TOWARDS A NEW URBAN PARADIGM? - Conceiving the city of the future

Lecture 1: urbanization - from the diffused to the eco-city model

SUNRAISE

UNIVERSITÄT SALZBURG

Co-funded by the Erasmus+ Programme of the European Union

MSc. Marc Giménez Maranges – Department of geography and geology – University of Salzburg

Let's start with a positive message!

Tomorrow, the world is full of solutions

https://www.youtube.com/watch?v=0SI-Kyam_Jk

Urban areas: key for the attainmnt of sustainability goals?

Urban areas

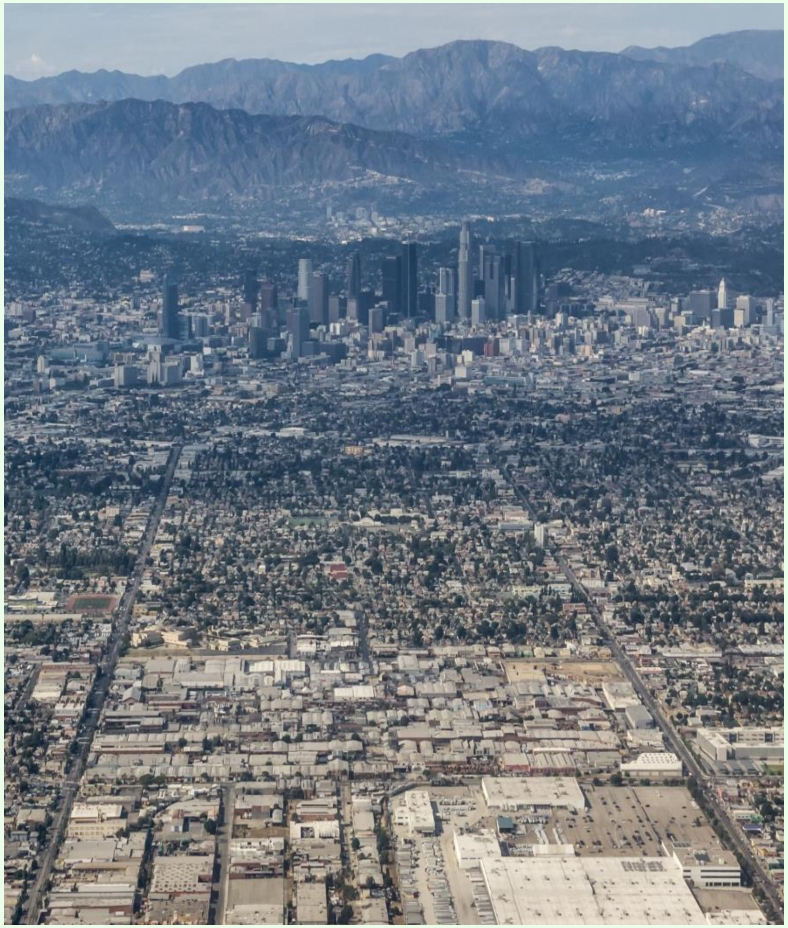
Main source of pressures on the environment

Paramount in order to generate opportunities for a more sustainable future

The diffused city model

London, UK

Shanghai, China



Los Angeles, USA

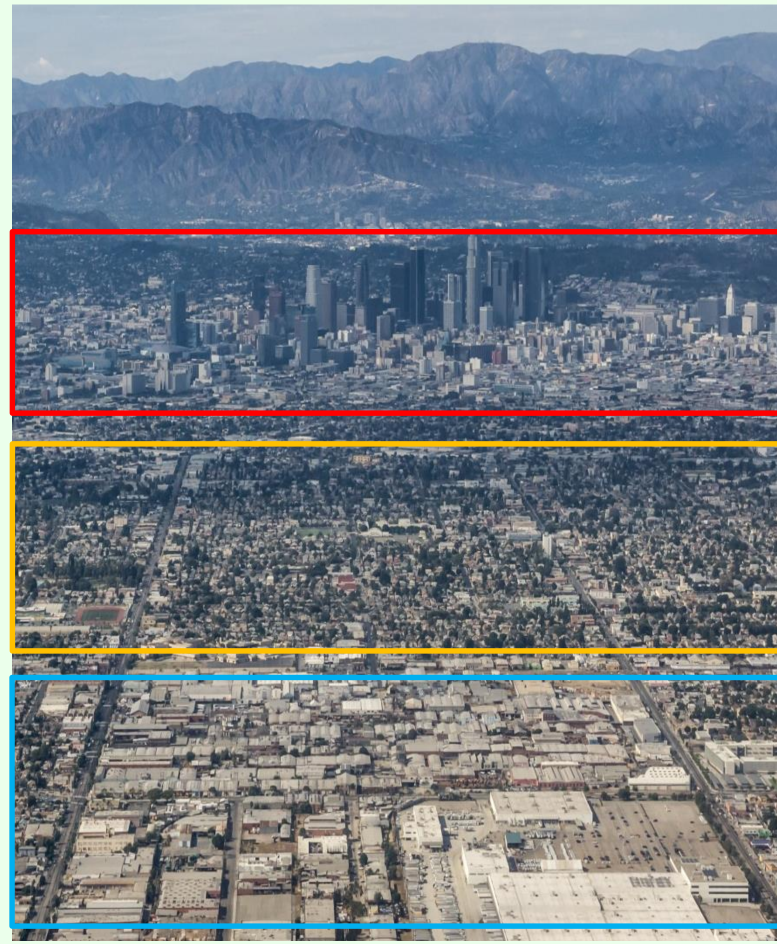
The diffused city model

Zoning of the space

Business area

Residential area

Commercial area



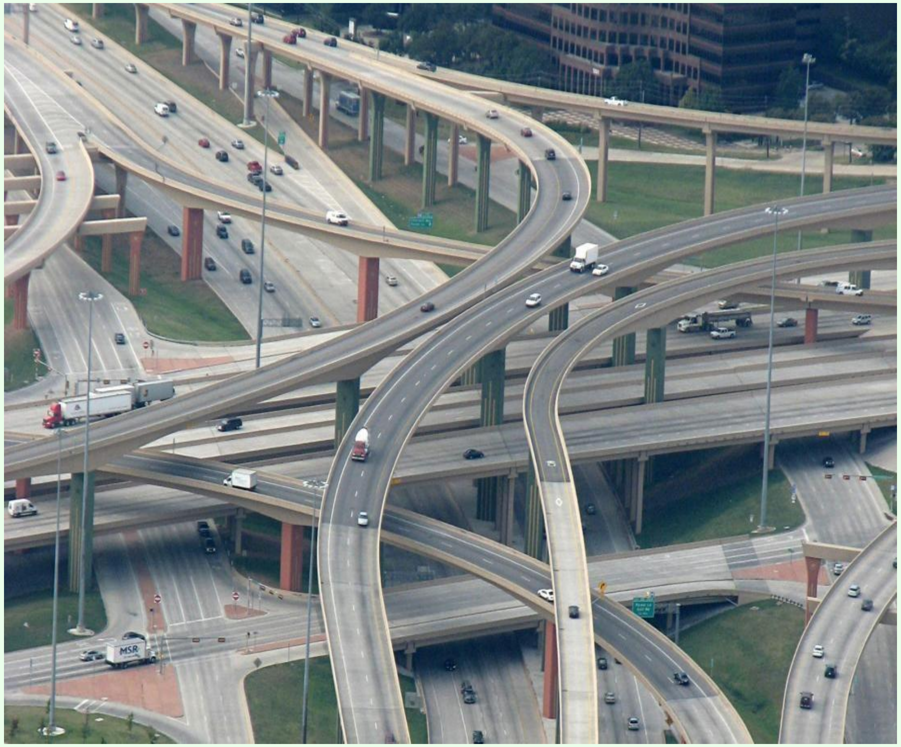
Los Angeles, USA

The diffused city model

Zoning of the space

↓

Development of the mobility network



The diffused city model

Zoning of the space

Development of the mobility network

Social problems

The diffused city model

Zoning of the space

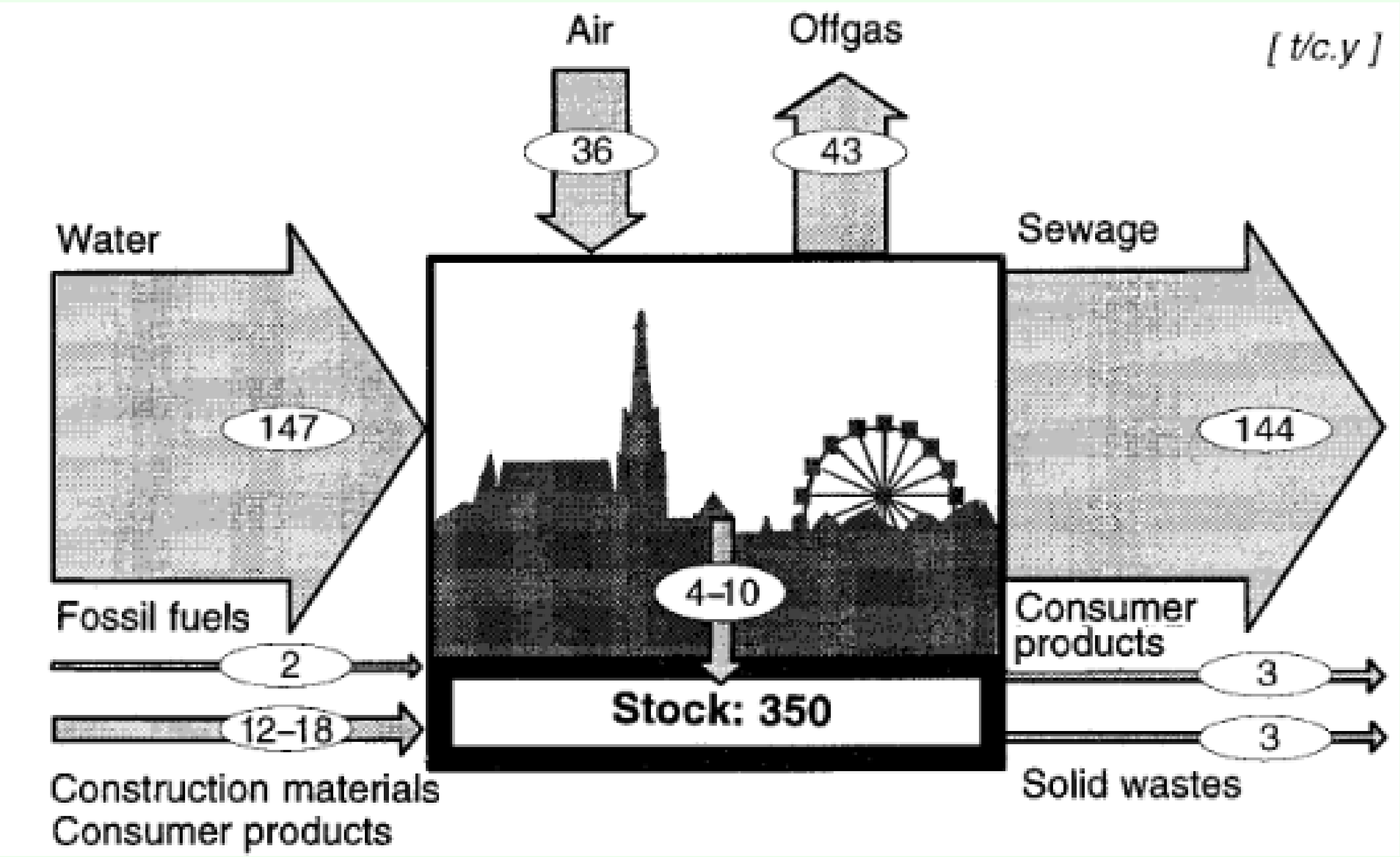
↓

Development of the mobility network

↙ ↘

Social problems | Environmental strains

Material flows in cities - the globalised city



Flows and stocks of goods in Vienna (*Daxbeck et al., 1996*)

Responses to the environmental crisis

2 main responses

International consensus (United Nations)

Private sector

3rd response → Calls for profound and radical changes

Responses to the environmental crisis

2 main responses

International consensus (United Nations)

1 Earth Summit held in Rio de Janeiro in 1992 → 2 Agenda 21/ Aalborg Charter → 3 Creation of numerous demonstration urban development projects

Concept of eco-city was introduced

Sets of principles and traits of sustainable cities were proposed

BUT: Processes trapped in a cycle of challenges

Agenda 21 Local

Responses to the environmental crisis

2 main responses

International consensus (United Nations)

The compact city model

1 Articulation of mixed-use compact nodes

2 Nodes are connected to each other through effective public transport

Responses to the environmental crisis

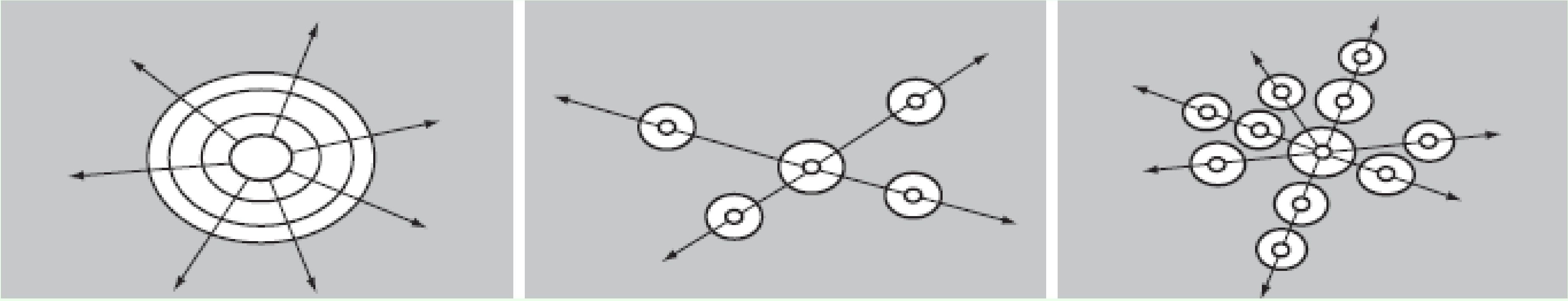
2 main responses

International consensus (United Nations)

The decentralized concentration model

1 Several centres throughout the territory

2 Avoidance to concentrate all functions in a single urban unit

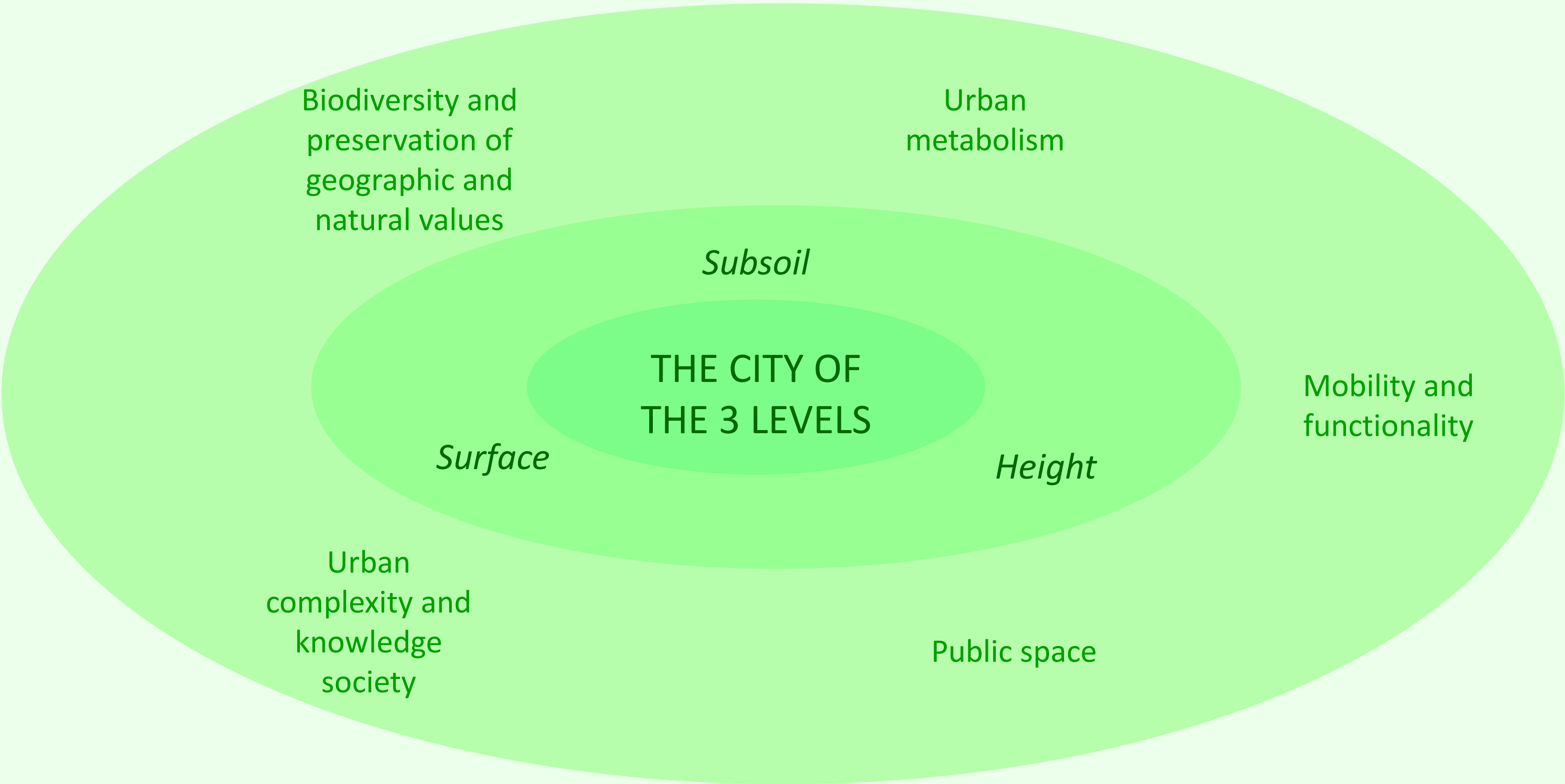


Only one central node | Small and multiple central nodes | Dispersed nodes

(Graham and Hunter, 1994)

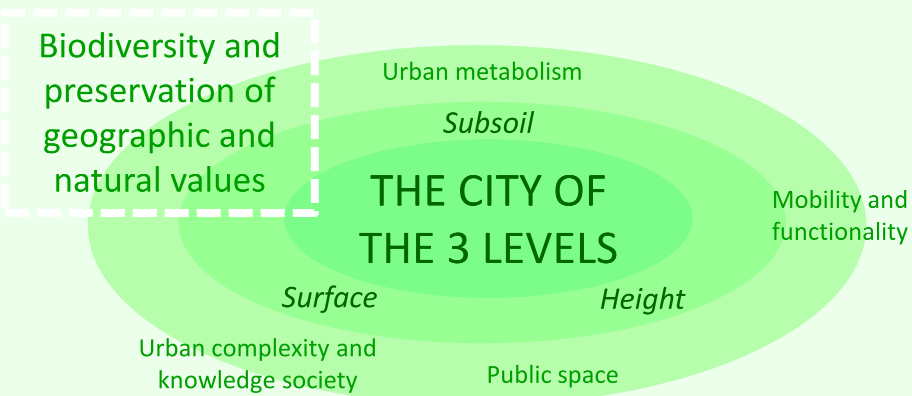
Responses to the environmental crisis

The city of the 3 levels (Salvador Rueda)



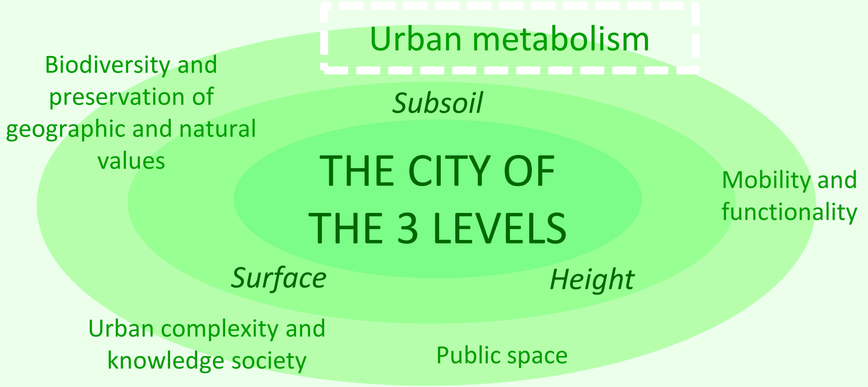
Responses to the environmental crisis

The city of the 3 levels (Salvador Rueda)



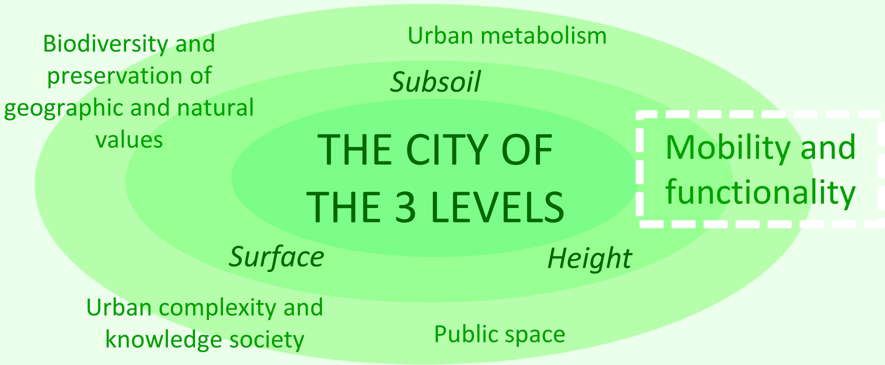
Responses to the environmental crisis

The city of the 3 levels (Salvador Rueda)



Responses to the environmental crisis

The city of the 3 levels (Salvador Rueda)



Responses to the environmental crisis

The city of the 3 levels (Salvador Rueda)

Biodiversity and preservation of geographic and natural values

Urban metabolism

Subsoil

THE CITY OF THE 3 LEVELS

Mobility and functionality

Surface

Height

Urban complexity and knowledge society

Public space

Responses to the environmental crisis

The city of the 3 levels (Salvador Rueda)

Biodiversity and preservation of geographic and natural values

Urban metabolism

Subsoil

THE CITY OF THE 3 LEVELS

Mobility and functionality

Surface

Height

Public space

Urban complexity and knowledge society

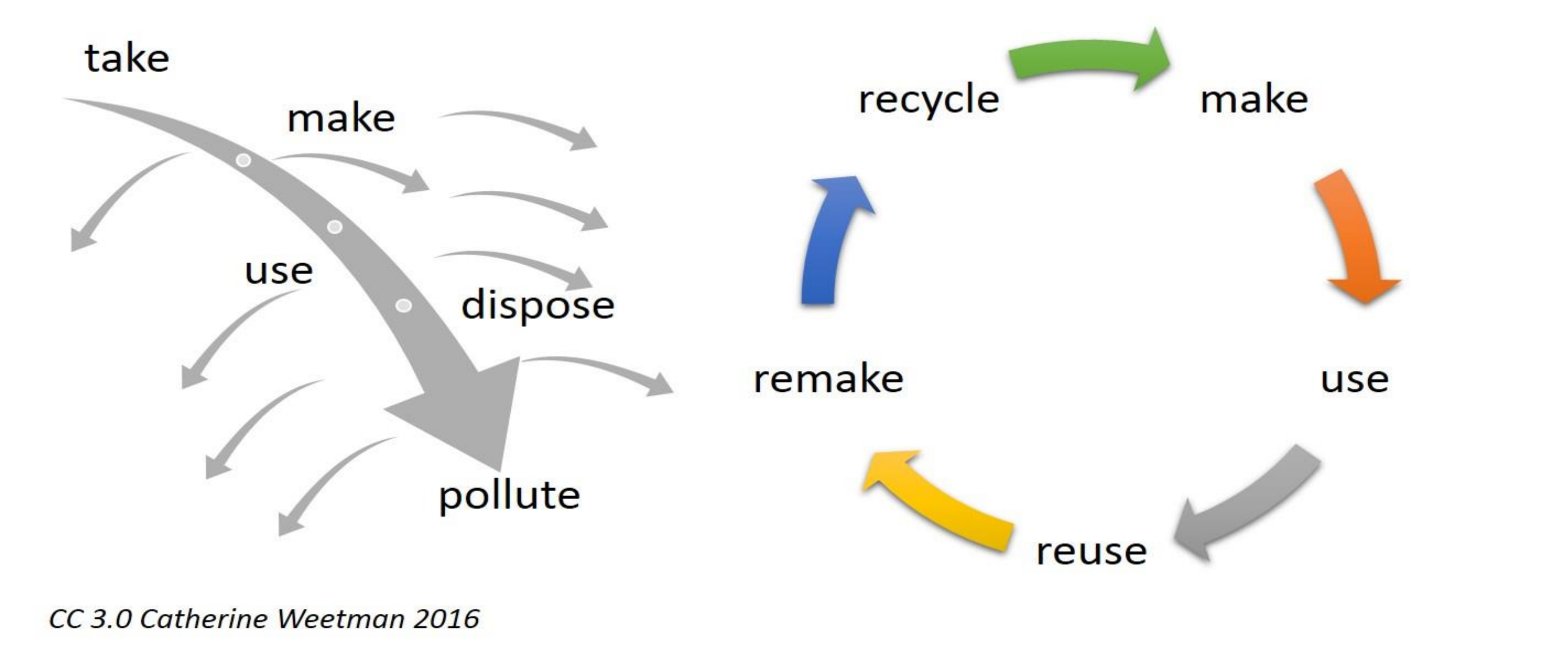
Responses to the environmental crisis

Other concepts: the example of the circular economy

https://www.ellenmacarthurfoundation.org/circular-economy/concept

Linear model

Circular model



Responses to the environmental crisis

2 main responses

Ecological modernisation

Private sector

1 Emergence during the 1980s and 1990s → Multinational corporations wield more power than national governments

2 Market-based system of consumption and production is not incompatible with environmental reforms

3 Business language and concepts are used

Eco-cities

What is an eco-city?

