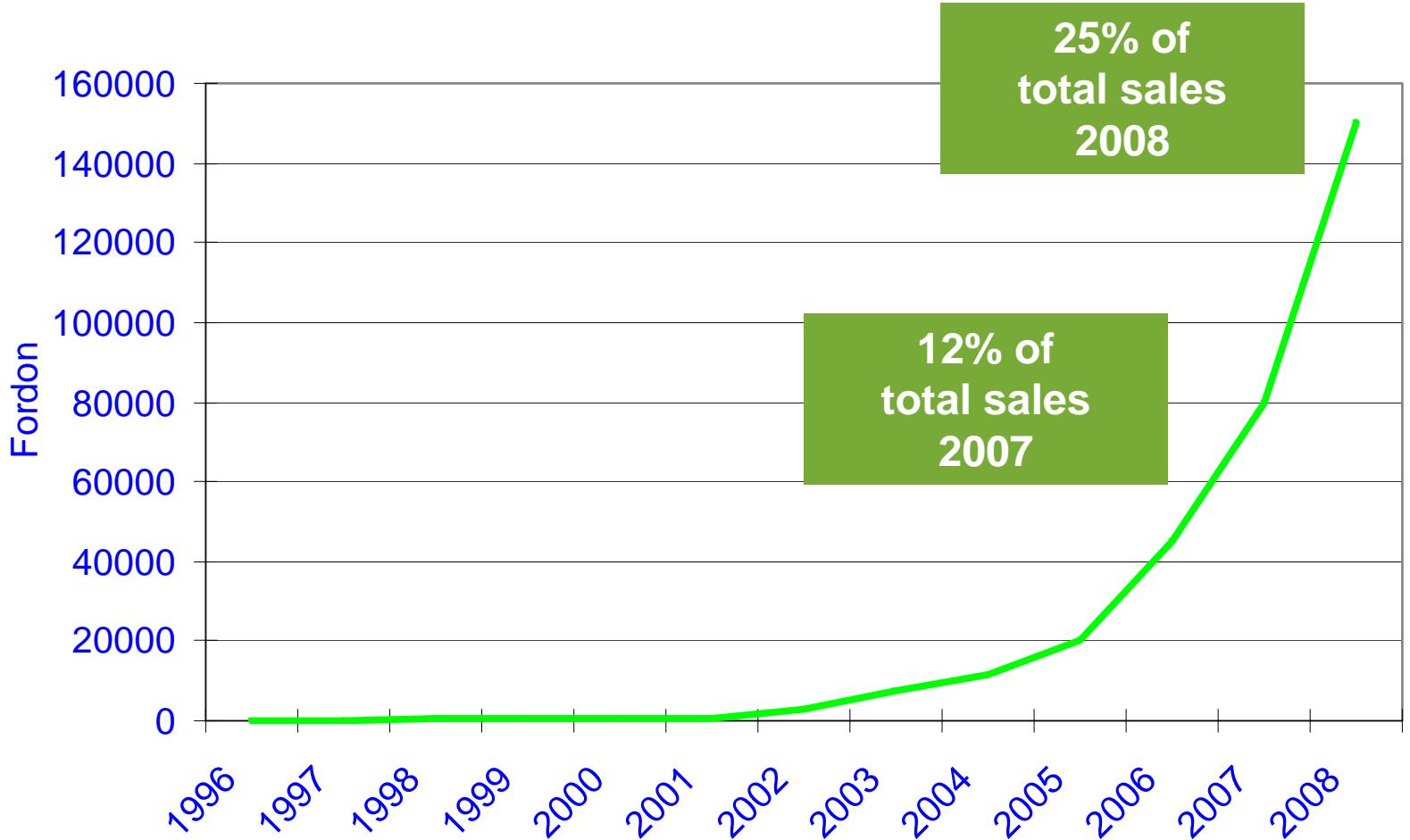
Diesel engines (Hydrated ethanol incl. water)

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

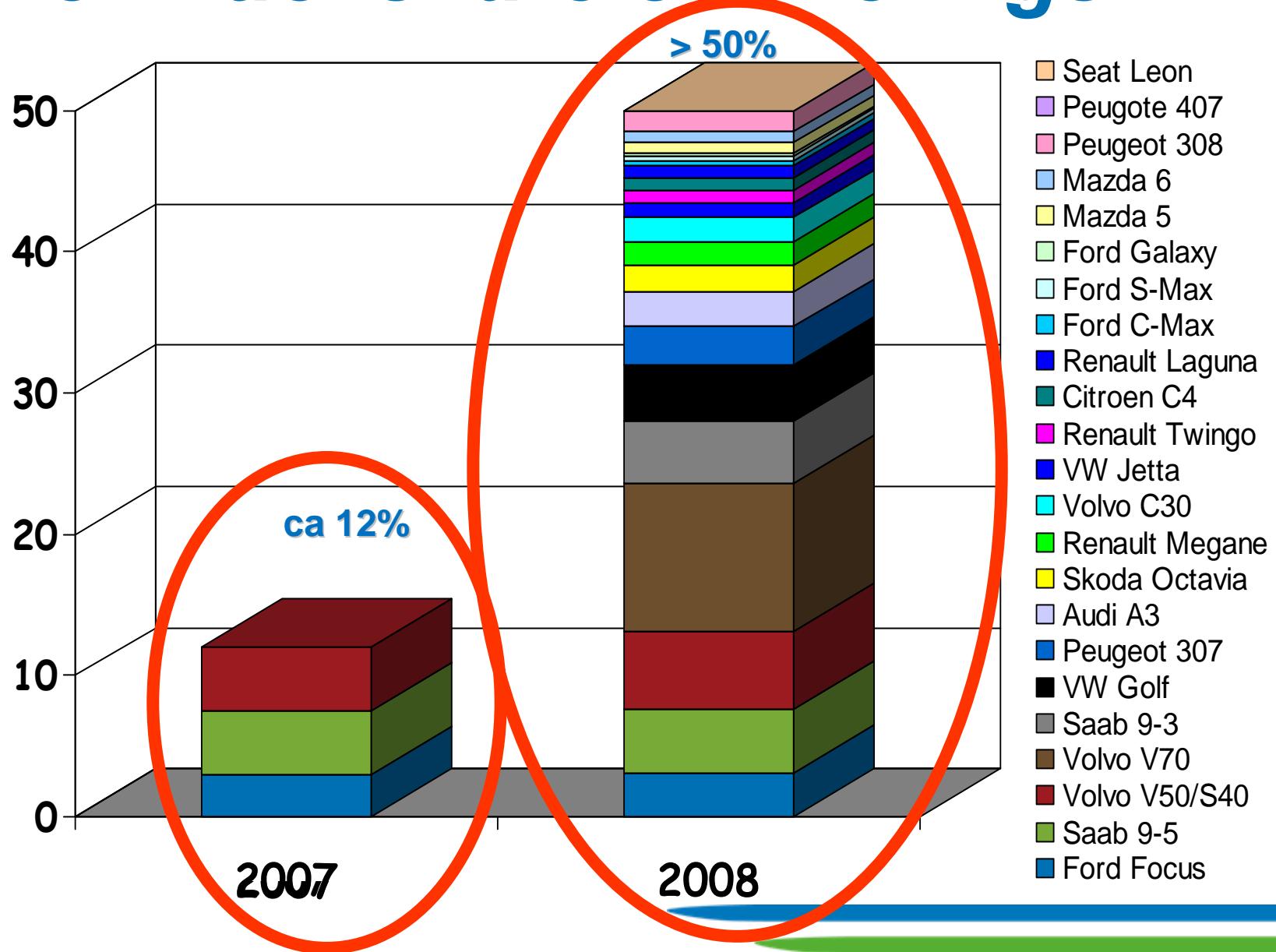


FlexiFuel in Sweden

35% of
total sales
2009



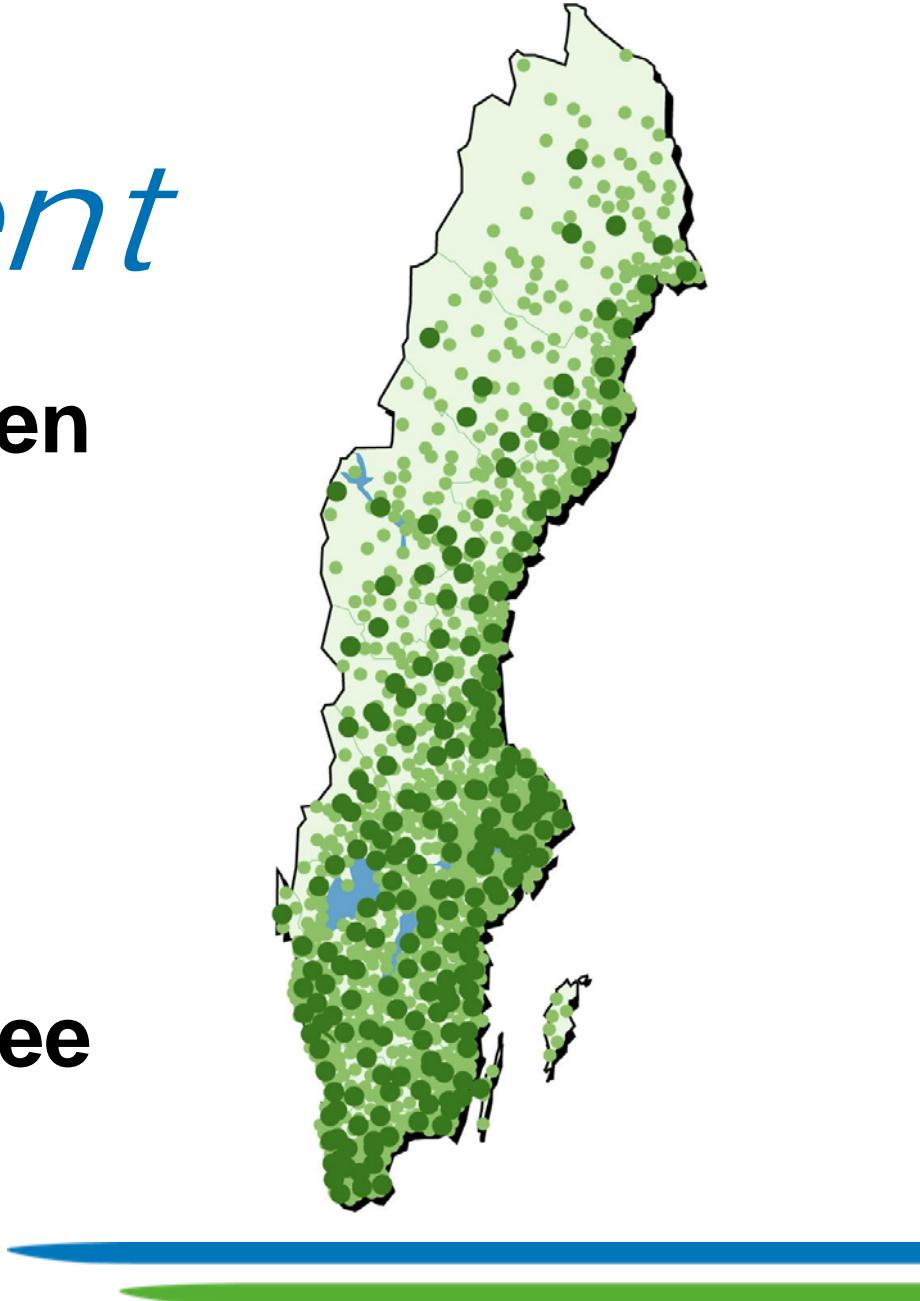
FlexiFuel share of offerings..



