From sustainable production to the Green city

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Chiang Mai, Thailand, AGRIA, 4 December 2010

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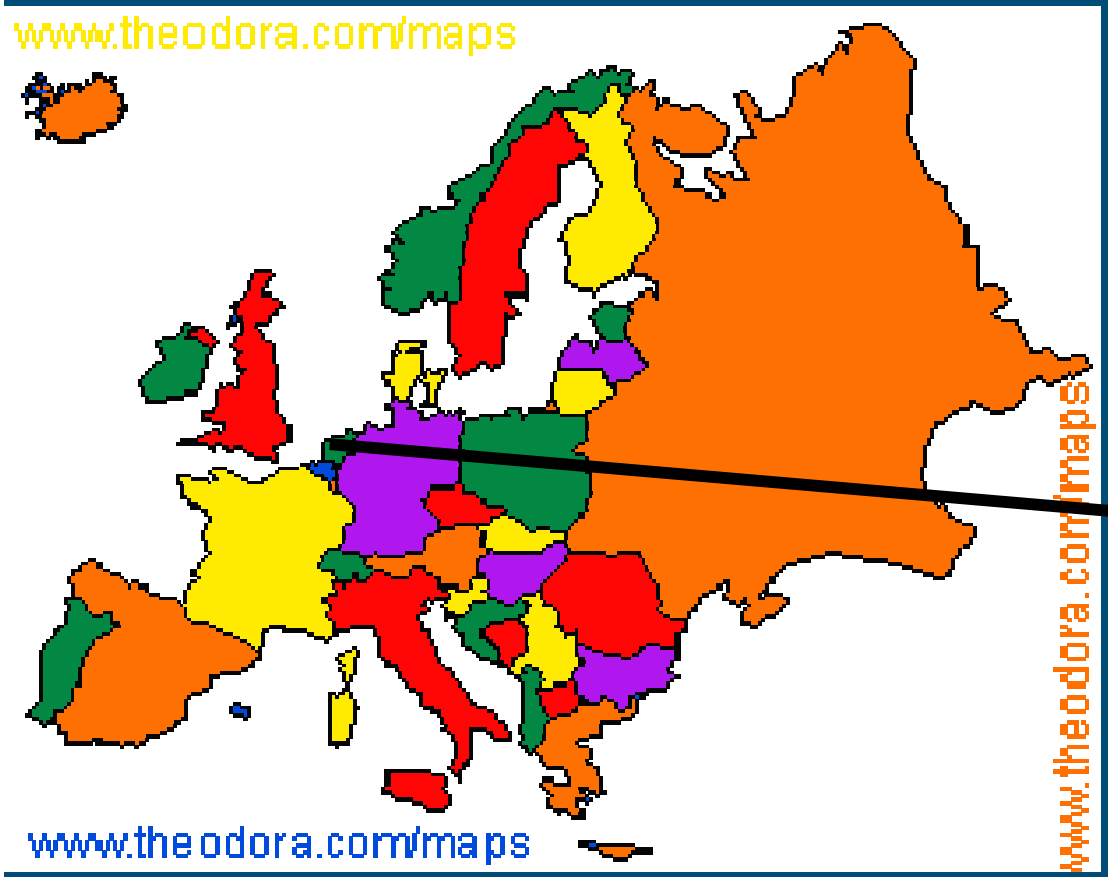
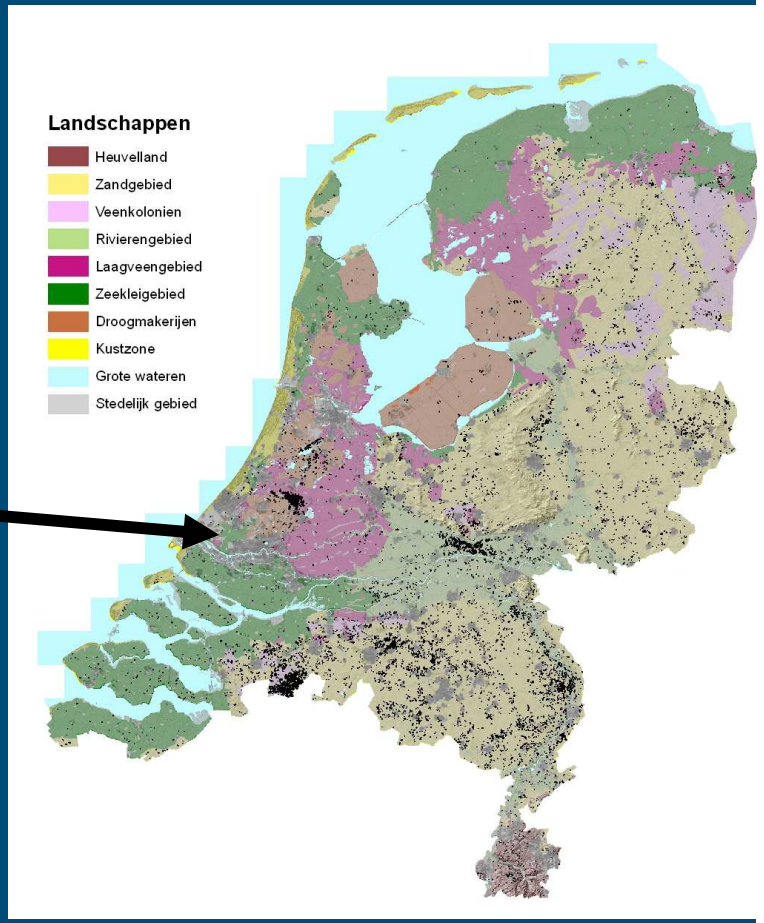
Outline

