ECONETWORK
ENVISION CHARLOTTE

Something in the Air: Improving Air Quality through Community Partnerships

ENVISION
CHARLOTTE

FOUNDATION FOR THE CAROLINAS

@EnvisionCLT | @FFTC_RCCL | #EcoNetworkCLT

Internet: MINT-GUEST Password: Today123

Liveable Low-carbon Cities

Synergetic urban landscape planning with Water & Energy

City of Charlotte NC - U.S.A. , 19th of September 2017

Nico Tillie @nicotillie72

Landscape Architecture, Delft University of Technology,

World Council on City Data and advisor City of Rotterdam

Paris Climate Agreement

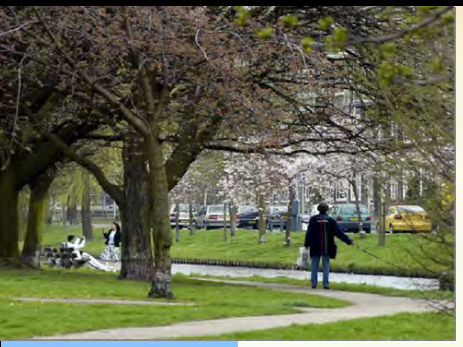
Global average temperature to well below 2 ° C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 ° C
<u>This means a 80-90 % CO2 reduction target</u>

Increasing the ability to **adapt to the adverse impacts of climate change**

Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

The Paris deal is the world's first comprehensive climate agreement.

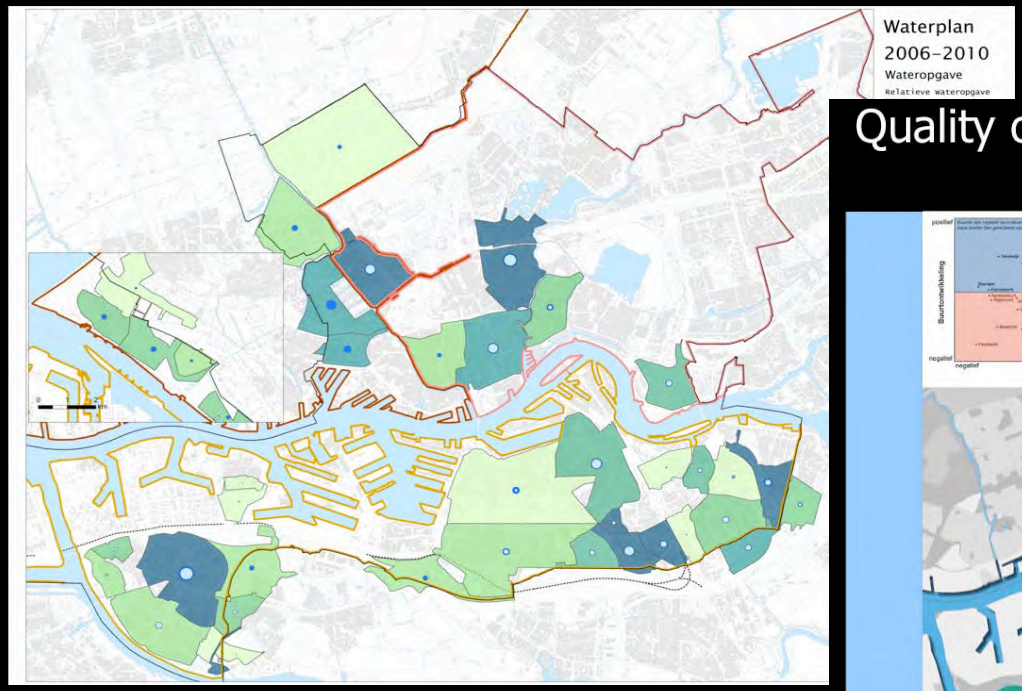
Singelplan waterplan 1850 as an example?



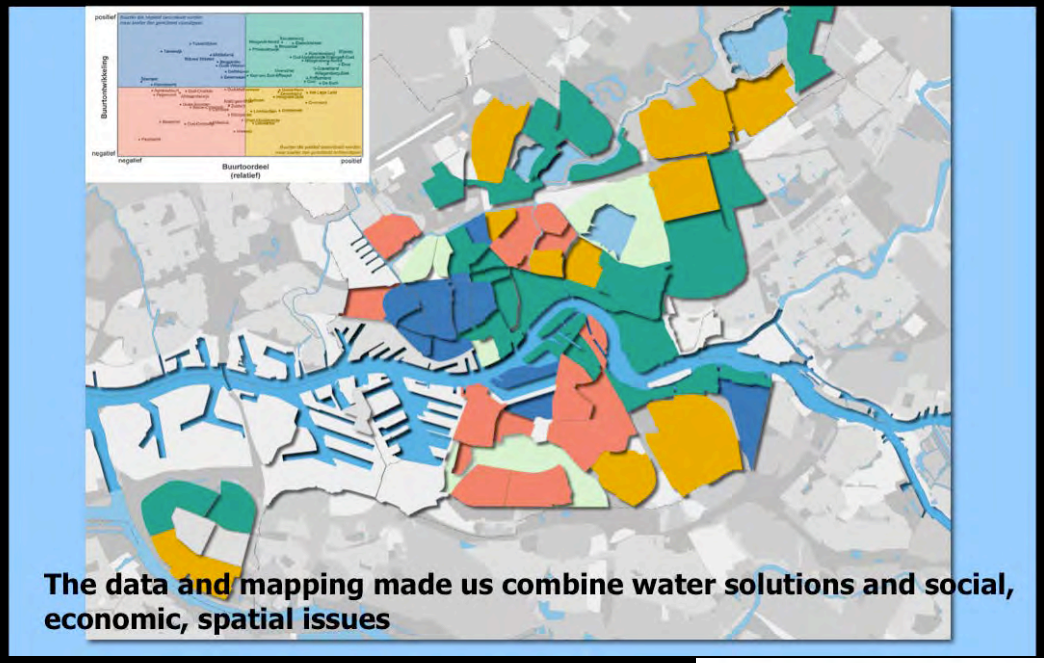
21e century version of the Singelplan Rosé from 1850's?

21th century version of 1850 Singelplan

1.Water: Precipitation, storage capacity per district



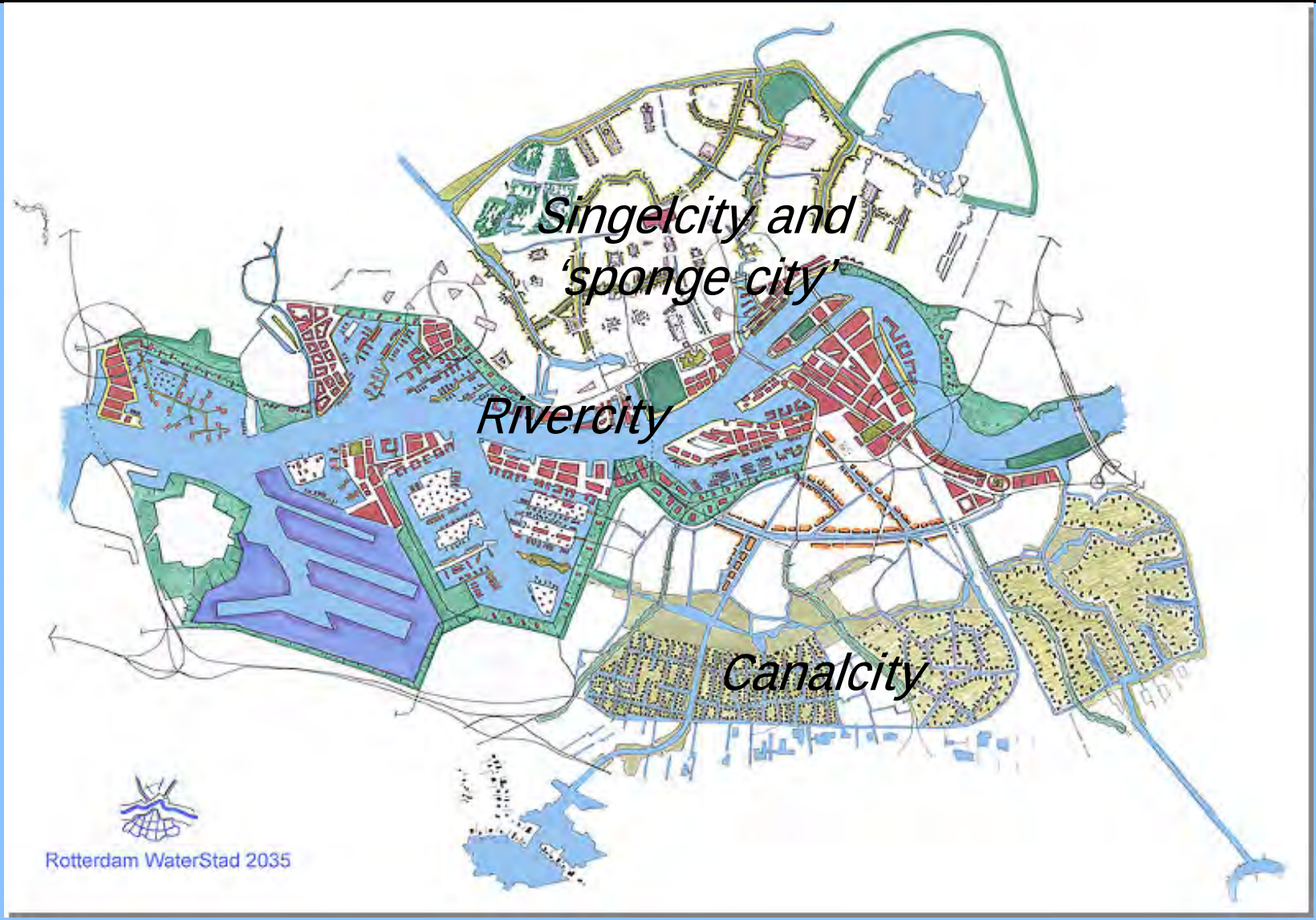
Quality of life data per district



The data and mapping made us combine water solutions and social, economic, spatial issues