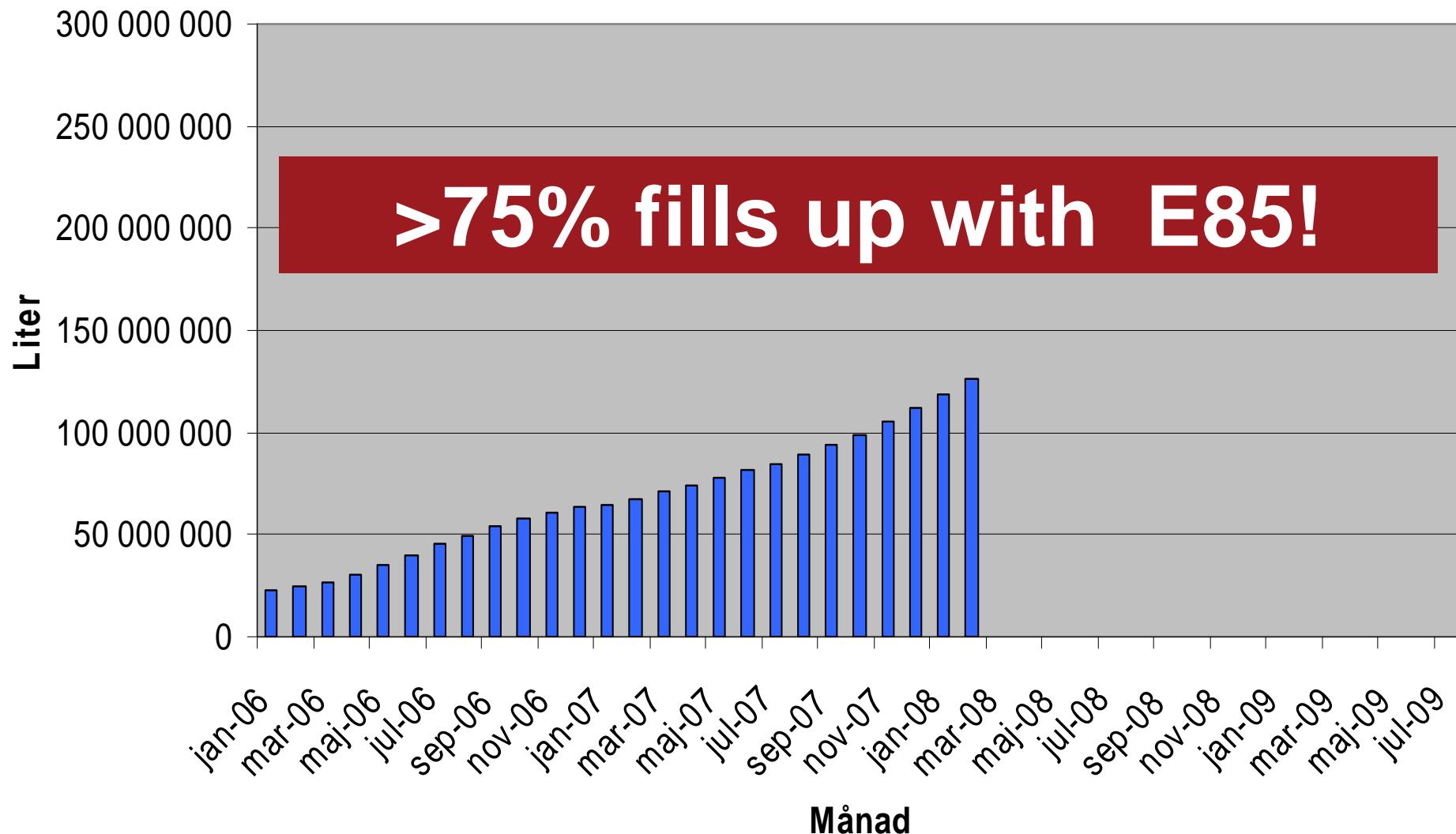
A dynamic development

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

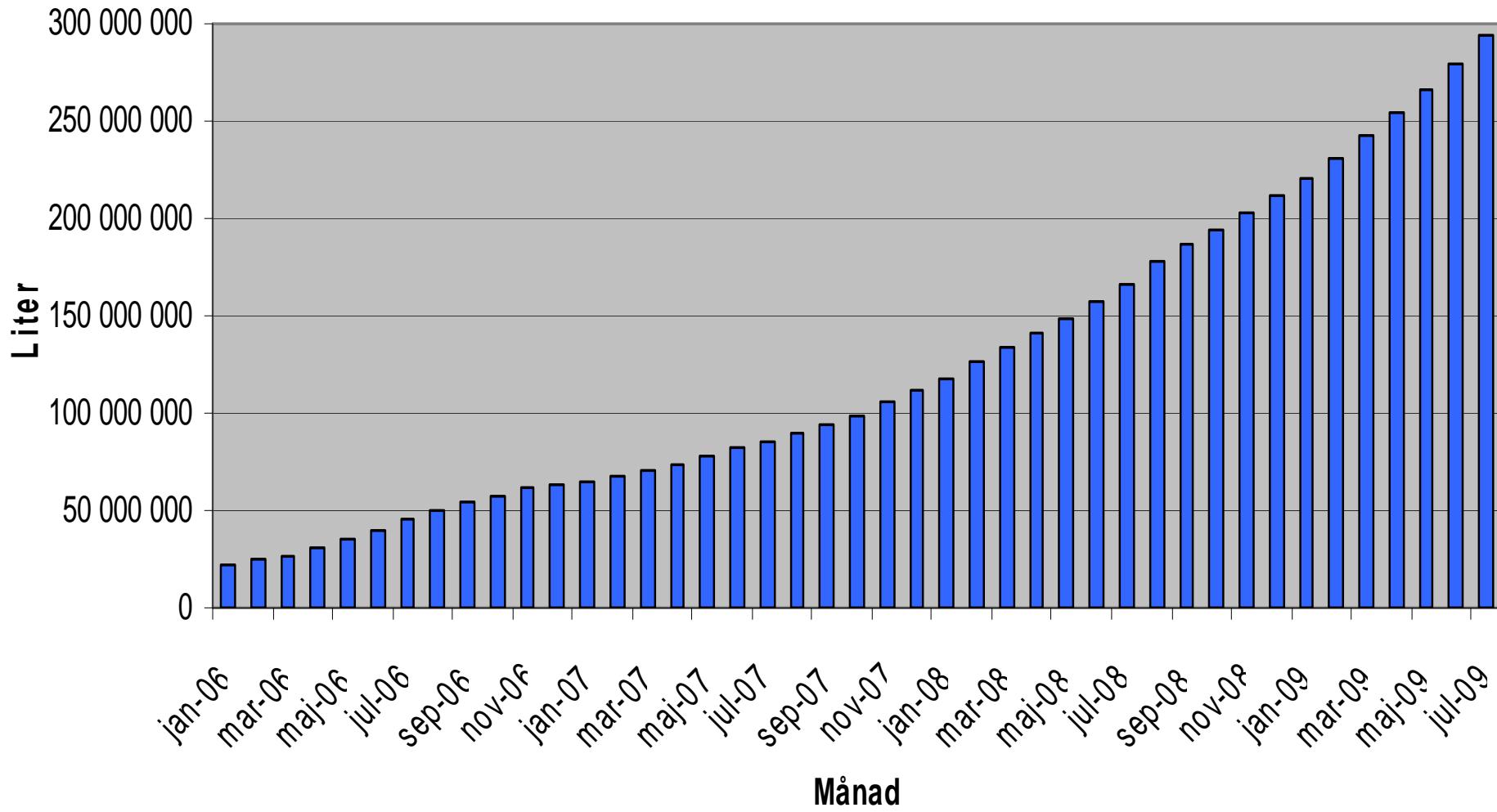
The last 100 stations opened in the past three months.



E85 - Års volym



E85 - Års volym



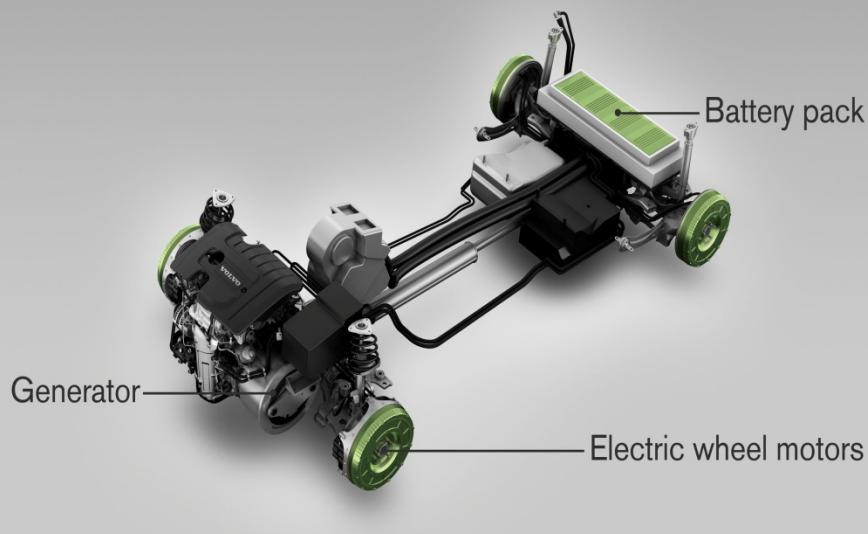
World's First E100 Hybrid (Plug In)



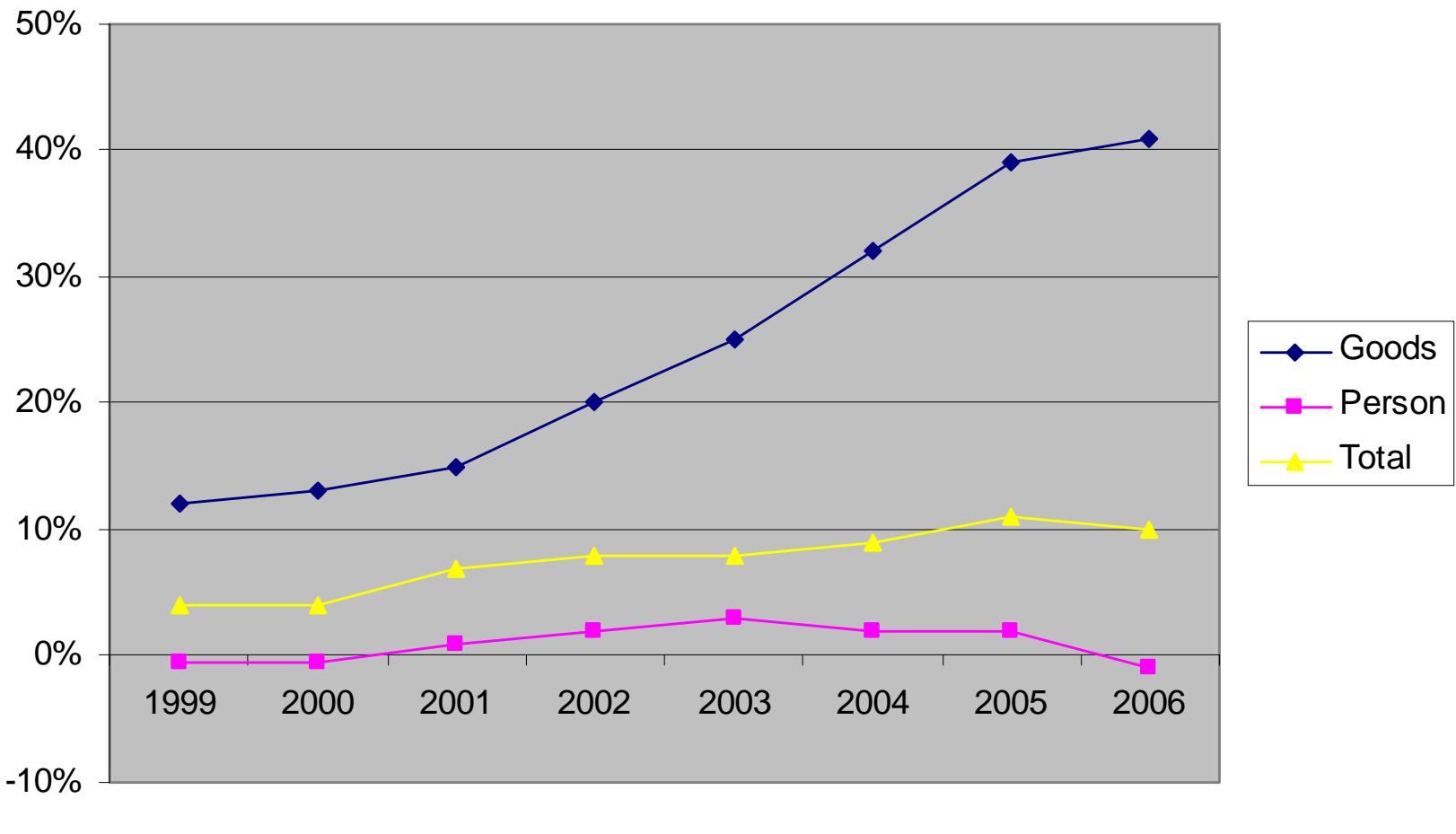


Volvo "ReCharge Concept"