- Introduction
- Nursery stock production
- Green city concept
- Ornamentals in Chiang Mai
- Eye catching trees
- Concluding remarks

The Netherlands





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Nursery stock

Wide range of products

Nursery stock in the Netherlands

- Extent 17.000 ha
- Number of companies 3.000
- Number of workers 15.000
- Average farm size 5 ha
- Range 1 – 300 ha
- Production value 592 m€
- Production value/ha 34.500 € = 1.400.000 B
- Export >70%

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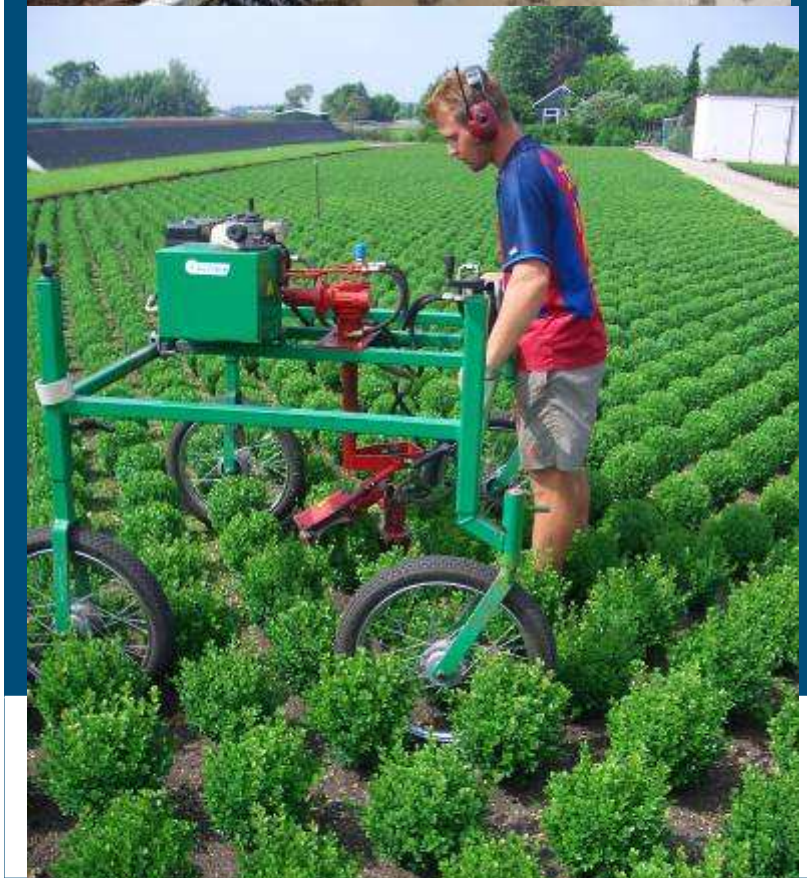
Different seasons



Water

Sustainable production

High economic value

Constraints People, Planet, Profit

Sustainable production

Constraints

- People labour, availability, conditions
- Planet materials, water quality
- Profit competitive market, costs
  family labour, succession

People

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Planet

Water quality - ground- and surface water

Leaching of nutrients and chemicals

Restricted use

Weed control

Restricted use of herbicides or mechanically

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No damage to the plants

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Crop protection

Restricted use of chemicals

Warning models

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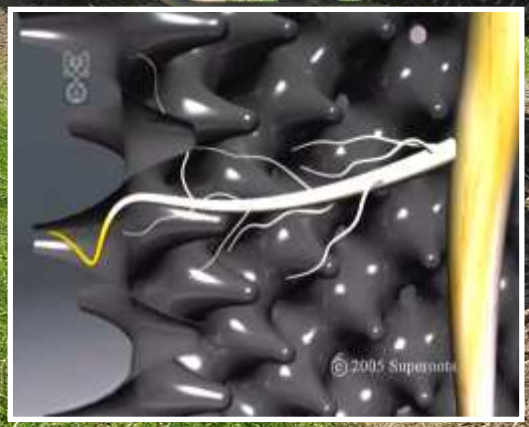
Profit

Constraints

- labour
- soil bound diseases
- quality
- environment

Continuous innovation

Profit



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Advantages

Advantages

- Labour
- Soil bound diseases
- Quality of products
- Fast growth
- Environment

Disadvantages

- Investment
- Sustainability

From production to use

→ ?