Vision Rotterdam Watercity 2035

watersolutions, good public space plus water transport



Watersolutions good housing + public space + watertransport

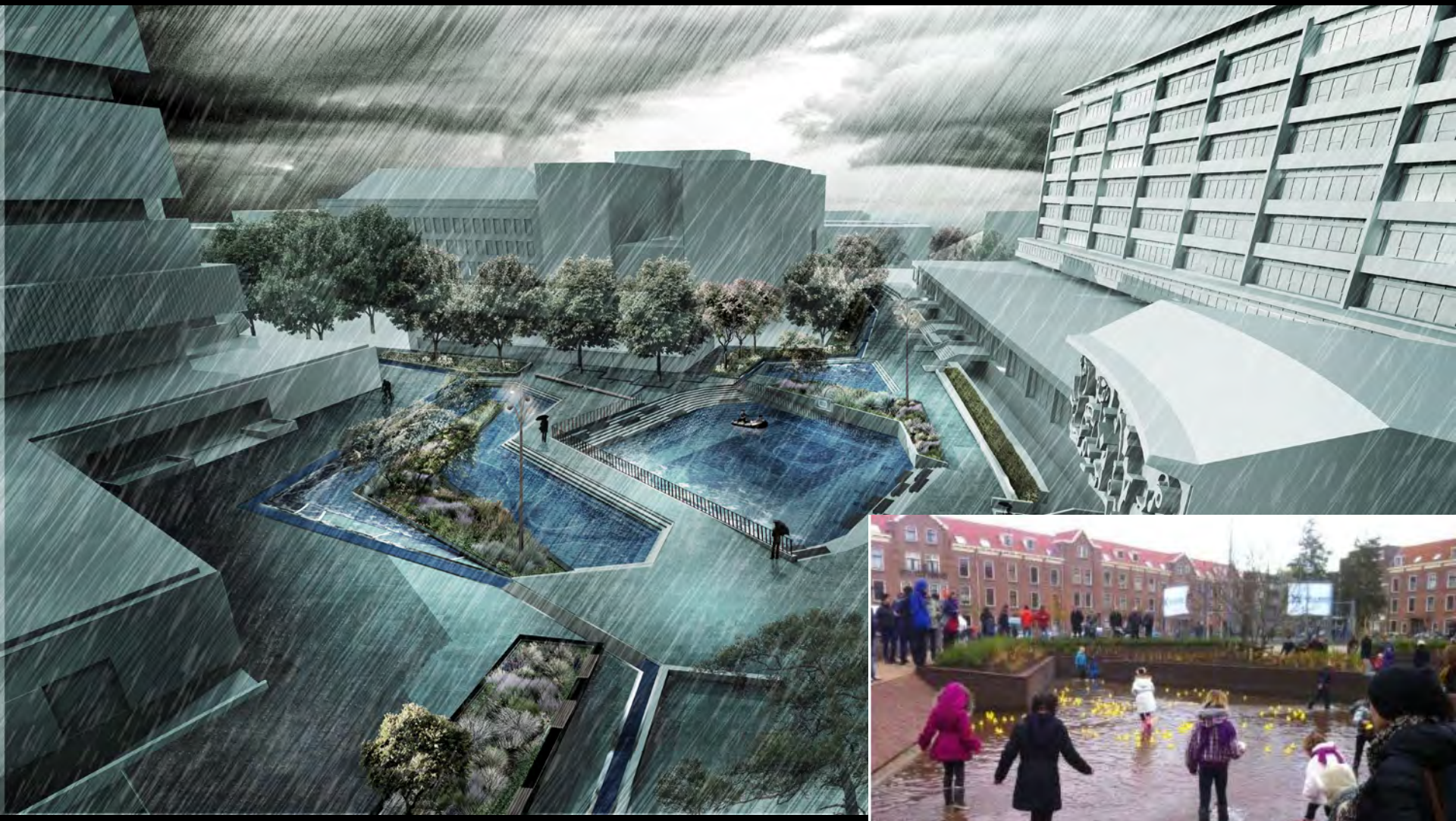
Watersquare finished in nov 2012

Watersquare finished in nov 2012

TU Delft
Delft University of Technology

Study from the 'De urbanisten' Rotterdam

Watersquare finished in nov 2012

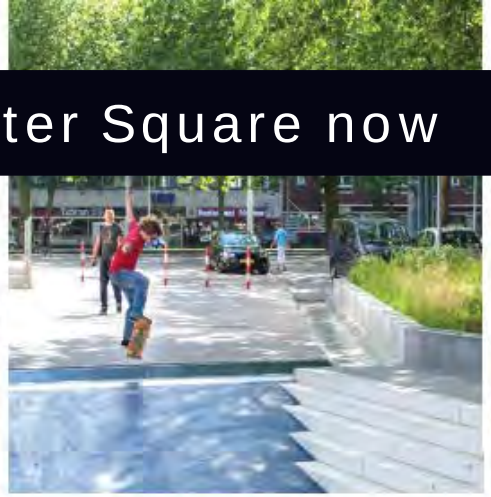


TU Delft
Delft University of Technology

Study from the 'De urbanisten' Rotterdam

Water Square now


Trappen te gebruiken als tribune voor bijv. lessen Zadkine



Daily Use


Veelvuldig gebruik bassin #2 voor samenkomst van mensen


Grote bassin ingericht op actief gebruik door verschillende groepen

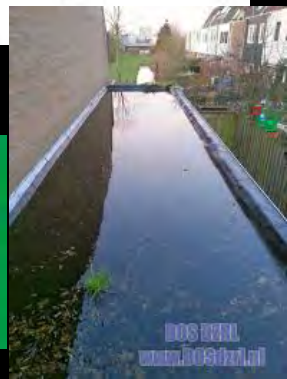

Afbeeldingen: De Urbanisten

Programmatic Approach on District Level

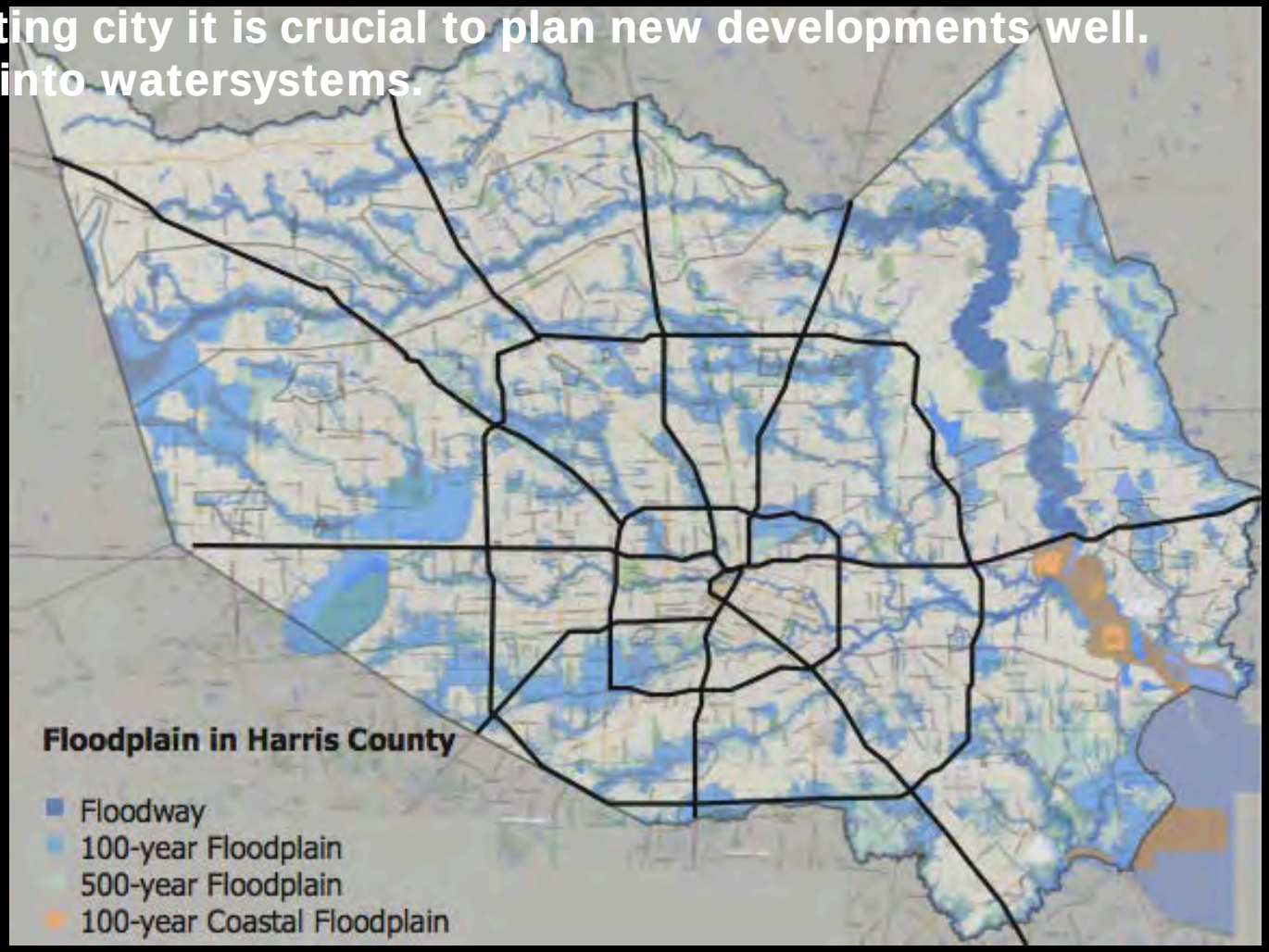
Building a green framework and programmatic clusters for and with the neighbourhood

+

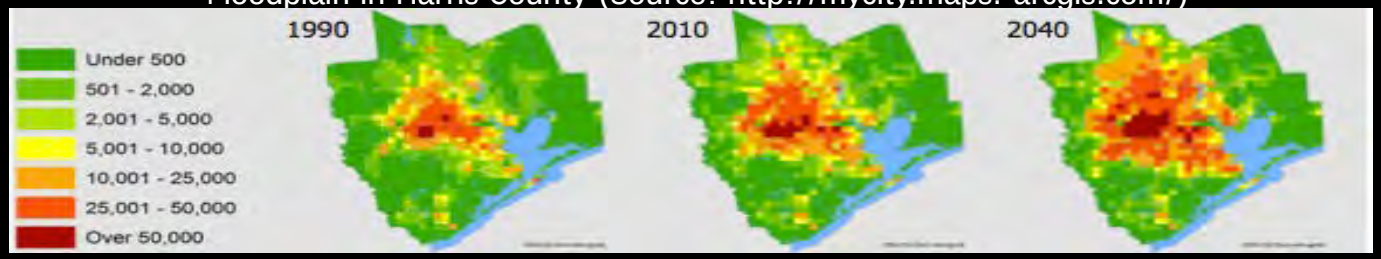
DE PAVE PARADISE



Apart from the existing city it is crucial to plan new developments well. Cities tend to grow into watersystems.



