



# Didactics on effects of energy to climate and environment

by **Janneke Verloop**  
The Netherlands

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GD Bildung und Kultur

**LLP/AT-230/22/08**

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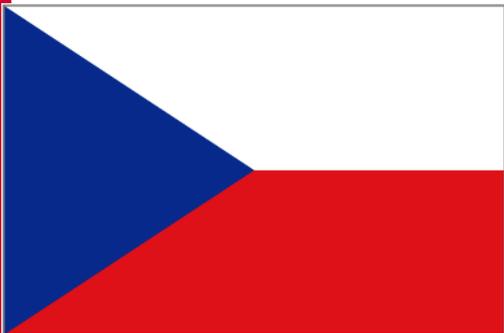
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# Καλημέρα

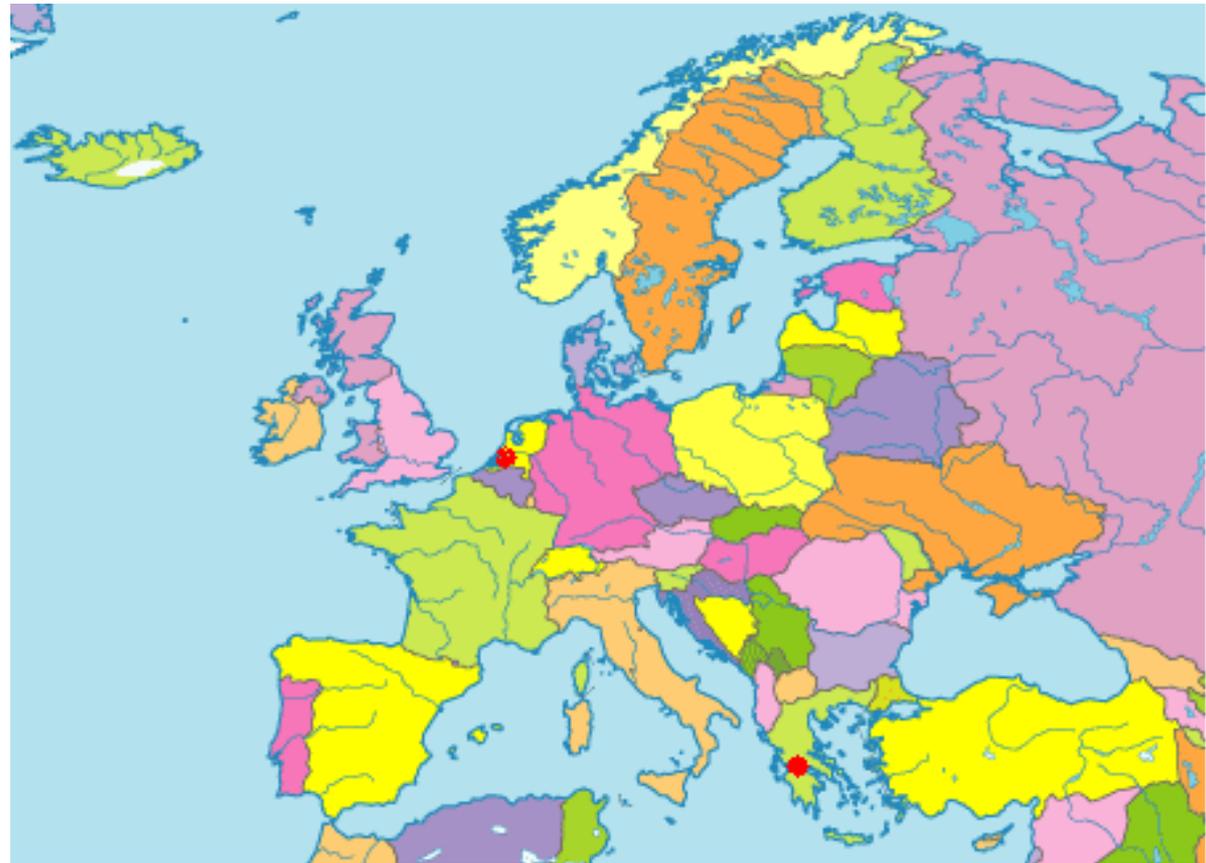
- Καλημέρα (kalimera)
- Bună dimineața
- Good morning
- Labas rytas
- Guten morgen
- Hyvää huomenta
- Bom dia
- Goede morgen
- Dobré ráno