Requirements to be met by an eco-city (Eco-city World Summit, 2008):

1. Ecological security
2. Ecological sanitation
3. Ecological industrial metabolism
4. Eco-scape
5. Ecological awareness

Eco-city of Dongtan, China

Eco-cities

What is an eco-city?

Actions needed for the development of eco-cities (Łobejko et al., 2015):

1. Provide safe water, sanitation, etc.
2. Build cities for people
3. Identify ecological sensitive areas, etc.
4. Design cities for energy conservation, renewable energy uses and the reduction, re-use and recycling of materials
5. Build cities for safe pedestrian and non-motorized transport use

Masdar City, United Arab Emirates

Eco-cities

What is an eco-city?

Actions needed for the development of eco-cities (Łobejko et al., 2015):

6 Encourage investment in eco-city building

7 Provide education and training programs

8 Create a government agency at each level

9 Address global heating, etc. in the plans and actions of all institutions

10 Share experiences, lessons and resources

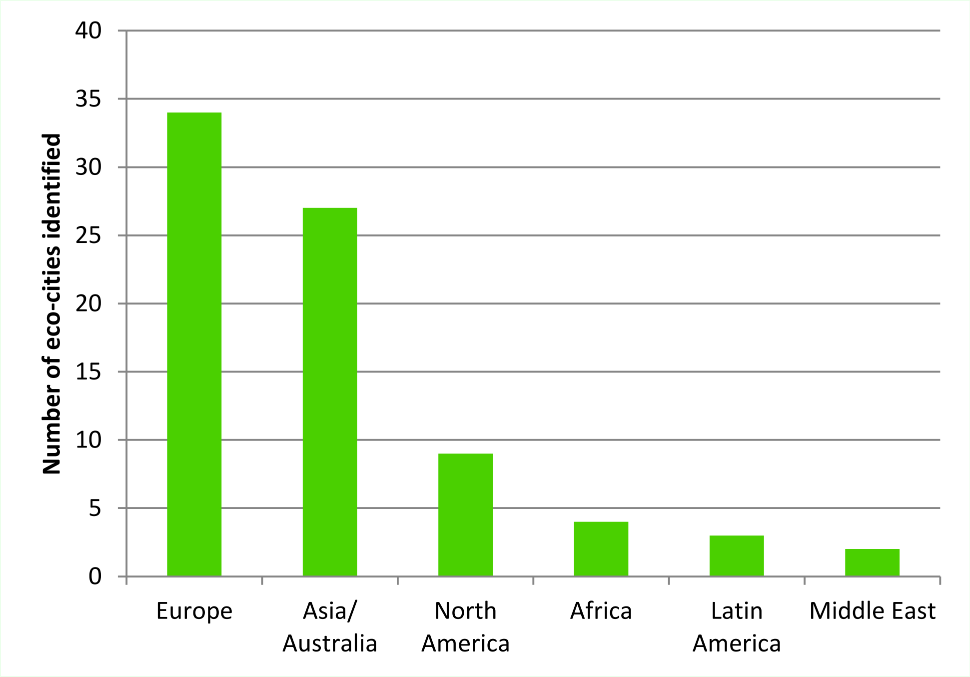
BedZED, UK

Eco-cities

Current trends

Joss (2009) identified:

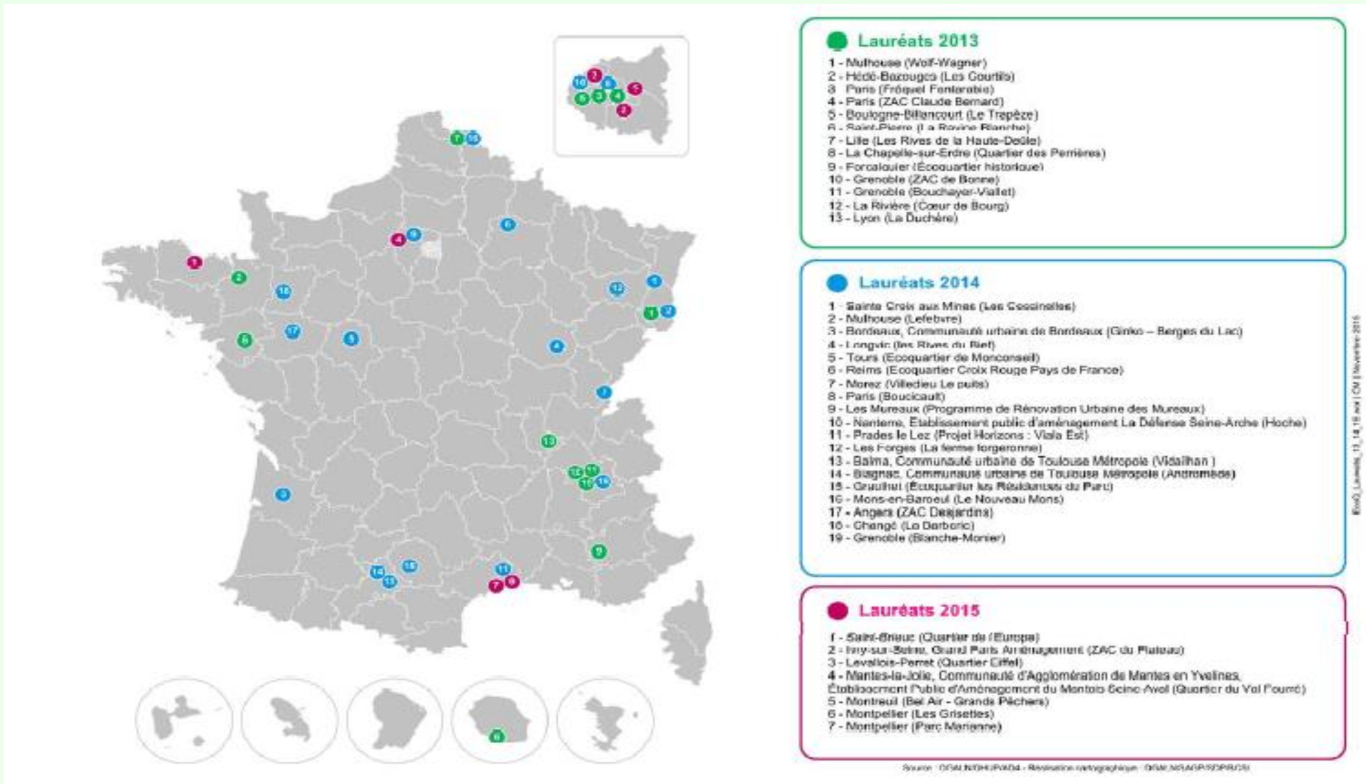
- 79 eco-city initiatives around the globe (autumn 2009)
- In Europe, most eco-cities in Scandinavian countries, the UK and Germany
- Over ¼ of the eco-city initiatives have been implemented



Number of eco-quarters identified by Joss (2009) per geographical region

Eco-cities

Current trends



Districts awarded as eco-quarters in France between 2013 and 2015 (*Ministry of Housing, Territorial Equality and Rurality of the French Republic, 2015*)

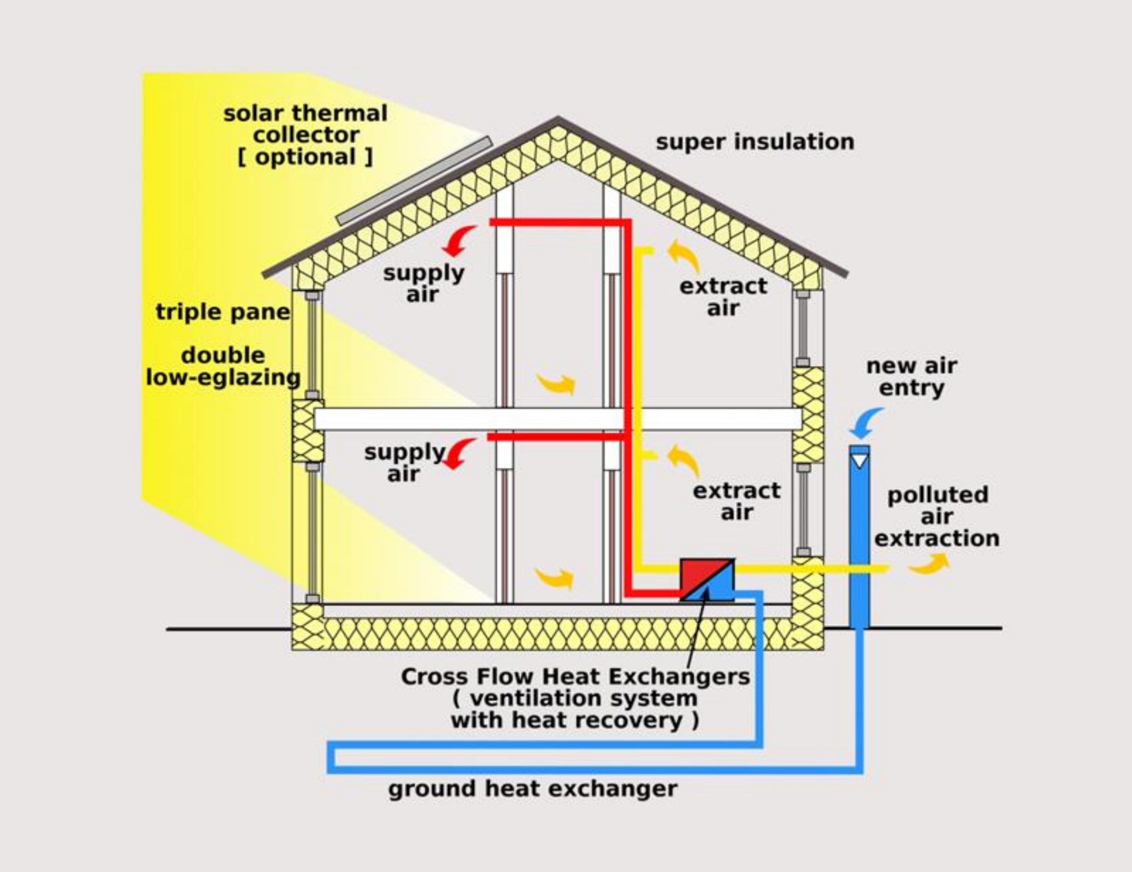
Eco-cities

The example of Freiburg im Breisgau

Eco-cities

The example of Freiburg im Breisgau

Energy saving



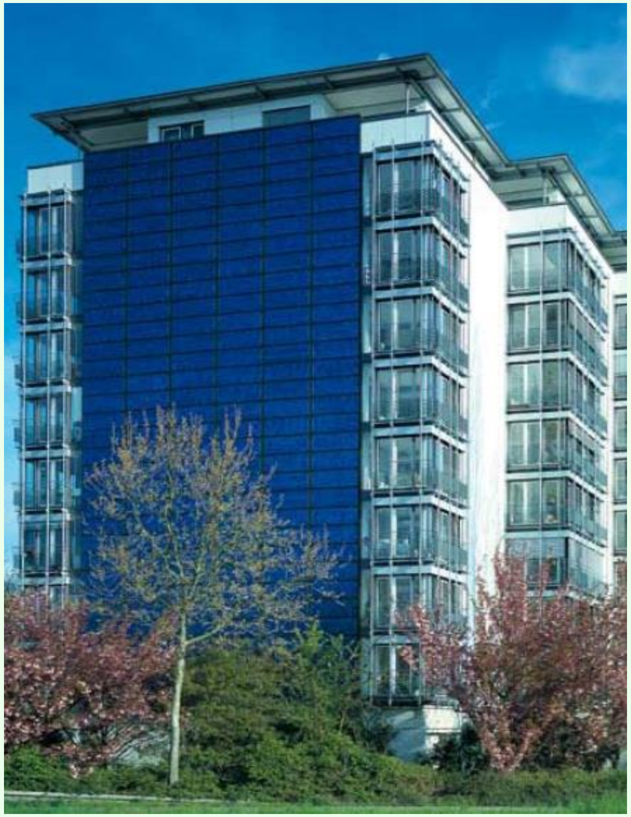
Eco-cities

The example of Freiburg im Breisgau

Renewable energy sources

Football stadium of Freiburg *(Management Marketing FWTM Freiburg, 2018)*

Solar city hall (*City of Freiburg, 2008*)



Solar facade of the residential complex at Wilmersdorfer Street (*City of Freiburg, 2008*)

The Heliotrope

Eco-cities

The example of Freiburg im Breisgau

Renewable energy sources

1 **Solar power plant, micro gas plant Eichelbuck**
ASF Solar/badenova AG & Co. KG

2 **Biogas plant**
RETERRA Freiburg GmbH

3 **CHP for heat supply of Landwasser**
badenova AG

4 **Wood pellet steamer & Energie Management System**
Pfizer Manufacturing Deutschland GmbH

5 **E-Mobility**
IKEA Deutschland GmbH & Co. KG

6 **Hydrogen station**
Fraunhofer ISE

7 **Smart2Grid (CHPs)**
Fraunhofer ISE

8 **Elektrolyseur – Power to Gas**
Fraunhofer ISE

9 **Technology and Competence Centre for Renewable Energy**
Solar Info Center

10 **Solar power plant Messe Freiburg**
FWTM GmbH & Co. KG

11 **Solar power plant St. Gabriel**
ASF Solar

12 **Gas and steam turbine plant**
Wärmeverbundkraftwerk Freiburg GmbH

13 **Power generation out of waste water** (planned)
IMTEK/Solvay Acetow GmbH

14 **Expansion „Technische Fakultät"** (planned)
Albert-Ludwigs-Universität Freiburg

15 **CHP**
Micronas GmbH

Green industry park
(Management Marketing FWTM Freiburg, 2016)

Eco-cities

The example of Freiburg im Breisgau

Transport

Management Marketing FWTM Freiburg, 2016

Eco-cities

The example of Freiburg im Breisgau

Public involvement

Management Marketing FWTM Freiburg, 2016

Eco-cities

The example of Freiburg im Breisgau

International reputation/ eco-tourism

Fraunhofer Institute for Solar Energy Systems

Eco-tourism in Freiburg *(Management Marketing FWTM Freiburg, 2016)*

Eco-cities

The example of Freiburg im Breisgau

Eco-district of Vauban – energy

Eco-cities

The example of Freiburg im Breisgau

Eco-district of Vauban – transport

Eco-cities

The example of Freiburg im Breisgau

Eco-district of Vauban – transport

Car-free areas

(https://freiburg-vauban.de/en/traffic/)

Eco-cities

The example of Linz

Eco-cities

The example of Linz

The SolarCity – energy

Eco-cities

The example of Linz

The SolarCity – water

Eco-cities

The example of Linz

The SolarCity – transport

Eco-cities

The example of Linz

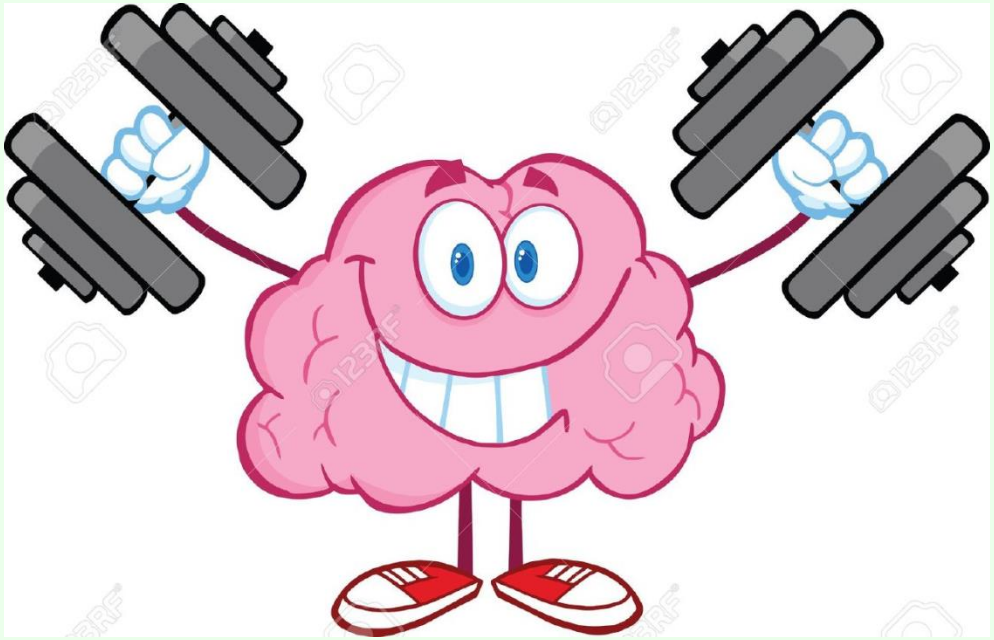
The SolarCity – landscape and urban planning

Eco-cities

Exercise 1 (SE 1)

Please gather in groups and prepare yourself for an exciting quiz on strategies for the sustainability of cities.

We will have three group, 1 hour and lots of points to deliver. And the most important thing: one winner. Who will be the winner? You decide!



THANKS FOR YOUR ATTENTION!!

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TOWARDS A NEW URBAN PARADIGM? - Conceiving the city of the future

Lecture 2: transitioning towards a more sustainable urban paradigm

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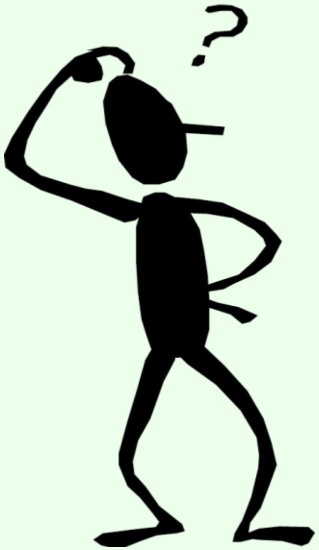
Criticisms to eco-modernisation

In-class discussion 1

Now, it is time to discuss! Please gather in groups and discuss on your conclusions. Afterwards, discuss your ideas with the rest of your classmates.

1. Do you think that the eco-city approach suffices for the attainment of a more sustainable urban paradigm? Think on the strengths and weaknesses of the eco-city concept.

Time: 30 minutes



Criticisms to eco-modernisation

Eco-cities – really ecological?

- Number of not fulfilled ecological demands
- Technological focus, social issues generally disregarded
- No change on residents' behaviour
- Ideal city model → problematic
- Eco-modernisation has reached its limits
  ↘ Positive outcomes, but questionable when compared to the effects of economic growth

Criticisms to eco-modernisation

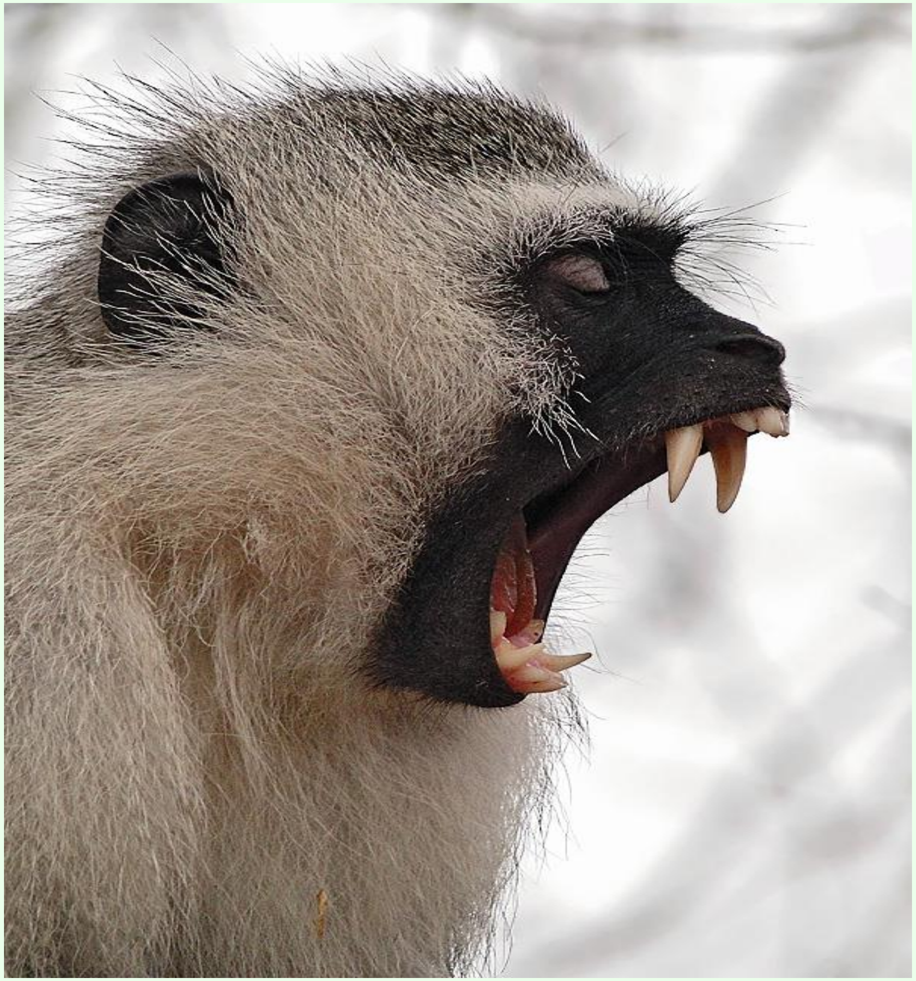
Need for radical change?

Current approaches:

- Inability to respond to the underlying problems
- Exclusion of alternative visions

↓

Is a drastic and systemic transformation necessary?



Alternative paradigms

Regenerative sustainability paradigm

A new understanding of sustainability

- Development approach based on how nature works
- World as an ever-changing set of processes
- Humans and nature are partners in the processes of co-creation

Alternative paradigms

Regenerative sustainability paradigm

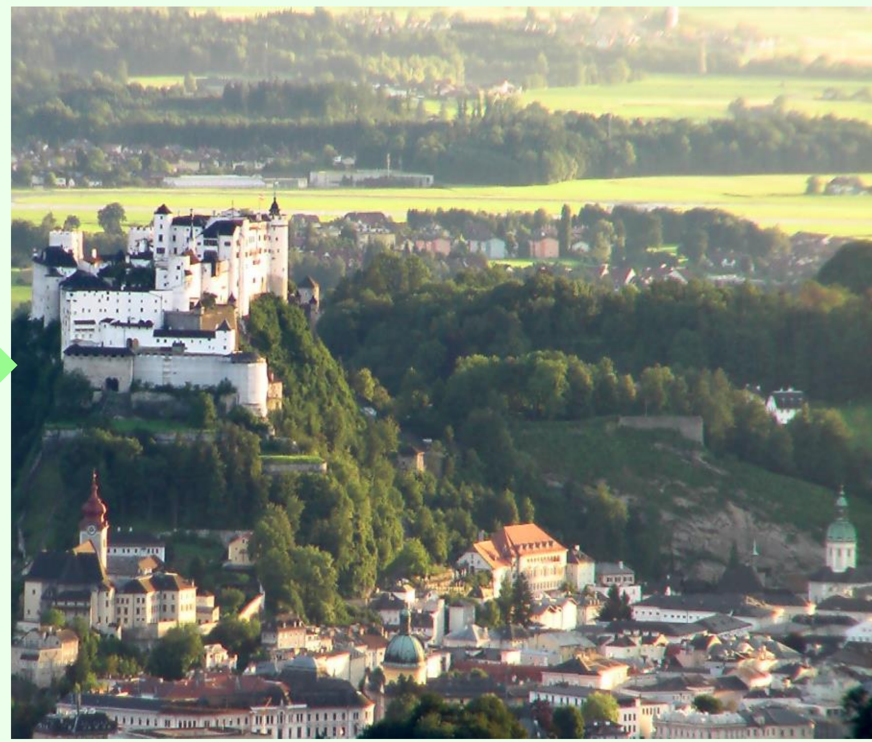
Main ideas

- Humans are part of nature
- There is no set of ideal 'sustainability' conditions that should be maintained
- It is sought to create cities and building that function as ecosystems
- It is sought to generate positive impacts on the remaining environment
- Place is at the core of human life
- All stakeholders, including citizens are involved in the design of place

Alternative paradigms

Regenerative sustainability paradigm

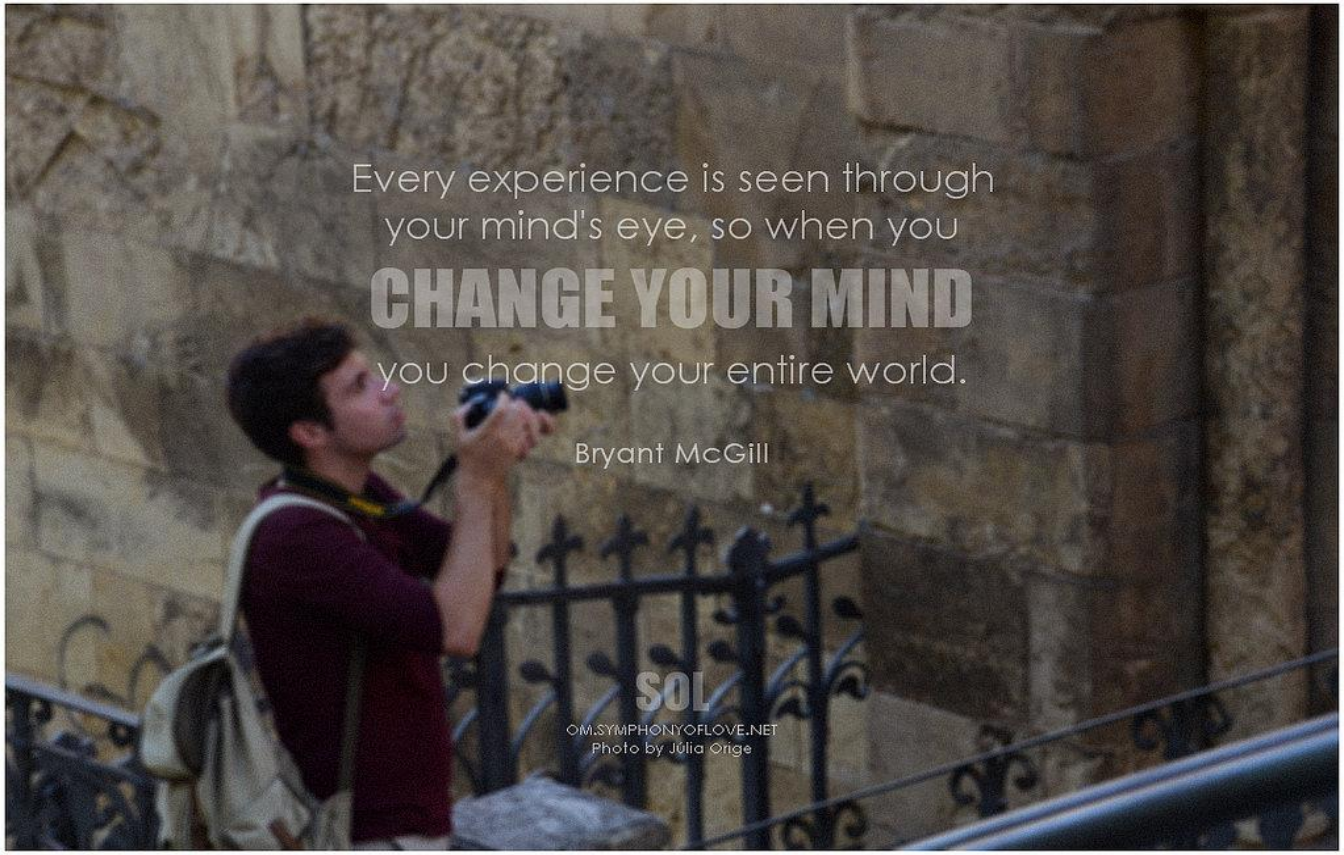
The compact city model and the reconciliation between the city and nature – incompatible?