Floodplain in Harris County (Source: http://mycity.maps. arcgis.com/)



Student:

Song-Ya Huang

Delft University of Technology

with Han Meyer and Nico Tillie

i.c.w. Prof T. Colbert University of Houston

Relate climate change to urban growth

Istanbul – growth threatens watershed areas, what to do?

International Architecture Biennal Rotterdam 2012 Istanbul Project by HNS and and 51N4E

Since 2005-2007 Energy and Climate Initiatives Worldwide

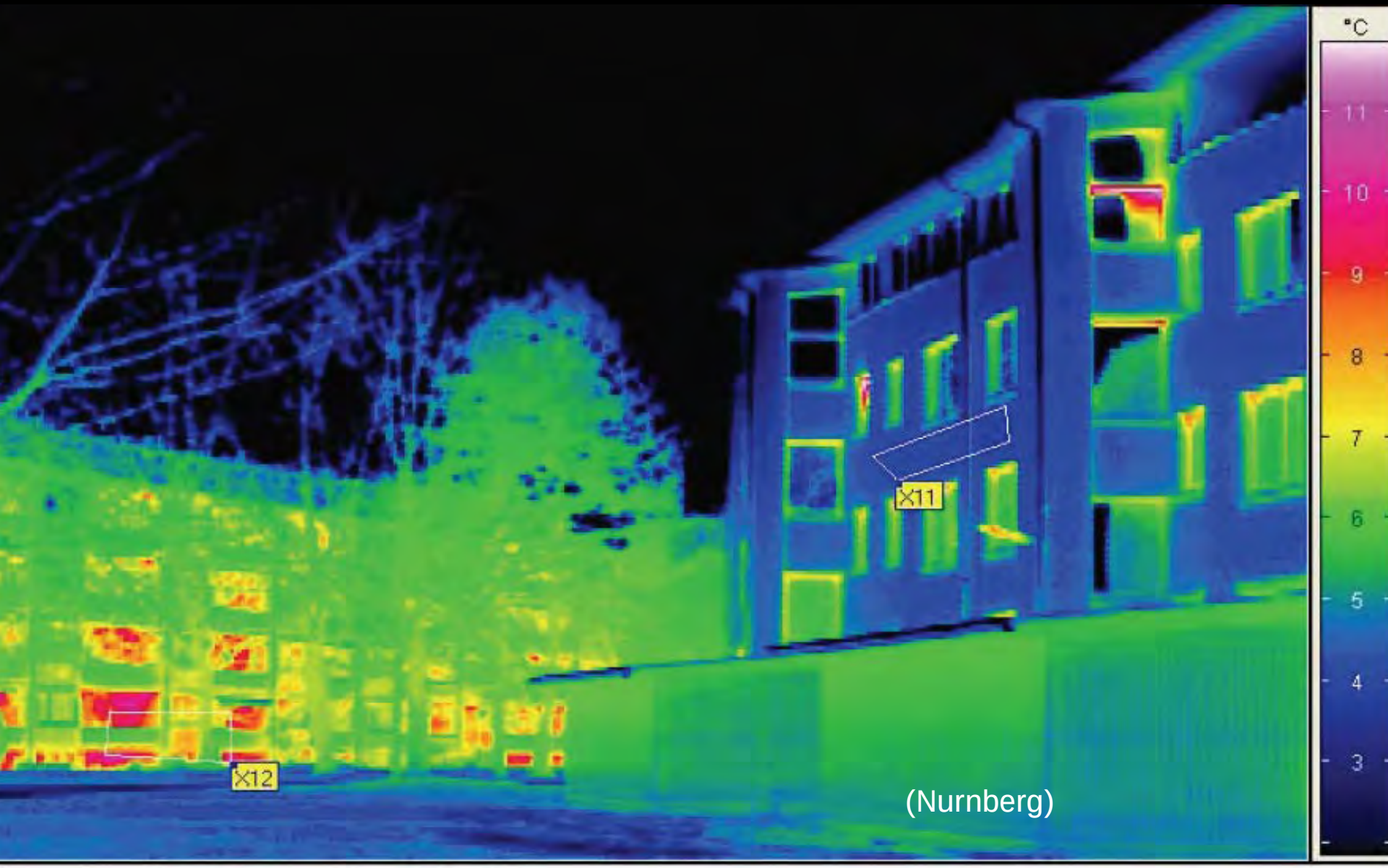
CO2 reduction and renewable energy supply

From list of solutions to a spatial inclusive strategy for Energy transition and improving Quality of life

Residential & services	Transport	Behaviour	Innovation	Industry & food
•deals with corporations •Public lighting •Compulsory use of district heating •Fiscal incentives •Local laws	•public transport, cycling •Renewable energy •Parkingfees • vehicles and ships	•All public vehicles co2 free •All public buildings co2 free •Campagne •Incentives	•innovationfund •Knowledge cluster of new techniques •Research connections with universities to implement	•Carbon captivity storage •Deals with companies to filter •Biofuel •CO2 to greenhouses •Quai electricity

.... to a vision ...from there, a tailormade plan for our specific situations, neigborhoods!

……to the scale of the building and lower



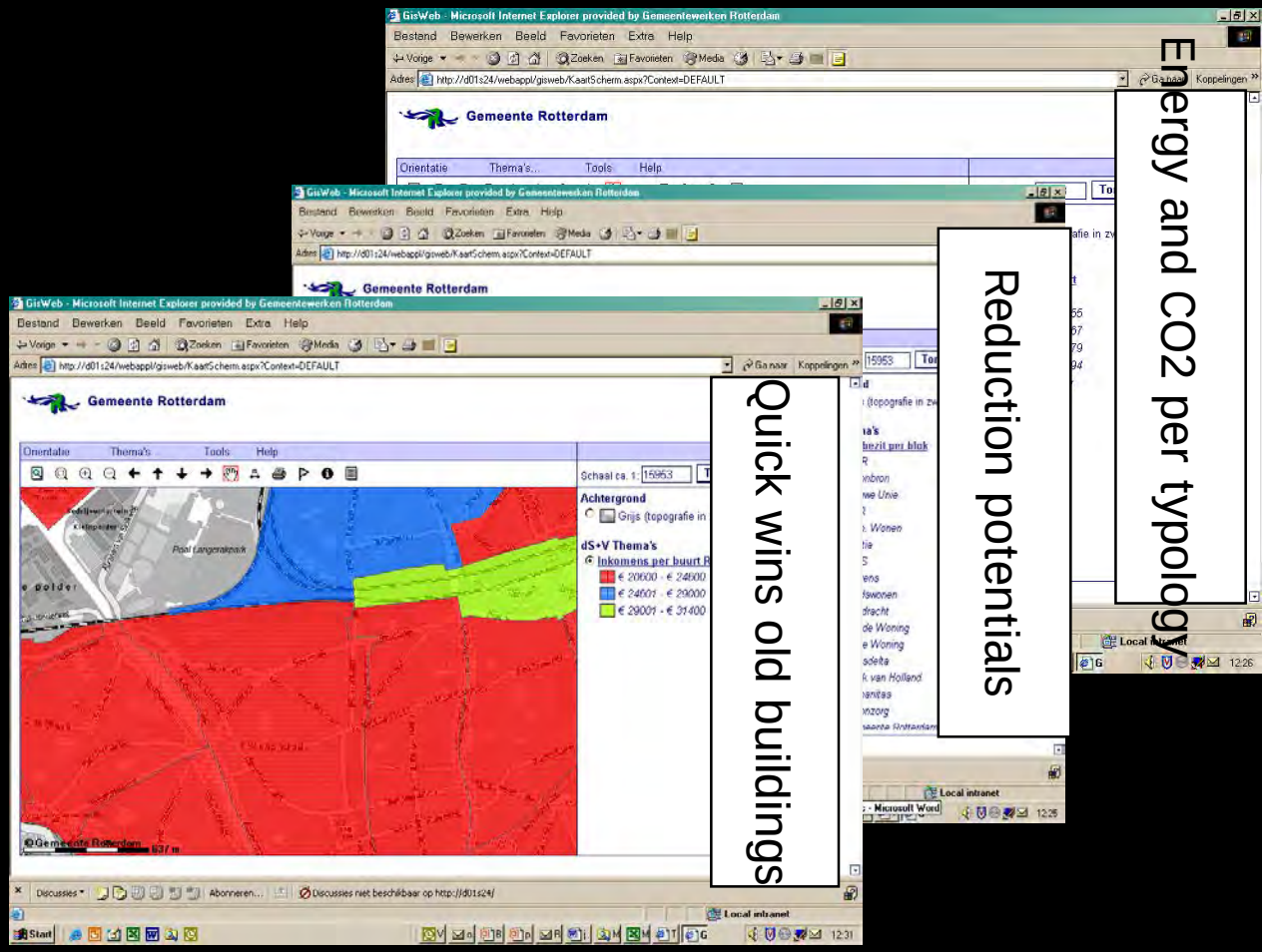
(Nurnberg)

Challenge is how to go from..

Website Ken Yeang

Rough overview of steps for cities

1. reduction of demand, less consumption



Cooling buidings takes 7-10 times more energy than heating them

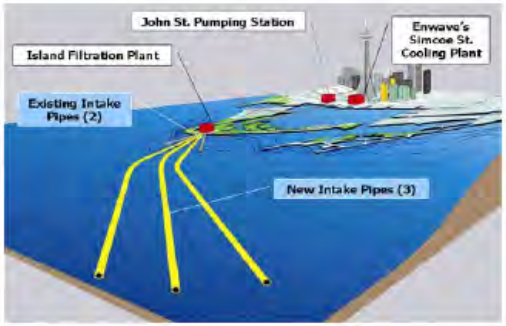
Supplying the Cooling demand

Deep Lake Water Cooling

Enwave Energy Corporation

benefits:
reduces energy consumption up to 90%
reduces carbon dioxide emissions

The pipes take water (4°C) from Lake Ontario at a depth of 83 meters. In the pumping station heat exchangers transfer energy between the cold lake water and the closed chilled water supply loop.
The water then is distributed into the city water supply. Enwave uses only the coldness from the lake water, not the water, as alternative to conventional air-conditioning.