# "Didactics on effects of energy to climate and environment",

- Rotterdam The Netherlands
- European Problems
- Photosynthesis
- Sustainable solutions
- Primary Education
- Secondary Education
- Higher Education
- Citizens
- World

**Rotterdam**

**Patras**



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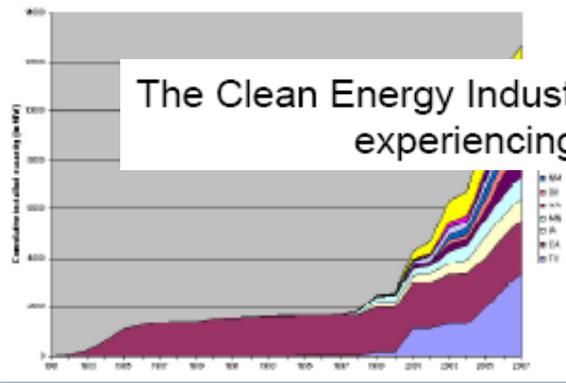


# Rotterdam The Netherlands University of Applied Sciences



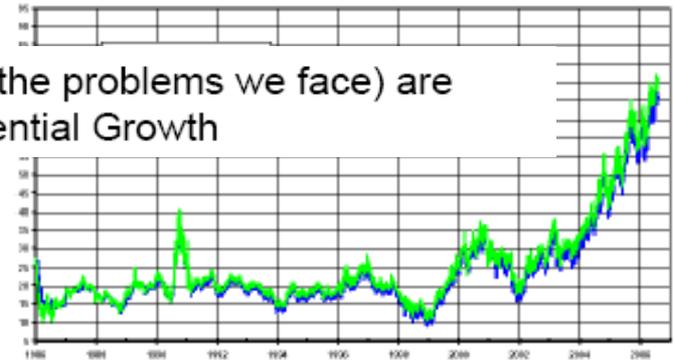
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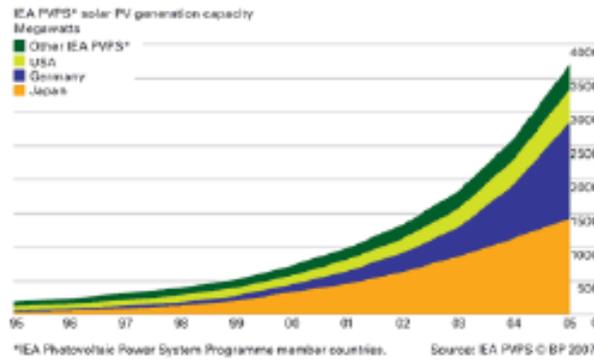


The Clean Energy Industry (and the problems we face) are experiencing exponential Growth

Wind Power Installations

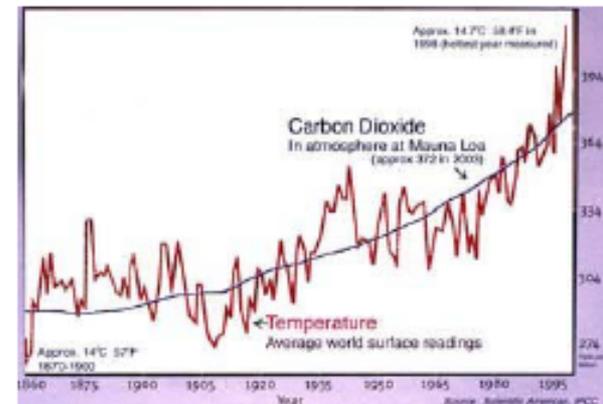


Oil Prices



\*IEA Photovoltaic Power System Programme member countries. Source: IEA PVPS © BP 2007.