Alternative paradigms

Regenerative sustainability paradigm

Transition to a regenerative paradigm (Mang and Reed, 2012)



Alternative paradigms

Regenerative sustainability paradigm

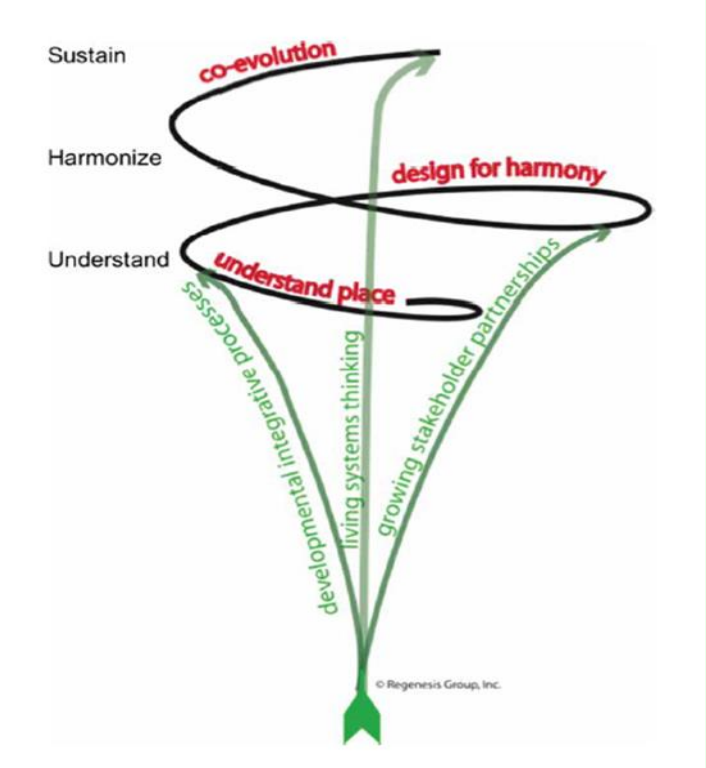
Transition to a regenerative paradigm (Mang and Reed, 2012)

1 Phase 1: understanding and conceptualising the right relation to place

- Determine the extension of a place
- Discern the core of a given place
  → Emergence of a story of place
- Relate the stories → Invite local participants to test the initial candidate
- Generate a concept from understanding

2 Phase 2: designing for harmony with place

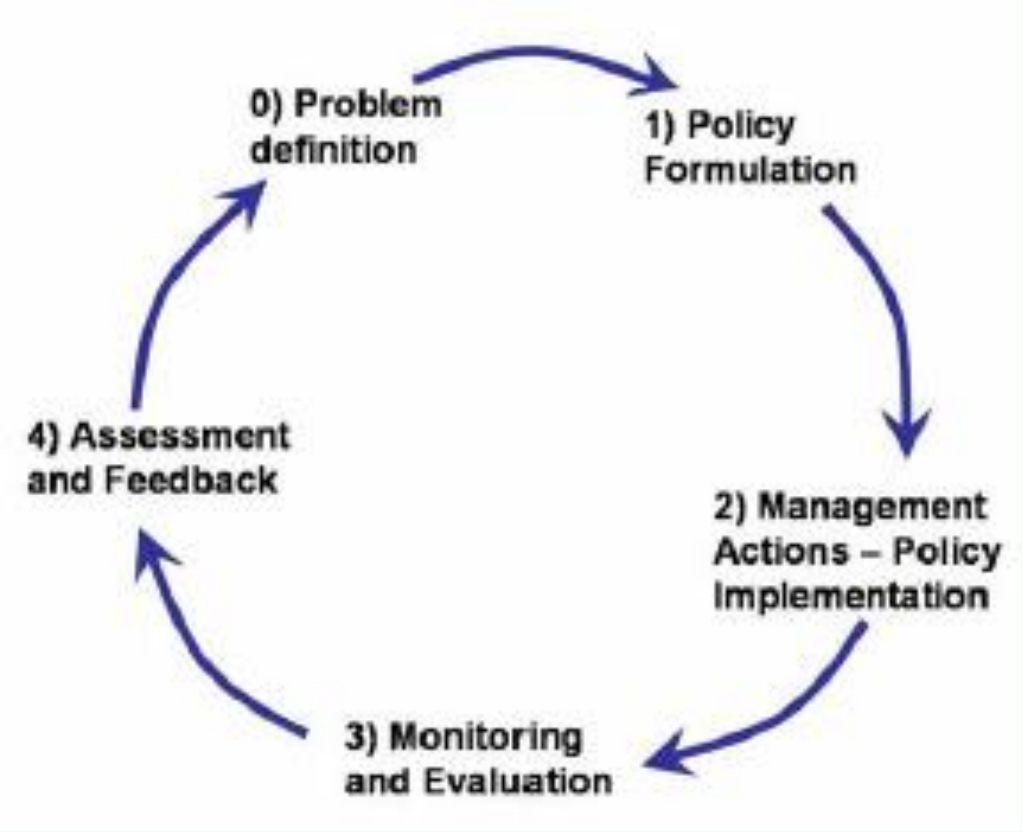
3 Phase 3: co-evolution



Regenerative framework
(Mang and Reed, 2012)

Alternative paradigms

Adaptive management



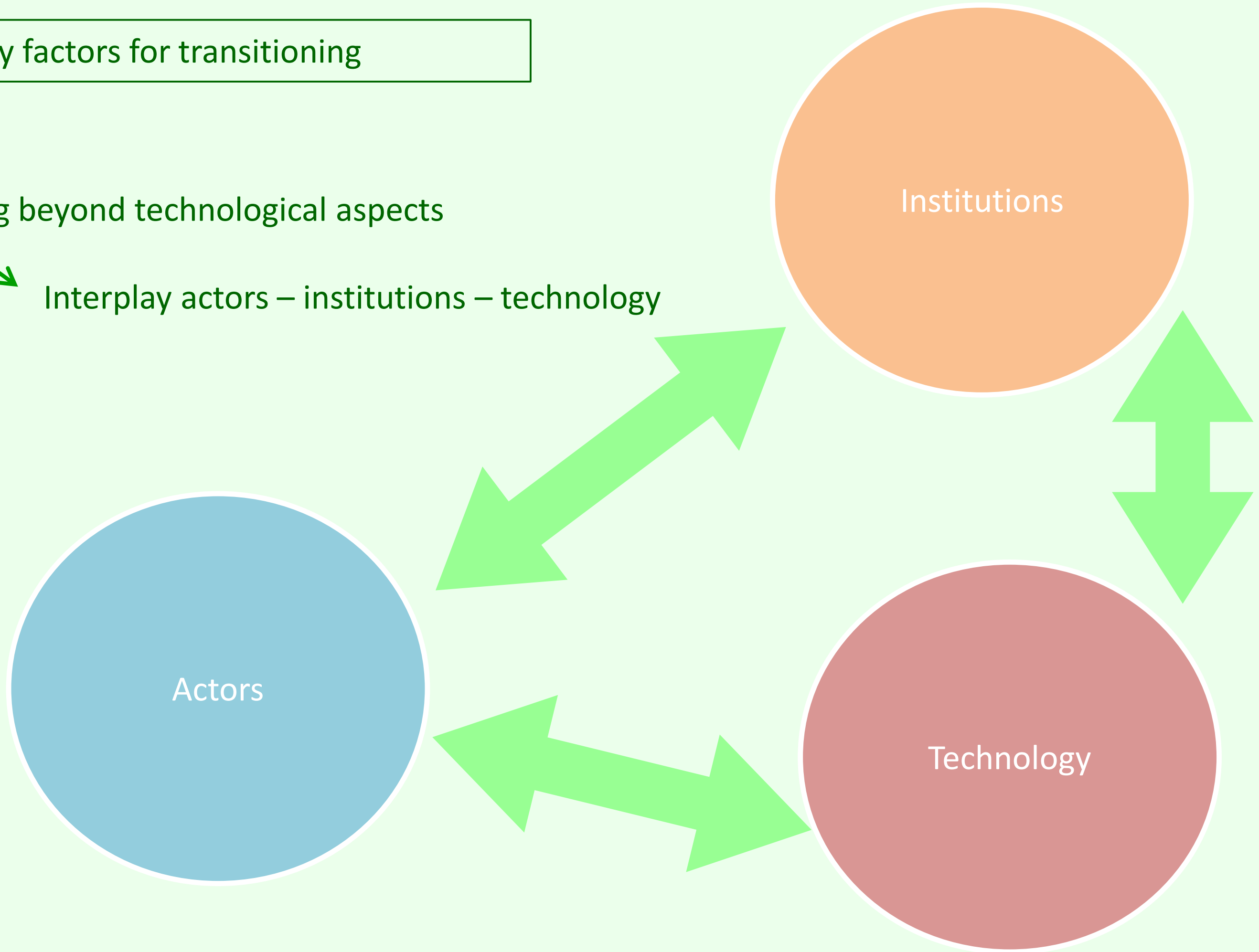
Iterative cycle of policy development and implementation in adaptive management
(Pahl-Wostl et al., 2008)

In the transition to...

Key factors for transitioning

- Going beyond technological aspects

  ↘ Interplay actors – institutions – technology



In the transition to...

Key factors for transitioning

- Influence of frames of reference

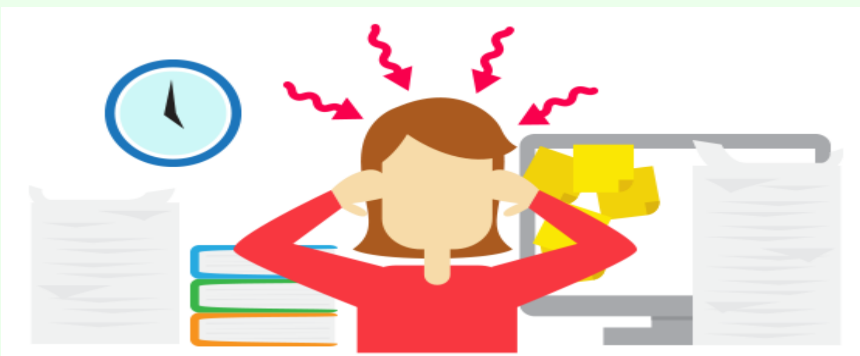
- Feeling of powerless

In the transition to...

Key factors for transitioning

Knowledge

http://www.ted.com/talks/tim_jackson_s_economic_reality_check (Minute 8:22 to 9:51)



OPEN ACCESS

Vested interests

In the transition to...

Key factors for transitioning

- Changes are not to be enforced

- Involving a broad range of actors

In the transition to...

Key factors for transitioning

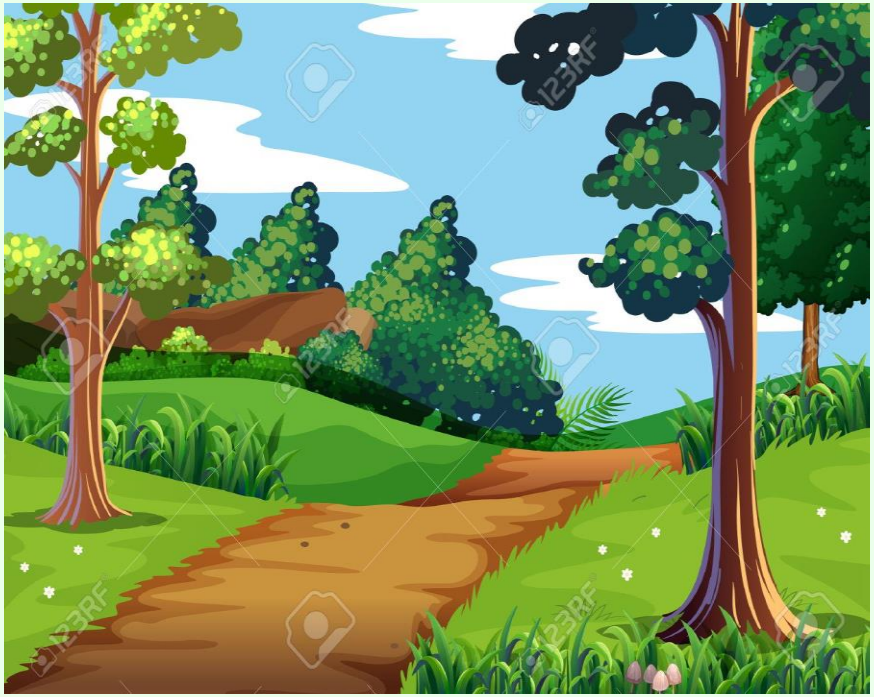
- Frontrunners/ leadership

- Selection of actors?

In the transition to...

Key factors for transitioning

Place



Protected spaces

In the transition to...

Action for transitioning

Institutional work

"The purposive action of individuals and organisations aimed at creating, maintaining and disrupting institutions" (Lawrence and Suddaby, 2006)

Three categories:

- Creating work
- Maintaining work
- Disrupting work

In the transition to...

Action for transitioning

Transitioning steps (Rogers et al., 2015)

For radical change:

1. First step: generating understanding, collating evidence, etc.

2. Second step: carrying on with the latter, and constructing values, generating policy shifts, etc.

In the transition to...

A panacea?

Transition processes have to be adapted in every context!

In the transition to...

A utopia?

It is not the first time...

Renaissance

French revolution

Conclusions

Key ideas

- Centrality of urban areas for the attainment of sustainability goals
- Current urbanisation trends (diffused city) entail a myriad of social and environmental challenges
- New forms of urbanisation are endorsed and implemented: emergence of eco-modernisation and eco-cities
- Positive outcomes, but insufficient to tackle the existent challenges: radical change is necessary
- Need for a new worldview, a reconciliation with place, new governance structures, etc.
Need for a transition to a new paradigm (e.g. regenative sustainability paradigm)

IS THIS TRANSITION UNFOLDING??

Conclusions

Towards a new paradigm

Existing initiatives

Windmills in Denmark (1970s)

Conclusions

Towards a new paradigm

Existing initiatives

Solar energy in Austria (1970s)

Conclusions

Towards a new paradigm

Existing initiatives

The transition towns movement https://www.youtube.com/user/TransitionTowns

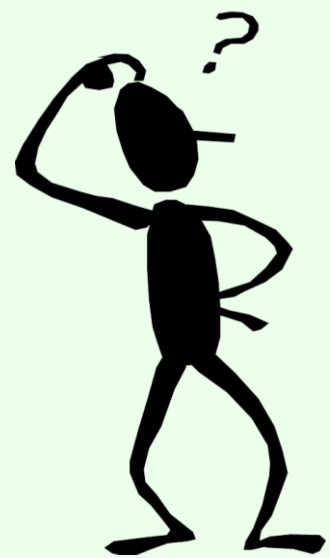
Conclusions

Exercise/ preparation at home 2

Please gather in groups and discuss on the following question. Develop your arguments on the basis of the knowledge gained through the video on the transition towns network that you have previously watched.

1. You are very environmentally engaged and want to start with a grassroots initiative for the transformation of the urban area where you live. Think of how you would start a grassroots initiative, for a more sustainable urban development. Not least, think of: 1) the topic which you would like to develop (energy, etc.); 2) how you would start with the grassroots process (gathering of people); 3) how you would arrange the decision process; 4) how you would keep people engaged, etc.

Time: 1 hour and 30 minutes



Conclusions

Oral presentation 1

It is time to present your results! Please present your results to the class on the following question. Afterwards, discuss on the distinct ideas suggested.

1. You are very environmentally engaged and want to start with a grassroots initiative for the transformation of the urban area where you live. Think of how you would start a grassroots initiative, for a more sustainable urban development. Not least, think of: 1) the topic which you would like to develop (energy, etc.); 2) how you would start with the grassroots process (gathering of people); 3) how you would arrange the decision process; 4) how you would keep people engaged, etc.

THANKS FOR YOUR ATTENTION!!

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Research Group
Urban and Landscape Ecology

Urban and Landscape Ecology

Urban Nature and Urban Ecosystem services

Prof. Dr. Jürgen Breuste
Paris Lodron University Salzburg, Austria

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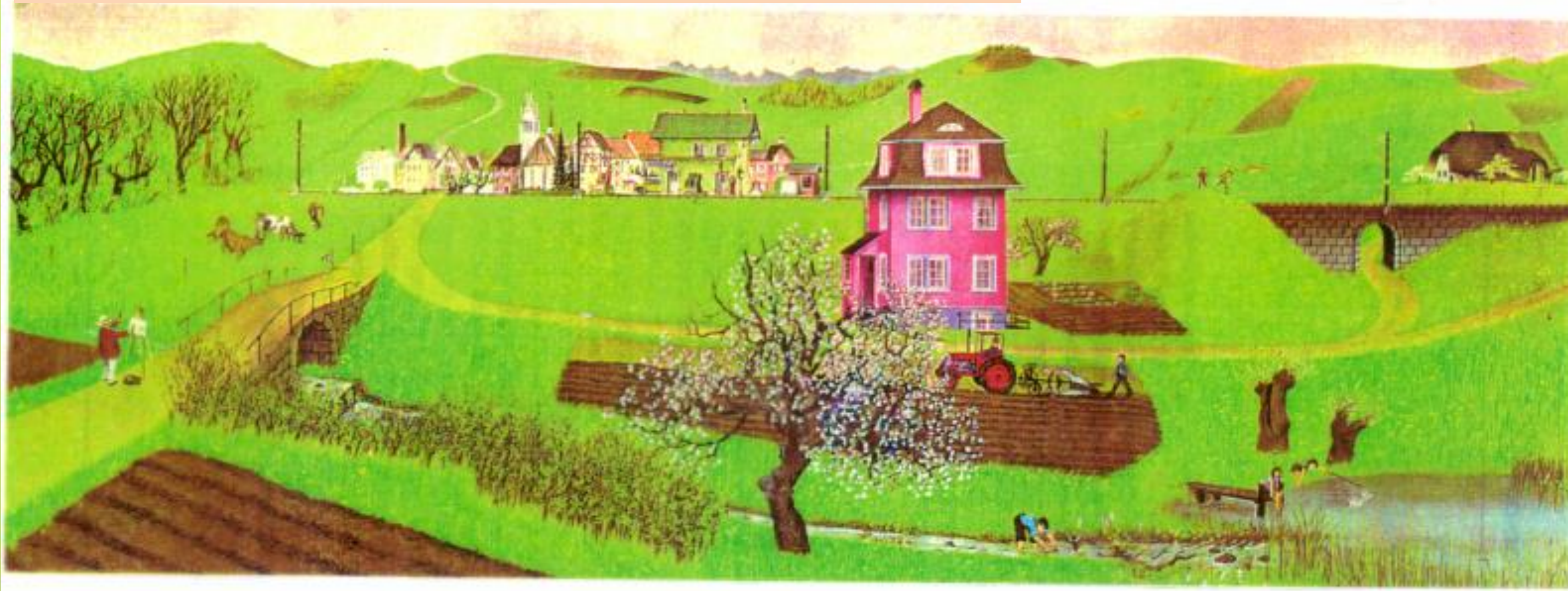
Co-funded by the Erasmus+ Programme of the European Union

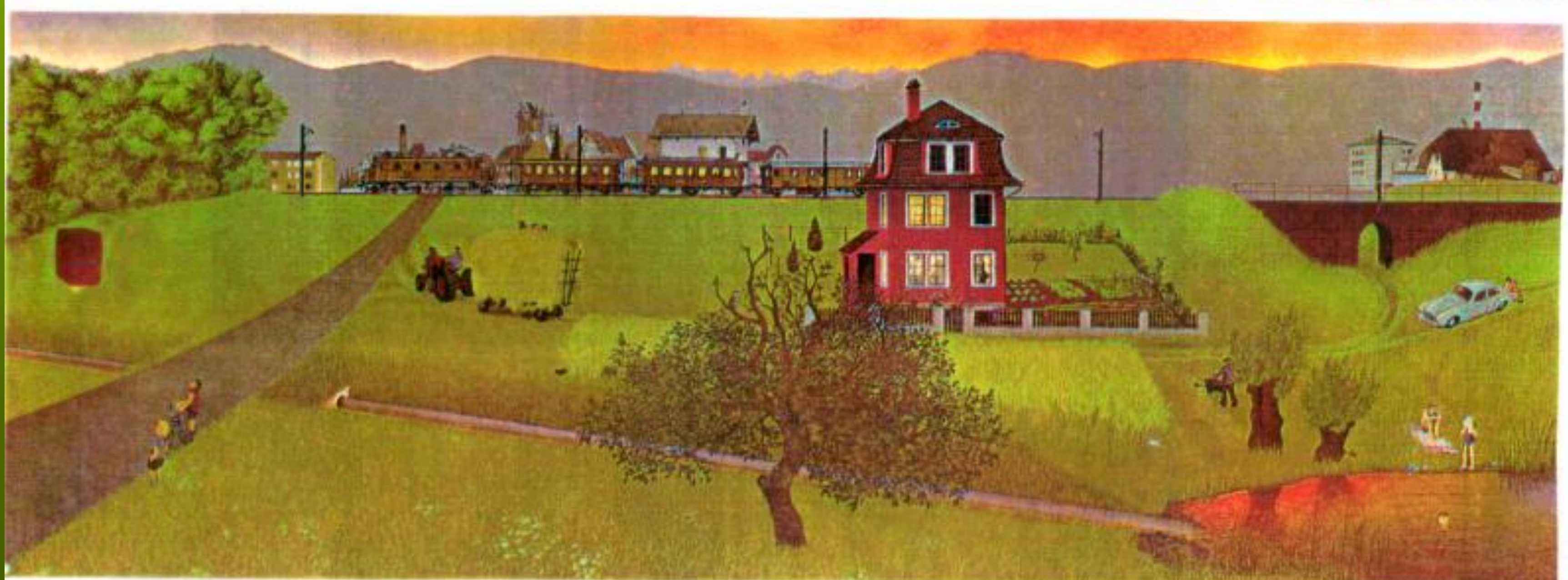
Urban Ecosystem services on the local level

Urban green spaces as providers of urban ecosystem services

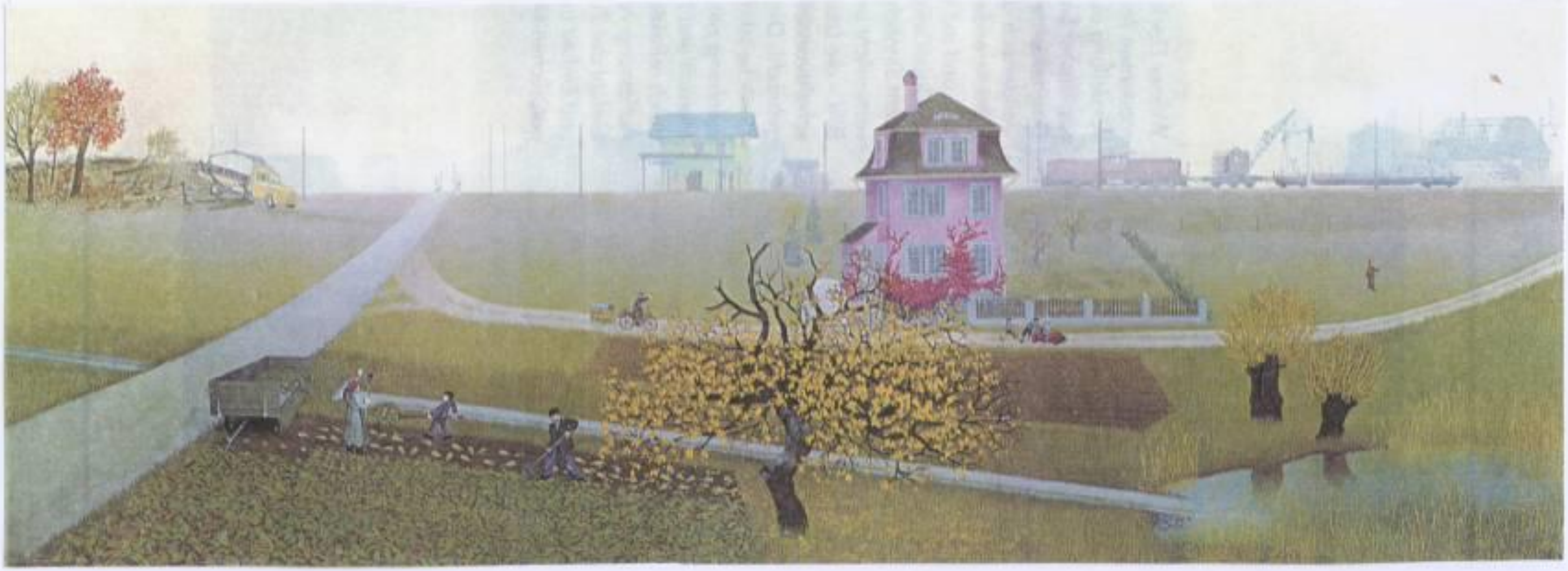
- The services - overview
- The providers/generators
- The spaces and spatial scales
- The services on site level – four selected case studies
- A methodological proposal
- New chances – new challenges

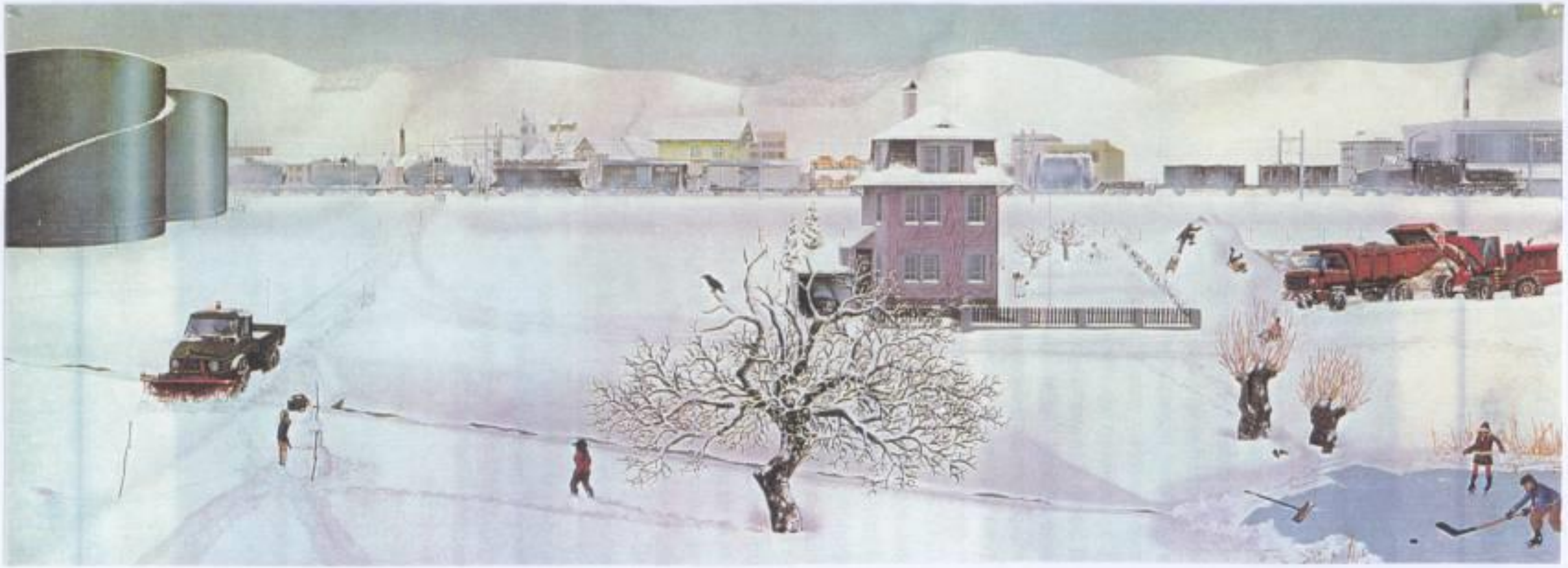
Landscape goes urban!