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Green city concept

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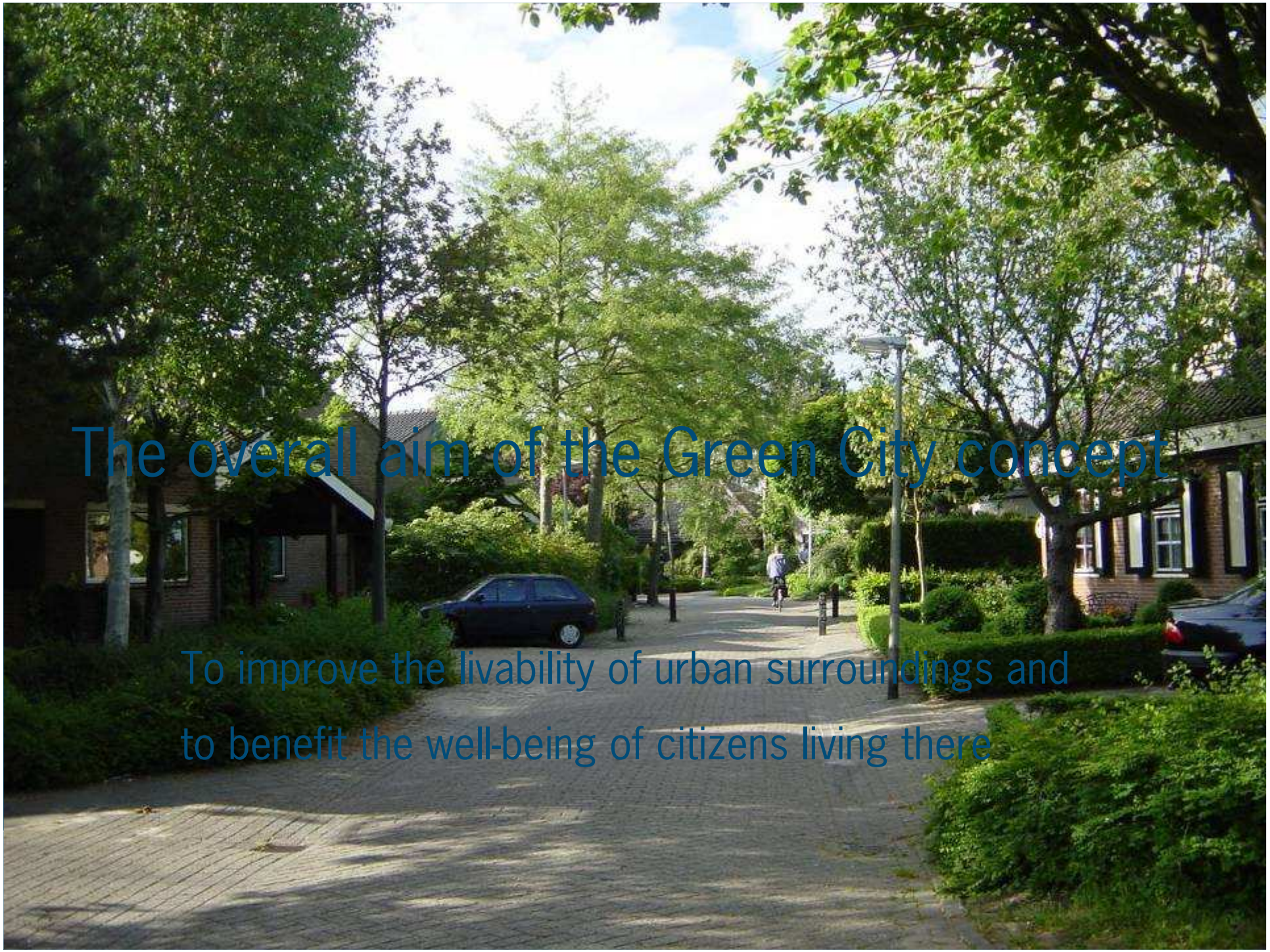
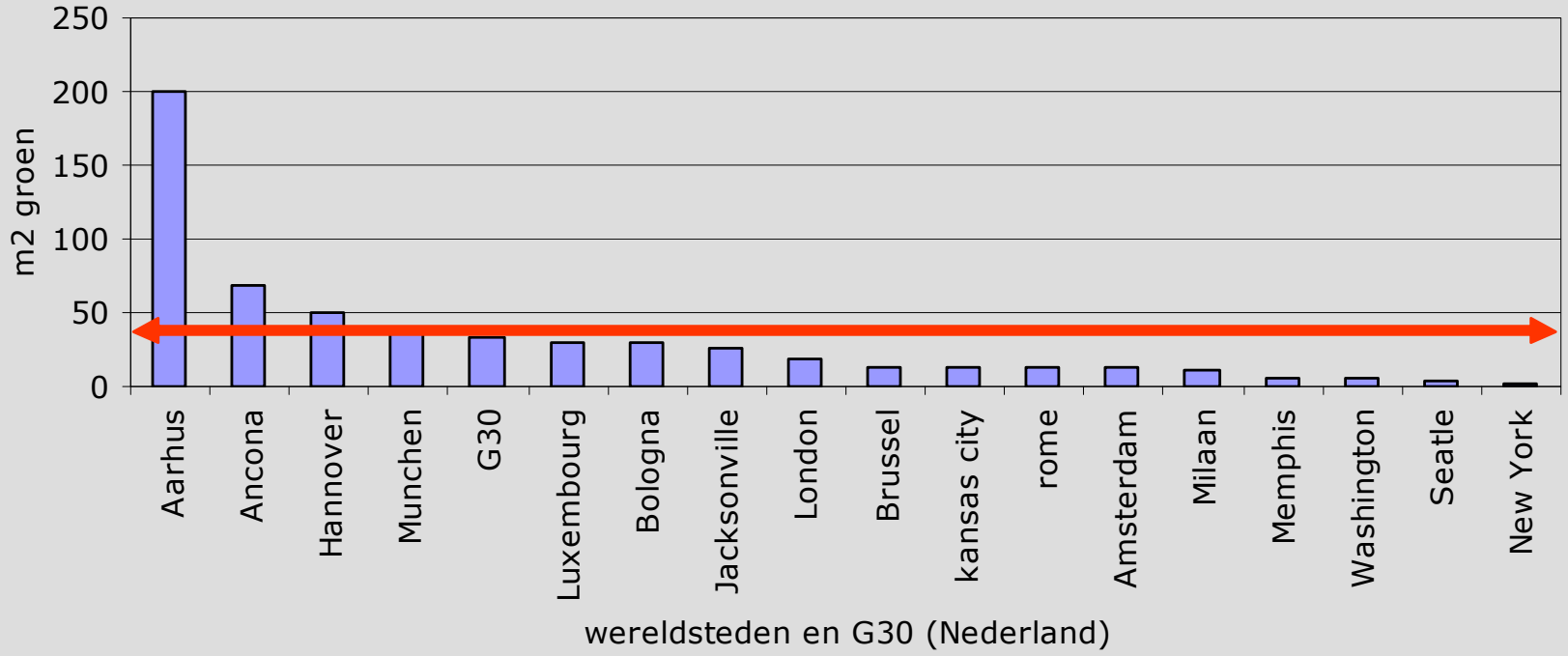