Solar Power Installations



CO2 and Temperature

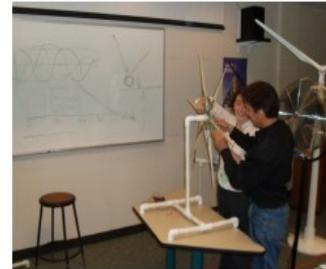
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## Education & Training Fills your needs ... and Theirs

Education & Training  
Fills your needs ... and  
Theirs

- Industry needs skilled workers
- Schools need engaging, hand's-on projects with real world applications and current technologies
- Schools want to place students in good jobs



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# Can we get fuel from Photosynthesis?

- Energy from Photosynthesis?
- Cyanobacteria, in which the process of Photosynthesis first evolved



# Efficiency

- About 1% of the sun's energy is being captured and converted into biomass by agricultural crops
- Energy from the Photosynthesis reactions from Cyanobacteria promises an energy conversion of at least about 10% from these synthetic processes

Ashwin Satyanarayana

# Energy Consumption

- In 2000, the world consumed 12.8TW (TeraWatt)
- in 2050 we will consume 35 TW globally.
- Sun gives 14 TW per 1 hour of sunlight



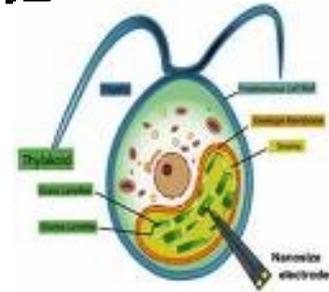
## Sun / Biomass

- Sun panels are too expensive
- Give an efficiency of 15 -20 % for electricity production
- The efficiency for making fuel is even less productive.
- Making fuel out of biomass costs a lot of Energy and takes up a lot of fertile soil.

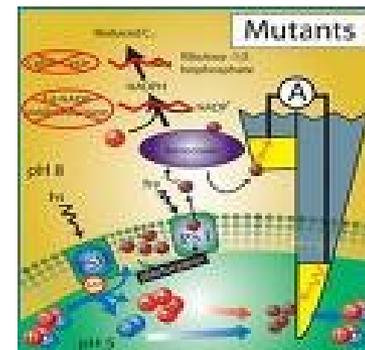
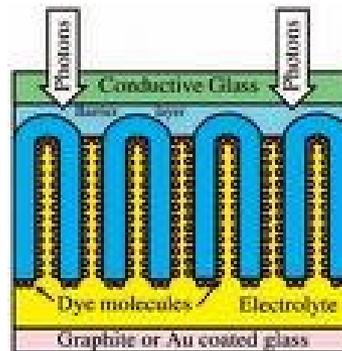
# Photosynthesis

- Often only 1 % of the energy fixed by Photosynthesis
- The fixing of photons to chemical structures is efficient
- The leak is in the rhizomes and defence

# Energy from artificial photosynthesis



- Project *Towards Bio Solar Cells*
- The Netherlands awarding for Photosynthesis Research
- We could go to 5 % efficiency in stead of 1 %
- Through selection and better circumstances