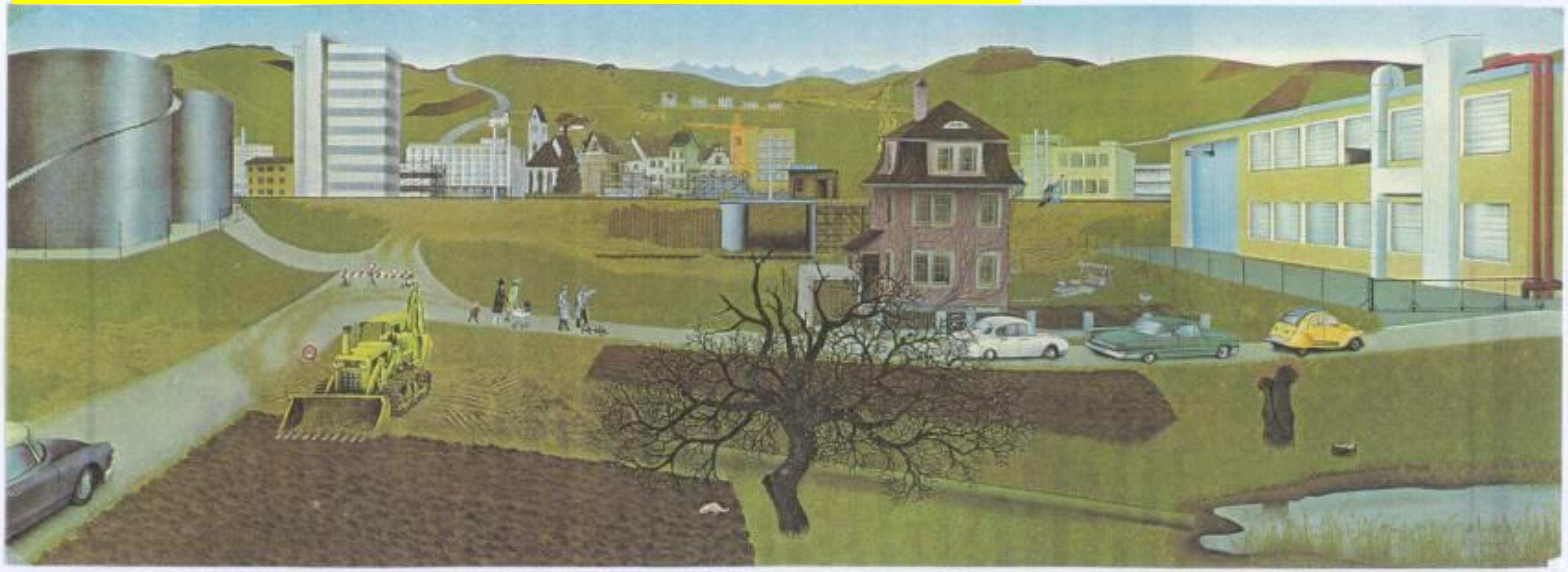


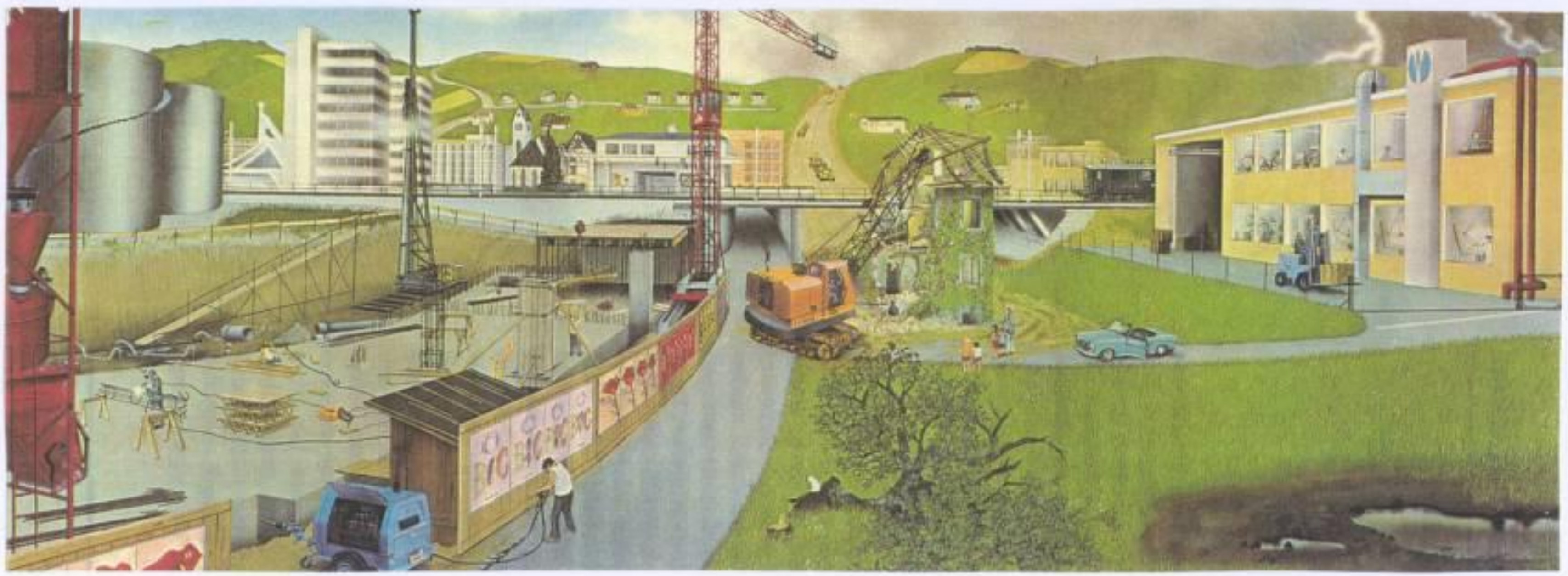
Landscape goes urban!





Landscape goes urban!





The Services

URBAN ECOSYSTEM

OPEN SPACE SYSTEM

- Parks
- Street trees
- Gardens (House, Institutional, Other private)
- Agricultural areas
- Rehabilitated areas
- Fragmented natural areas in city
- Natural areas surrounding city (Including nature reserves)
- Other open areas

ECOSYSTEM SERVICES AND FUNCTIONS

- Provisioning
  - Food
  - Wood and fibres
  - Genetic resources
  - Clean water
  - Habitat
  - Natural medicine
- Regulating
  - Air purification
  - Climate regulation
  - Mineral cycling
  - Water purification
  - Erosion regulation
  - Waste treatment

Supporting
  - Soil formation
  - Primary production
  - Photosynthesis
- Cultural
  - Aesthetics
  - Education
  - Ecotourism
  - Spiritual values
  - Recreation

ECOSYSTEM HEALTH

- Air quality
- Water quality
- Soil structure
- Habitat and species diversity
- Ecosystem resilience

Services and indicators of quality of life related to the dimensions of sustainability

Sustainability dimension	Urban Ecosystem Service	Quality of life indicator
Ecology	Air filtration Climate regulation Noise reduction Rain water drainage Water supply Waste water treatment Food production	Health (clean air, protection against respiratory diseases, protection against heat and cold death) Safety Drinking water Food
Social sphere	Landscape Recreation Cultural values Sense of identity	Beauty of the environment Recreation and stress reduction Intellectual endowment Communication Place to live
Economy	Provision of land for economic and commercial activities and housing	Accessibility Income

Jürgen Breuste, Dagmar Haase, Thomas Elmqvist (2011): Urban landscapes and Ecosystem Services. In: Harpinder Sandhu, Steve Wratten, Ross Cullen and Robert Costanza (Editors): *ES^2: Ecosystem Services in Engineered Systems,* Forthcoming from Wiley-Blackwell, Oxford, 2011. according to Millennium Ecosystem Assessment, 2005 and Santos and Martins, 2007

Potential Ecosystem Services

	Allotment areas	Domestic gardens	Golf courses
Provisioning services			
Fire wood		X*	
Food (fruits & vegetables)	X*	X*	
Ornamental resources (flowers)	X*	X*	
Cultural services			
Aesthetic values	X	X	X
Inspiration	X*	X*	X*
Nature education	X*	X*	X
Recreation	X*	X*	X*
Social relations	X*	X	X*
Regulating services			
Air filtration	X	X	X
Erosion regulation	X	X	X
Noise reduction	X	X	X
Nutrient retention (in ponds)			X
Pest regulation	X	X	X
Regulation of microclimate	X	X	X
Surface water drainage	X*	X*	X*
Supporting services			
Habitat for flora & fauna	X*	X*	X*
Soil formation	X	X	X
Seed dispersal	X	X	X
Pollination	X*	X*	X
Water cycling	X	X	X

Colding 2011, for Sweden

Urban ecosystems generating local and direct services, relevant for Stockholm (Bolund and Hunhammar, 1999)

	Street tree	Lawn/parks	Urban forest	Cultivated land	Wetland	Stream	Lake/Sea
Air filtering	x	x	x	X	x		
Micro climate regulation	x	x	x	X	x	x	x
Noise reduction	x	x	x	X	x		
Rainwater drainage		x	x	X	x		
Sewage treatment					x		
Recreation/cultural values	x	x	x	X	x	x	x

The serives (Niemelä et al 2010, changed)

Group	Ecosystem service	Service generating unit
Provisioning services	• Timber products	• Different tree species
	• Food: game, berries, mushrooms	• Different species in land, fresh-water and sea ecosystems
	• Fresh water, soil	• Groundwater infiltration, suspension and storage
Regulating service	• Regulation of microclimate at the street and city level, changes in heating costs	• Vegetation
	• Gas cycles, O_2 production, CO_2 consumption	• Vegetation, especially forests
	• Carbon sequestration and storage	• Vegetation, especially trees
	• Habitat provision	• Biodiversity
	• Air pollution purification	• Vegetation covered areas, soil • microorganisms
	• Noise cushioning in built-up areas and by transportation channels	• Protective green areas, thick/ • wide forest, soft surfaces
	• Rain water absorption, Balancing storm water peaks	• Vegetation cover, sealed surface, soil
	• Water infiltration	• Wetlands (vegetation, microorganisms)
	• Pollination, Maintaining floral populations, food production	• Insects, birds, mammals
	• Humus production and maintaining nutrient content	• Litter, invertebrates, microorganisms
Cultural services	• Recreation of urban dwellers	• Biodiversity, especially in parks, forests and water ecosystems
	• Psycho-physical and social health benefits	• Forest nature
	• Science education, research and teaching	• Biodiversity

Niemelä, J, S-R Saarela. T Söderman, L Kopperoinen, Vsa Yli-Pelkonen, S Väre, D J Kotze (2010). Using the ecosystem services approach for better planning and conservation of urban green spaces: a Finland case study. Biodivers Conserv (2010) 19:3225–3243

p.3229-3230

The generators (Niemelä et al 2010, changed)

Group	Ecosystem service	Service generating unit
Provisioning services	• Timber products	• Different tree **species**
	• Food: game, berries, mushrooms	• Different **species** in land, fresh-water and sea **ecosystems**
	• Fresh water, soil	• Groundwater infiltration, suspension and storage
Regulating service	• Regulation of microclimate at the street and city level, changes in heating costs	• **Vegetation**
	• Gas cycles, O_2 production, CO_2 consumption	• **Vegetation**, especially forests
	• Carbon sequestration and storage	• **Vegetation**, especially trees
	• Habitat provision	• **Biodiversity**
	• Air pollution purification	• **Vegetation** covered areas, soil • **microorganisms**
	• Noise cushioning in built-up areas and by transportation channels	• Protective **green areas**, thick/ • wide forest, soft **surfaces**
	• Rain water absorption, Balancing storm water peaks	• **Vegetation** cover, (sealed **surface?)**, soil
	• Water infiltration	• Wetlands (**vegetation, microorganisms**)
	• Pollination, Maintaining floral populations, food production	• **Insects, birds, mammals**
	• Humus production and maintaining nutrient content	• **Litter, invertebrates, microorganisms**
Cultural services	• Recreation of urban dwellers	• Biodiversity, especially in **parks, forests and water ecosystems**
	• Psycho-physical and social health benefits	• **Forest nature**
	• Science education, research and teaching	• **Biodiversity**

- Ecosystems (natural, man-made)
  - Biological processes: Species, organisms
  - Physical processes: Physical surface qualities

Niemelä, J, S-R Saarela. T Söderman, L Kopperoinen, Vsa Yli-Pelkonen, S Väre, D J Kotze (2010). Using the ecosystem services approach for better planning and conservation of urban green spaces: a Finland case study. Biodivers Conserv (2010) 19:3225–3243

p.3229-3230

Potential Functions and Benefits of Urban Green Spaces

Urban green spaces ...

... play a key role for recreation, enhance the quality of life for people living and working in an urban area and provide locations for different leisure, sport and play activities.

... help promote healthy lifestyles.

... contribute to social inclusion, to community development and citizenship and provide venues for cultural and social events.

... support environmental education and lifelong learning as an educational resource and help develop better understanding concerning ecological and environmental processes.

...

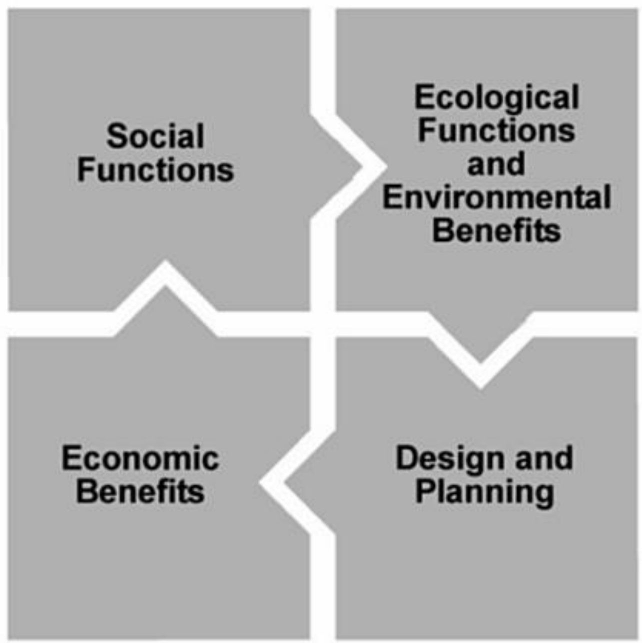
Urban green spaces ...

... support the protection of natural resources.

... provide wild life habitat and positively affect species diversity.

... mitigate environmental stress associated with the urban climate, by their ecological regulatory effects, absorption of emissions, the reduction of noise, reducing air pollution, controlling water run-off and form important elements for storm water management and sustainable urban drainage systems.

...



Urban green spaces ...

... serve as a factor in the location of new businesses.

... invigorate local businesses and neighbourhood economies by attracting tourists and investment.

... offer direct employment opportunities for those people who develop, manage and maintain the sites.

...

Urban green spaces ...

... define the urban structure.

... give local character and identity, provide distinctive landscape and give legibility and structure to the urban fabric.

... contribute to the aesthetic, historical and cultural identity of a city, provide a natural balance to built form and can be developed as a green network to ensure contact with the natural world.

...

URGE-Team, 2004, S. 12.

The Green

The Grey

- *First type of nature*: remains of the original natural landscape such as forests and wetlands

- *Second type of nature:* cultural landscapes formed by agriculture with meadows, pastures, fields, hedges, drifts, dry grasslands*,*

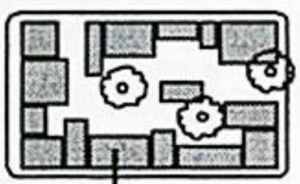
- *Third type of nature*: horticultural designed green spaces such as parks, road trees, front gardens, green buffers or potted plants,

- *Fourth type of nature:* specific urban industrial nature such as ruderal urban forests, spontaneous vegetation, waste land etc. (Kowarik 1992)

Vegetation Group	Vegetation structure type	Main existing Ecosystem Services	Main potential ecosystem services
A) Vegetation remnants of the original natural landscape	Woods and forests Wetlands	Timber production, recreation, **biodiversity**, micro-climate regulation, rainwater drainage, sewage treatment	**Nature experience, learning about nature**
B) Vegetation of the cultural landscapes formed by agriculture	Meadows, pastures, drifts, dry grasslands arable land	Food production, **micro-climate regulation**, rainwater drainage	**Recreation, biodiversity, nature experience**
C) Ornamental, horticultural and designed urban vegetation spaces	Decorative green (flower beds, small lawn patches, bushes, hedges, etc.) Accompanied green along traffic lines or as addition to fill up the space between apartment blocks Gardens/parks Allotment gardens, urban trees	Decoration, cultural values Air filtering, micro-climate regulation, rainwater drainage **Recreation, micro-climate regulation, Air filtering,**	**Biodiversity, rainwater drainage** **Recreation, biodiversity** **Biodiversity, nature experience, learning about nature**
D) Spontaneous urban vegetation spaces	Spontaneous herbaceous bush and pre-forest vegetation	**Biodiversity, , micro-climate regulation**	**Biodiversity, learning about nature, nature experience, recreation**

Breuste according to Arbeitsgruppe Methodik der Biotopkartierung im besiedelten Bereich (1993), Kowarik 1992, Bolund and Hunhammar, 1999 (modified)

The spaces and spatial scales

Scale Level	Administrative	Planning Level	Landscape Dimension	Research Topic Urban Climate
	Urban Region/ City	Land Use Plan	Urban Eco-System meso-choric/ macro-chorical	Joint Climatope
	District Urban District	Land Use Plan	Subsystem nano-chorical	Climatope of Concentrated Building
	Statistical Block	Building Plan	Landscape Structure topical	Court Yard Climate
	Building	Building Plan	Landscape Element topic/subtopical	Building Climate Tree Climate

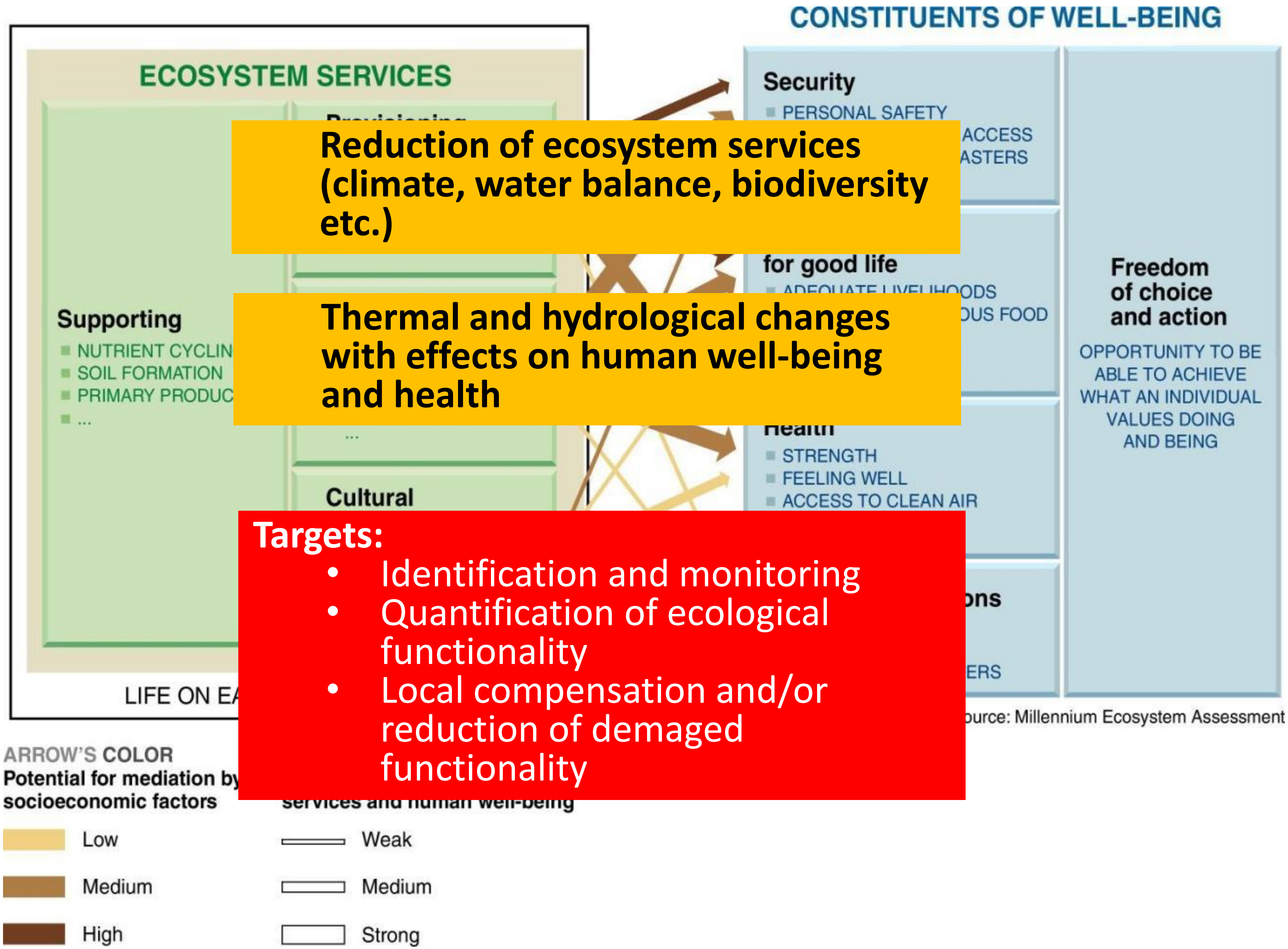





Urban Structure Typs

Sealed surfaces in differend urban structure types of Salzburg (in %)

Urban Structure Type	Built-up (%)	Sealed open space (%)	Not sealed open space (%)	Soil sealing degree (%)	Target (%)
Detached curb-close apartment buildings with built-up courtyards	50	31	19	81	60
Detached curb-close apartment buildings (renovated)	42	33	25	75	60
Detached curb-close apartment buildings with open courtyards	56	17	27	73	60
Detached curb-close apartment buildings with open courtyards	39	26	35	65	60
Terraced curb-close apartment buildings with open courtyards	37	22	41	59	60
Large prefabricated housing estates	29	25	46	54	50
Detached and semi-detached houses	28	23	49	51	40
Villas	20	11	69	31	40



Reduction of ecosystem services (climate, water balance, biodiversity etc.)