The overall aim of the Green City concept
To improve the livability of urban surroundings and
to benefit the well-being of citizens living there


50% of the entire
population of the world lives in cities...

M2 Green per inhabitant in different cities

De hoeveelheid groen per inwoner in een aantal wereldsteden. Het gemiddelde voor de G30 steden in Nederland is eveneens aangegeven. De horizontale lijn komt overeen met het richtgetal uit de Nota Ruimte van 75 m2 groen per woning
.



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Green

Research data prove the positive effects of Green space

- Health and well-being
- Social harmony; neighborhood crime reduction & community development
- Property value & subsequent economic development
- Environmental benefits

Green and health

Danish study

- 93% believes greenery affects mood and health positively;
- Short distance to green reduces stress;
- Short distance encourages higher use frequencies.

Health and well-being

Complaints	Prevalence per 1000	
	10% green space	90% green space
Depression	32	24
Asthma / COPD	26	20
Diabetes Mellitus	10	8
Coronary heart disease	2	1.5
Total	70	53.5

Social harmony

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Property value

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Property value

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What one trees does

- Beech 100 years old
  - 600 000 leaves
  - 1200 m^2 surface of all leaves
- Uses CO_2
  - 18 kg/day
  - 36 000 m^3 air
  - 400 liter H_2O
  - 18 kg O_2 = 10 people
- Replacement?
  - 2000 young trees
  - Costs > 100 000 €