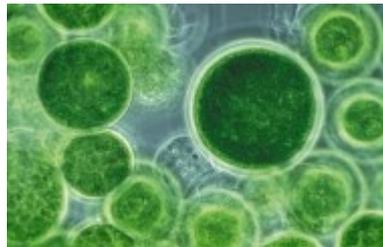
# Saturation of light

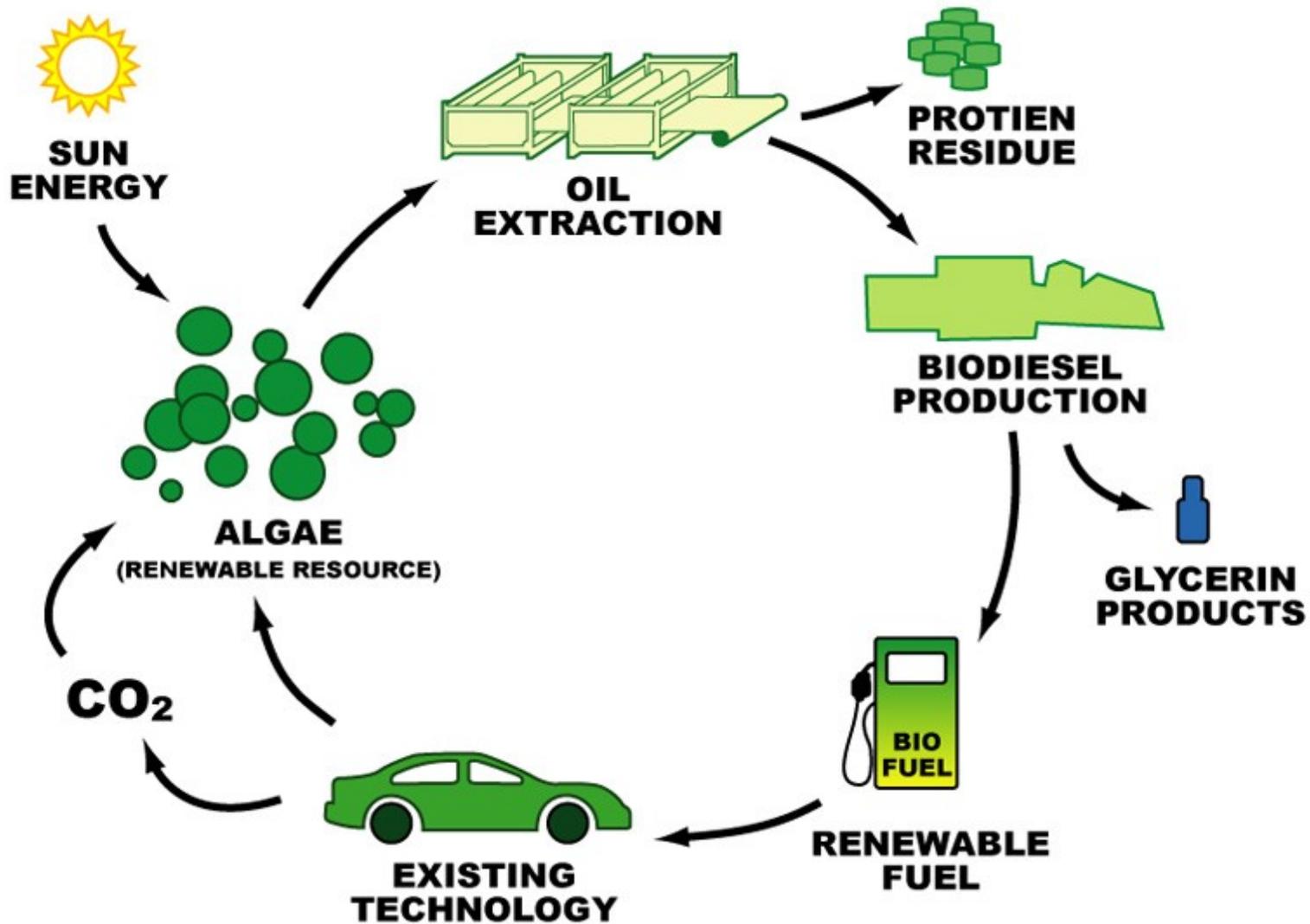


- C4 plants (corn) are more efficient than C3 plants
- Algae could be very efficient, you have to mix them
- Genetic modification, like shorter antennae less energy to useless processes, like defence and roots
- Algae, no roots 5-10 times more efficient

# Fix the energy of sunlight without going into Biomass

- Elementary Photosynthesis processes
- Light chain reaction and Calvin cycle
- Bind to fermentating organisms (yeast)
- Convert sugar into ethanol
- Giving fermenting genes to cyan bacteria