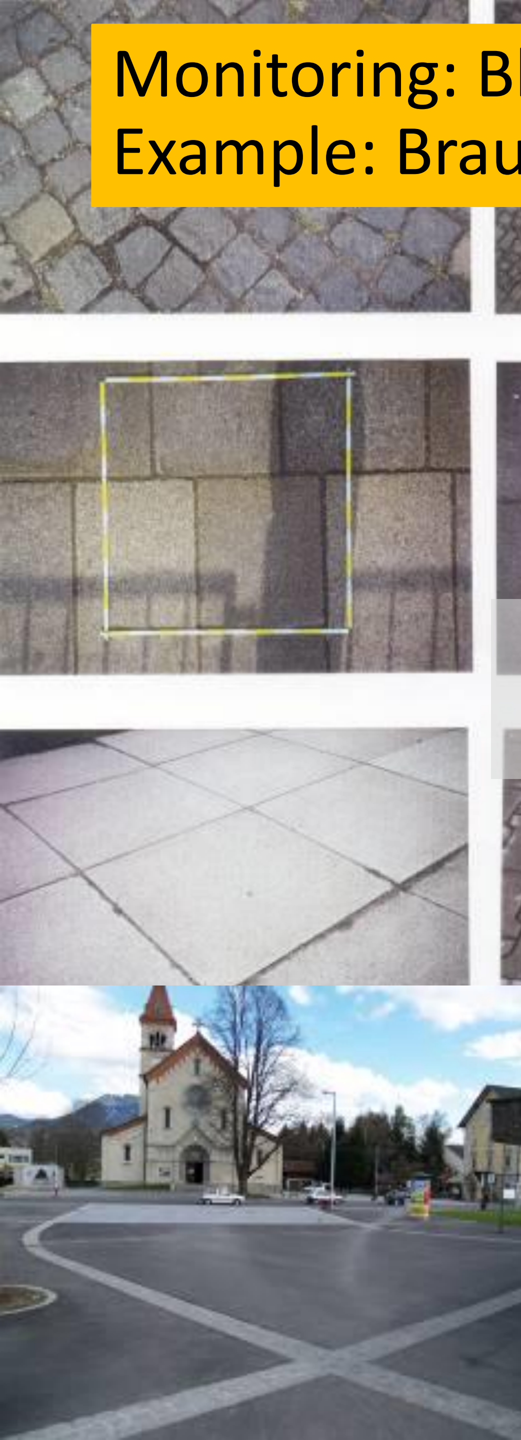
Thermal and hydrological changes with effects on human well-being and health

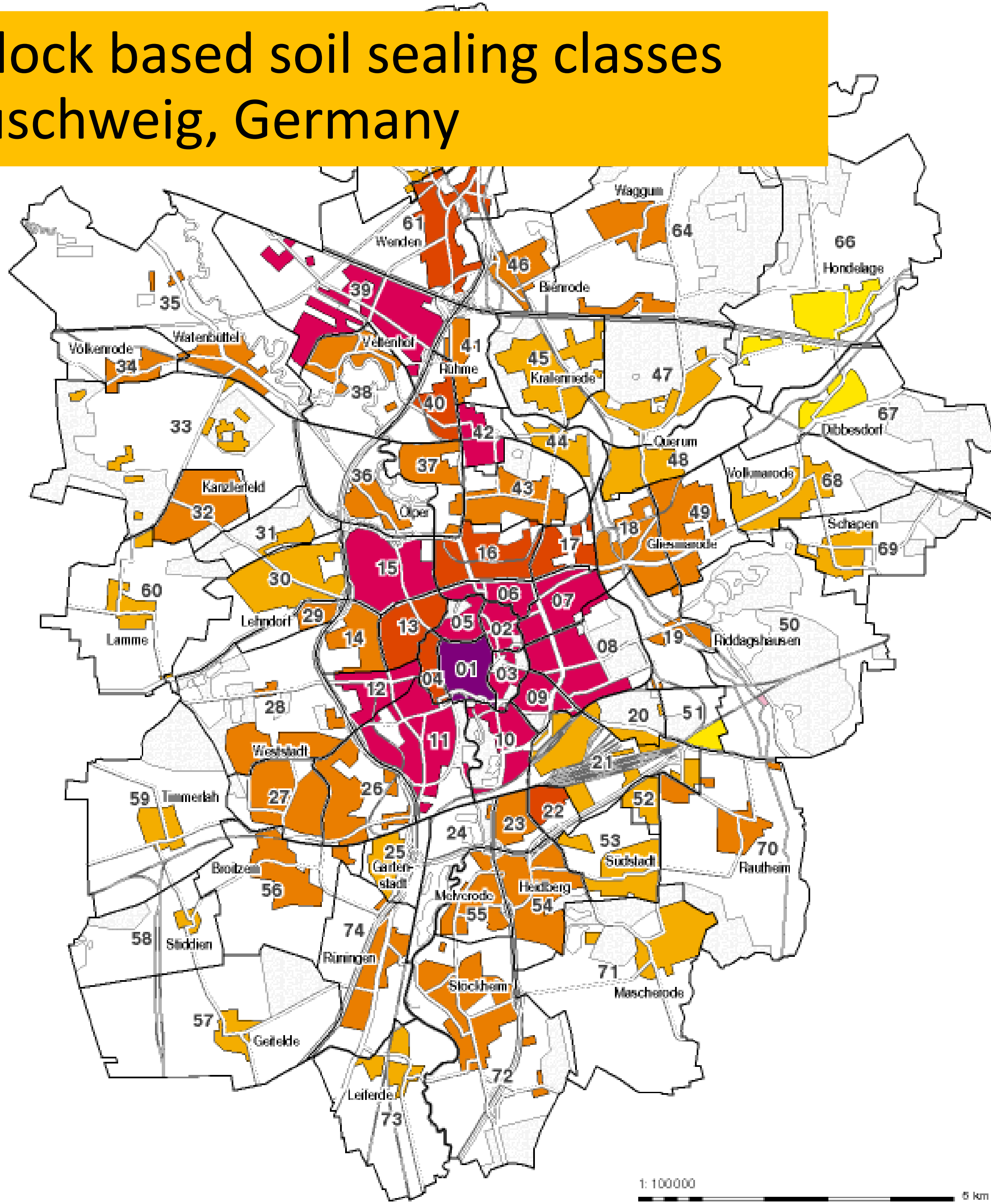
Targets:

- Identification and monitoring
- Quantification of ecological functionality
- Local compensation and/or reduction of demaged functionality

Differences of soil sealing in urban structural units

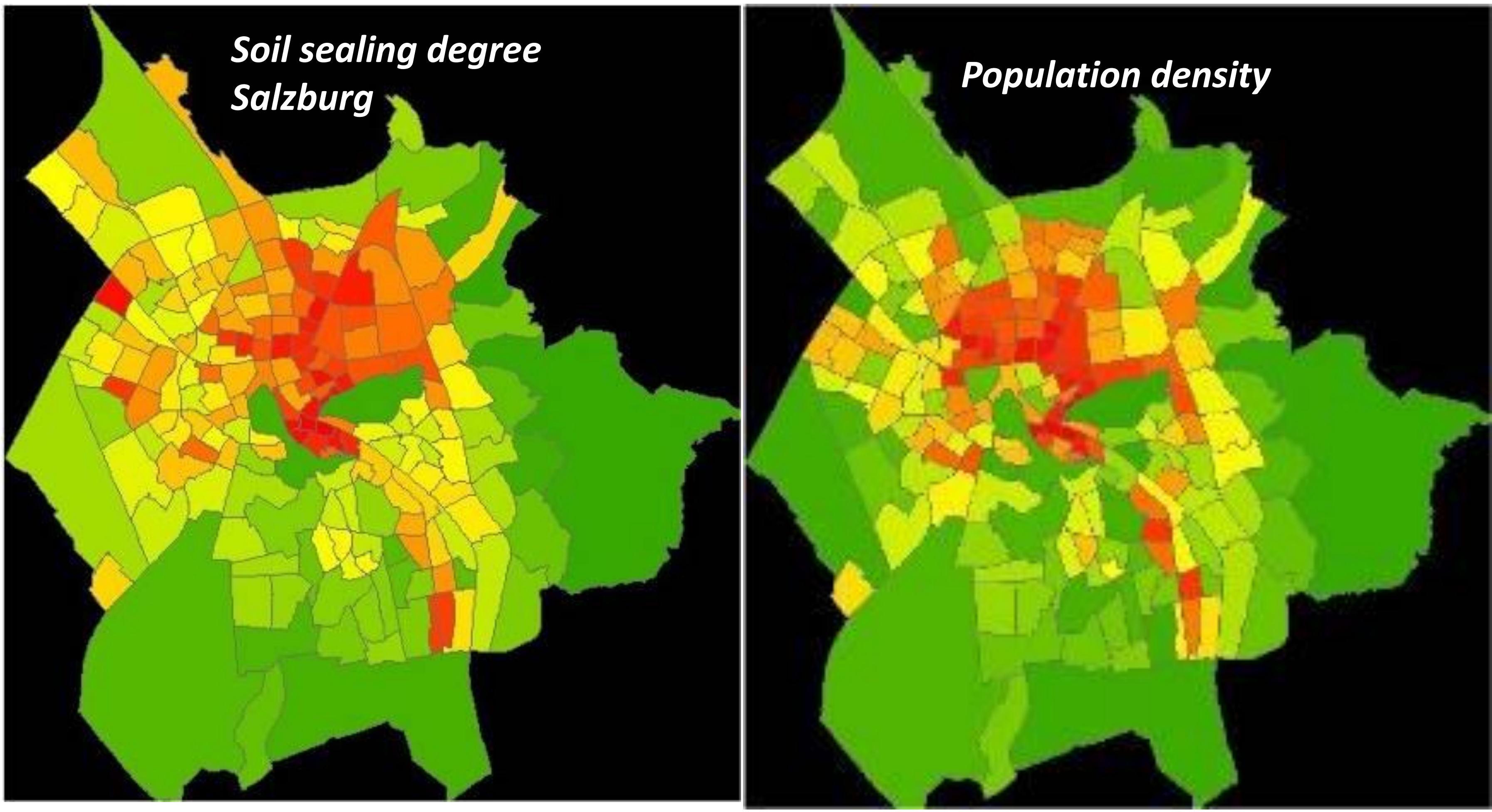
Monitoring: Block based soil sealing classes
Example: Brauschweig, Germany



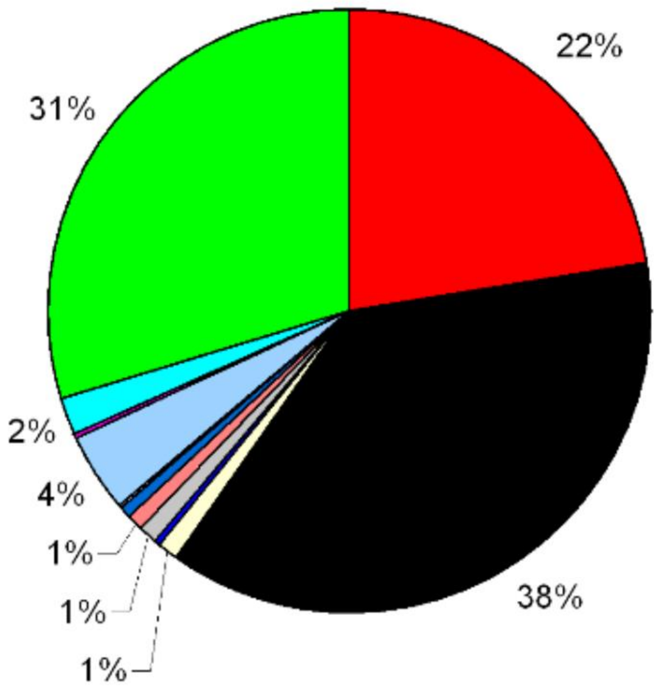


uildings

Where is it green? Who profits from ist ecosystem services?

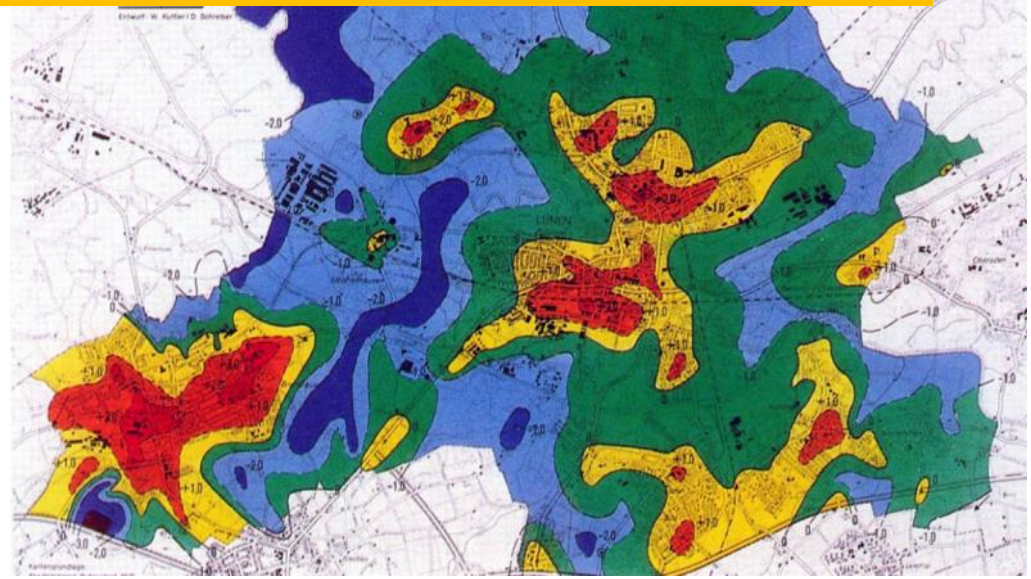


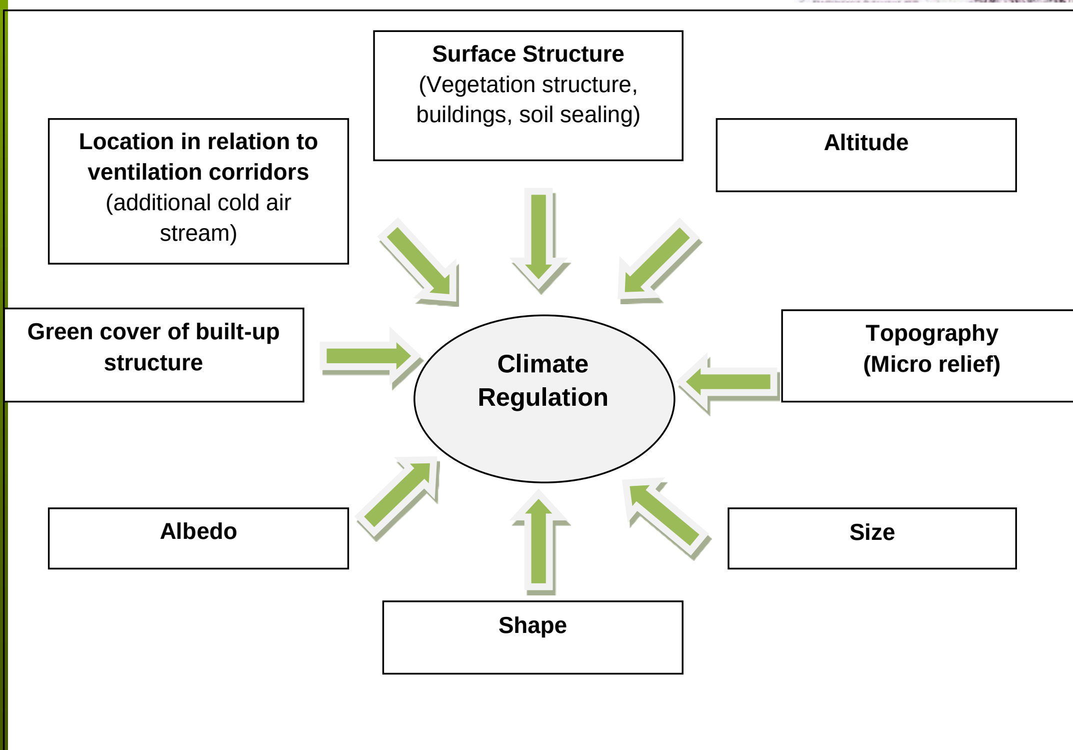
Structure of Soil Sealing Types
Example Salzburg



Red – buildings
Black – Asphalt
Green – Green Areas
Other colours – Different Sealing Types

The services on site level - 1) Climate regulation





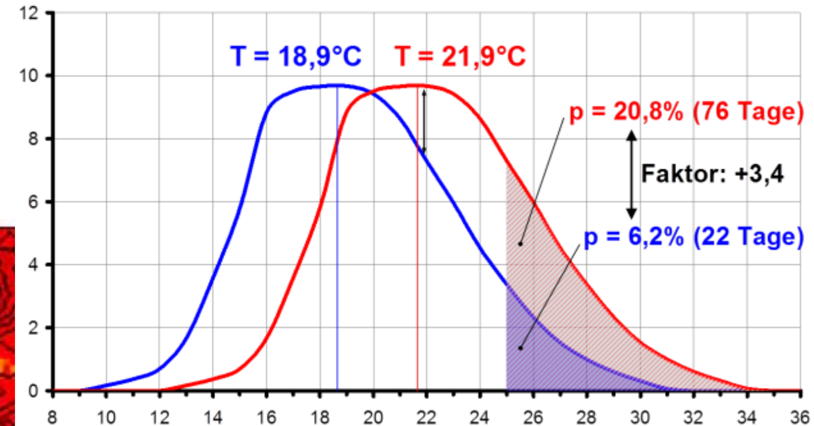
RG Urban and Landscape Ecology

RG Urban and Landscape Ecology

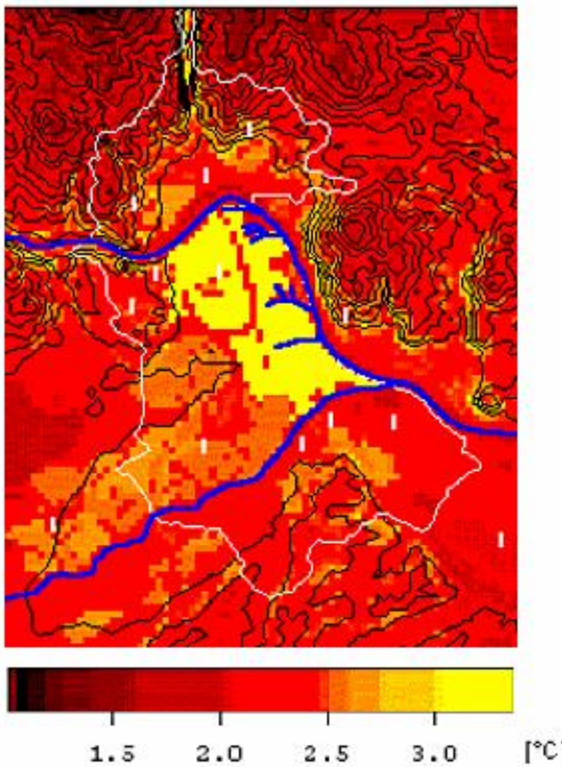
Climate Change in Cities – What we can expect:

- warmer and more arid summers,
- erratic distributed precipitation,
- increase of der hot days with daily average temperatures over 25 ° C

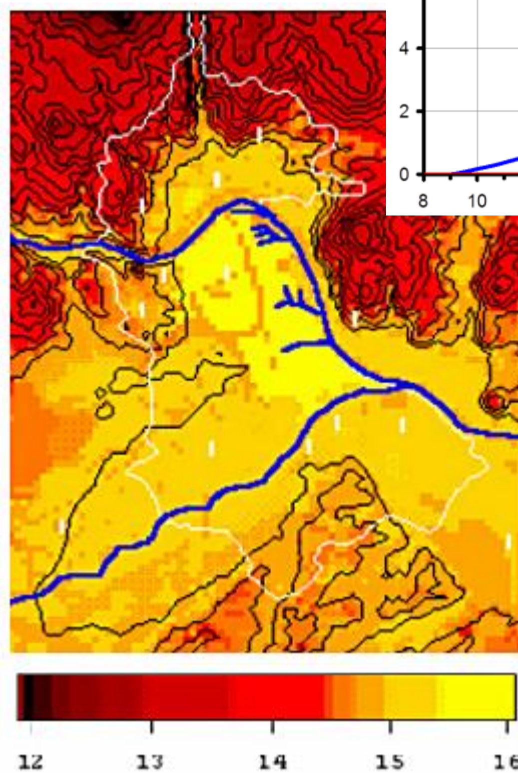
(Essen 22 – 2100: 76 – Kuttler)



City of Linz, Austria

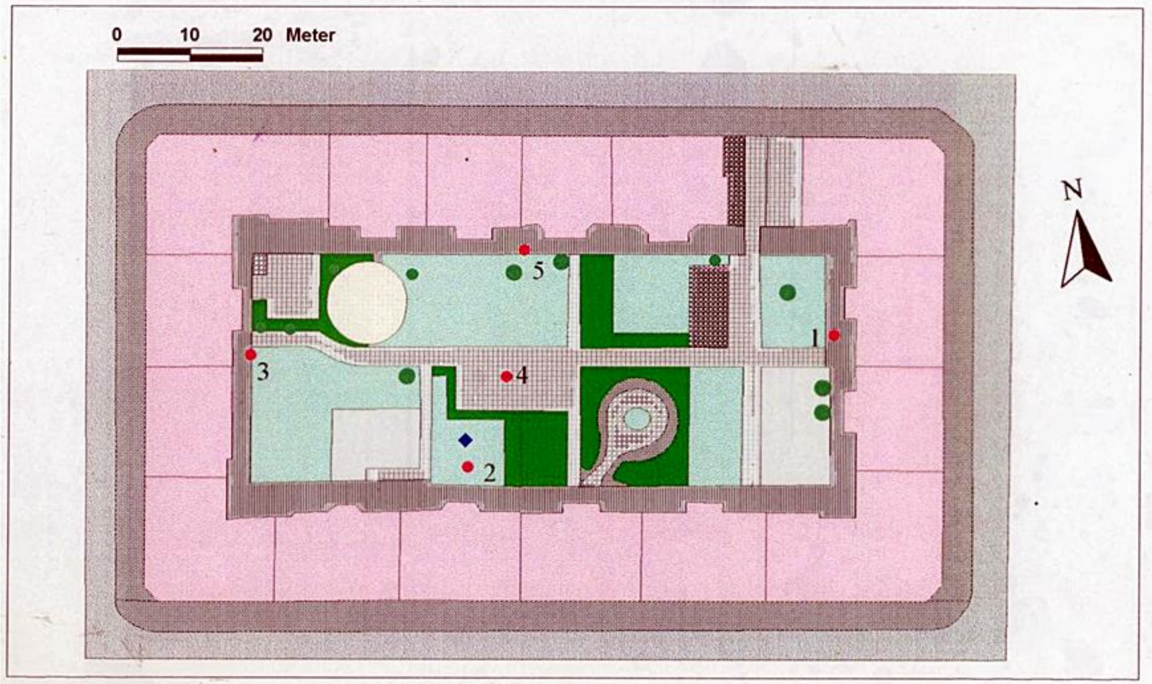


Winter temperatures



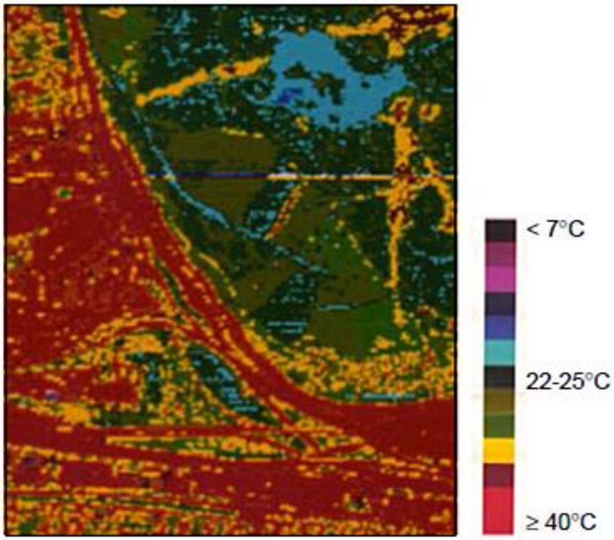
Sommer temperatures

Mirco-climate measurement

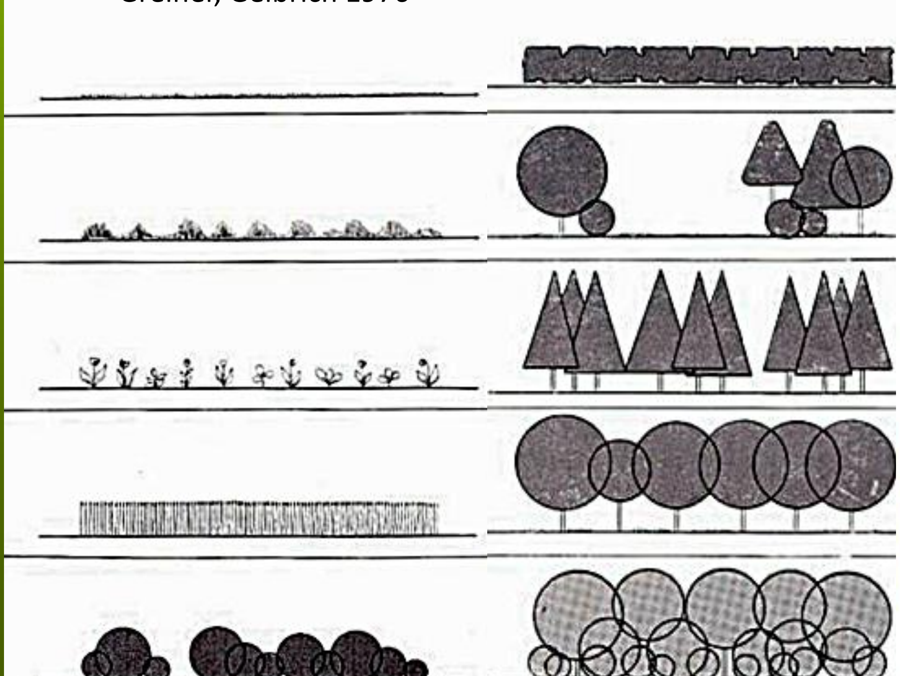


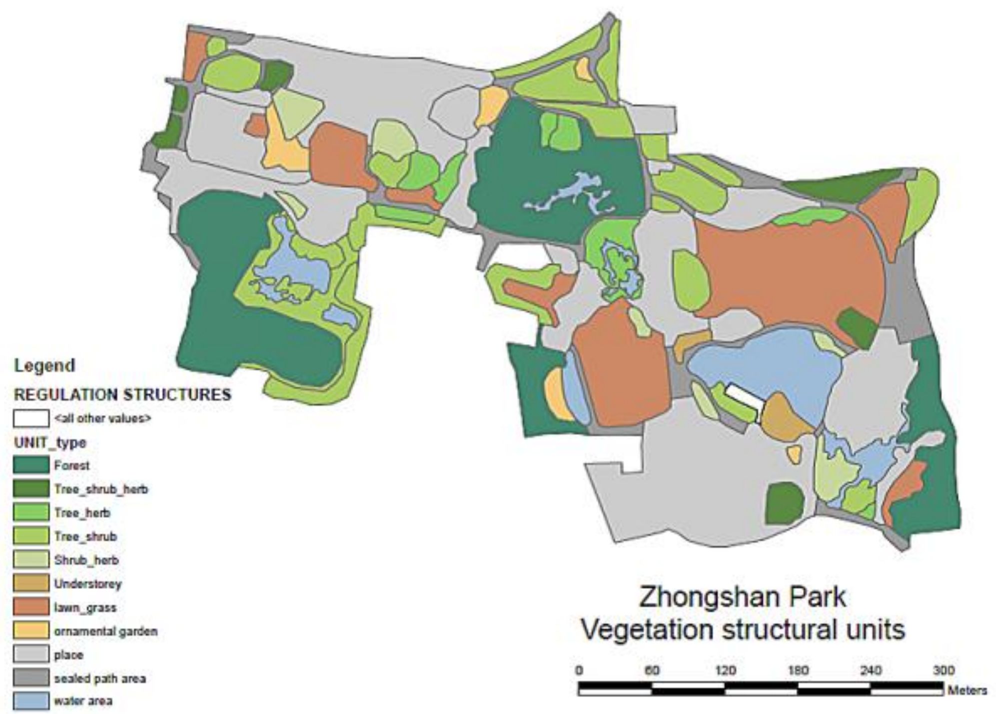
Bauer 1998, Leipzig

Vegetation structures as generators and indicators of climatic regulation services