Metro Hall's energy savings

Item	Value
Power consumption	3,000,000 kilowatt-hours per year less
Power saved is sufficient to supply	300 homes
Reduction in Water Consumption from Cooling Towers	4,400 cubic metres per year less
Greenhouse Gas Reduction: Carbon Dioxide	732 tonnes per year
Number of Cars with equivalent emissions	160

www.toronto.ca/environment/initiatives/cooling.htm

"Koudecirkel", the cold circle

Universiteit Twente

The cold circle is a manmade basin which stores cold during the night for use during the day for the offices and university buildings.
The prototype has been implemented by Universiteit Twente.

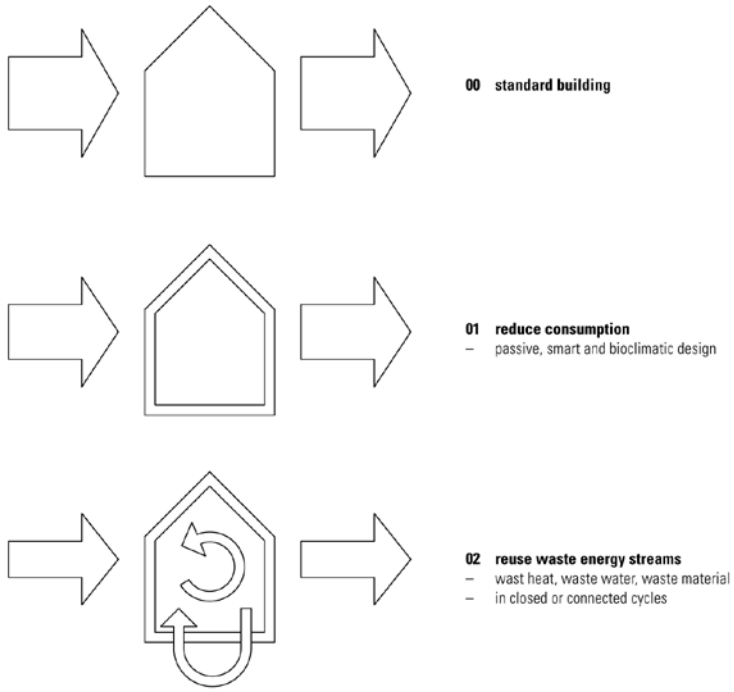
The basin is 10 meters deep by 36 meters in diameter; it has a cool capacity of 11MW.
The water is cooled by night, either naturally or with machines that make use of electricity of the lowest fare.

The application at a harbour of a 10 meter deep circle could have the capacity of 2500 MW
It is also can be used as a sprinkler installation.

www.utwente.nl/nieuws/pers/cont_08-025.doc/

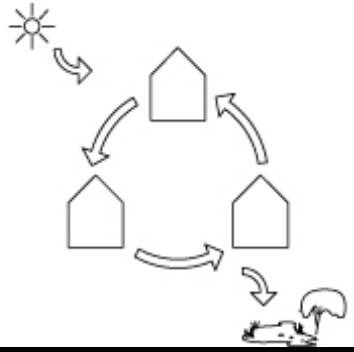
Co_2 neutrale Maas en Rijnhaven: with Florian Boer, City of Rotterdam and Andy van den Dobbelsteen TUD

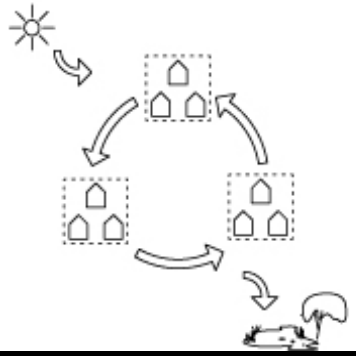
2. Exchange waste flows, energy in planning

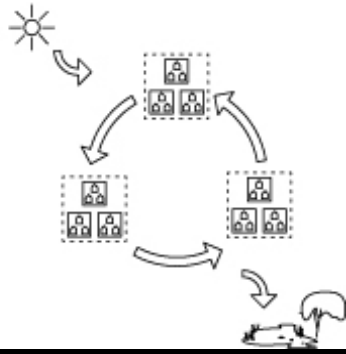


...and upscaling

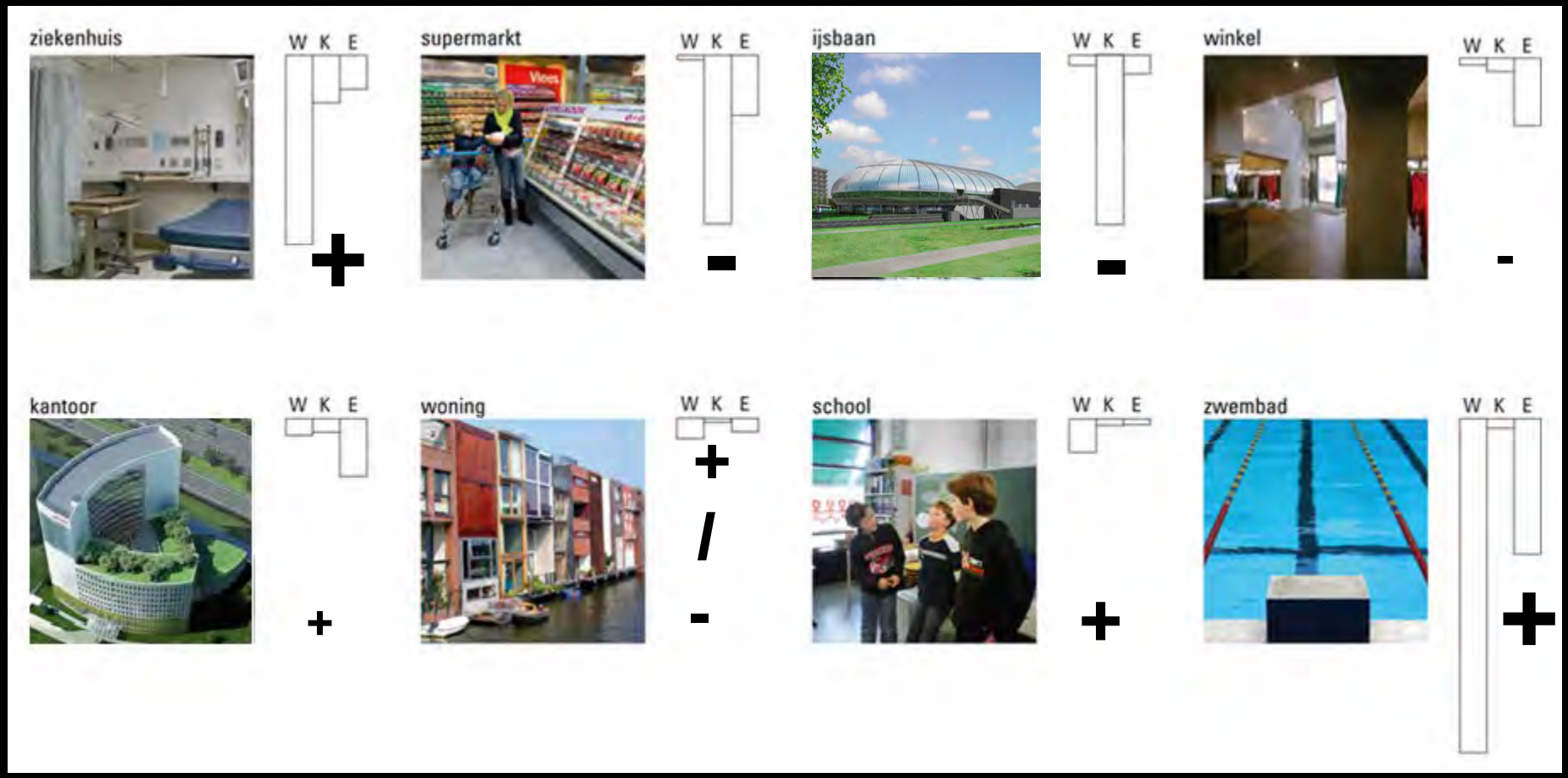
By: new stepped strategy by A. Van den Dobbelsteen