Limited range on electricity +
FlexiFuel engine for BioEthanol



CO2 emissions from road transports in Sweden



Compared to emissions in 1990

Goods = 4,0 Mtons

Person = 13,0 Mtons

Source: SIKA



From 1986, Stockholm: no new purchases of diesel buses

Euro 5 and EEV ethanol

9-litre diesel engine

Scania EGR

270 hp, 1200 Nm

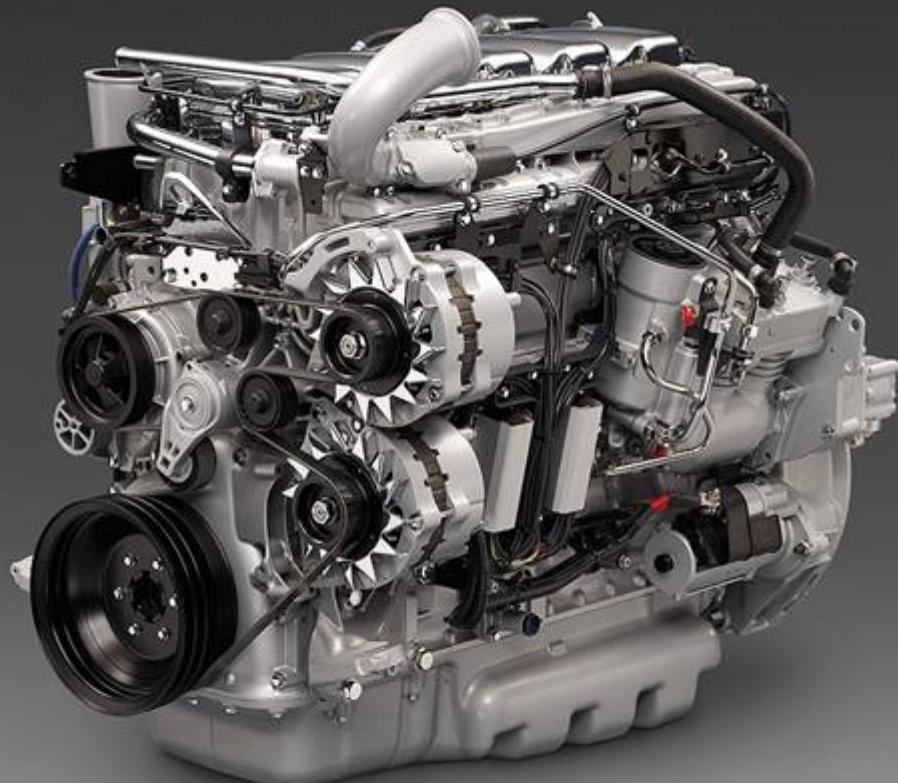
Thermal efficiency

Ethanol up to 43%

Diesel up to 44%

Proven technology

600 buses sold since 1989



Up to 90% CO₂-saving



Buses and trucks on 95% ethanol

Electric Hybrid on BioEthanol 10 buses in 2008

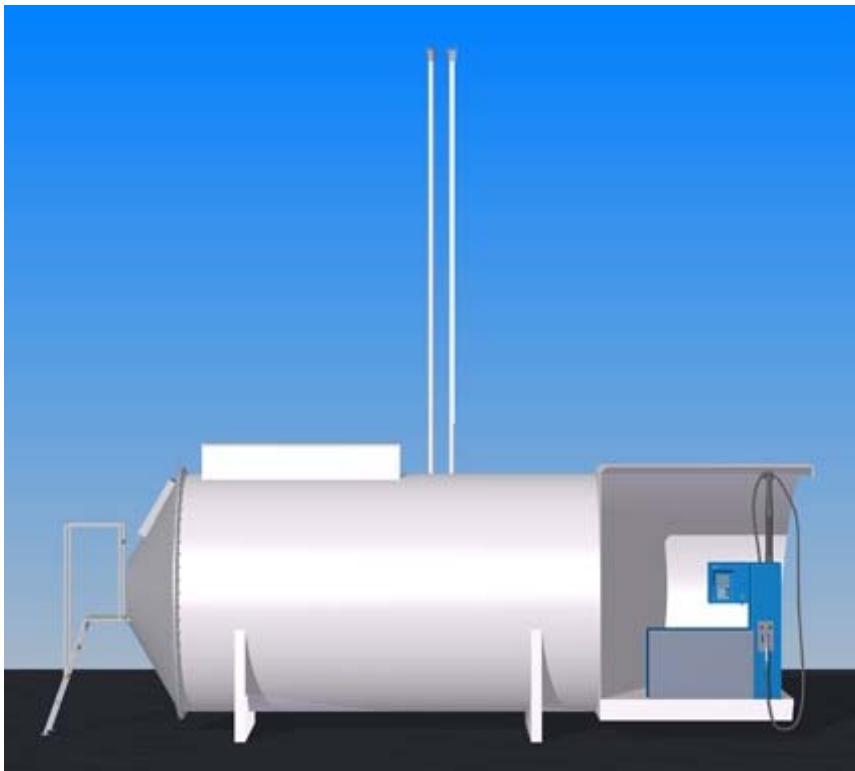




Ethanol for heavy vehicles

Infrastructure

Phase 1

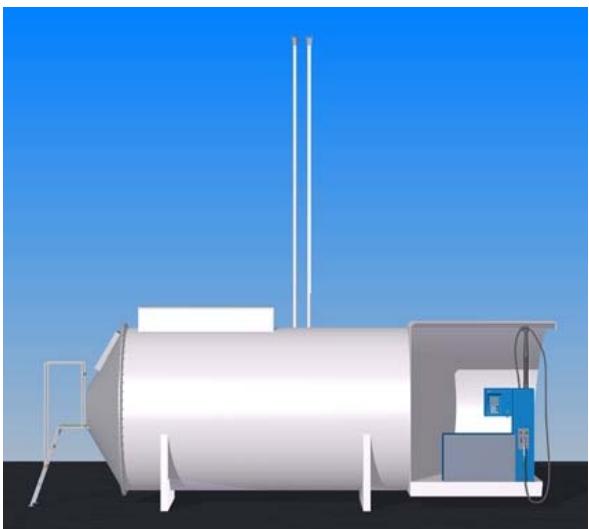


SEKAB

Energimyndigheten



Infrastructure England Stage 1



Enough biofeedstock to replace 50% of fuel

INCREMENTAL FEEDSTOCK POTENTIAL 2020*,

Million tons

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200

Sugarcane

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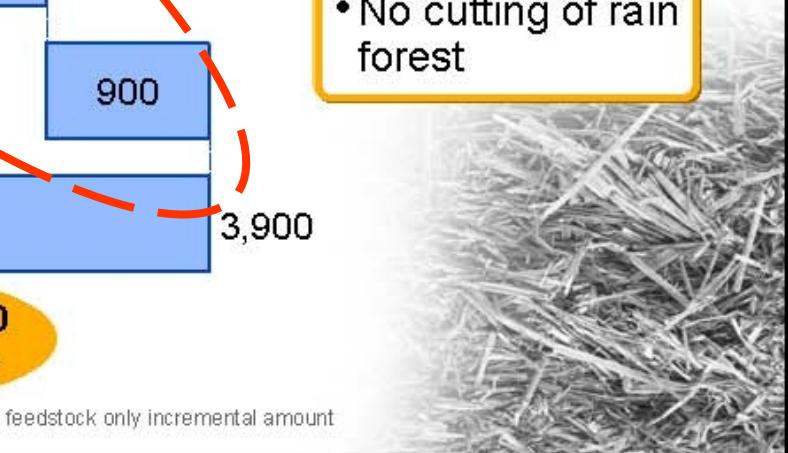
Total

3,900

Enough for 360
billion gallons

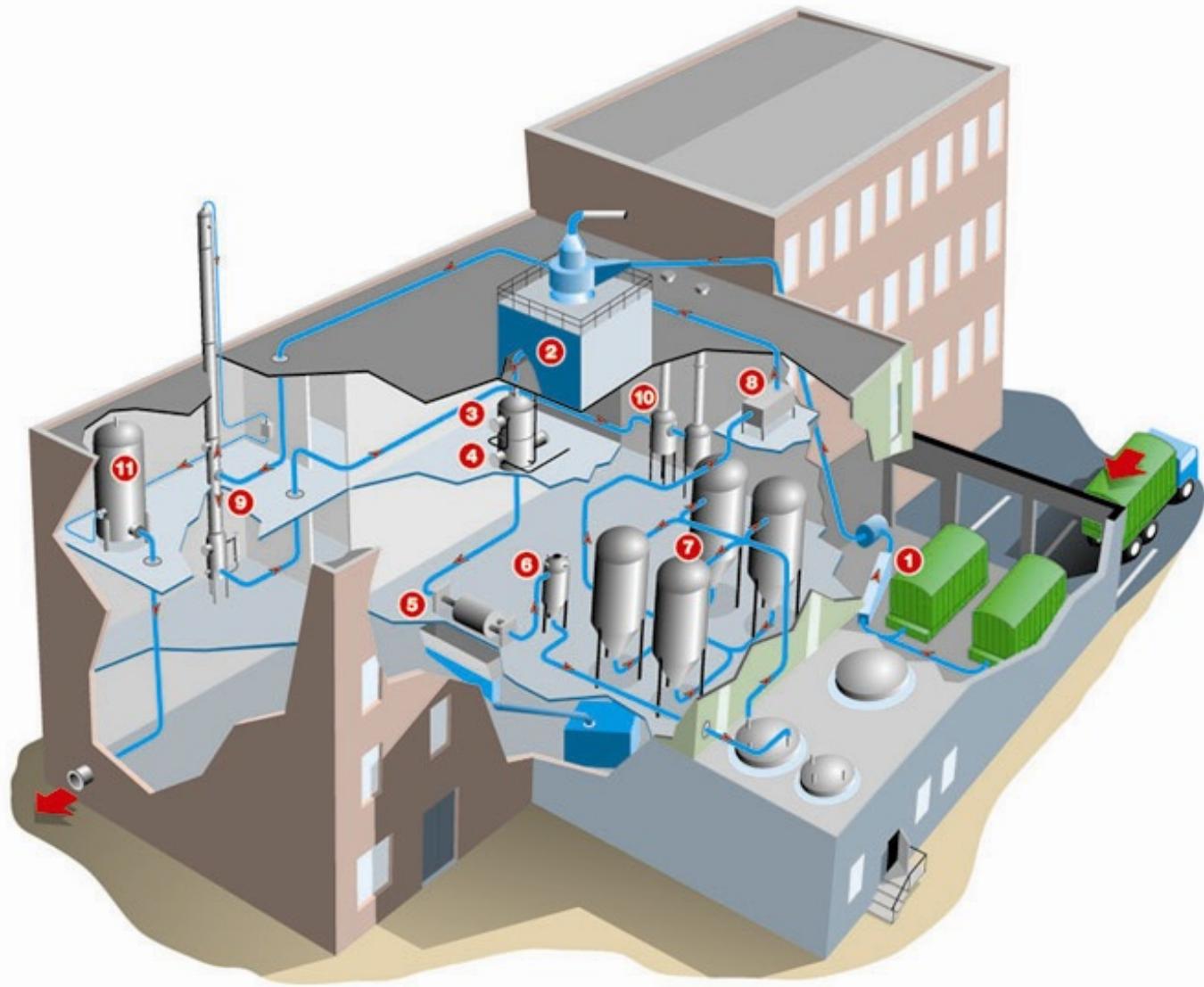
- Moderate agricultural yield increase
- Food/feed demand first
- No cutting of rain forest