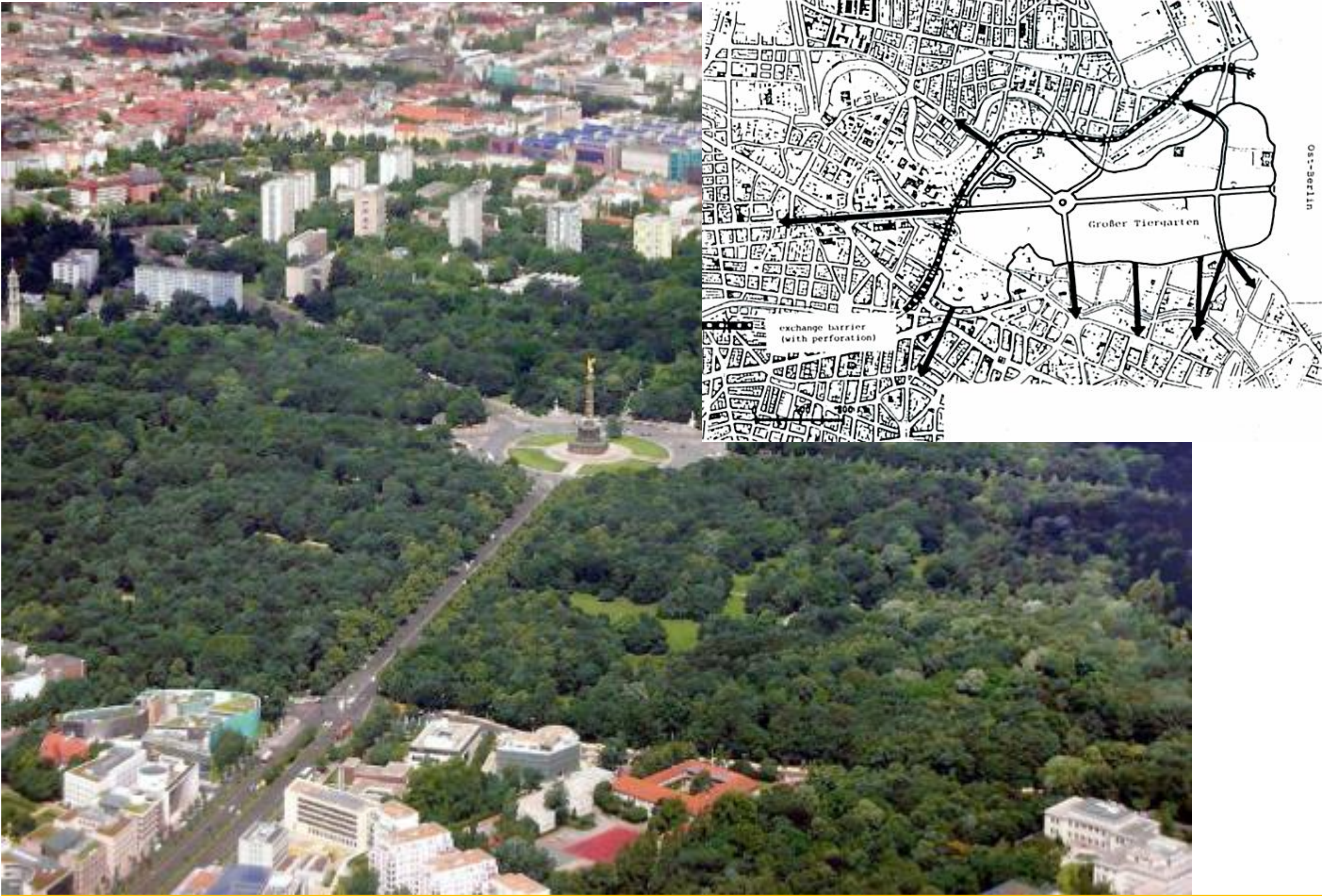


Greiner, Gelbrich 1976

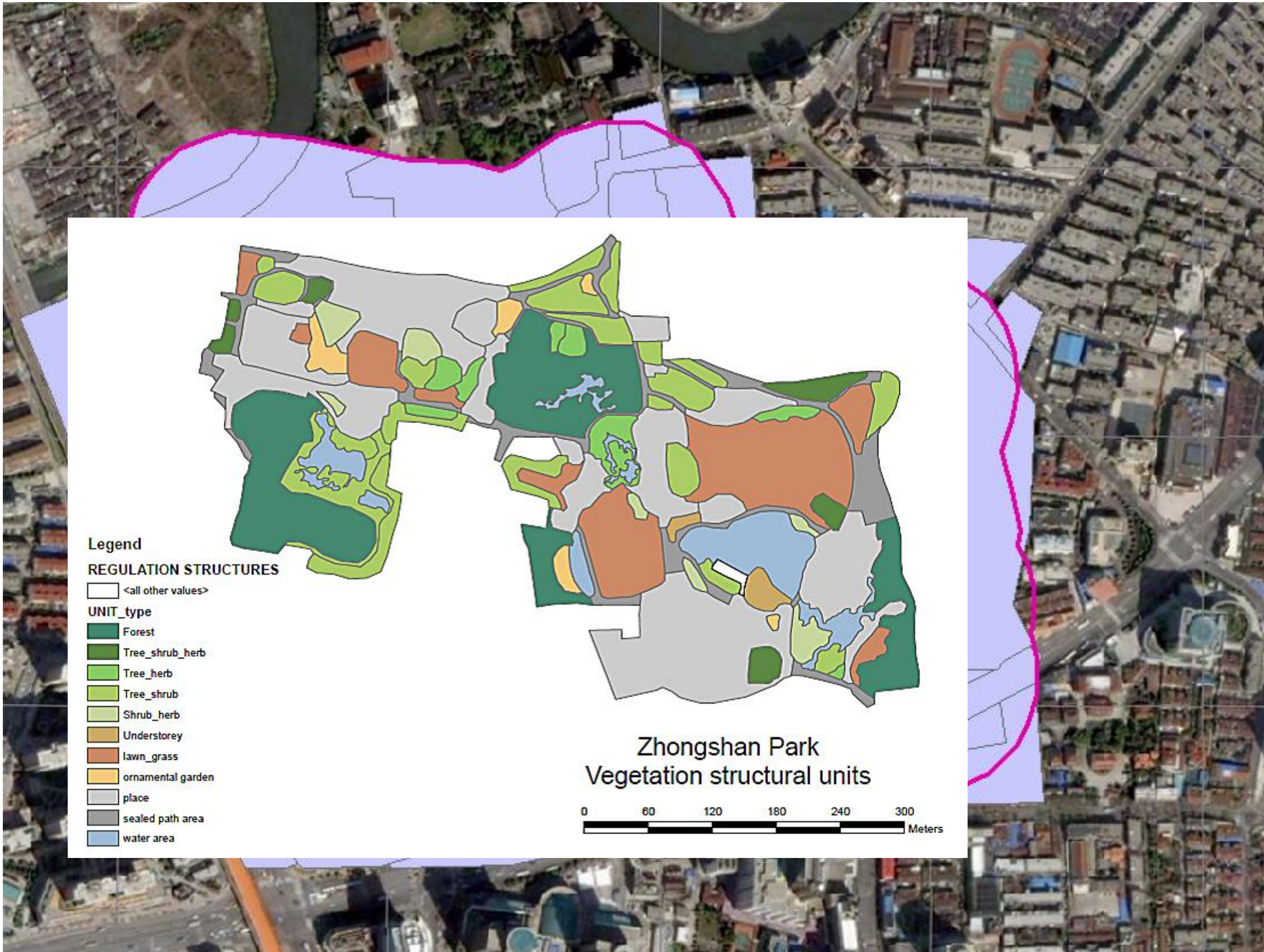




Vegetation Structures – Regulating Service – Climate Moderation



Degree and extension of climatic service


Legend
REGULATION STRUCTURES
<all other values>
UNIT_type
Forest
Tree_shrub_herb
Tree_herb
Tree_shrub
Shrub_herb
Understorey
lawn_grass
ornamental garden
place
sealed path area
water area
Zhongshan Park
Vegetation structural units
0
60
120
180
240
300
Meters

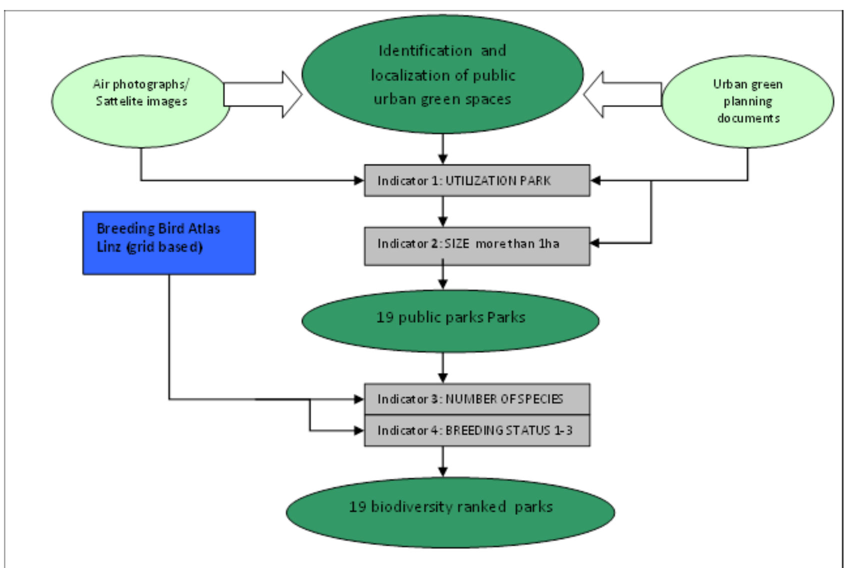
Shanghai, Yanzhong Greenery 2000-2001

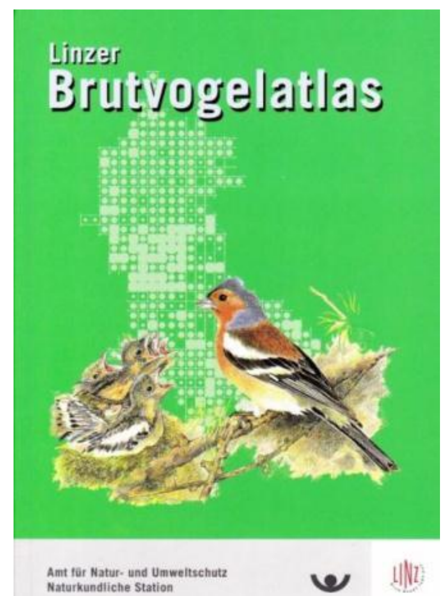
17,07 ha built-up land was changed into 11,85 ha green area, 4.837 families were settled elsewhere

2) Biodiversity, Linz, Austria

Bauernberg-Park, Linz, Austria

Harbach-Park, Linz, Austria





Parks	BS1	BS2	BS3	Aggregate Value of different Breeding Categories	Number of breeding bird species
Bauernberg	15	10	12	71	37
Freinberg West-Ost	12	12	8	52	32
Hummelhofwald	10	8	13	65	31
Freinberg Aroboretum	9	8	8	51	24
Bergschlössl	1	14	9	37	25
Panuliwiese	11	6	7	37	24
Wasserwald	10	10	3	36	22
Schlossberg	3	10	9	41	23
Donaupark	6	13	2	36	21
Volksgarten	6	7	6	32	19
Universitätspark	6	6	4	26	16
Pöstlingsberg	6	6	3	24	15
J.W.Kleinstrasse	4	5	1	16	10
Wag-Park	4	5	1	16	10
Ökopark	7	1	2	13	10
Ing.Stern.Strasse	2	2	5	16	9
Erholungspark Urfahr	3	1	3	11	7
Peuerbachstrasse	3	1	0	5	4
Harbachpark	0	0	1	2	1

Czermak 2008, p. 57 and 63, changed

BS 1 = Breeding possible, BS2 = Breeding probable and BS 3 = Breeding proved

3) Nature experience

Mainz, Germany

Spaces of Nature Experiences

- **The function of nature conservation in the city is… maintenance of species and biocenosis‘ as a basis for direct contact of the citizens with the natural elements of their environment (Sukopp & Weiler 1986, p. 25).**


Nature experience

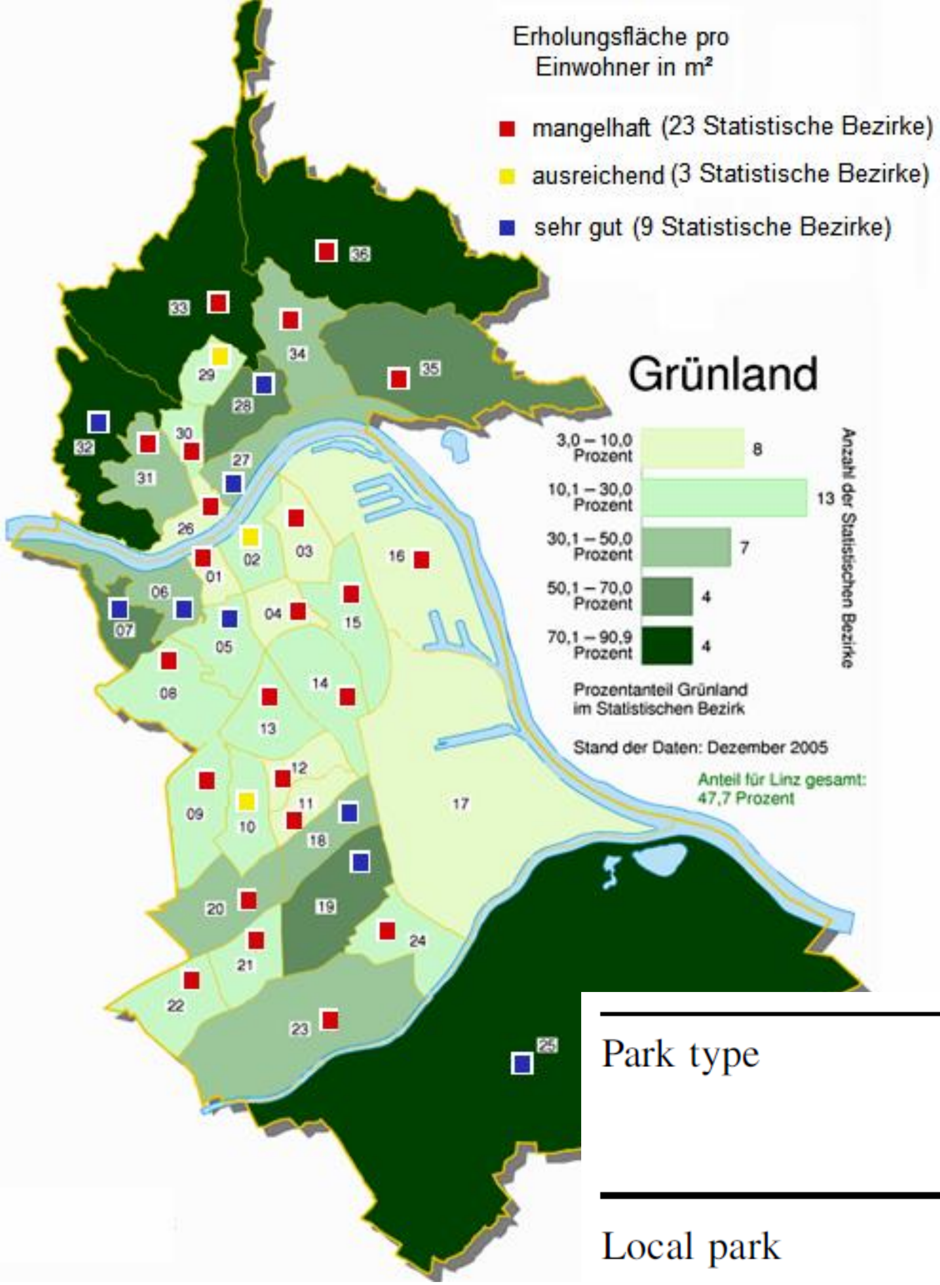
d Landscape Ecology

Year	Visitors to Parks and Zooes (10 000 person-times)	Trees Planted (10 000 trees)	Roadside Trees (10 000 trees)	Greenlands Newly Created (hectare)	Coverage Rate of Urban Green Areas (%)
1978	3 876	35	13		8.2
1980	6 404	60	13	44	8.2
1985	8 372	208	15	226	9.7
1990	8 474	130	23	186	12.4
1995	9 064	279	33	516	16.0
1996	9 797	355	41	587	17.0
1997	9 757	383	43	728	17.8
1998	9 285	773	48	1 077	19.1
1999	9 601	845	54	1 315	20.3
2000	8 184	827	57	1 458	22.2
2001	8 561	1 384	65	1 374	23.8
2002	8 796	2 729	68	2 600	30.0
2003	9 629	2 540	74	4 904	35.2
2004	13 381	2 037	80	2 434	36.0
2005	13 656	2 117	83	2 116	37.0
2006	16 652	2 187	86	1 691	37.3

Year	Total Area of Urban Parks,Gardens and Green Areas	of which # Publi Green Area	of which: Area of Parks	of which: Roadside Green Area	# Special-Purpose Green Area	Gardens and Nurseries	Parks (unit)
1978	761	383	309	75		308	42
1980	1 738	390	319	71	970	303	45
1985	2 339	522	412	110	1 551	143	52
1990	3 570	983	712	271	2 255	294	83
1995	6 561	1 793	920	873	4 429	309	100
1996	7 231	2 008	933	1 076	4 889	305	105
1997	7 849	2 484	961	1 523	5 083	253	108
1998	8 855	3 117	976	2 141	5 456	253	111
1999	11 117	3 856	993	2 863	6 888	318	115
2000	12 601	4 812	1 153	3 658	7 346	388	122
2001	14 771	5 820	1 291	4 529	8 624	248	125
2002	18 758		1 411	6 399	9 591	267	133
2003	24 426	9 450	1 473	7 977	10 218	335	136
2004	26 689	10 979	1 481	9 498	10 921	335	136
2005	28 865	12 038	1 521	10 516	11 591	335	144
2006	30 609	13 307	1 529	11 782	12 202	331	144

Note:Data in table 10.15 to 10.17 are provided by Shanghai Landscape Bureau.

4) Recreation



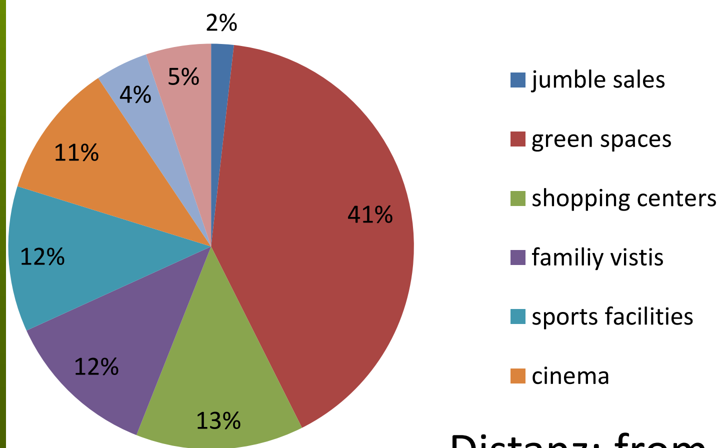
Park type	Minimum area (ha)	Maximum distance from a housing area (m)
Local park	1.5–3	300
Outdoor recreation park	20–25	1,000
Outdoor recreation area	100–200	1,000–15,000

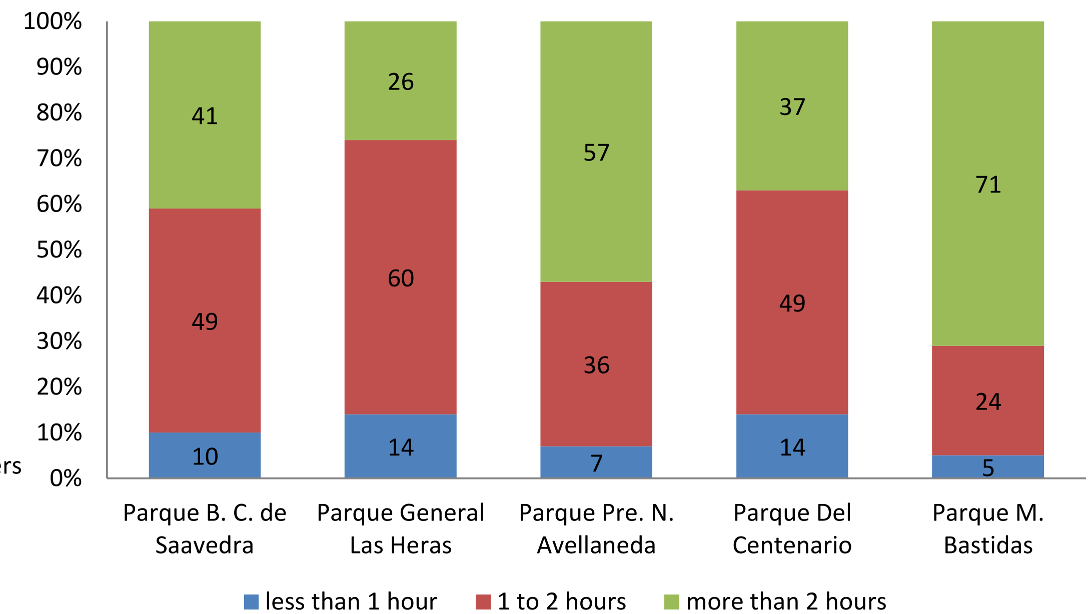
Parque Micaela Bastidas

Parque Brigadier Cornelio de Saavedra

Parque del Centenario

Parque General Las Heras





Distanz: from less than 500 m, Duration: 1/3 every day

Expectations: cleanness and security

URBAN GARDENS

Allotment garden

Roof garden

Community garden

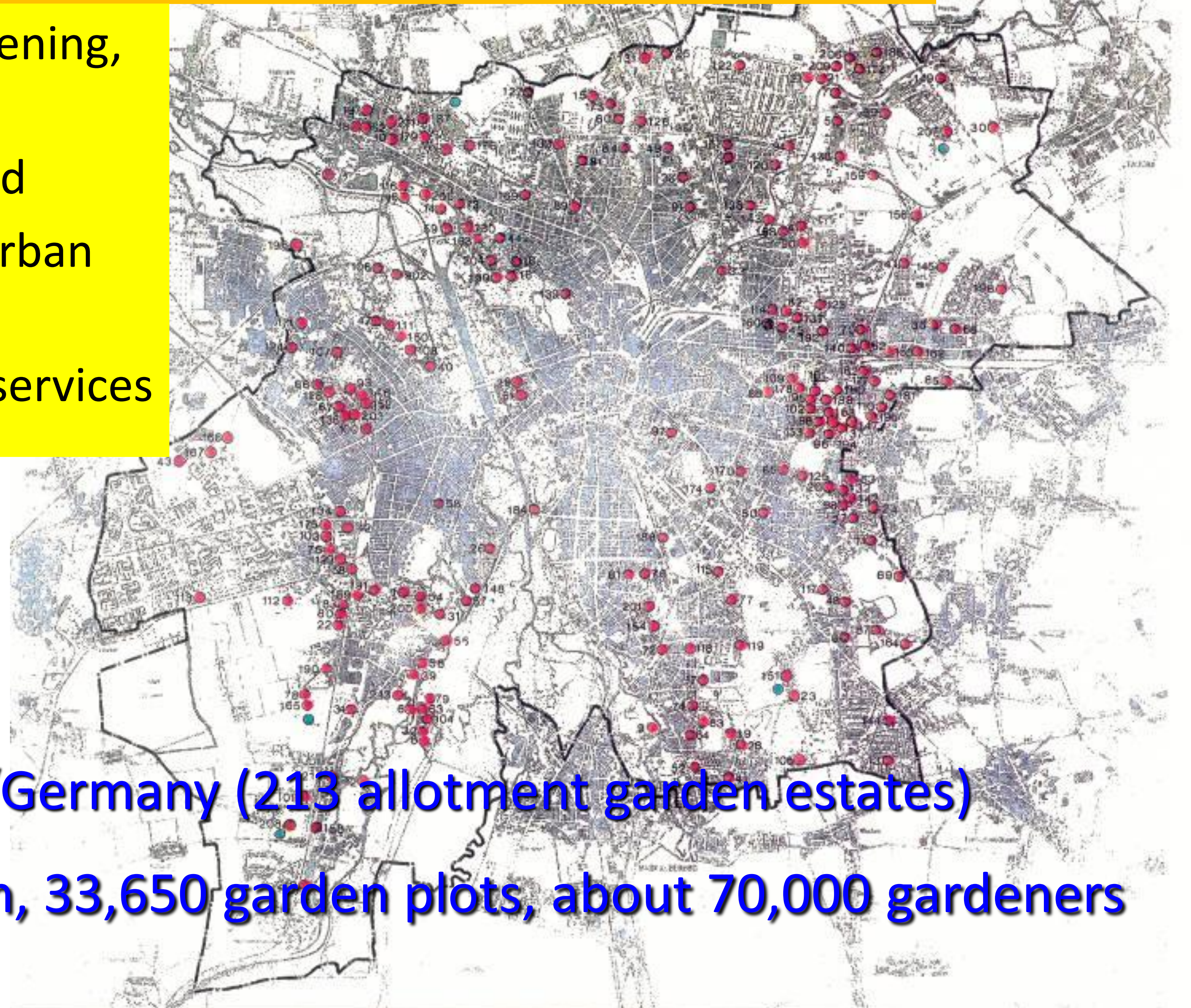
School garden

Intercultural garden

Hospital garden

New chances – new challenges

- Urban Gardening, Allotments
- Derelict Land
- Trees and Urban Forests
- Combining services