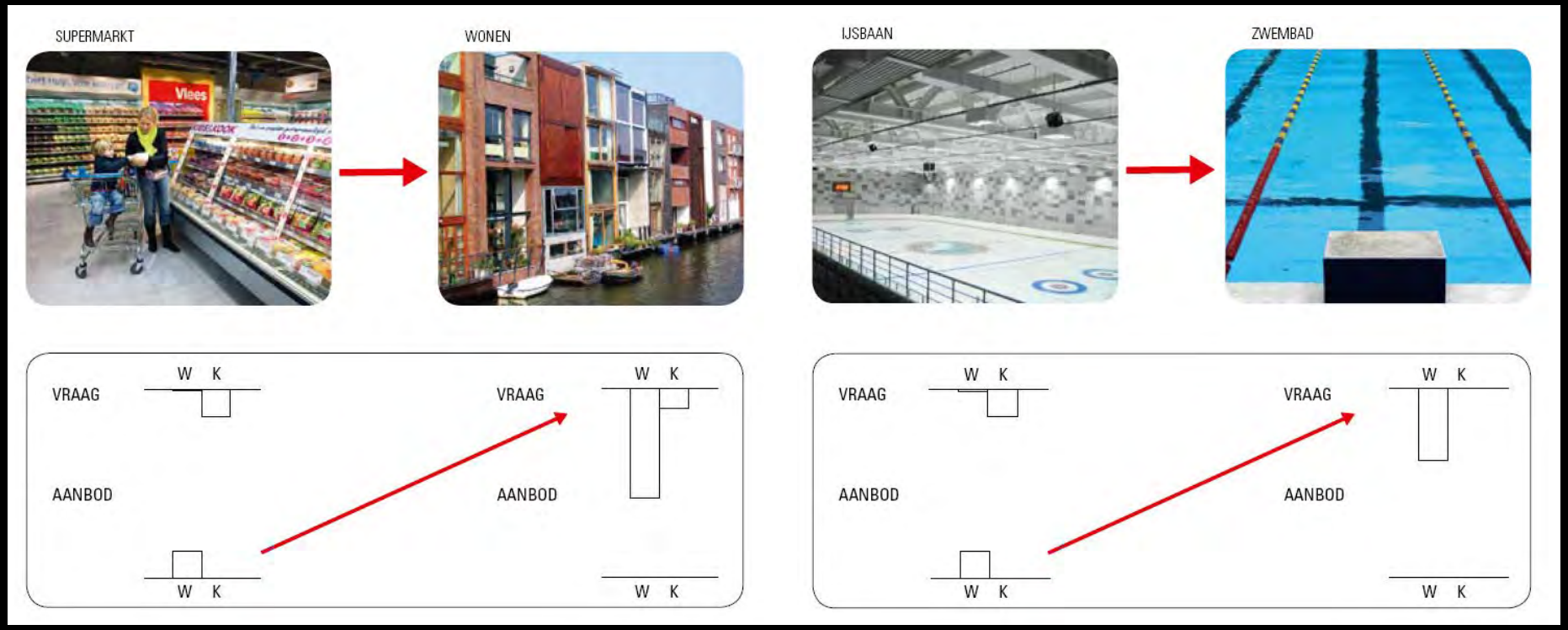


Different energy needs and left-over per program. Look for ultimate combinations

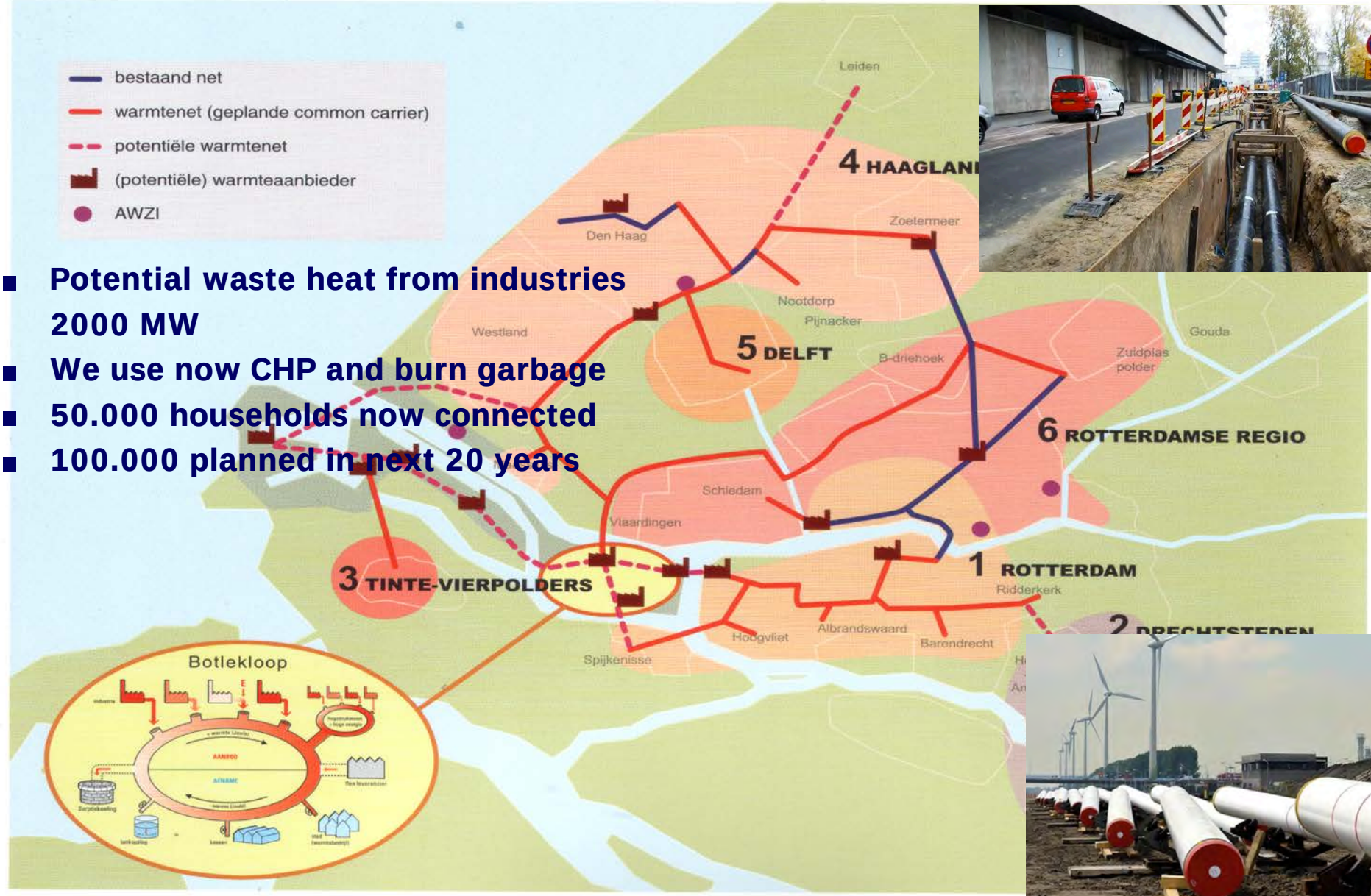


Heat cold and electricity for different programmes (changes per season)

Attuning demand and waste flows



District heating, CO2 pipelines for greenhouses, heat company founded



- **Potential waste heat from industries 2000 MW**
- **We use now CHP and burn garbage**
- **50.000 households now connected**
- **100.000 planned in next 20 years**

You can use every m2 only once (or not?)

ENERGIE PER VIERKANTE METER LAND- OF WATEROPPERVLAK	
Windmolens	2 W/m2
Offshore-windmolens	3 W/m2
Getijdenpoelen	3 W/m2
Getijdenstroom	6 W/m2
Zonnepanelen	5-20 W/m2
Gewassen	0,5 W/m2
Regenwater (hooglanden)	0,24 W/m2
Hydro-elektrische centrales	11 W/m2
Geothermisch	0,017 W/m2
Zonneschoorsteen	0,1 W/m2
Thermisch (oceaan)	5 W/m2
Concentratie van zonne-energie (woestijn)	15 W/m2

Tabel 4. Faciliteiten voor hernieuwbare energie moeten van nationale omvang zijn omdat hernieuwbare energievormen zo diffuus zijn. In deze tabel wordt de hoeveelheid energie per vierkante meter land of zee vermeld voor verschillende vormen van hernieuwbare energie.

uit David Mackay, energy without hotair

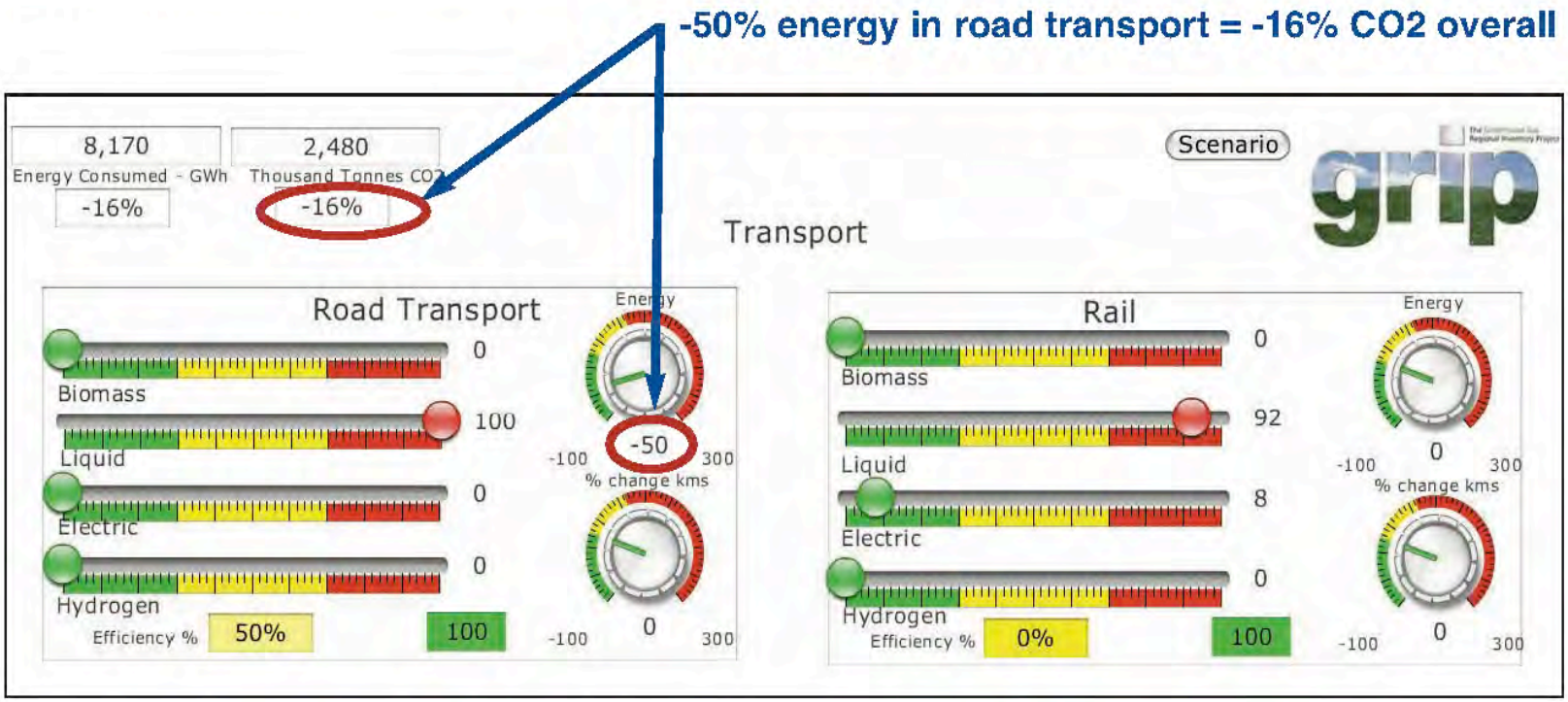
3. Energy potentialmaps per district

Energiepotenties

	DGC; 700ha	Toegepast
Zon 9640 MWh_{pr}/ha	6750 GWh_{pr}	PV, daken 12 GWh_e Zonne-collectoren, daken 25 GWh_{th}
Wind, 100m 228 MWh_e/ha	160 GWh_e	Wind, grote turbines 160 GWh_e
Wind, 30m 56 MWh_e/ha	5 MWh_e/turby	Wind, turby's 39 GWh_e
Afval, huishoudens 1,7 $MWh_{(e+th)}$/ha	1,2 $GWh_{(e+th)}$	Afval, verbranding 1,2 $GWh_{(e+th)}$
Restwarmte	Kappa 2x 125 GWH_{th}	Restwarmte Kappa 250 GWh_{th}
Biomassa Natuuronderhoud 4,7 MWh_{pr}/ha Bosonderhoud 18,9 MWh_{pr}/ha	Onderhoud DGC 2,4 GWh_{pr} Eifarm 1,1 GWh_{pr} Onderhoud omgeving 20 GWh_{pr}	Biomassa Onderhoud DGC 2,4 GWh_{pr} Eifarm 1,1 GWh_{pr} Onderhoud omgeving 20 GWh_{pr}
Bodem tot -50m verticale WW	Bodemgeschiktheid WW Zeer geschikt Geschikt	
Aquifers w/k opslag	Aquifergeschiktheid Zeer geschikt Niet geschikt Onbekend Restrictiegebeiden	
Geothermie, -3000m 105 °C	Geothermie Gasboorpunt	