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# Artificial leaf

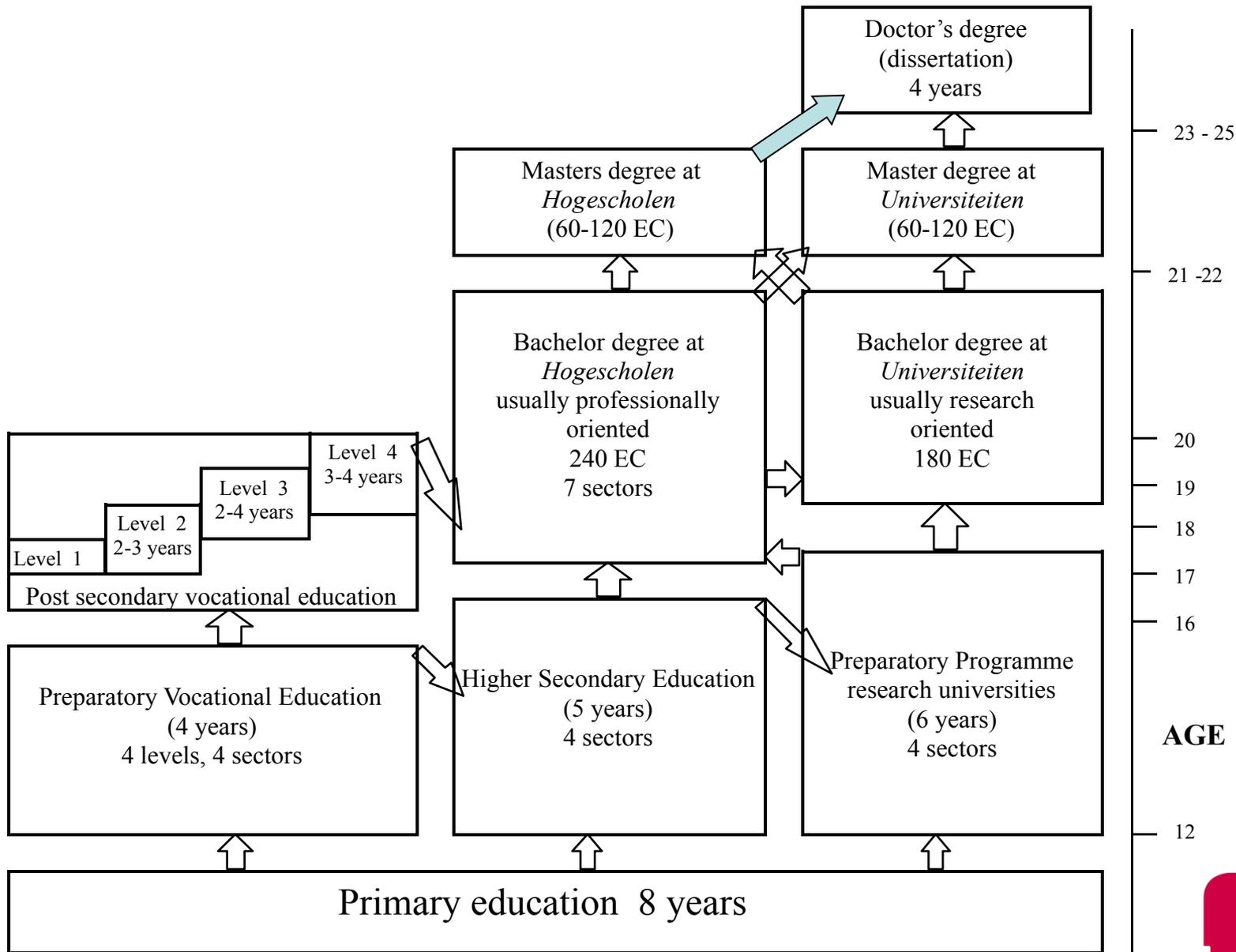
- Like bird wing and plane, similar but different
- A carrier, like titanoxide
- A receiving system that oxidices water with incoming light
- The photones are captured and used to make ethanol from water
- Within 5 years this all should work
- Imagine highways producing their own fuel