* Wheat, corn, and sugarcane include total amount for biofuels available, cellulosic feedstock only incremental amount
Source: FAPRI, FAOSTAT, expert interviews, McKinsey analysis

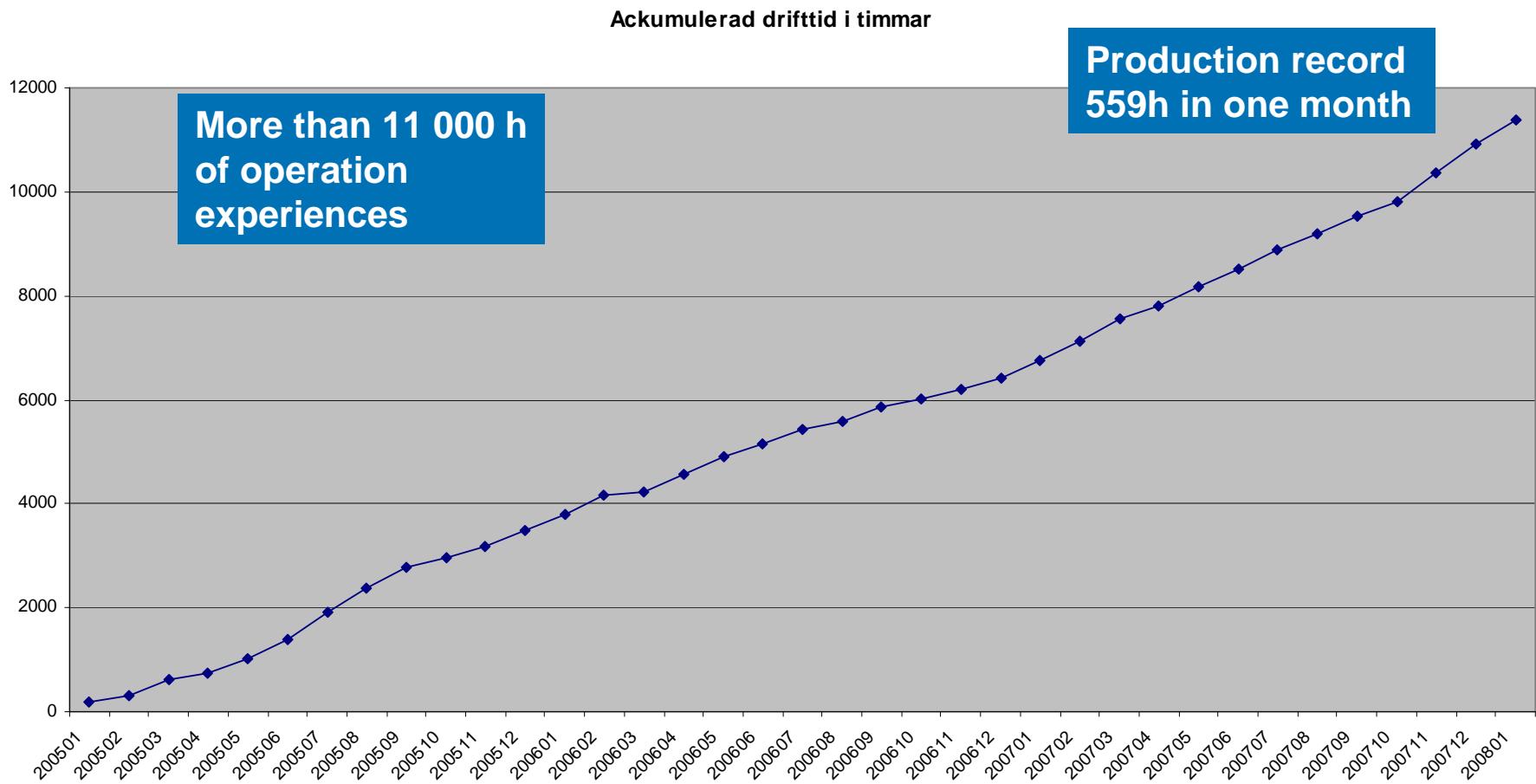




Ethanol pilot plant



Total Accumulated Operating Hours Jan 2008

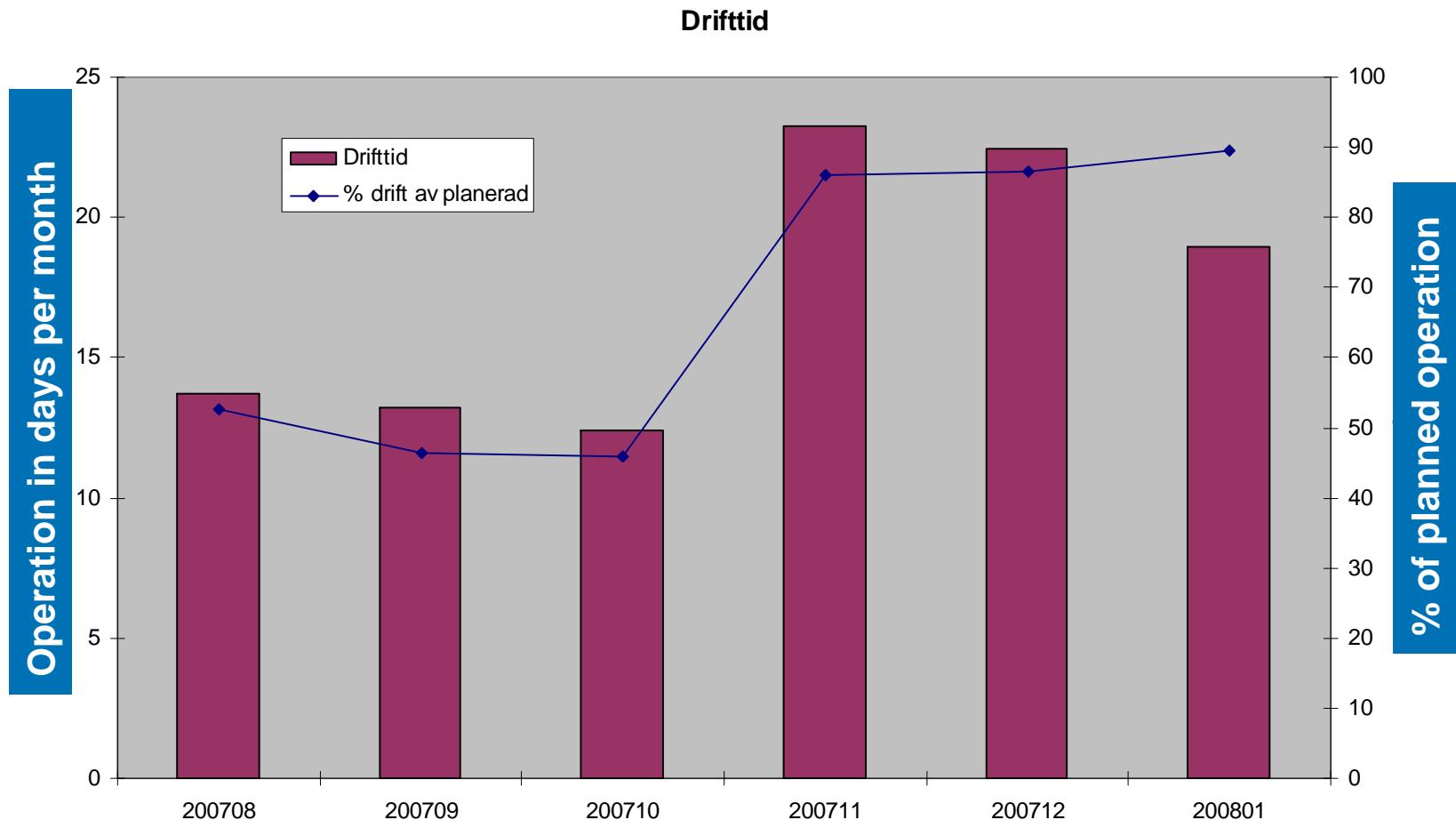


Branddörr
stall hållas stängd

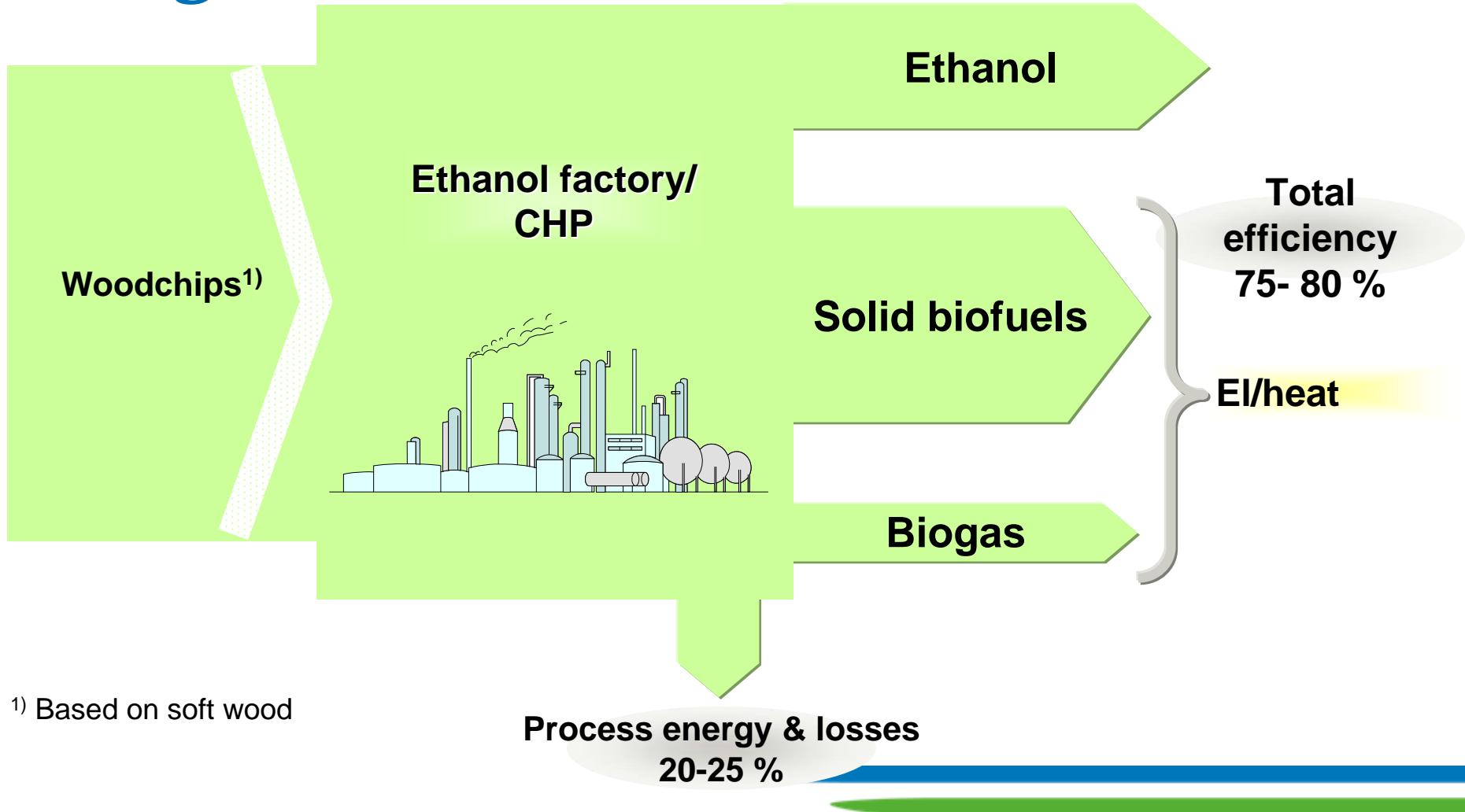
!! Använd
skyddsglasögon
Ingen kan aterfa en
förlorad syn