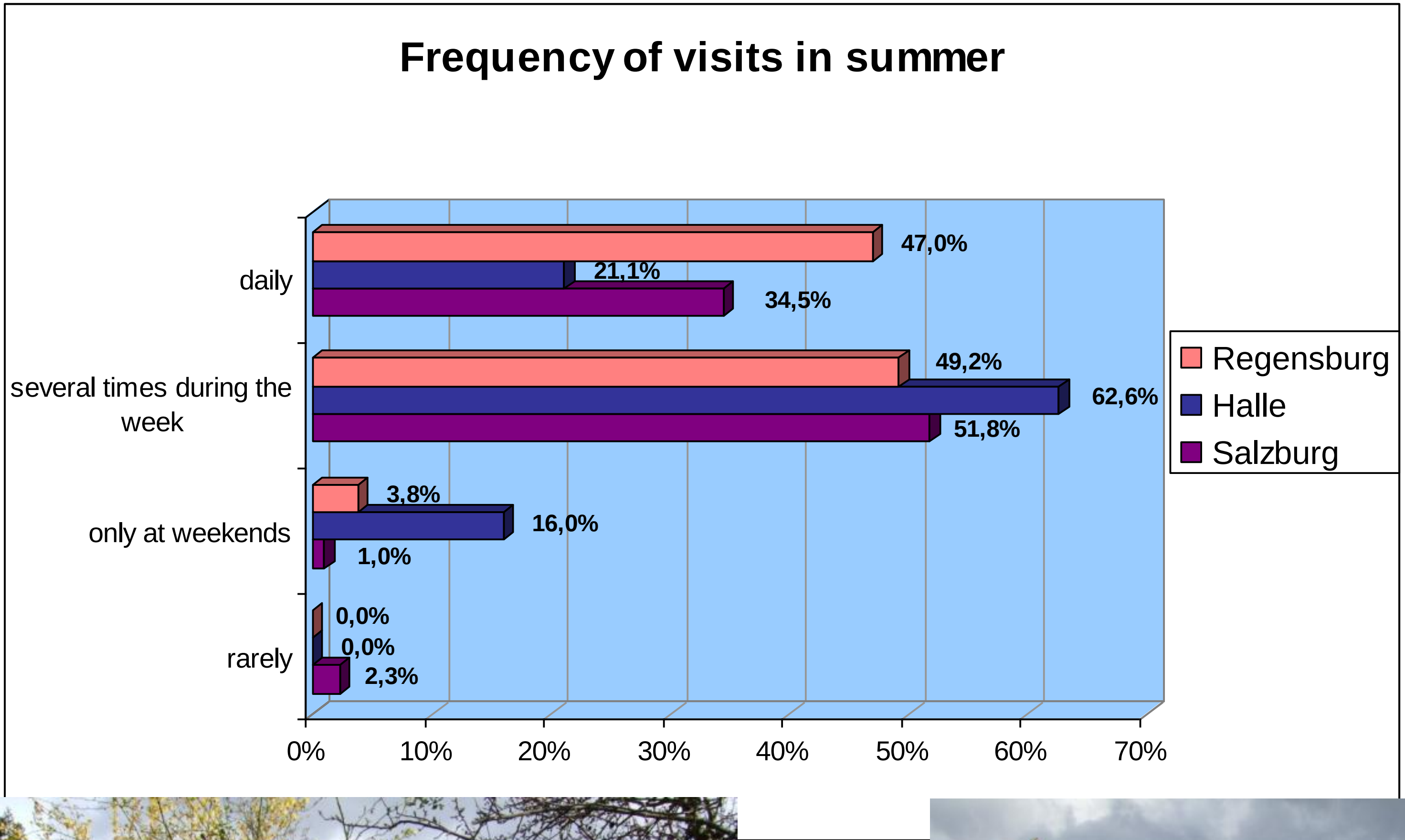


Leipzig/Germany (213 allotment garden estates)

10 sqkm, 33,650 garden plots, about 70,000 gardeners

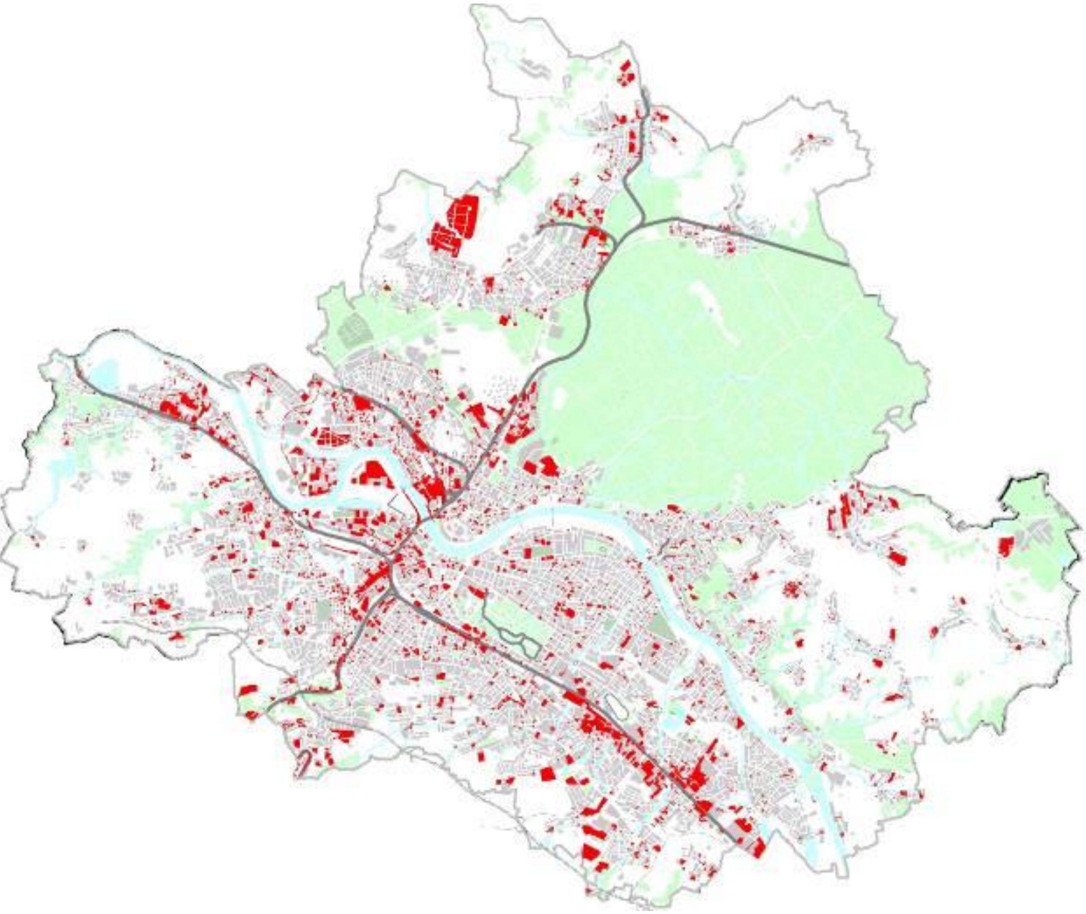
Allotment Gardening

The allotment garden in Austria



Frequency of visits in summer
daily
several times during the week
only at weekends
rarely
47,0%
21,1%
34,5%
49,2%
62,6%
51,8%
3,8%
16,0%
1,0%
0,0%
0,0%
2,3%
0%
10%
20%
30%
40%
50%
60%
70%
Regensburg
Halle
Salzburg

Dresden – 1550 ha derelict land!



Green Conections Eilenburg Railway Station and Line Leipzig

Berlin, Germany: Natur-Park Südgelände

Free nature development and succession

RG Urban and Landscape Ecology

inputs and waste outputs

nded field of landscape aesthetics (fourth nature)

nnection

Stave Hill Ecological Park, London (1986-88)

Ecology

d became the 2nd

rvancy Council

d to bring

nto towns.

Max Nicholson

(www.urbanecology.org.uk/; 08.09.10)

Concepts of Ecological Parks

William Curtis Ecological Park

Newton Farm Ecological Park

Bow Creek Ecological Park

Greenwich Peninsula Ecology Park

Trafford Ecological Park

(www.rotherhithe.spaces.live.co

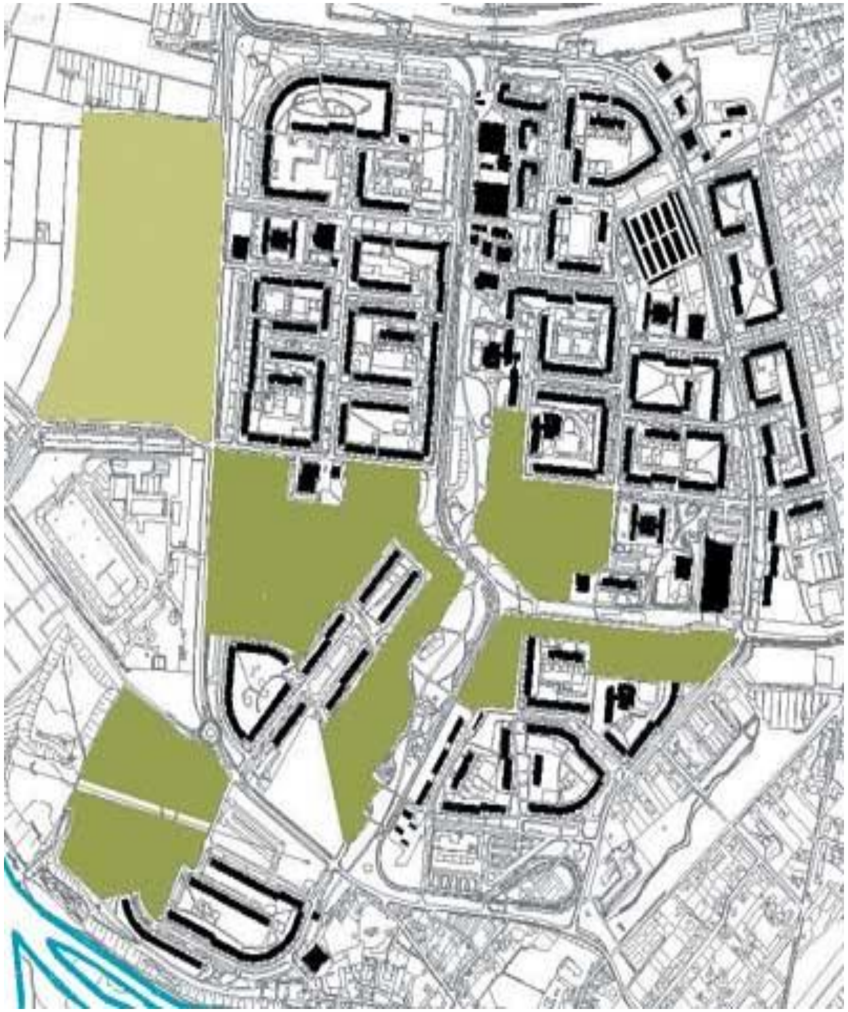
(www.urbanecology.org.uk/stavehillcontacts.html.spaces.live.co)


Kirsch-Hainwald
Hasel-Weißdorn-Weiden-Wald
Walnuss-Hainwald
Wildobst-Hainwald
Esskastanienreihe
Elsbeere-Eberesche-Mehlbeere-Hainwald
Hainbuchen-Hasel-Wald
Eichen-Hainbuchen-Linden-Wald
Eichen-Hainbuchen-Linden-Wald
1911
2005
2009
2010
2040
2009 Abbruch und Beräumung
werk bund label 2010

RG Urban and Landscape Ecology

„Forest City“ Silberhöhe, Halle/Saale, Germany

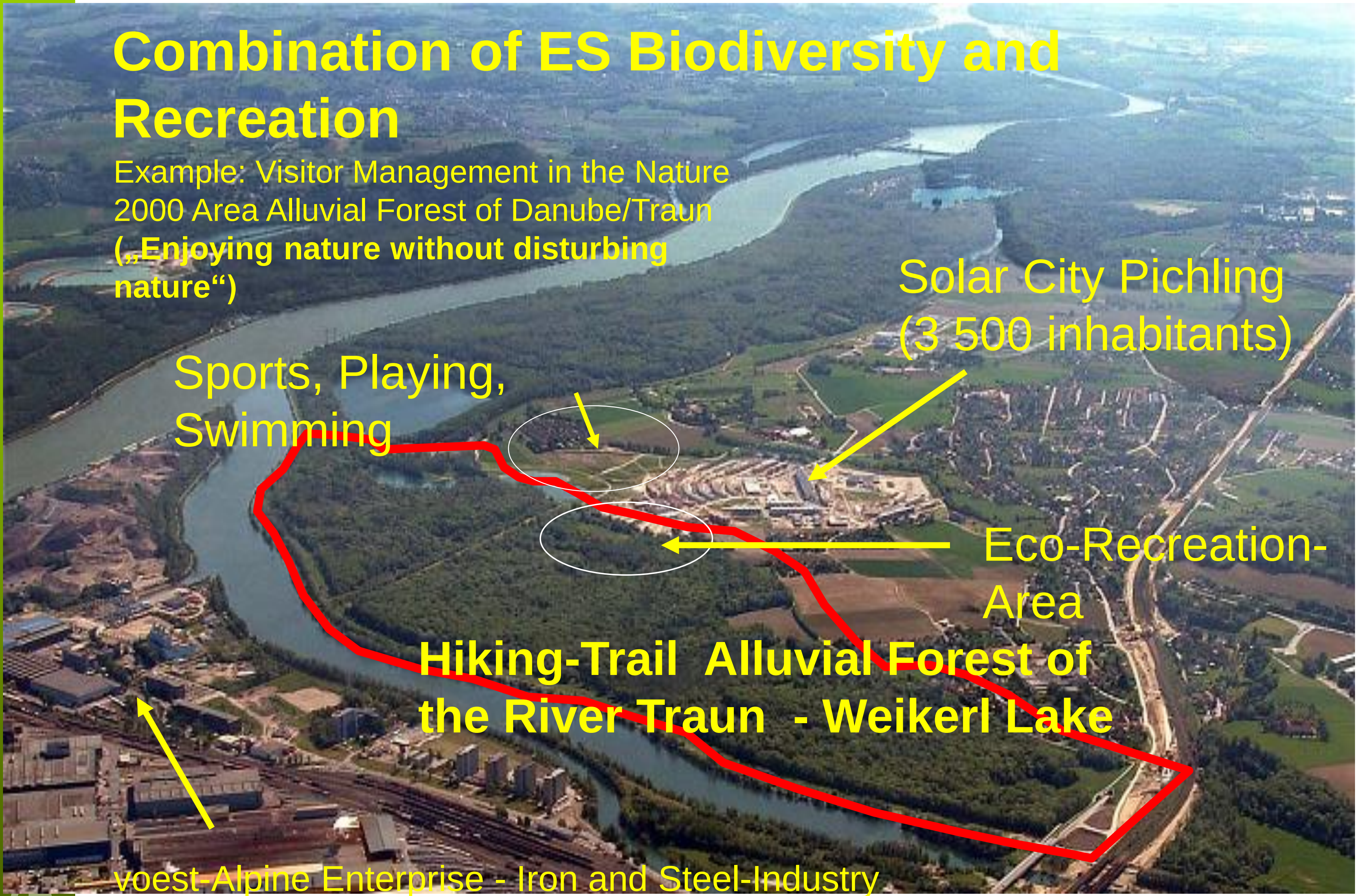
- Renaturation of the fallow land
- 1989: 40.000 residents
- 2008: 15.000 residents
- 2010: 10.000 residents
- Development plan untill 2015: „forest to grow into the city “
- Extensive growing of deciduous trees on the fallow land



Combination of ES Biodiversity and Recreation

Example: Visitor Management in the Nature 2000 Area Alluvial Forest of Danube/Traun

(„Enjoying nature without disturbing nature“)

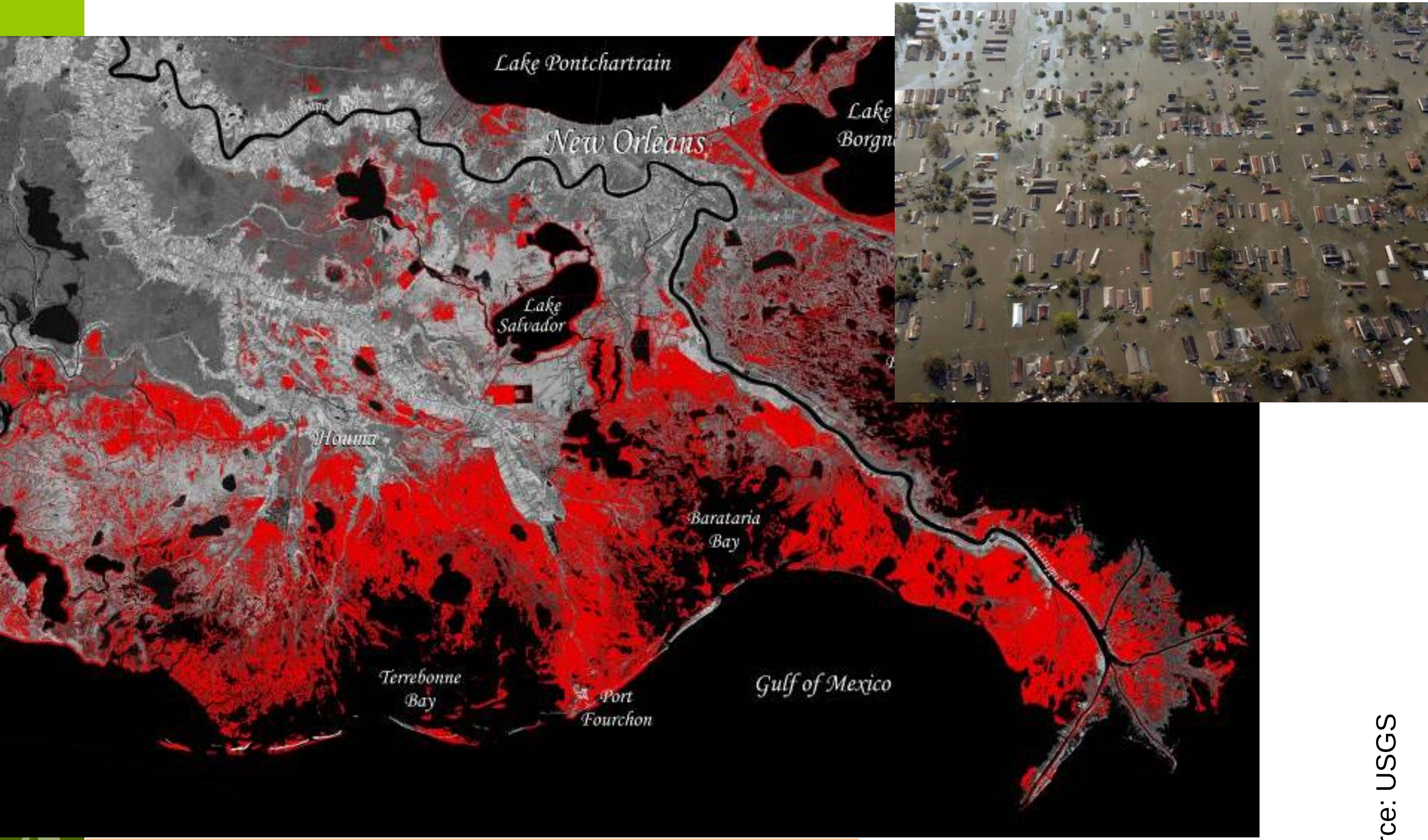


Riskmanagement

Salzburg, Sunday 2nd June, 2013

Regulating Service: I

Large-scale wetland restoration in southern Louisiana



New Orleans September 2005

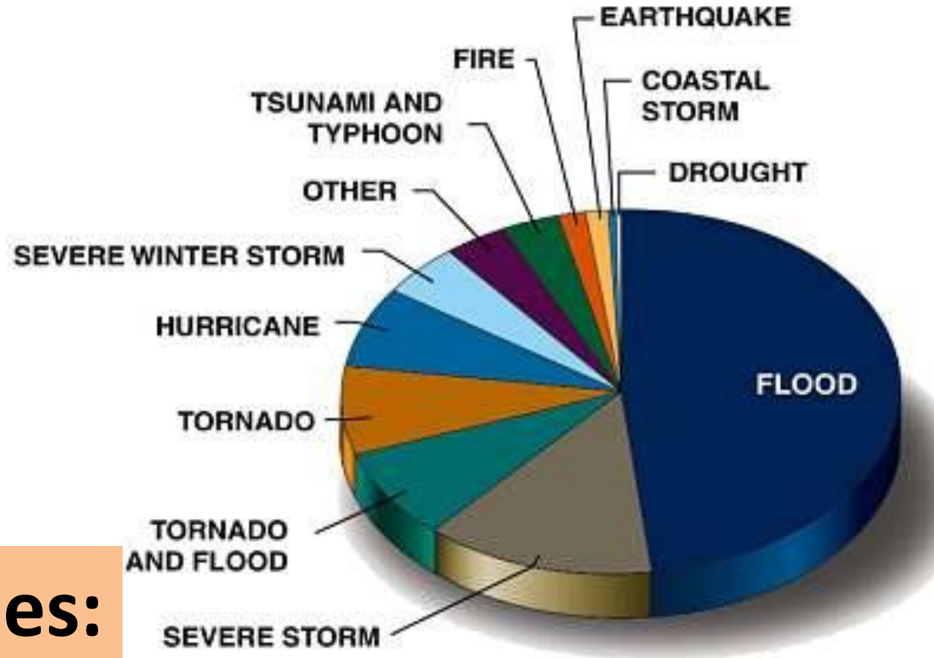
Every km of wetland reduce wave height by 1 m