Energievraag 3000 hh:
10,6 GWh_e
26,5 GWh_{th}

4. Energy sustanability scenario's for cities

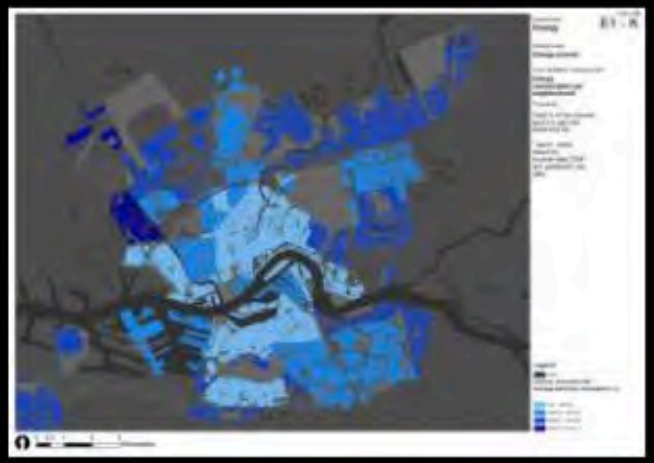


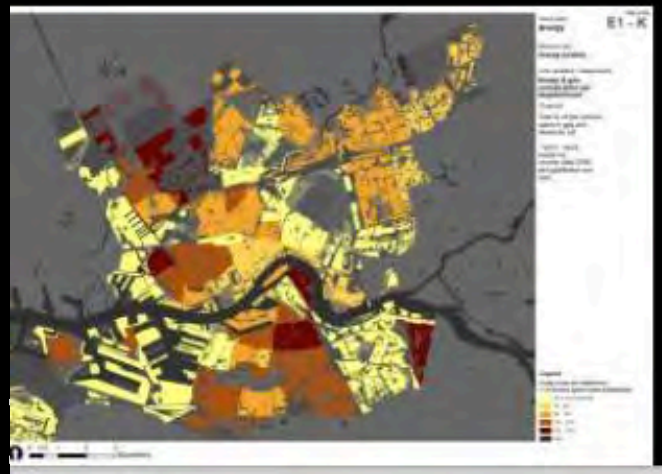
The scenario tool visualizes the effects of mitigation measures. Example: energy saving in road transport

How can we link low carbon planning to a more liveable, equitable city

High energy use, low income, energy too expensive

Possible solutions: smart meters, insulation,own production, lower rent, green loans





CO2-SLIMME STEDENBOUW IN STADSHAVENS, ROTTERDAM

OPGAVE Ontwerpend onderzoek naar de mogelijkheden voor CO2-neutrale stedenbouw in Stadshavens. Het sluiten van energie kringlopen op gebiedsschaal is onderzocht en leidt tot een herwaardering en herpositionering van verschillende programma's. Volgens de Trias Energetica: reduceren, uitwisselen en opwekken, zijn concrete maatregelen opgetekend en berekend op hun CO2-reducerend effect.

STATUS Studie 2008-2009.

CLIENT Rotterdam Climate Initiative en Projectbureau Stadshavens

ONTWERP DE URBANISTEN

i.s.m. Ingenieursbureau Rotterdam en APPM

Eén van de laadpalen in het Utrechtse project. © LomboXnet

Proef met elektrische auto als batterij voor zonne-energie

In Utrecht kunnen accu's van elektrische auto's worden gebruikt als kleine energiecentrale voor de opslag van zelf opgewekte zonne-energie. In de wijk Lombok start vandaag officieel een internationaal proefproject met nog voor het eind van dit jaar 20 lokale laadpalen. Utrecht is al akkoord met een uitbreiding tot 100 palen in de rest van de stad.

Door: Thijs van Soest 9 juni 2015, 11:43

Providing high quality flowscapes for low carbon mobility throughout the city

- Walkability
- childfriendly
- Energy advatages
- Cycling
- Public transport
- More program, economic input
- Lively streets
- Cleaner air and water
- Less heat island effect

TU Delft en UofT students work on these topics now

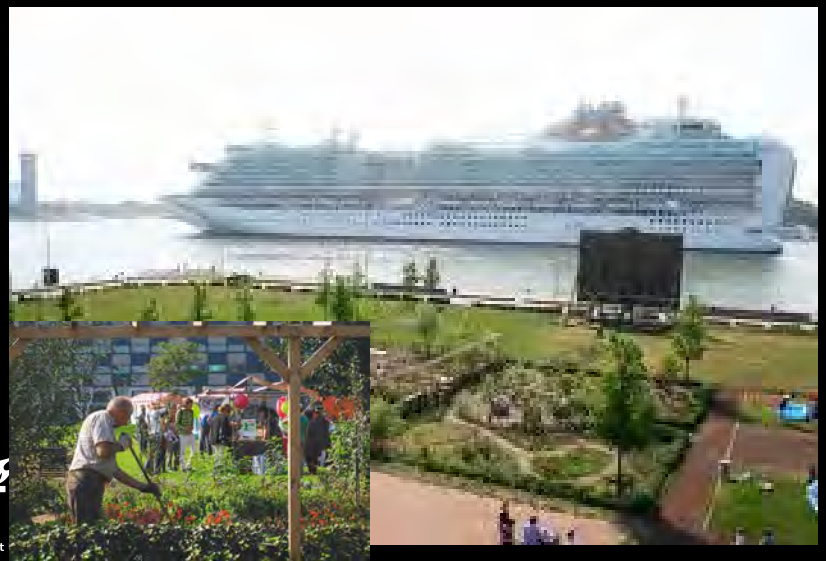
Green network with more walking and biking

- **Biking high ways**
- **Electric biking helps elderly**
- **Central Station 5500 bike storage**
- **Biking programs for migrants**
- **Bike parking spaces**
- **From 12 to 22% model split**

public transport 300 m from every home...and use grass!

Parking lot becomes green public space

Urban farming: what does the 'garden city' of the 21th look like reusing phosporus, producing biogas, social cohesion etc.



Childfriendly city 'woonerf revival ?' sidewalks go on for kids, special circulation for cars, public transport and bikes in all suburbs since 1980's

GREEN STRATEGY 05

PLAYGROUNDS

Kinderen zijn de toekomst van de stad

Hoe ben je zelf opgegroeid en wat waren jouw belangrijkste herinneringen? Met vriend
netjes buiten ravotten op het plein, klimmen in een boom, bloemen en bessen plukken kan ook in
Een kindvriendelijke buitenruimte is essentieel voor een wervend en compleet woonmilieu in de bin
vriendelijkheid heeft meer om het lijf heeft dan een aantal speelplekken te realiseren: het gaat om d
ing van de openbare ruimte. Brede stoepen, langzaam verkeer routes en drempelruimten (engels:
zones) spelen daarin een belangrijke rol. Brede stoepen bieden een informele ruimte voor spel. D
zijn overgangsgebieden tussen het privédomein en de openbare ruimte, waar kinderen beschut er
spelen. Daarnaast zijn ook specifieke voorzieningen voor allerlei doelgroepen nodig. Om de adoleso
een goede uitlaatklep te geven is er bijvoorbeeld het internationaal gewaardeerde skatepark aan
de kleinsten en allerkleinsten is er het speelplein op 't Landje en zijn er de openbare sportvelden op
werplein aan de rand van het centrum. Sport, spel en groen zijn bijzonder belangrijk voor de het
vitale en gezonde kinderen. In de speelplekkenstrategie wil de gemeente oases voor kinderen make
spelaanleidingen en voldoende zitgelegenheid. In combinatie met de verschillende leefmilieus, on
ken en voorzieningen die eigen zijn aan een binnenstad wordt het centrum zo een waar eldorado vo
kinderen.