*Development is biggest
when it feels toughest!*

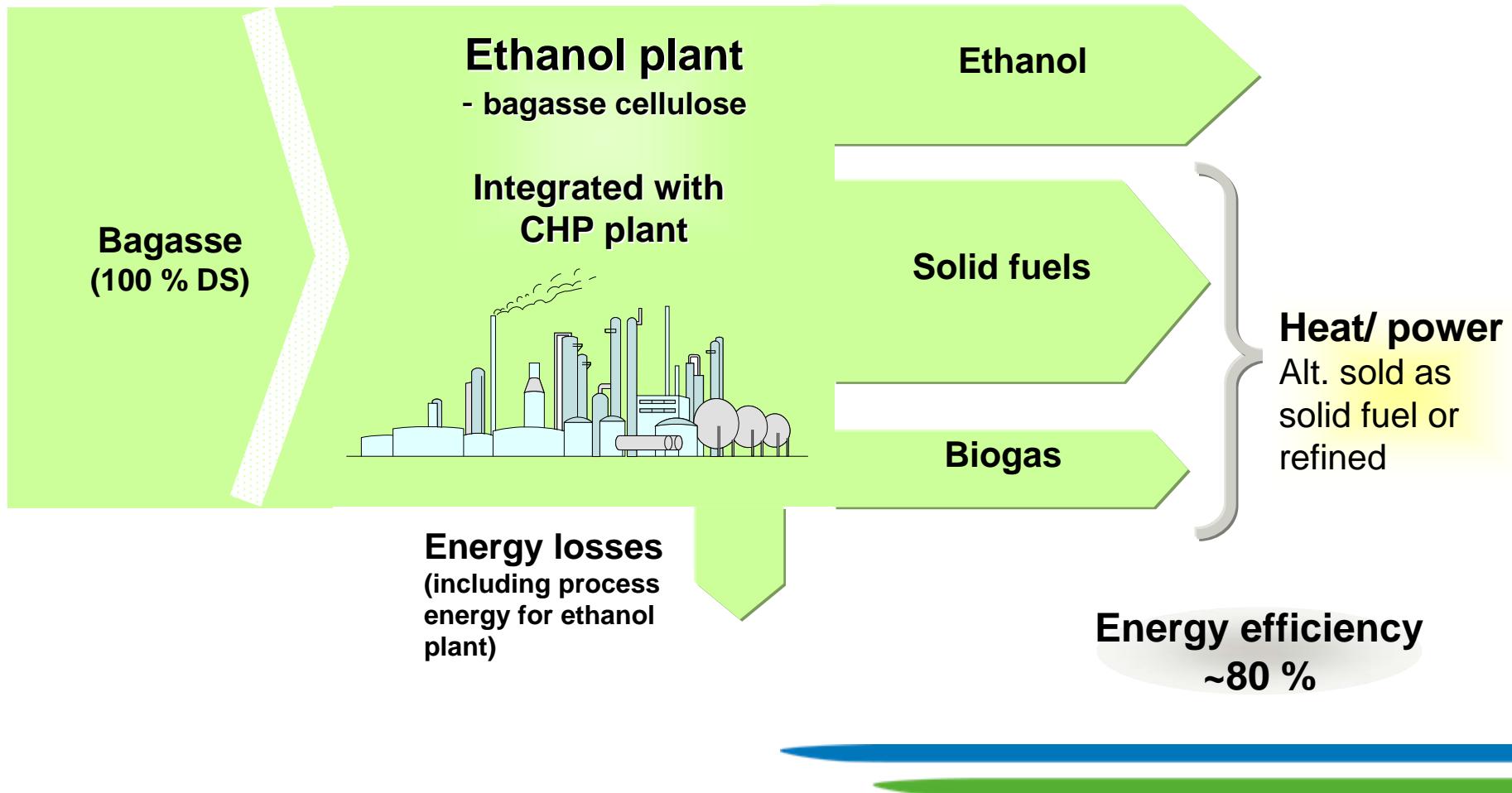
Operating efficiency in pilot plant

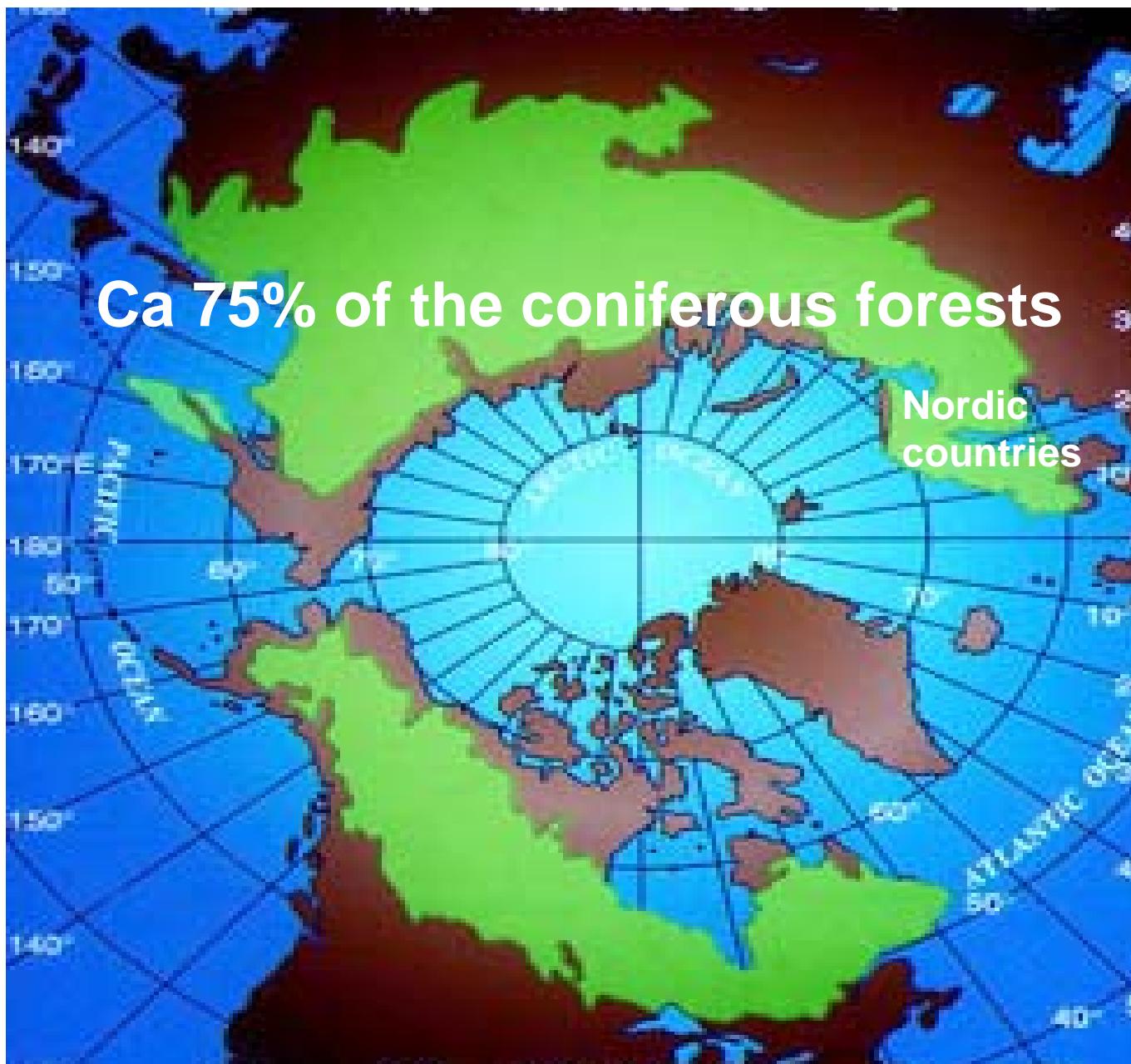


Energy balance in a BioRefinery integration with CHP



Energy balance for ethanol production from bagasse