# Solutions: Education

- Primary Education
- Secondary Education
- Higher Education
- Citizens
- World



# Primary Education

**(4-11 year old)**

- Clean your street
- Energie Different



# Primary Education

- Opgeruimd st(r)aat netjes
- Clean your street



## 'Natuurlijk energie' (Natural Energy)

- Energie Different is a project about Energy for year 3 t/m 8 (6-11 yrs).
- Aim: get kids acquainted with many aspects and forms of sustainable Energy.
- In a positive and stimulating way kids are challenged at their level to make decisions in the field of Energy



# Secondary Education (12- 16/17/18 years old)

- Schools for Sustainability
- Choose the Future
- WK Soccer



# Schools for Sustainability



- Melanchthon Bergschenhoek (Rotterdam)
- Year 4 HAVO VWO
- A Sustainable Port
- Letter from the Mayor of Rotterdam
- Visit the port
- Different taskforces
- 6 weeks till presentation with advice
- Experts were to be consulted



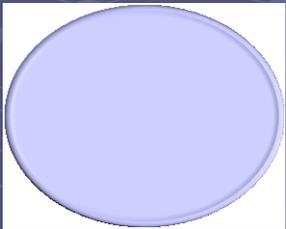
# Onze ideeën

Dijken met waterkrachtcentrales.

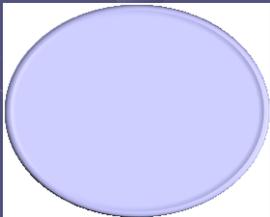
Duurzame kranen.

Opvouwbare Containers.

# Soorten Kranen



Hijskraan.



Telescopische kraan.



# Choose the Future

- Accent College in Vlaardingen
- They become aware of Climate problems and their social concerns will be enlarged.
- The long version takes 2 days and there are councilors and experts organized



# WK Soccer

- VMBO TL
- Project to give suggestions for a more energy efficient stadium
- Compare the energy usage of different stadiums
- Make your own pictogram





## Higher Education (from 17 years and up)

- Sustainability Café
- Design stamps on Sustainability

# Sustainability Café





# Citizen

- Warm Pullover Day
- Rotterdam Climate Initiative
- INGREPRO algae producer
- Happy Shrimp

# “Warm Pullover Day”.



- Friday 13 th februari 2009 more than 2 million people (NL:16 mi total) at home, at school or at work gave their statement, by joining “Warm Pullover Day”.
- The amount of participants doubled since last year. They all saves 2 milion euro on the energy accounts and prevented in one day the emission of 66 tons of CO2.

13 februari 2009



# Rotterdam Climate Initiative

## **Ambition:**

Improving the climate for

- the benefit of people
- the environment
- the economy

The Rotterdam Climate Initiative creates a movement in which collaborate:

- government
- organizations
- companies
- knowledge institutes
- citizens

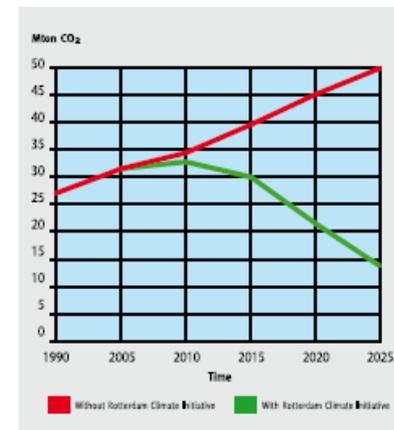
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# Rotterdam Climate Initiative

- To achieve a 50% reduction of CO2 emissions by 2025,
- Adapt to climate change,
- Promote the economy in the Rotterdam region.
- Rotterdam is aiming to be the World Capital of CO2- free energy