***Kinderen zorgen voor levendigheid op straat en voor sociale contacten tussen alles en ieder
zijn de dragers van de nieuwe stedelijkheid.*** Quote Larry Beasley maart 2009

IN PROGRESS

POTENTIAL MAP 2040 & infografphics of +houses/district

'A city is a way of life'
Thank you for your attention!

twitter: nicotillie72
n.m.j.d.tillie@tudelft.nl

Photo: speeldernis Rotterdam (play wilderness)

Thank you for your attention!

n.m.j.d.tillie@tudelft.nl

@nicotillie72

TU Delft Delft University of Technology

Photo: speeldernis Rotterdam (play wilderness)

ECONETWORK
ENVISION CHARLOTTE

Brian Collier
Executive Vice President
Foundation for the Carolinas
@DBrianCollier

Leslie Rhodes
Director
Mecklenburg County Air Quality
@MeckLUESA

Nico Tillie
Professor, Landscape Architecture
Delft University of Technology
Director, European Office
World Council on City Data
@nicotillie72

MCAQ: A Local Resource for Improving Air Quality

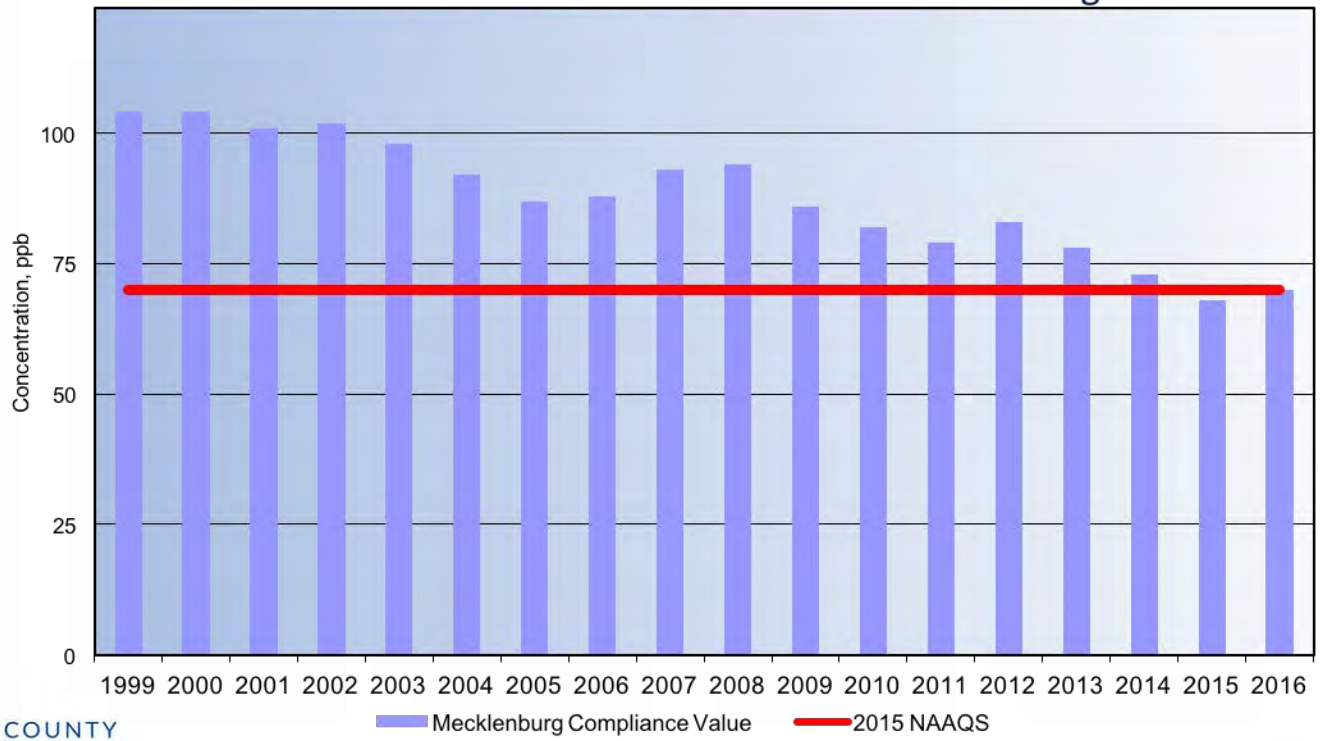
MISSION

Lead and assist Mecklenburg County towards **meeting and maintaining compliance** with the health-based National Ambient Air Quality Standards.

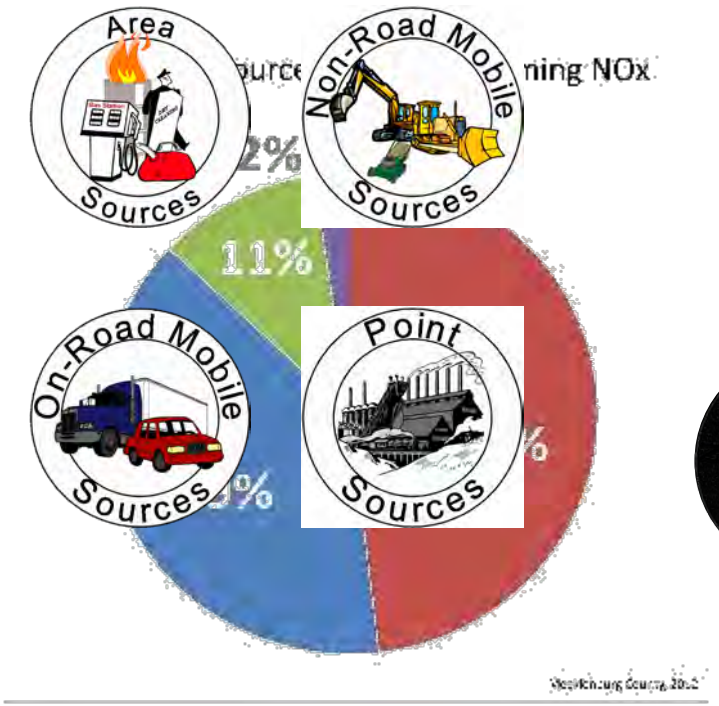
Ozone Air Quality, 1999-2016

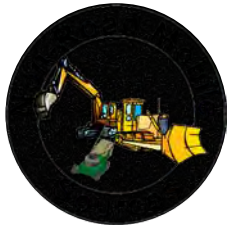
Mecklenburg County 8-hour Design Value Concentration

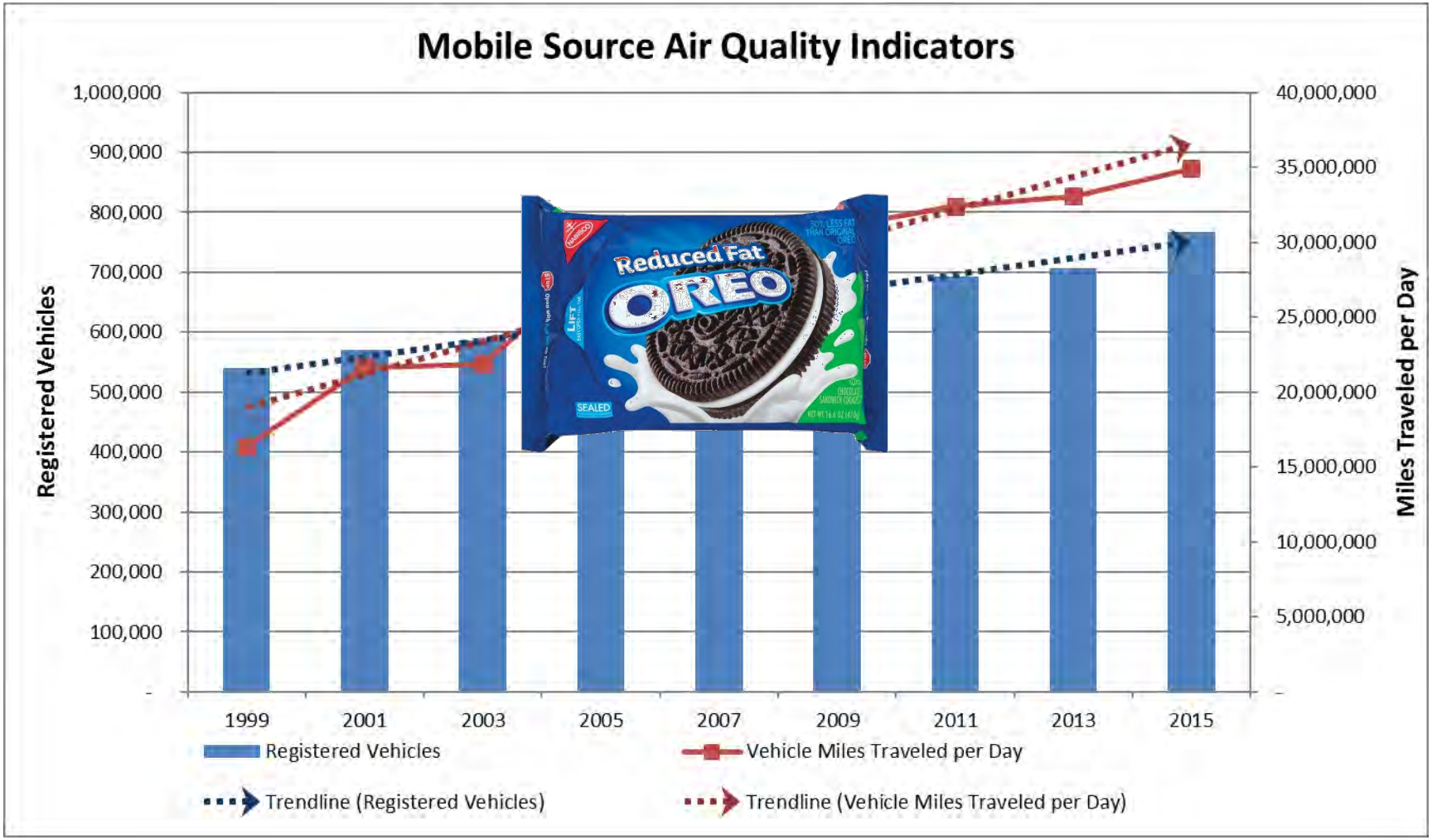
Based on Annual 4th Maximum 8-hour Average