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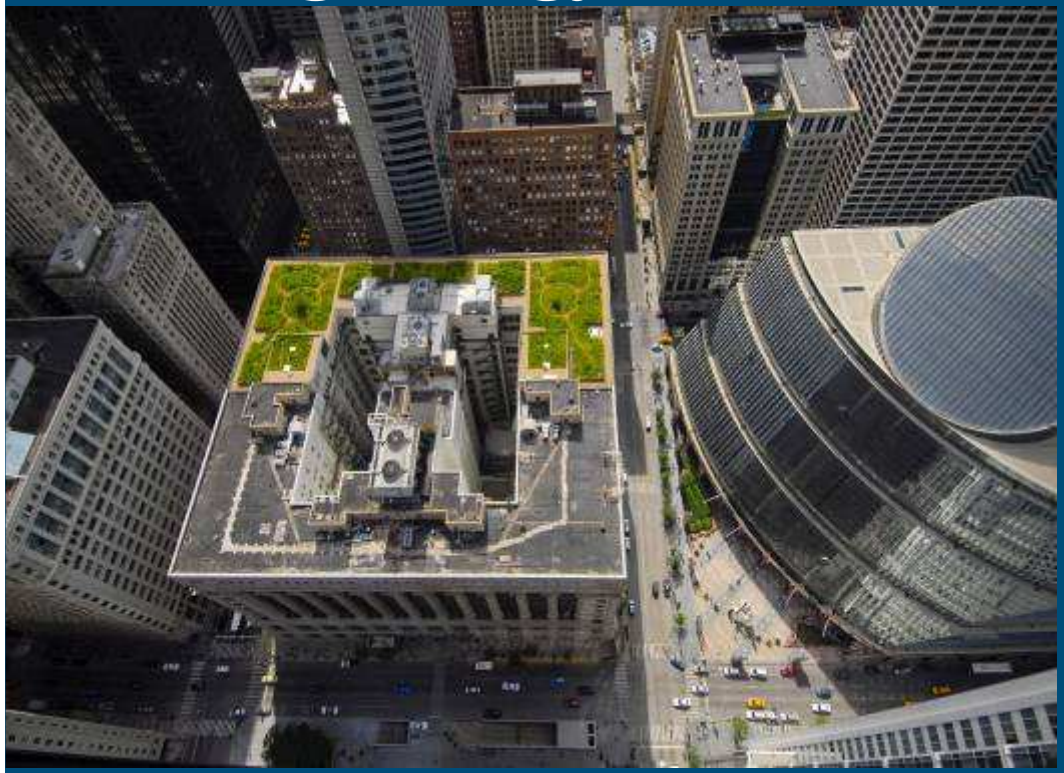
Saving energy



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Noise reduction

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Environmental benefits

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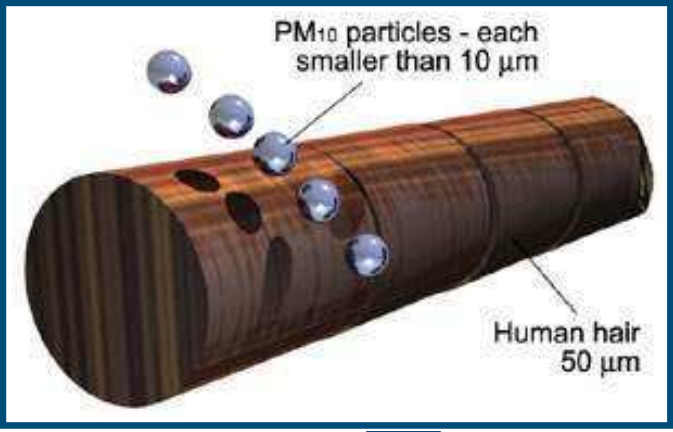
Environmental benefits