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

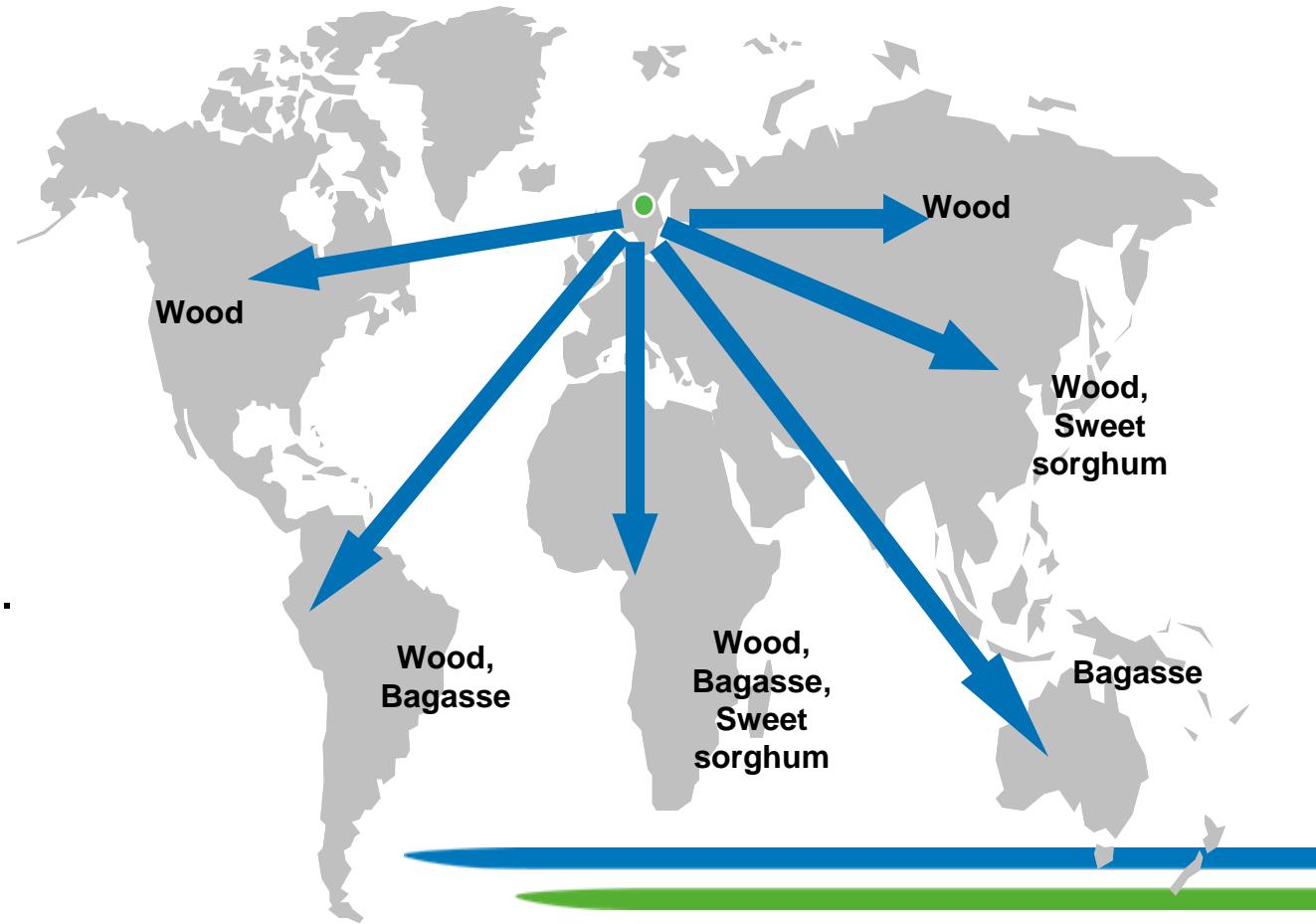
Wheat	2.000	
+ straw	+1.000	3.000

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

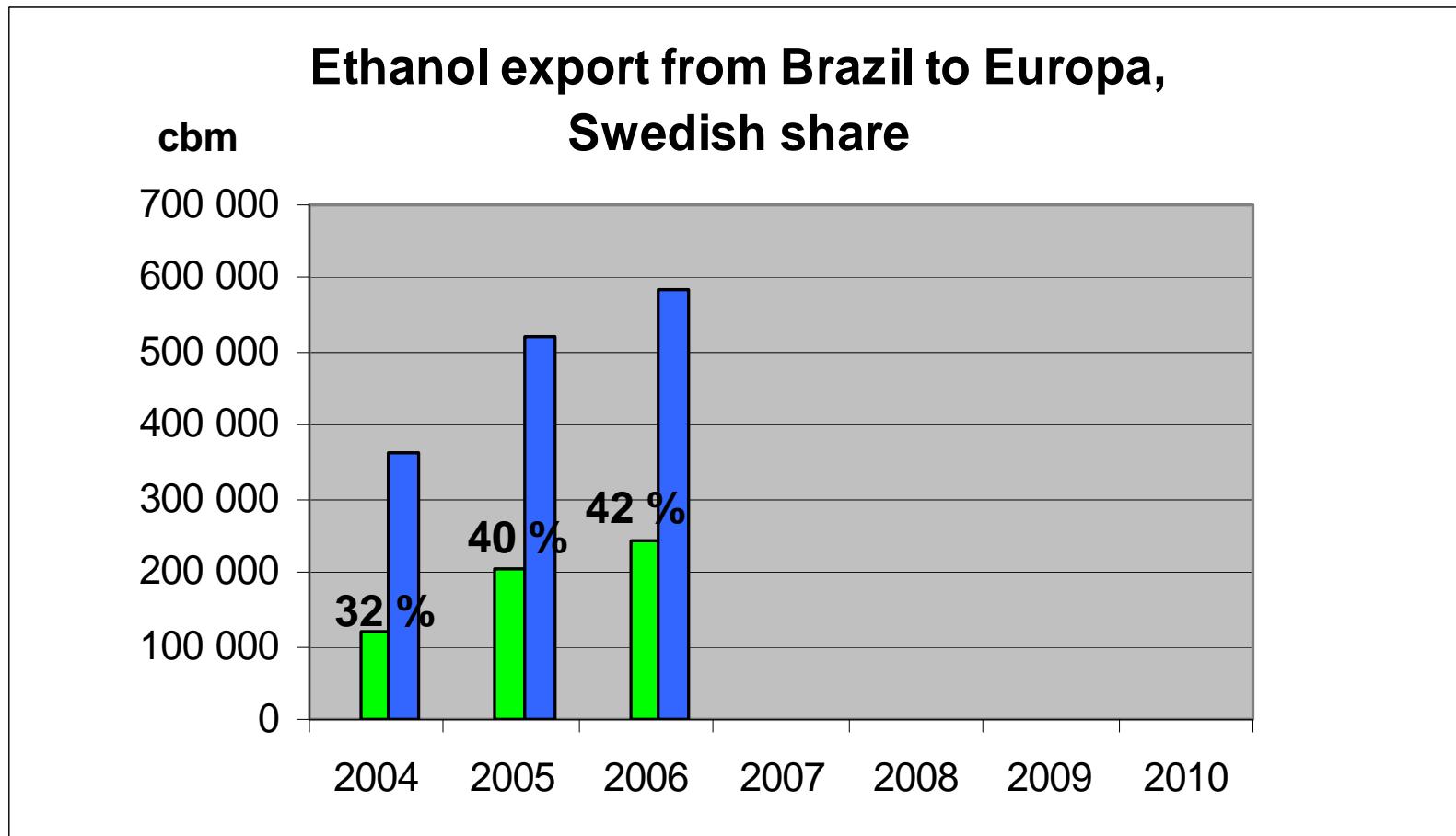
START 2011

Sugarcane

Today

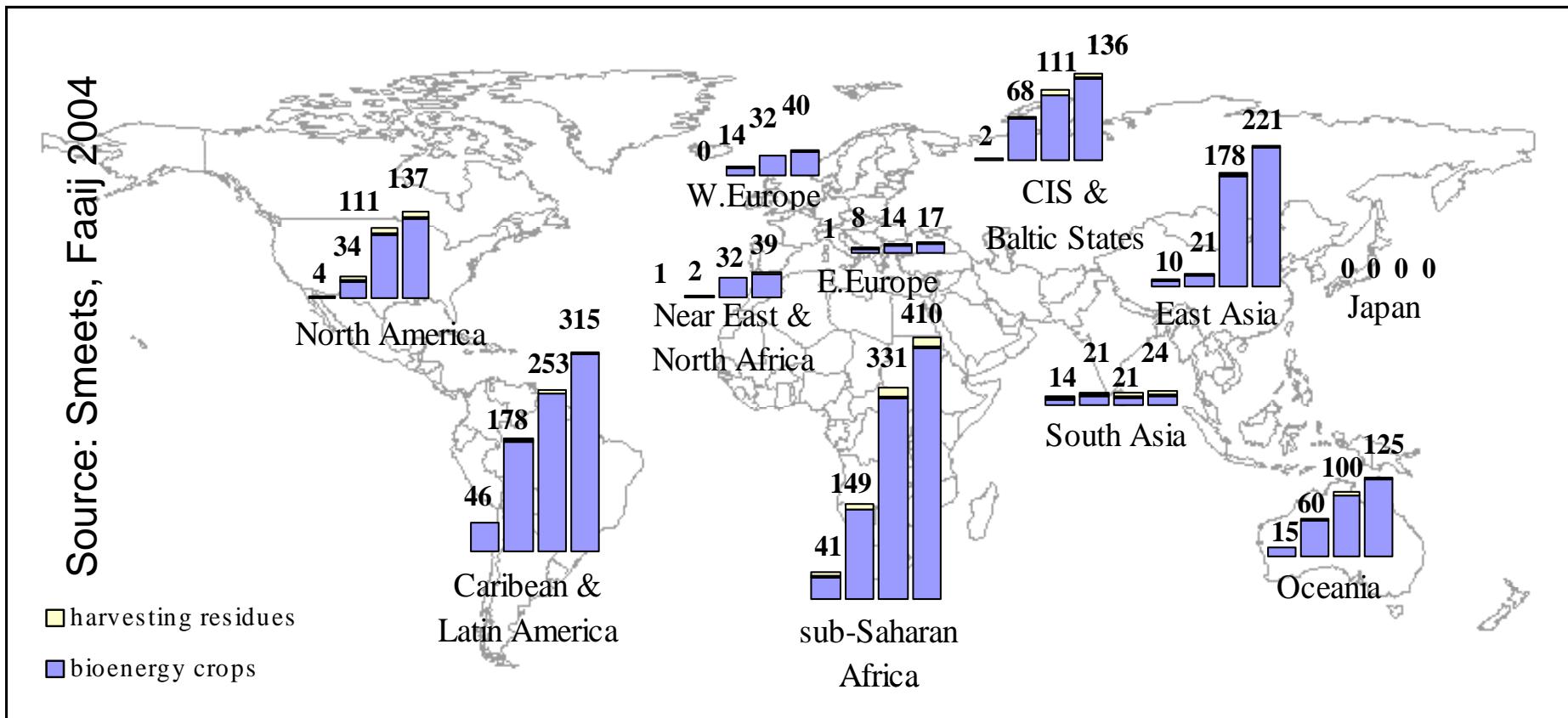


Sugarcane ethanol, a driver!