Local Sources of NOx






Mobile Source Air Quality Indicators
Registered Vehicles
Miles Traveled per Day
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
40,000,000
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
-
1999
2001
2003
2005
2007
2009
2011
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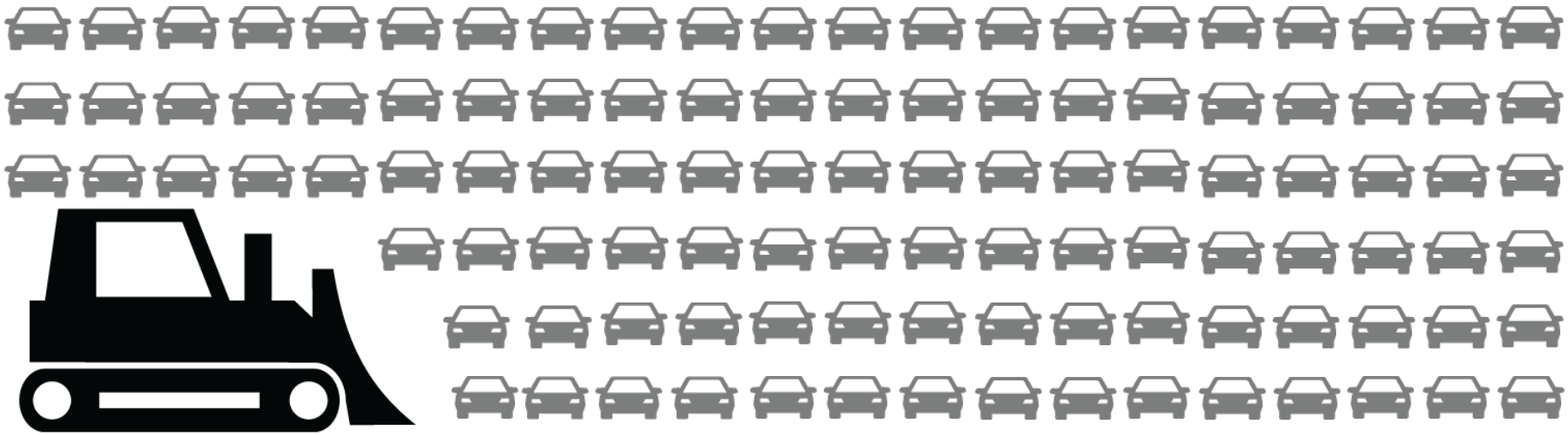
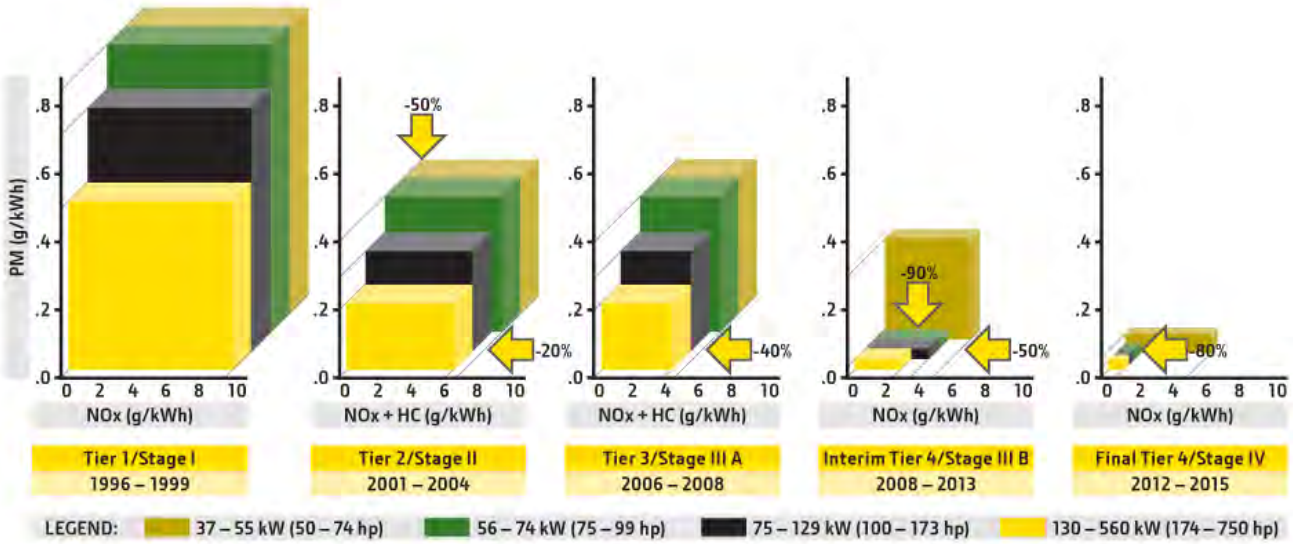
Trendline (Vehicle Miles Traveled per Day)

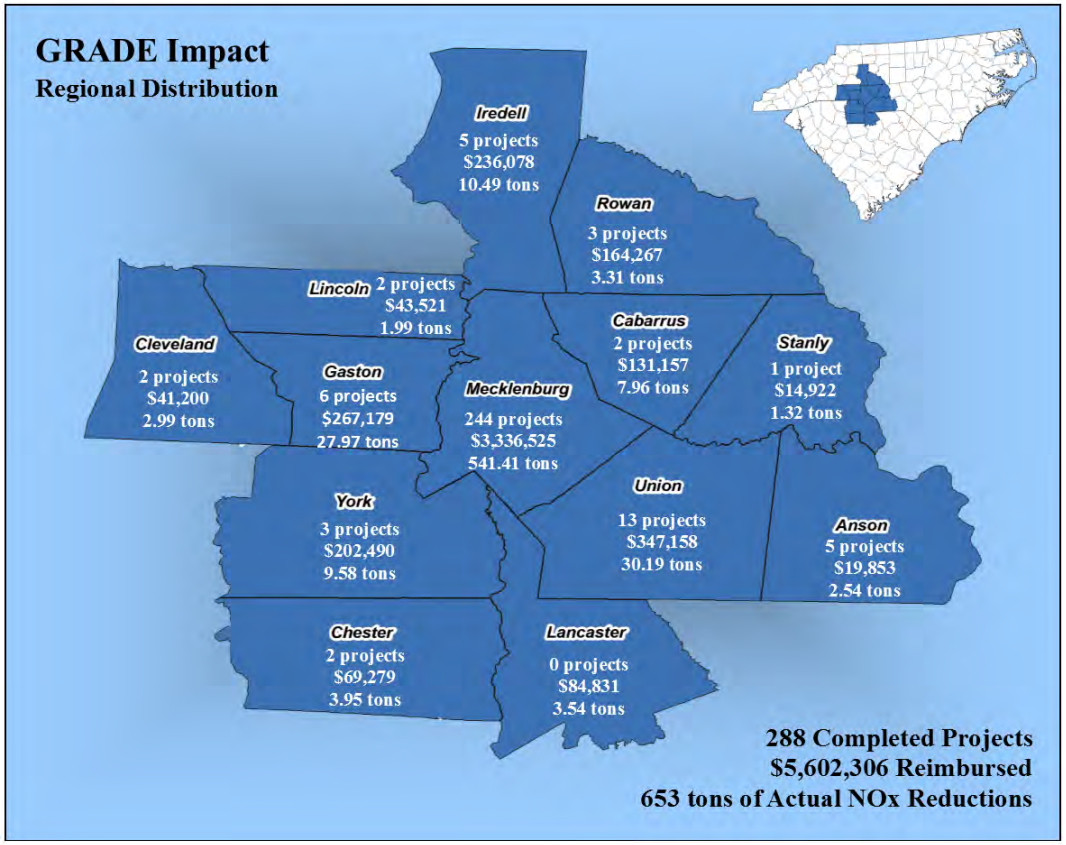


VEHICLE EMISSION STANDARDS

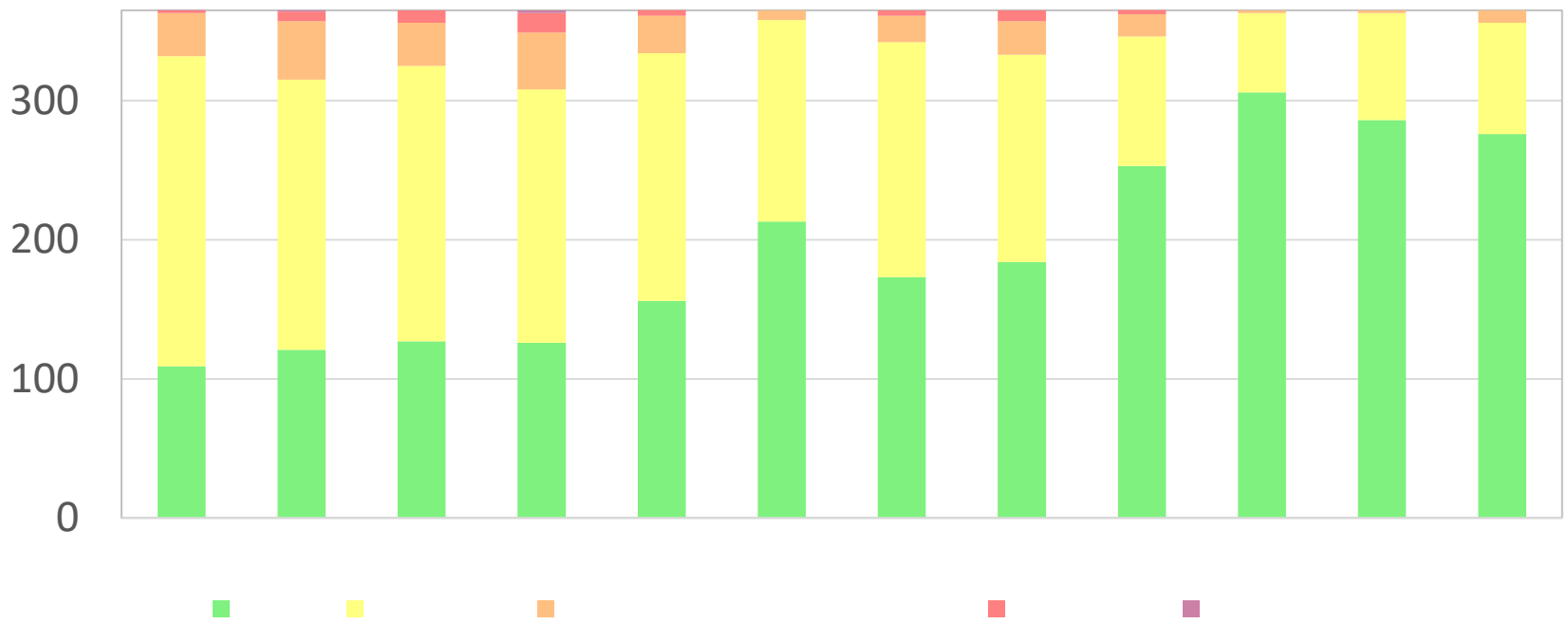


Regional Impact of GRADE

Since 2007, GRADE has funded **288 projects** and awarded over **$5.5 million** in rebates. These projects have reduced **653 tons** of ozone-forming NOx in the Charlotte region.



Good Days Have Doubled Since 2004



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Brian Collier
Executive Vice President
Foundation for the Carolinas
@DBrianCollier

Leslie Rhodes
Director
Mecklenburg County Air Quality
@MeckLUESA

Nico Tillie
Professor, Landscape Architecture
Delft University of Technology
Director, European Office
World Council on City Data
@nicotillie72

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Behavior Change Challenges

● Skip extra car trips by planning your route ahead and bundling stops.

● Instead of driving alone, carpool or hop on the bus or LYNX. If it is nice outside, bike or walk to your destination – download the new App **CATS Pass**.

● Find your Carbon Footprint
http://carbonfootprint.c2es.org

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Thank you!

Next Event will be early 2018

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