Air quality

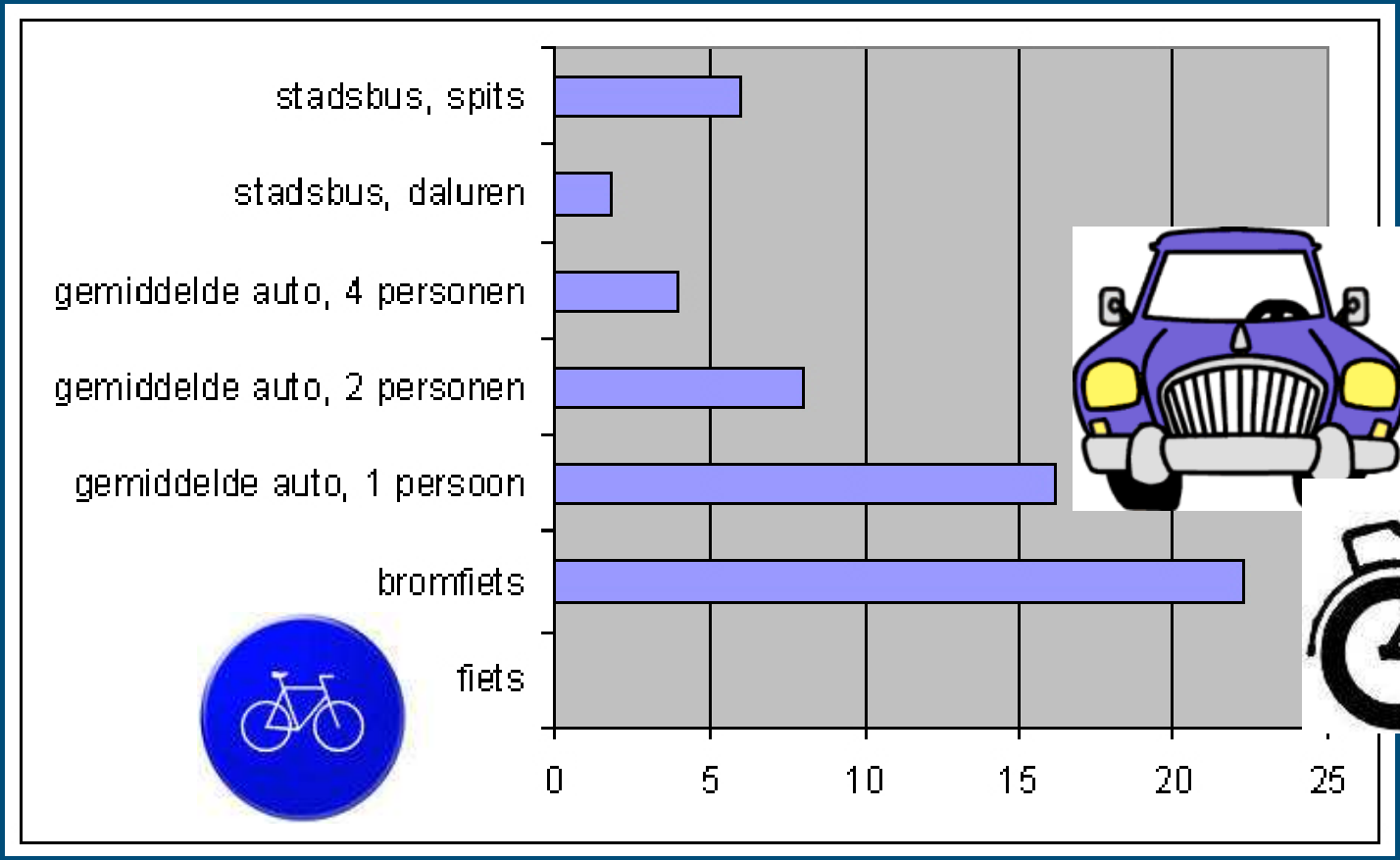
PM10 / PM2.5

Nitrogen dioxide (NO2)

Ozone (O3)

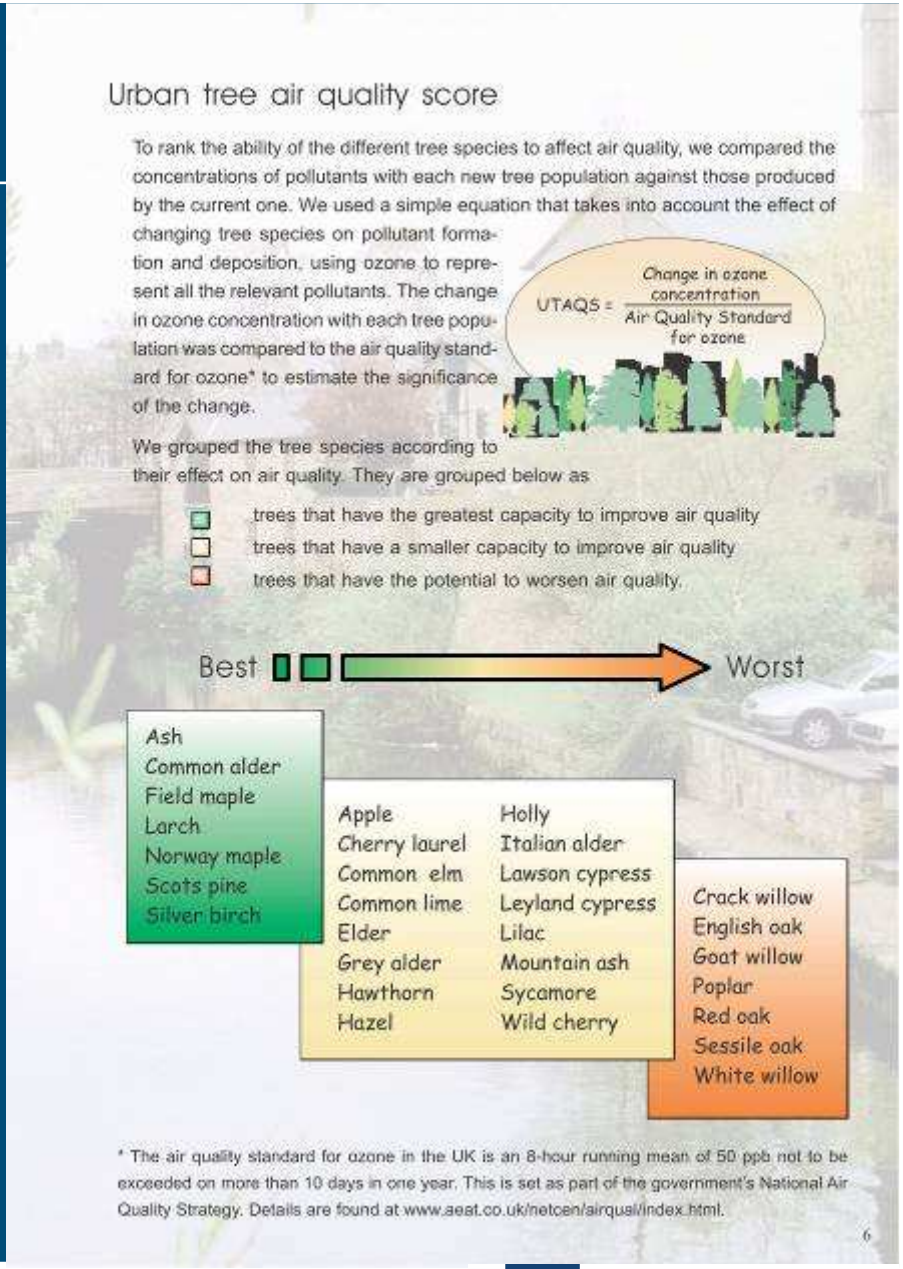


Pollution per transported person (4 km)