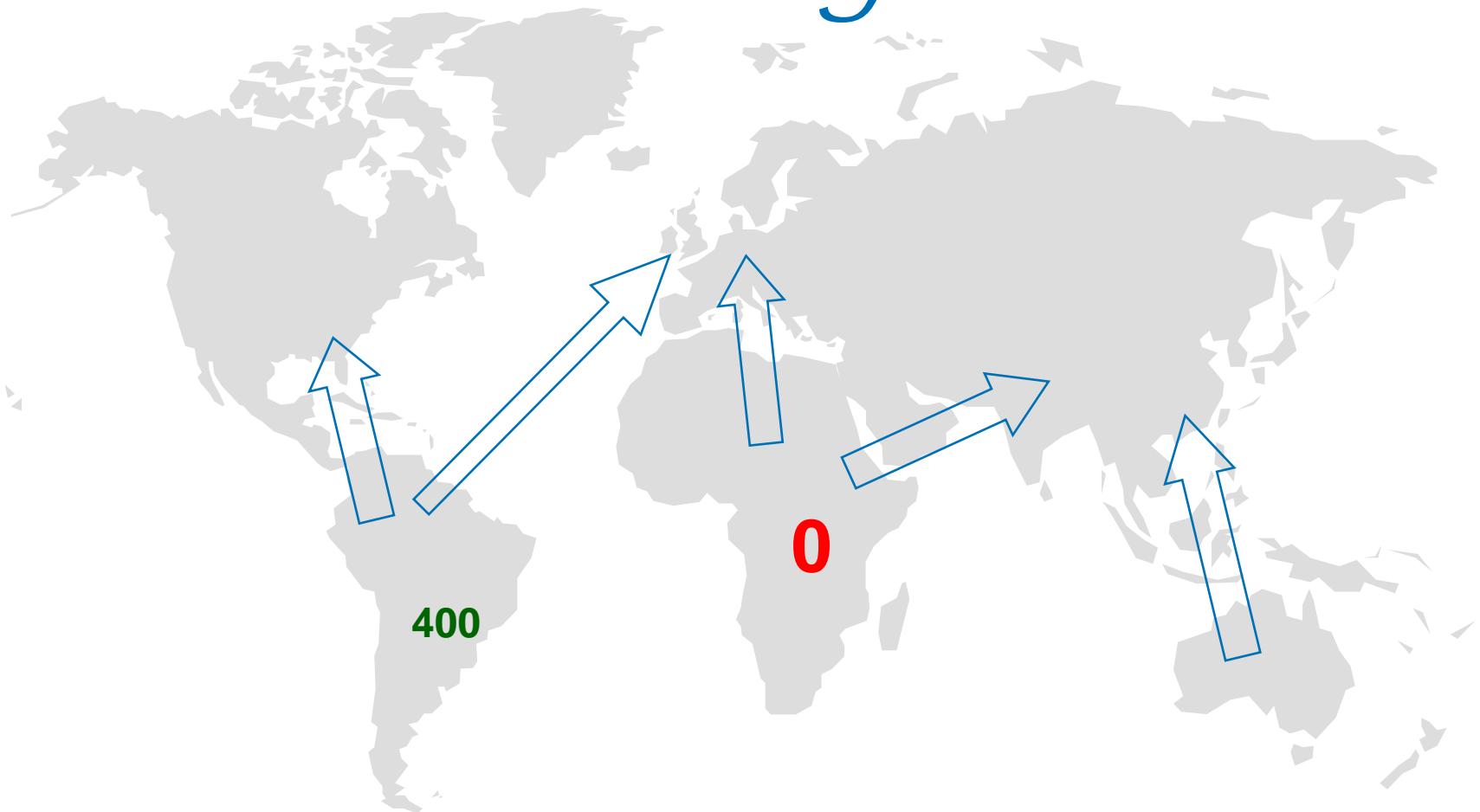


BioEnergi Potential 2050

Different scenarios



Ethanol trading



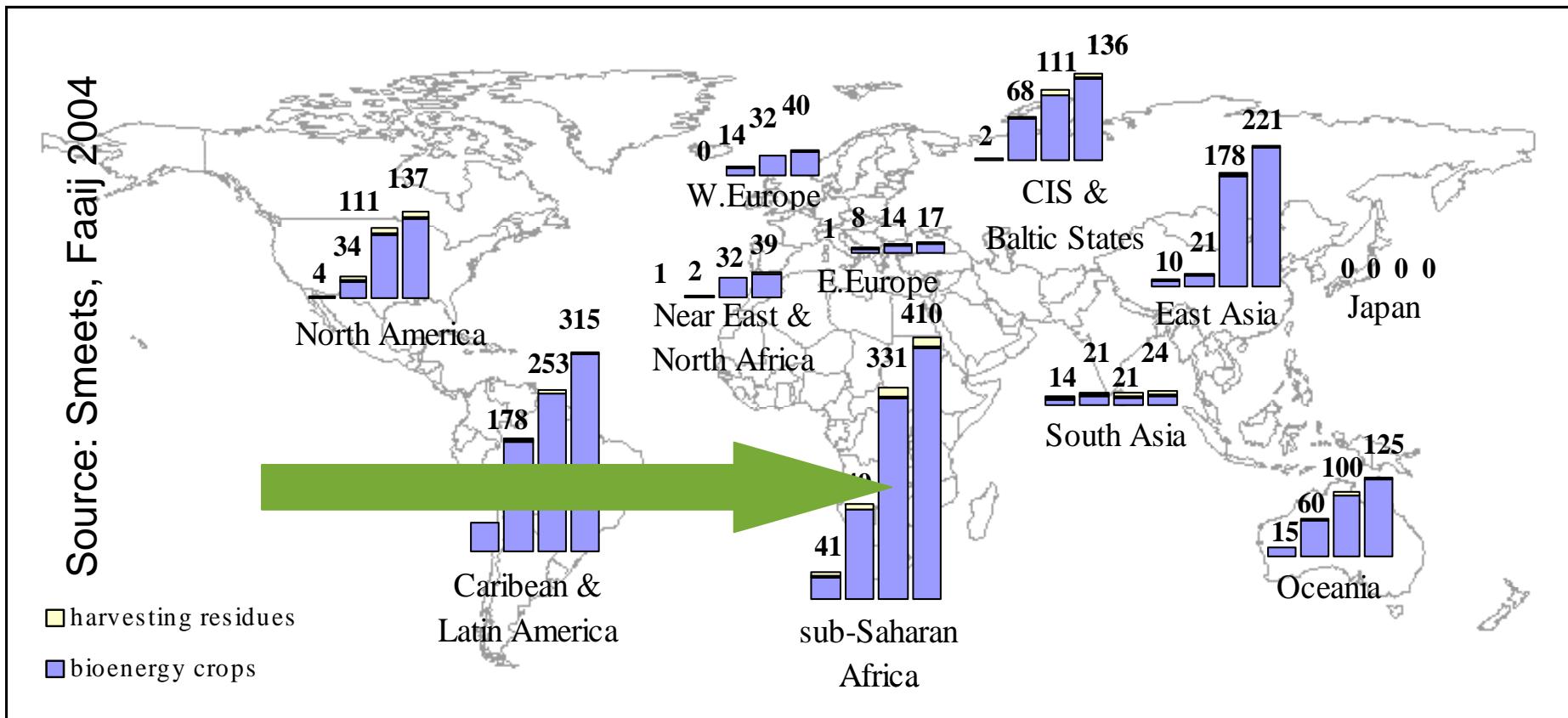
Comprehensive strategy

- **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!*

**Domestic Market
100% substitution
of Gasoline =
0,3%**

**Land increment for
National Platform =
11,1%**

- Assumptions:

- 20% of the country as arable land

- Productivity is 8,000 Lts/hectare.year

- National platform = 2,000,000 hectares

**% of arable land in
Tanzania for other
purposes = 88.6%**

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

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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



www.time.com



Fult ös med cl
tän förr.

1 BACKSPEGELM

Ford Focus: modernare form. SIDORNA 6-7

A color photograph of a baker in a white uniform and cap loading a tray of bread into the open rear hatch of a red van. The van's interior is visible, showing shelves filled with more bread. The baker is holding a long loaf of bread in their left hand. The scene is set outdoors, likely at a bakery.

Det går åt stora mängder av vatten för att tanka en miljöbil med etanol. I en Volvo V50 Flexifuel motsvarar det 120 kilo vete, eller 240 lämpor bröd. Efter ett halvt och sockerbit. "Skrämmande, vi kan inte använda våra livsmedel som drivmedel", säger bageren Peter Fritzefors. Silderna 4-5

Hjälп oss
göra rätt
miljöval

KRÖNIKA

Det här är bilderna som är en del av serien om den svenska uppfinningen och dess utveckling och användning. Den kan verka givande, men man inte gör till något så här. Ned hittills har detta gjorts i fyra bokar med majoriteten omkring 100 sida var och en. Men nu kommer en stor del av de första 100 sidorna att tas ur och ersättas med en ny del om tekniken och dess utveckling. Detta kommer att ge en annan dimension till boken.

FNs rapport om risken til
milt, Jean Ziegler beskriver
sjøen på druknede av ismedie
som en katastrof. Han har ikke
sviktet at høye dødsundersøk blaa

ringa internationella forskare.
Samtidigt finns det forskare
som drar andra slutsatser. En del
menar till och med att det går att
finna uttaklig samband med en
bred ramning på biobanken,
även med livsmedel som äts var-

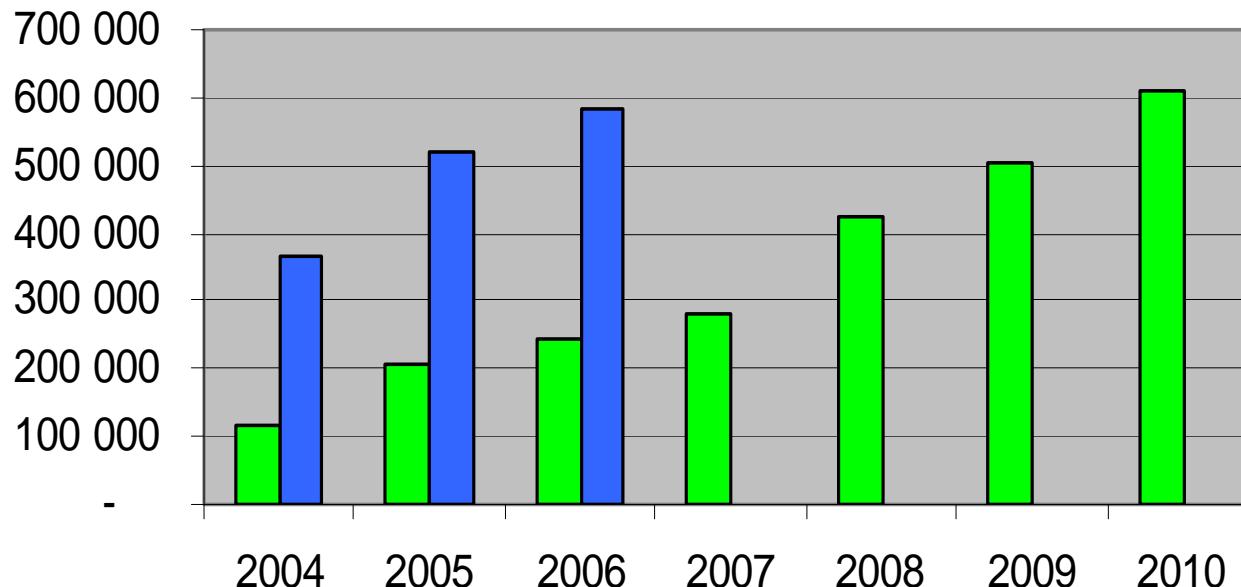
Konflikten har pålempats
med hennes egen hand,
så ager på denna motstående
sidan. De är inga separater.
Och nu kan vi klargöra hur
vi ser omkring i konflikten:
Är jag en del ganska illa med
min egen hand? Eller är jag en del
med jobben min som inte delar
detta osäkerheten. Sannat är alla
regler för att man är en miljö
av god spänning och flexibilitet
och det är en del dessutom att
miljöboden är en Stockholm
som i sittens, men inte av sitt
egen hand.

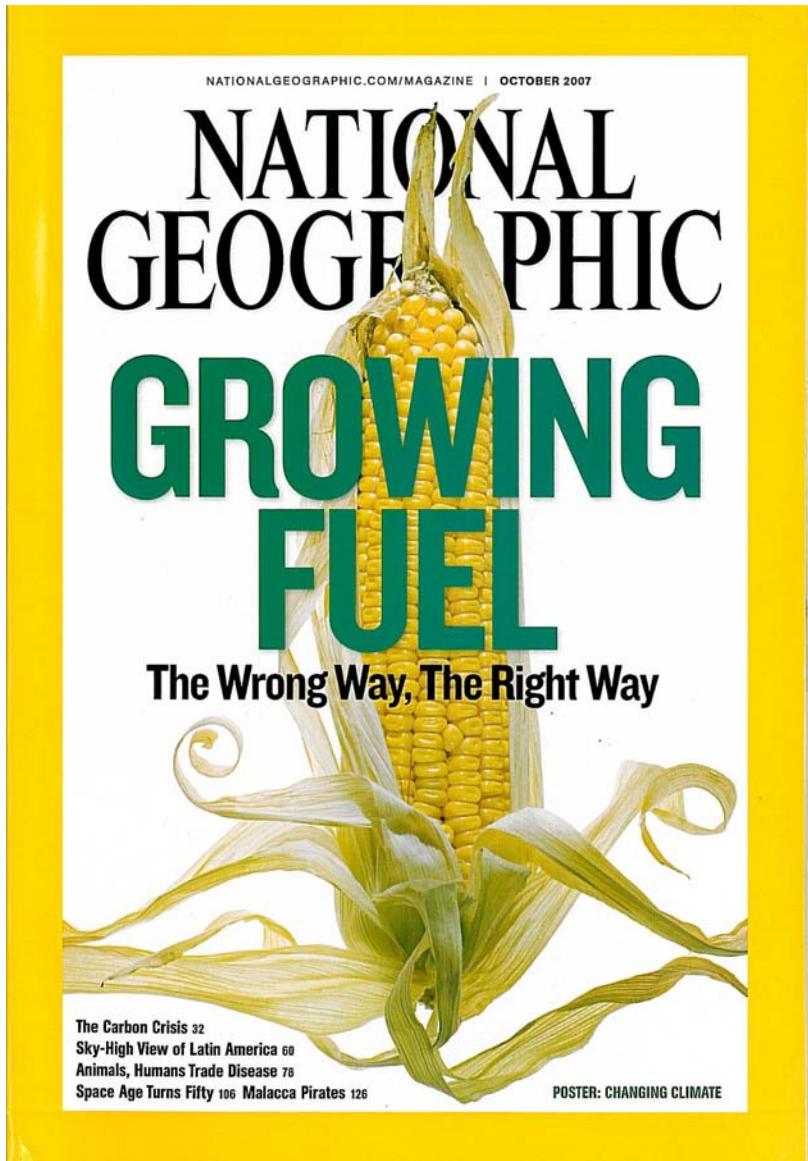
Bostaden är för vad som är konstigt nog byggd i en förtrollad stil med många spetsiga tak och fönster. Det är en härlig bostad och en härlig miljö att bo i.

Answer 5

Sustainable ethanol is the next challenge!

SEKAB imports from Brazil





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*



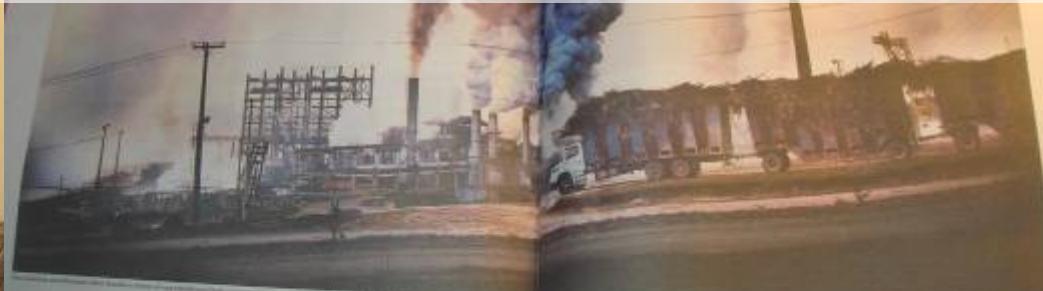
Etanolens väg

die gut mög-
liche Entwicklung
der Kindheit.