# Rotterdam Climate Initiative



50% CO<sub>2</sub> reduction in the Rotterdam region

CO <sub>2</sub> emission in Rijnmond in Mton/jaar (*)	Emission CO <sub>2</sub> in 1990	Emission CO <sub>2</sub> in 2005	Predicted emission of CO <sub>2</sub> in 2025	Technical reduction Potential	RECP in 2025
Industry (refining, chemical, energy)	21,7	24,8	40	-/30	
Developed surroundings and traffic (road and water)	5,8	7,9	10	-/6	
<b>Totaal</b>	<b>27,5</b>	<b>32,7</b>	<b>50</b>	<b>-36</b>	<b>14</b>

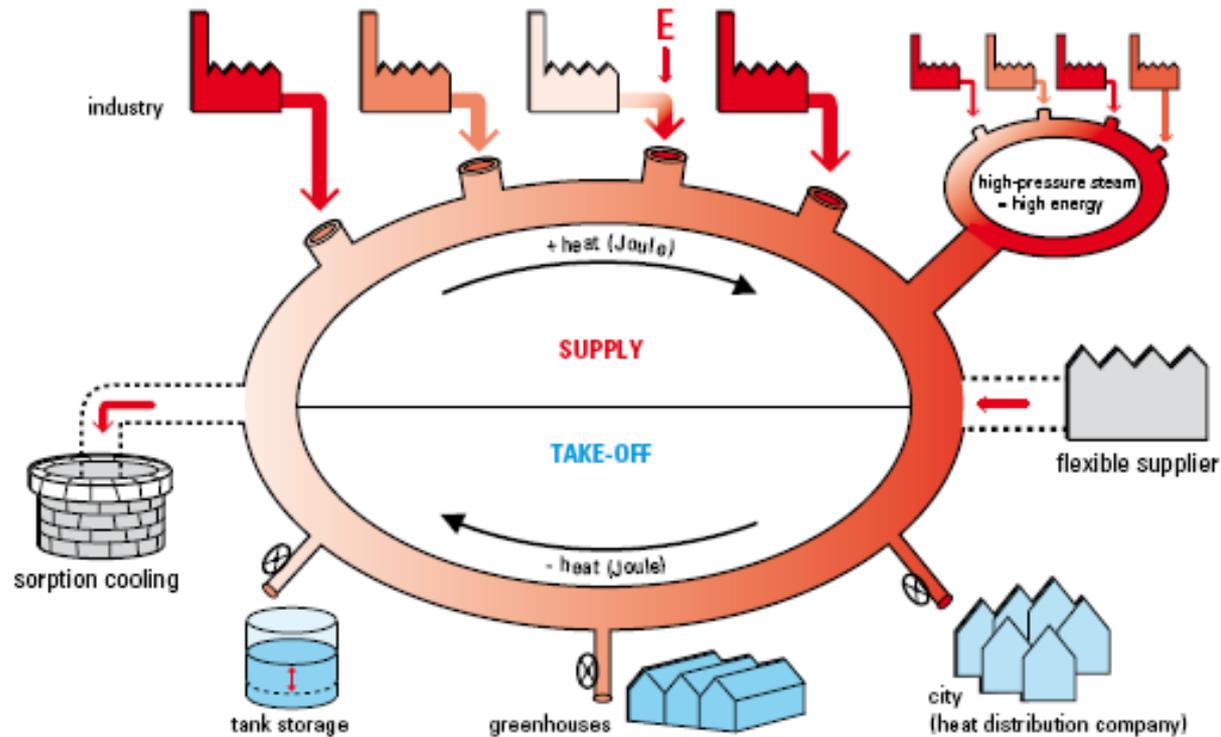
\* Rotterdam's share in Rijnmond: industry 100%, developed surroundings and traffic is estimated at 90%

Validation of the above figures will be undertaken in cooperation with ECN and others.

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# Rotterdam Climate Initiative



A good example of industrial residual heat utilization is the Botlekloop project. Various companies have agreed to share residual heat for mutual benefit. (Source: ROM-Rijnmond R3, Hans van Vliet)

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# Rotterdam Climate Initiative

- Collective initiators;  
Port of Rotterdam, the City of Rotterdam,  
employers' organization Deltalinqs, and  
DCMR Environmental Protection Agency  
Rijnmond



# INGREPRO

INGREPRO operates three large production sites in the Netherlands and is the largest industrial algae producer in Europe and unique in the world due to its in-depth knowledge of cultivating algae under extreme (stress) conditions in order to obtain Enriched Algal Biomass (EAB).