Design

- Integrated approach
- Identification of main source
- Aesthetic values
- Ecological conditions
- Right plant on the right place



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How to reduce air-pollution

- Reducing pollution from the source
- Stimulate methods that are friendly to environment
- Plants to filter pollutants (additional method)

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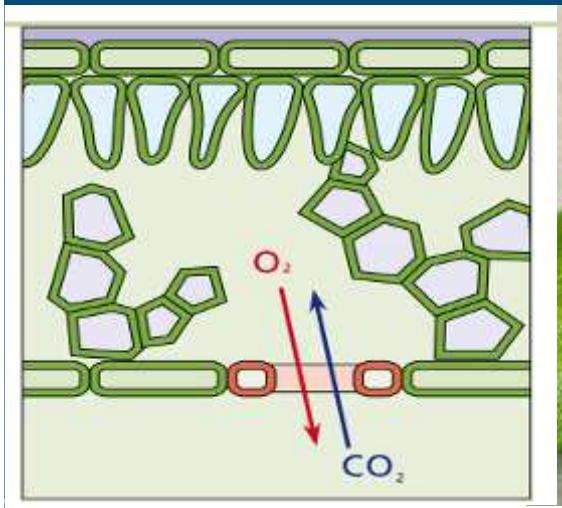
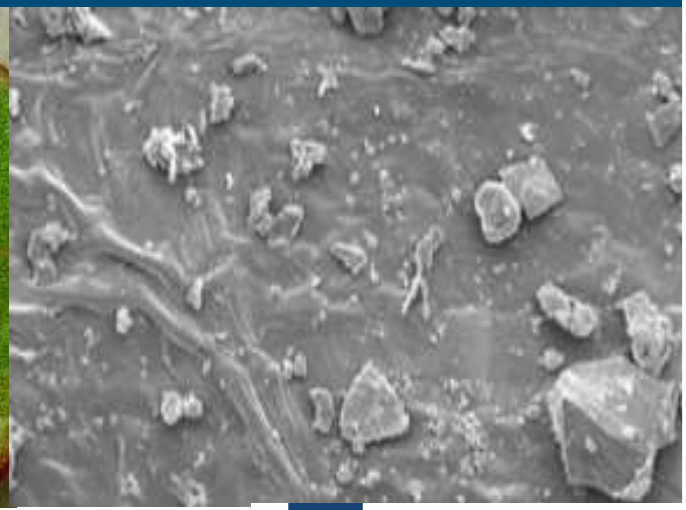
How do plants remove pollutants?

- Absorption via stomata - inside leaves NOx and ozone
- Via wax layer (cuticle) - VOC
- On surface - PM_{10}





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How much pollutants can be removed?

- Depends on species and concentration
- Much research has to be done (only few sources)
- Decrease of concentration seems limited to few %
- An adult tree can remove 300 g PM_{10} per year




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Plant characteristics for air-cleaning

- Criteria for reduction NOx
- Criteria for reduction PM10 (and PM2.5)
- Effect depending on species
- Only few measurements of certain species available

Criteria for reduction PM 10

- Plant- or crown volume
- Leaf volume throughout the year (evergreen or not)
- Leaf area index (small leaves)
- Leaf structure (needles positive)
- Hairs (hairs catch PM10)

Criteria for reduction NO_X

- Plant- or crown volume
- Leaf volume throughout the year (evergreen)
- Flat big leaves
- Glabrous (no hairs)

Ornamentals in Chiang Mai

- Trees
- Shrubs and climbers
- Herbs




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Qualitative evaluation

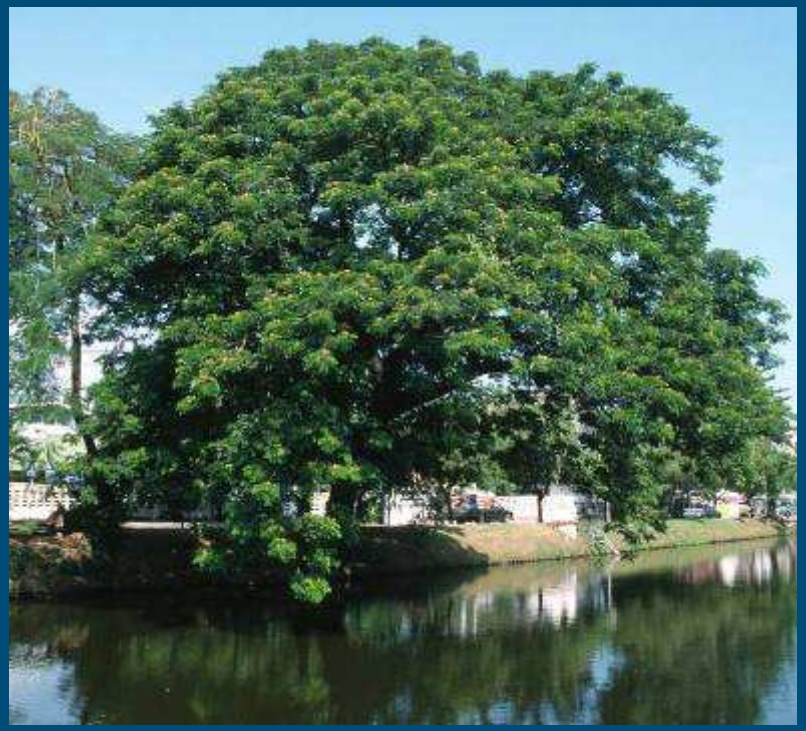
- Air-cleaning effect of ca. 130 species
- Based on model in The Netherlands
- Classification based on plant characteristics and expert judgement