Bakom ren etanol finns
en SMUTSIG produktion

The Background



Miljöbränsle

FERMELLI AND LIBERMAN Liberman's book has been very well received. Pauli's thesis on atomic symmetries, though written in a somewhat unconvincing style, is an excellent chapter. Fermi's theory of beta decay and nuclear magnetic moments is also excellent. Dirac's treatment of the wave equation is lucid and elegant. The discussion of the Dirac equation is however somewhat pedantic.

en annan sida av E85

Detta försöksattentat mot beväpnad militär omfattar för att
vara tillräckligt sikt i flygkraftverkets utvärld i ESS-typerna.
Det gäller tillståndet av artilleristerna, med artilleristens
förhållande till den militära ledningen.



SVENSKA DAGBLADET

MÄSTERLIGT HÅLLNADE ADULTERIUM

BEST OF



Ropet från regnskogen

<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&term=15451111>

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Vision 3-8

Visiting Pagar Mu

2008年卷(上)



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

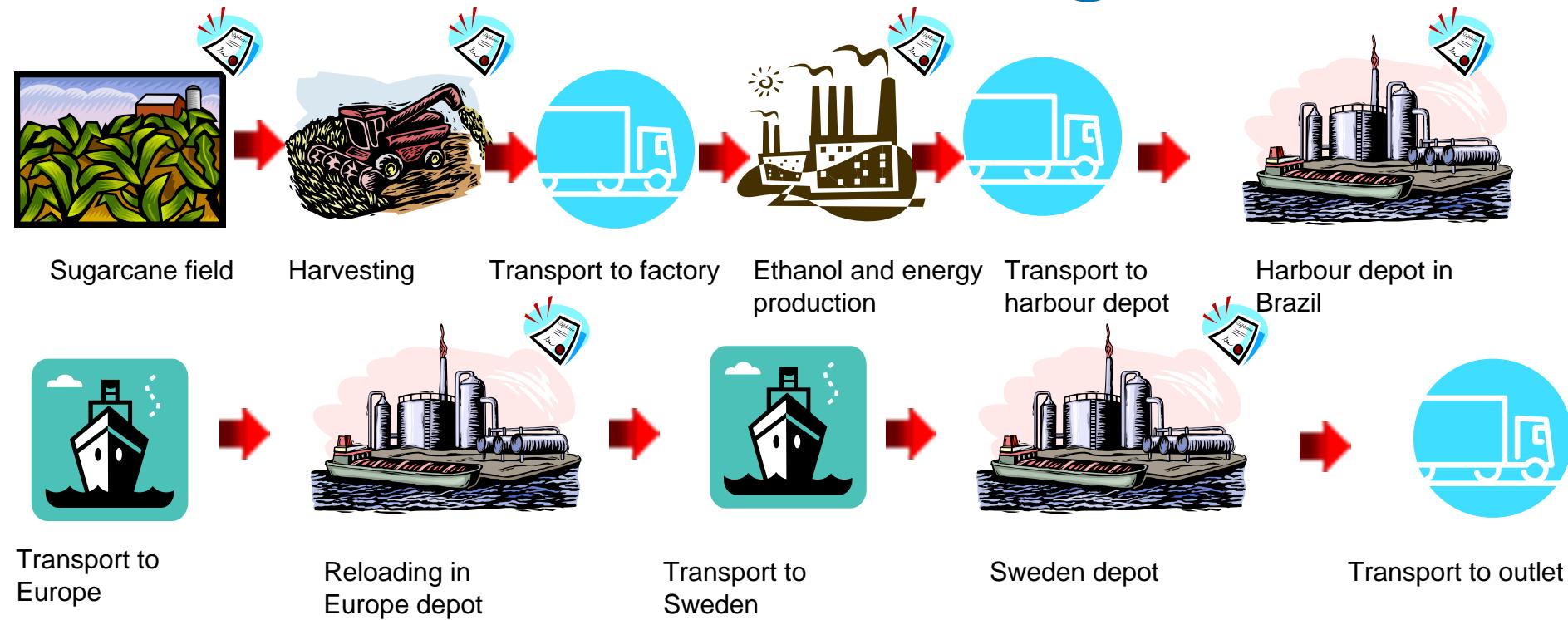
- Net reduction of fossil CO2
- Mechanical harvesting
- Labor rights
- Child labor
- Environmental protection program
- Rain forest



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

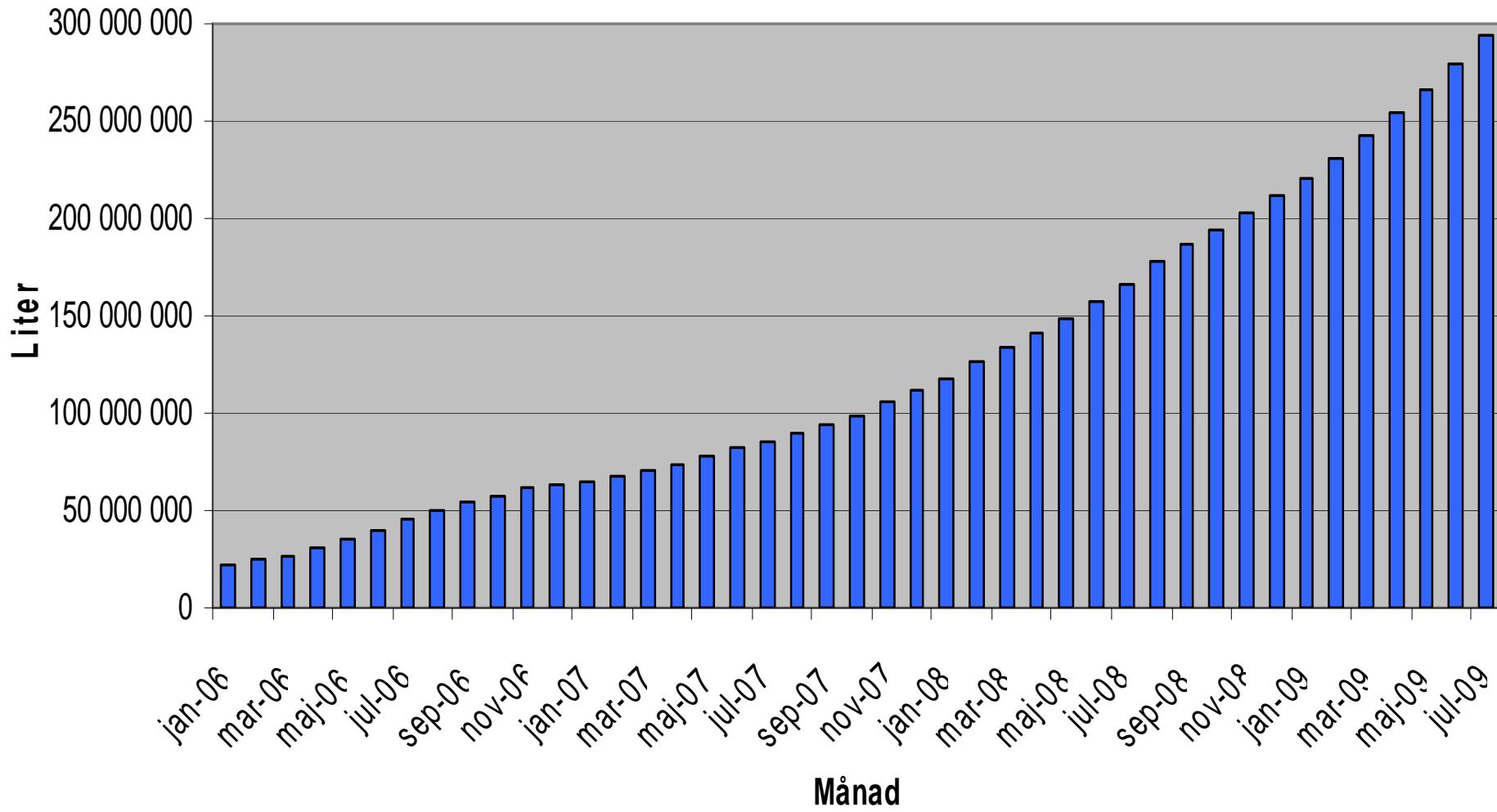


Verified Sustainability Criteria's

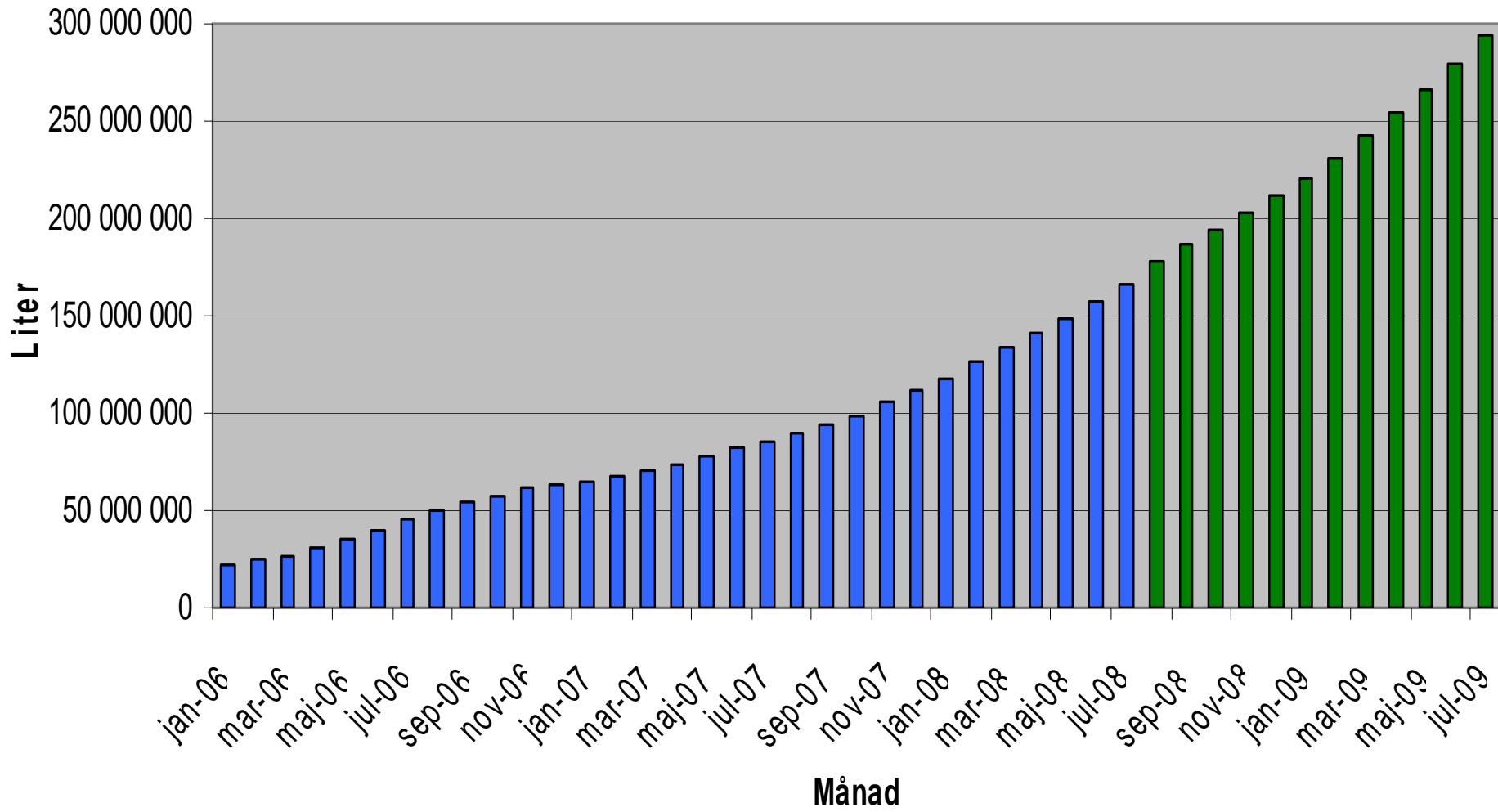
Traceability through the entire Chain of Logistics



E85 - Års volym



E85 - Års volym





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!