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# Algae



- Their biomass contains relatively high levels of valuable elements as unsaturated fatty acids (EPA, DHA, Omega 6 and Omega 9), vitamins, colorants.
- Algae are used in food and feed supply chains, plant nutrition, aquaculture, as an **energy source** and also as a feedstock for the chemicals industry.



# Happy Shrimp



- **Tropical Shrimps from the Lowlands**  
Using a heat-exchange system at the site of EON Maasvlakte's power plant.
- They utilize 'waste-heat' which otherwise would be released into the air.





# Happy Shrimp



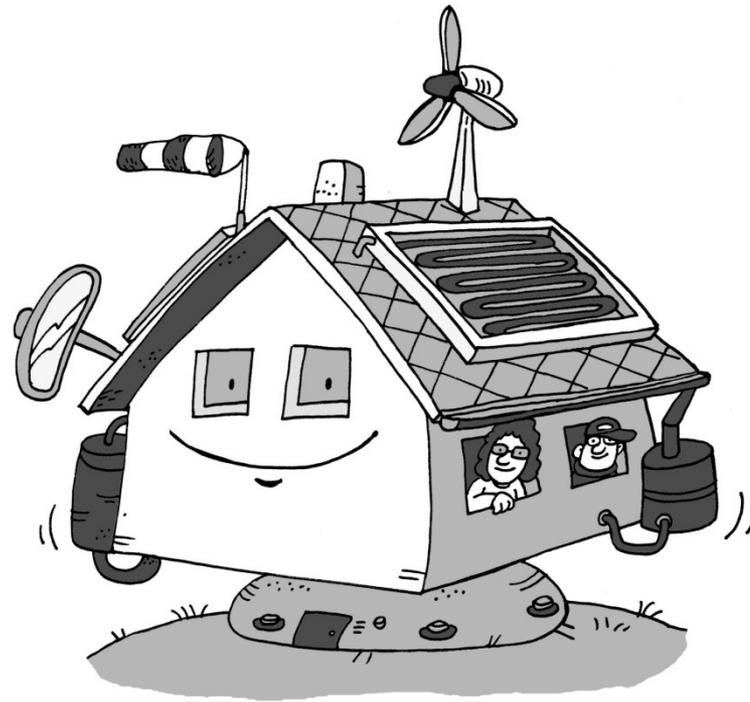
- Innovation combined with
- Environmental friendly approach, it is now possible to produce a tropical product close to the city and harbour of Rotterdam.
- This results in less transport and a higher quality product.
- Combined with Seabead (Zeekraal)



# Explore the world

- [www.kyotoinhome.info](http://www.kyotoinhome.info)
- Hands-on-experiences
- Our ocean acidification animation and virtual lab:  
<http://i2i.stanford.edu/Development/CarbonLab/co2lab.swf>
- Carbon footprint  
<http://i2i.stanford.edu/activities.htm>
- <http://virtualurchin.stanford.edu/>
- <http://esi.stanford.edu/>

[www.kyotoinhome.info](http://www.kyotoinhome.info)



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-Chinese Proverb-

***"If you are thinking a year ahead, sow a seed.***

***If you are thinking ten years ahead, plant a tree."***

***But if you are thinking one hundred years ahead, educate the people.***

# Hands on experiments

- Think of a hypothesis
- Do some experiments
- Present the results and conclusion
- Would you use this in your classroom?
- What was good, what could better?



# Monday 4 May

- 2 groups: Primary Education and
- 3 groups: Secondary Education
- 1 group: Clement, Rene, Andy solar cell and more

## Links

- <http://www.managenergy.net/products/R1245.htm>
- <http://www.aashe.org/>
- <http://ase.org/>
- <http://www.bioenergyinternational.com/>