			PM	NOx
Scientific name	**English name**	**Main Group**		
Acacia auriculiformis	Black Wattle	Tree	++	+++
Acalypha hispida	Red Hot Cat's Tail	Shrub	+	++
Acalypha wilkesiana	Painted copper leaf	Shrub	+	++
Adenium obesum	Mock Azalea	Shrub	+	+
Allamanda cathartica	Yellow allamanda	Shrub / Climber	+	+++
Alstonia scholaris	Devil tree	Tree	+	++++
Antigonon leptopus	Mexican creeper	Climber	+	++
Araucaria heterophylla	Norfolk Island pine	Tree-Conifer	++++	++
Arctocarpus heterophyllus	Jackfruit	Tree	+	++++

- Examples of good species for air-cleaning PM10

Casuarina equisetifolia (Australian pine)

Many other Legumes



Samanea saman (Rain tree)

Caesalpinia pulcherima

Effective for reduction NOx

Big leaves

Big crown

Glabrous leaves

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City conditions difficult for plants

- Often poor soil conditions
- Surrounded by pavement
- Pollution by traffic and industry
- Damage and vandalism
- Competition with cables, piping, foundations, etc.

Roots need space

Not only roots need space

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What be done?

Good design

Right plant for the right place

- Improve soil
- Enough space underground (tree container)
- Protection against vandalism, storm, etc.
- Good maintenance

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Inventory of eye catching trees in Chiang Mai

In cooperation with Dr. Yaowanit of Maejo University

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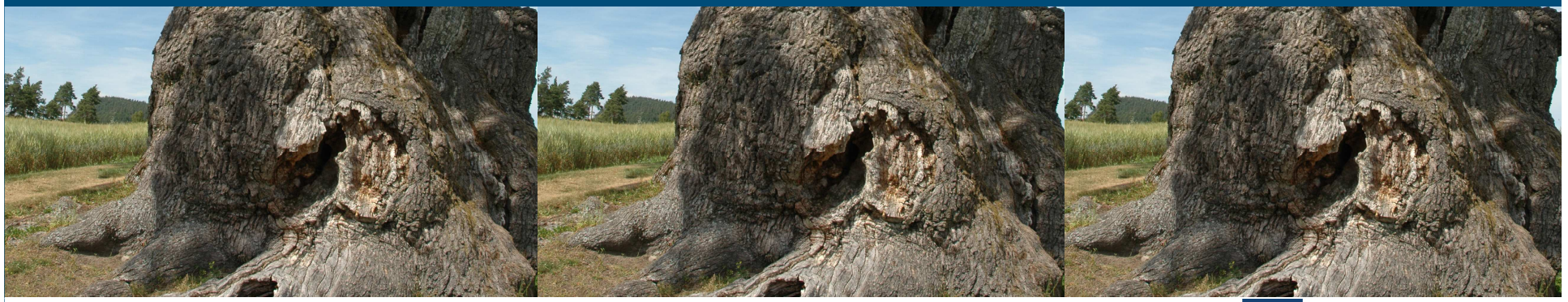
Criteria in the Netherlands

- Age of the tree more than 80 years

And one or more of the following criteria

- Important cultural heritage
- Valuable species
- Rarity because of age, seize, etc.



BIG TREE MAP IN CHIANG MAI,THAILAND

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Possibilities for follow up

- Choice of ca. 25 most characteristic trees
- Making brochure for education and promotion
- Possibilities for tourism

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What kind of information

- Descriptions of the species
- Botanical data of the tree: place, species, age, height, outline of the stem
- Cultural data and other characteristics of the tree (owner, goal of planting, damaged by storm, etc.)

Concluding remarks

- Nursery stock can be profitable
- On-farm experiments
- Continuous innovation
- Green has many effects
- Trees can improve the living conditions in cities but cannot solve all problems
- Fight pollution at the source
- Eye catching trees are worth protection
- Right plant at the right place

Thank you for your attention

Biodegradable pots and containers

- Advantages
  - No waste
  - Easy planting
  - Reduction of labour costs
- Disadvantages
  - Price
  - Life-time