Wetland/water conversions 1932-present

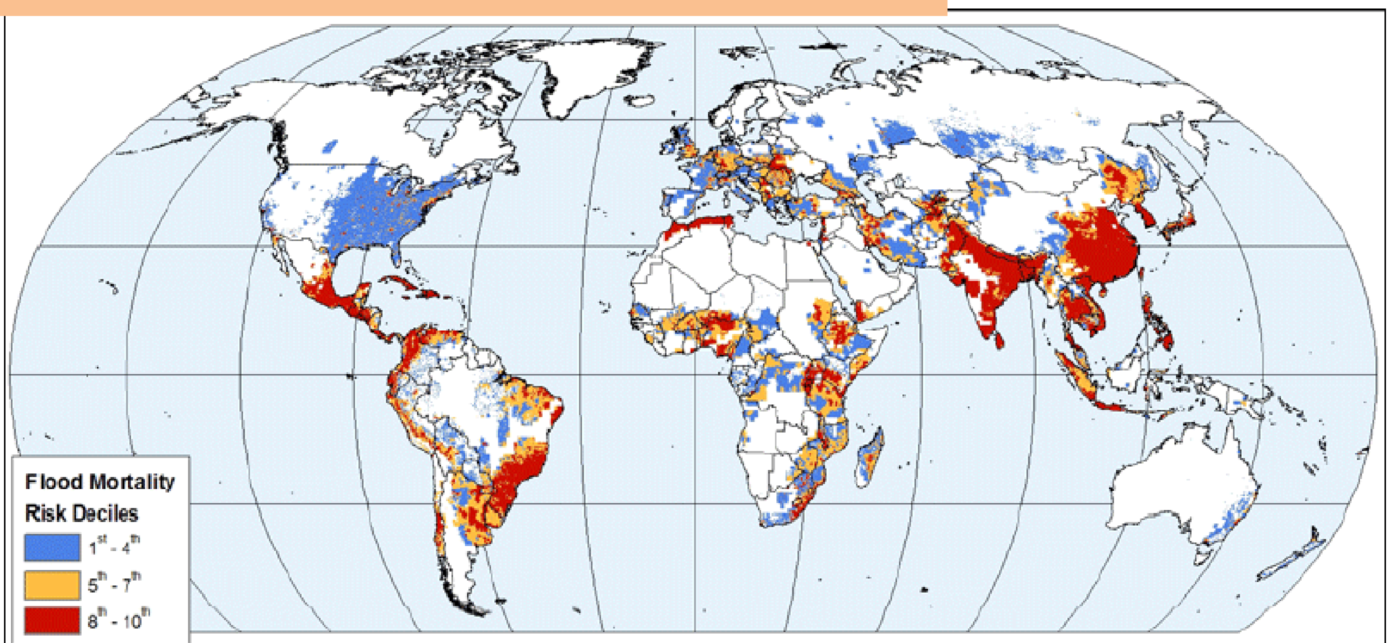
Source: USGS

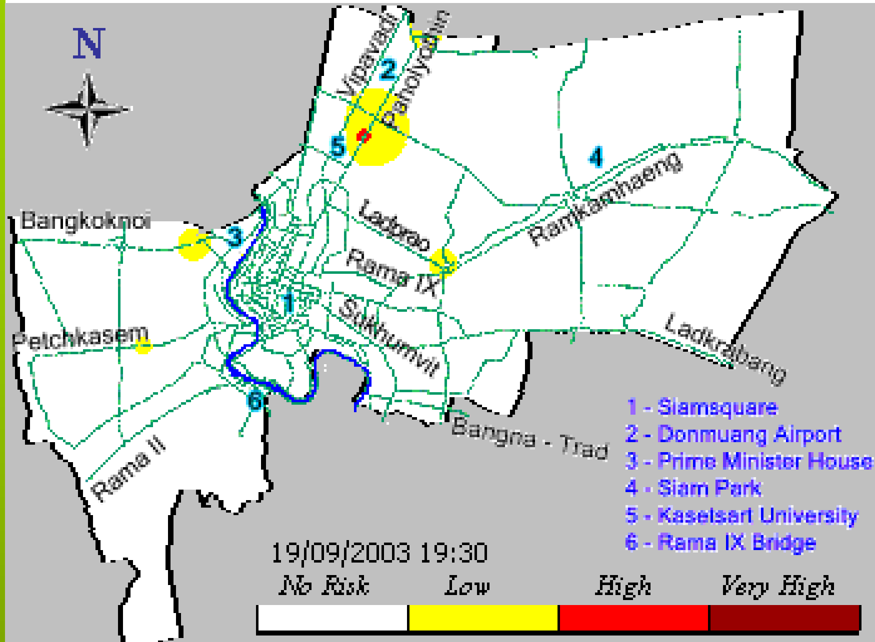
RG

RG Urban and Landscape Ecology



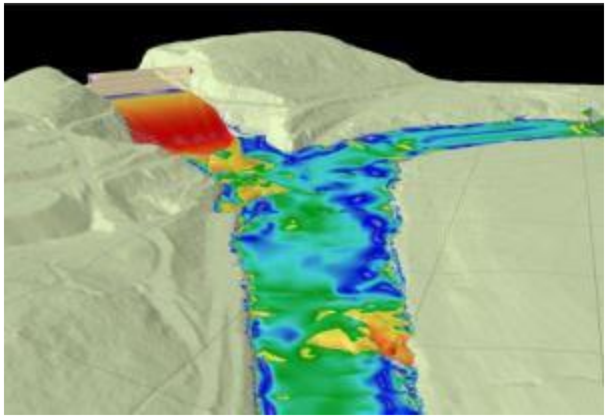
Cities in water landscapes: The risks

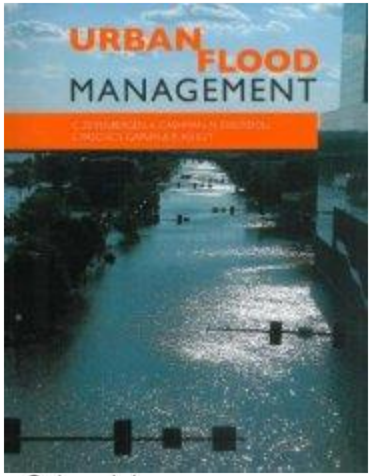


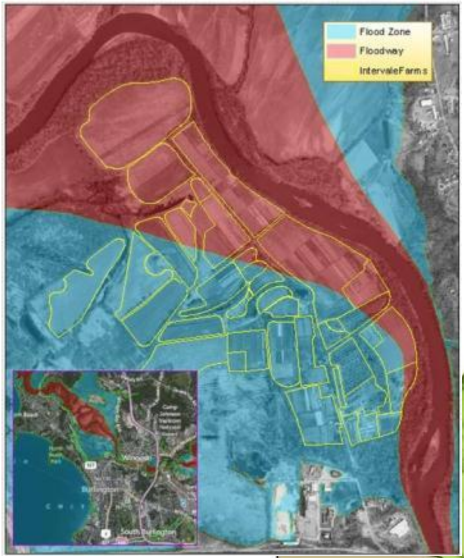


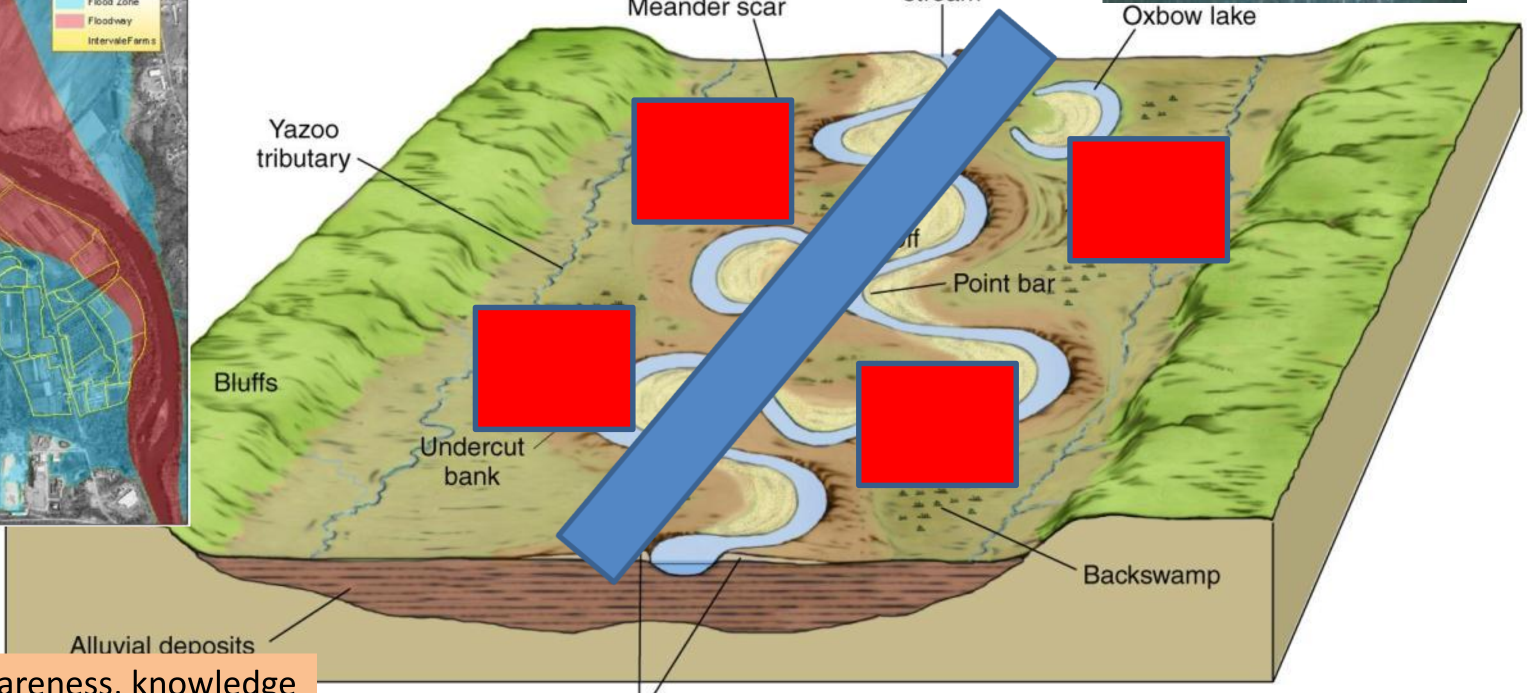
Bangkok - Living in Water Landscapes
The Flood 2011/2012

Understanding floodplains as ecosystems in cities!





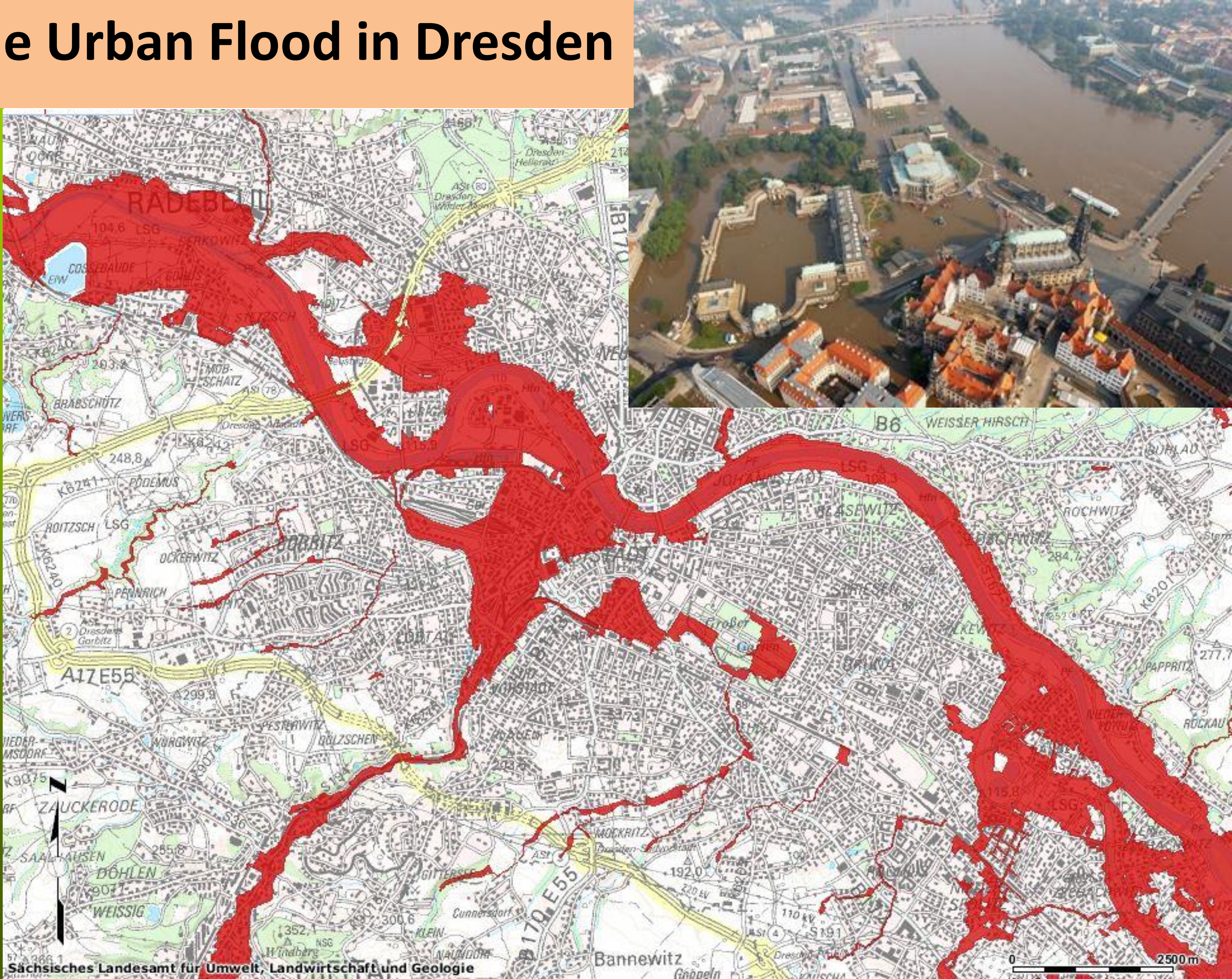




Information, awareness, knowledge and precaution are necessary among the population!

The Urban Flood in Dresden

RG Urban and Landscape Ecology



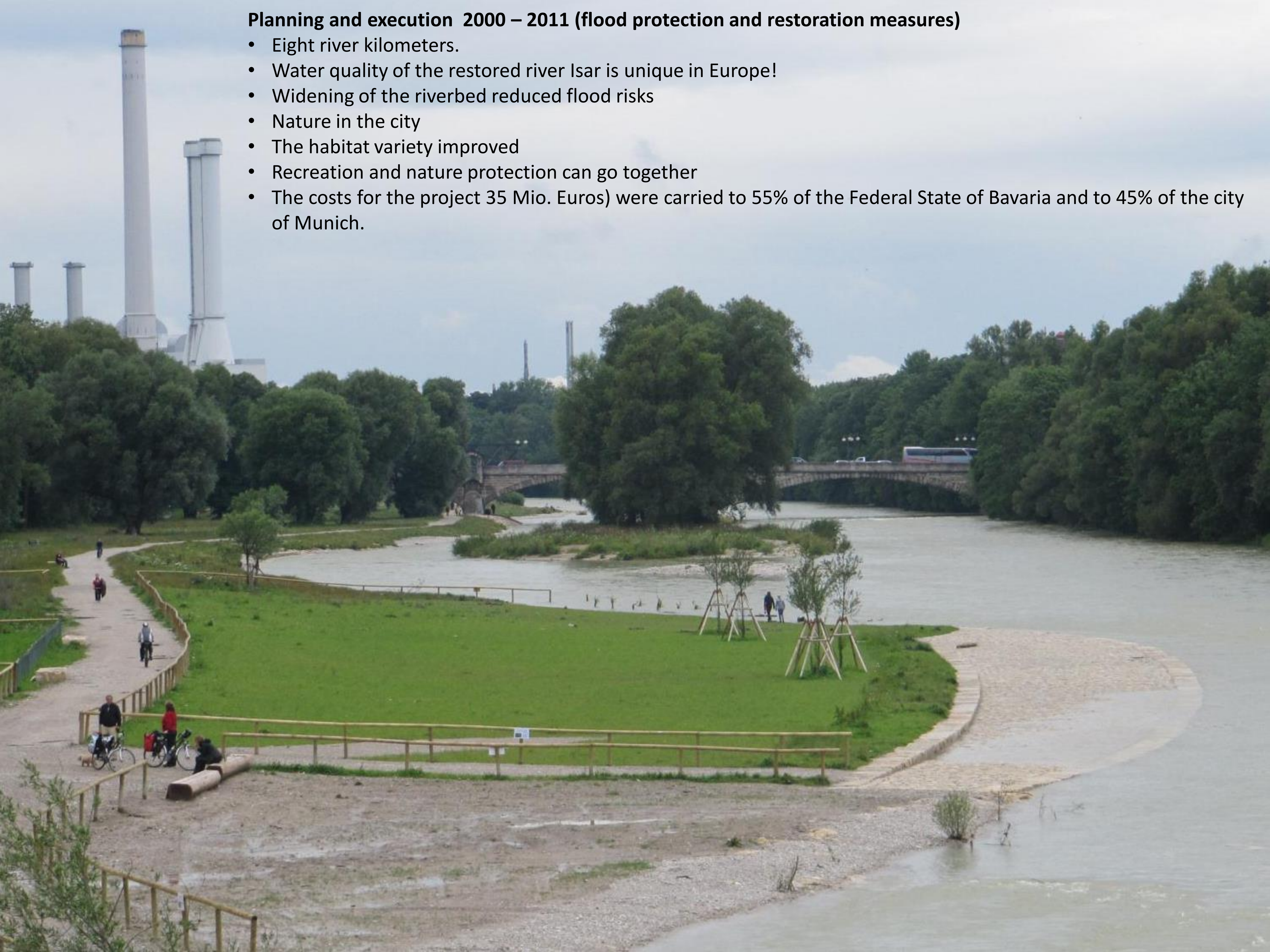
Restoration of river Isar in Munich (2000 – 2011)

Targets:

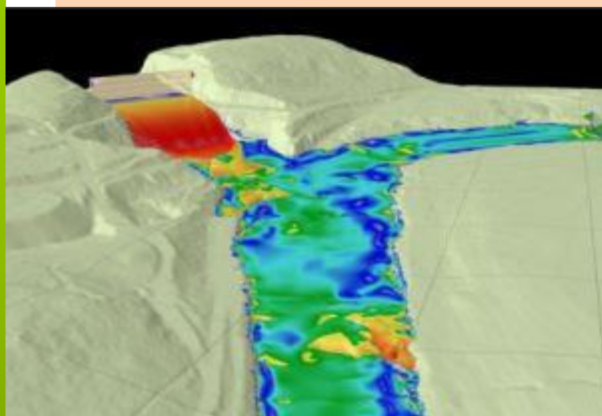
- Better flood protection
- More room and nature proximity for the riverside
- Improvement in the leisure and relaxation function of the urban river landscape.

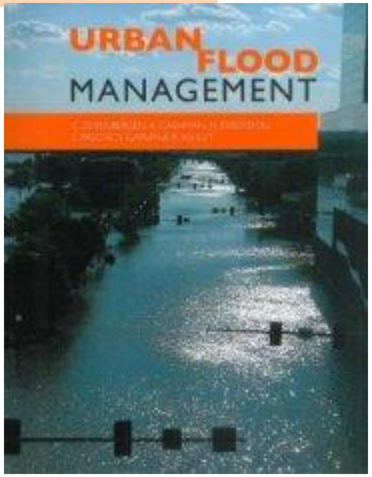
Planning and execution 2000 – 2011 (flood protection and restoration measures)

- Eight river kilometers.
- Water quality of the restored river Isar is unique in Europe!
- Widening of the riverbed reduced flood risks
- Nature in the city
- The habitat variety improved
- Recreation and nature protection can go together
- The costs for the project 35 Mio. Euros) were carried to 55% of the Federal State of Bavaria and to 45% of the city of Munich.

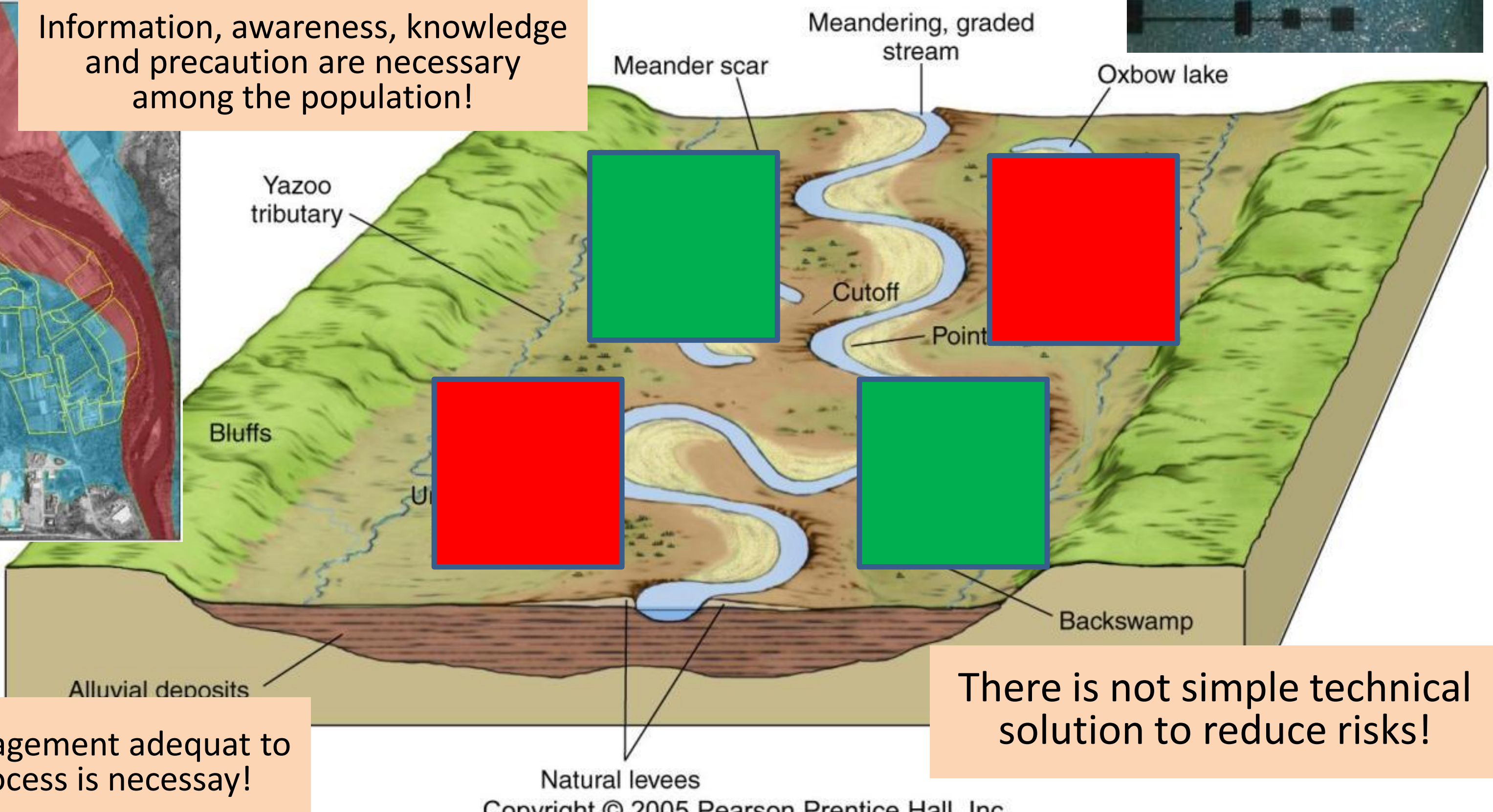


Understanding flood plains as ecosystems in cities!





Information, awareness, knowledge and precaution are necessary among the population!



There is not simple technical solution to reduce risks!

A land use management adequat to ecological process is necessay!

NATIONAL PARKS
NATIONAL PARKS BOARD SINGAPORE

Structure

Part I: Profile of the City (Qualitative)

- Indigenous ecosystems found in the city
- Native species found in the city
- Quantitative data on populations of key biodiversity indicators
- Other relevant biodiversity data

Part II: Indicators (Quantitative)

- Native Biodiversity in the City → 10 Indicators
- Ecosystem Services Provided by Biodiversity in the CIty → 4 Indicators
- Governance and Management of Biodiversity in the City → 9 Indicators

The Trends

- Urban ecosystem services (UES) are still not accepted as planning targets
- UES are not always properly developed where they can be generated (on green spaces)
- UES are provided on all levels – it starts with the site level!
- UES are partly destroyed by unattended planning and missuses
- UES can’t be developed by more public financing
- More UES are needed where the people live
- Less UES are available where the people live
- Social inconsistence in consuming opportunities of UESs

The Society for Urban Ecology has five goals…

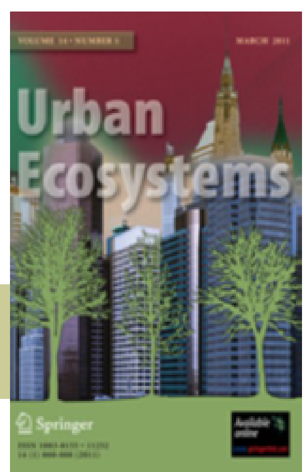
1. **Develop** an understanding of the structure and function of urban ecosystems;

2. **Advance** a balanced interaction between humans and their environments in cities and towns;

3. **Foster** and develop knowledge and implementation of urban ecology;

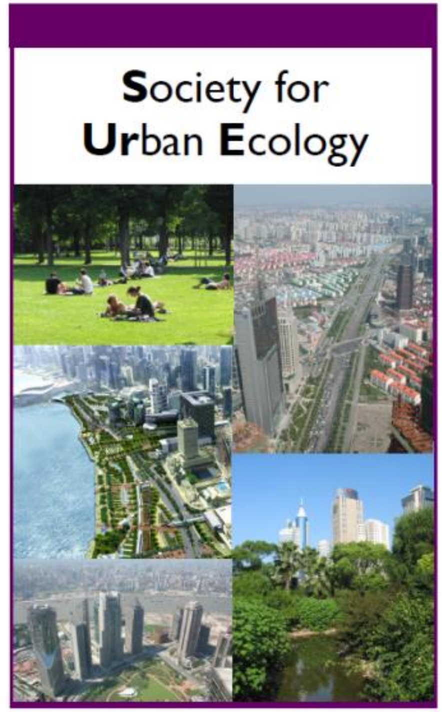
4. **Strengthen** contacts and enrich the dialogue between researchers, practitioners and teachers;

5. **Make** the collective expertise of urban ecologists available.



Urban Ecosystems - our flagship journal

S|URE



SURE

Jürgen Breuste

SURE President

Urban Ecology and SURE

There is always a chance for urbanecosystem service on site level!

TOWARDS A NEW URBAN PARADIGM?

Lecture 4: The case of urban rainwater management

SUNRAISE

UNIVERSITÄT SALZBURG

Co-funded by the Erasmus+ Programme of the European Union

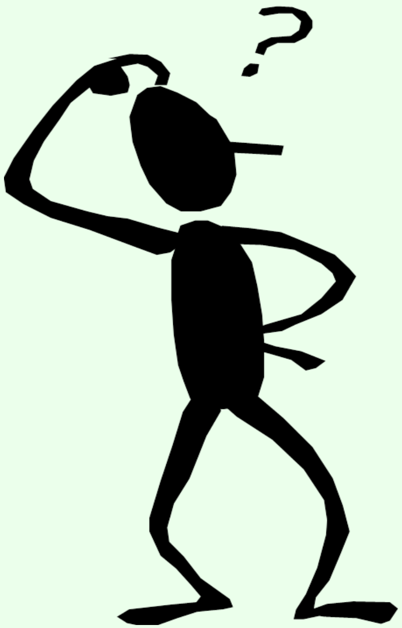
MSc. Marc Giménez Maranges – Department of geography and geology – University of Salzburg

Conventional rainwater management

New project for our team

Design of a new very modern building in the city of Salzburg

How should we carry out the management of rainwater in the building?



Conventional rainwater management

Summary of the ideas

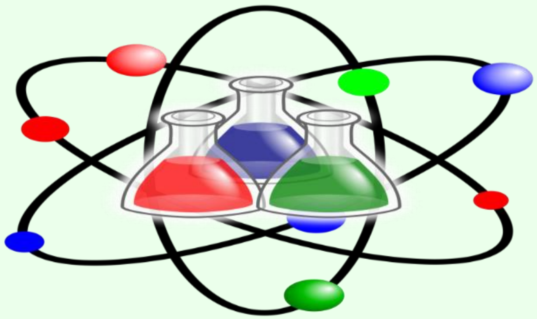
- Systems of pipes and gutters

- High degree of soil sealing

Conventional rainwater management

Summary of the ideas

- Top-down governance structures



- Fragmentation of organisation responsibilities

- Mismatch between urban boundaries and those of hydrologic units

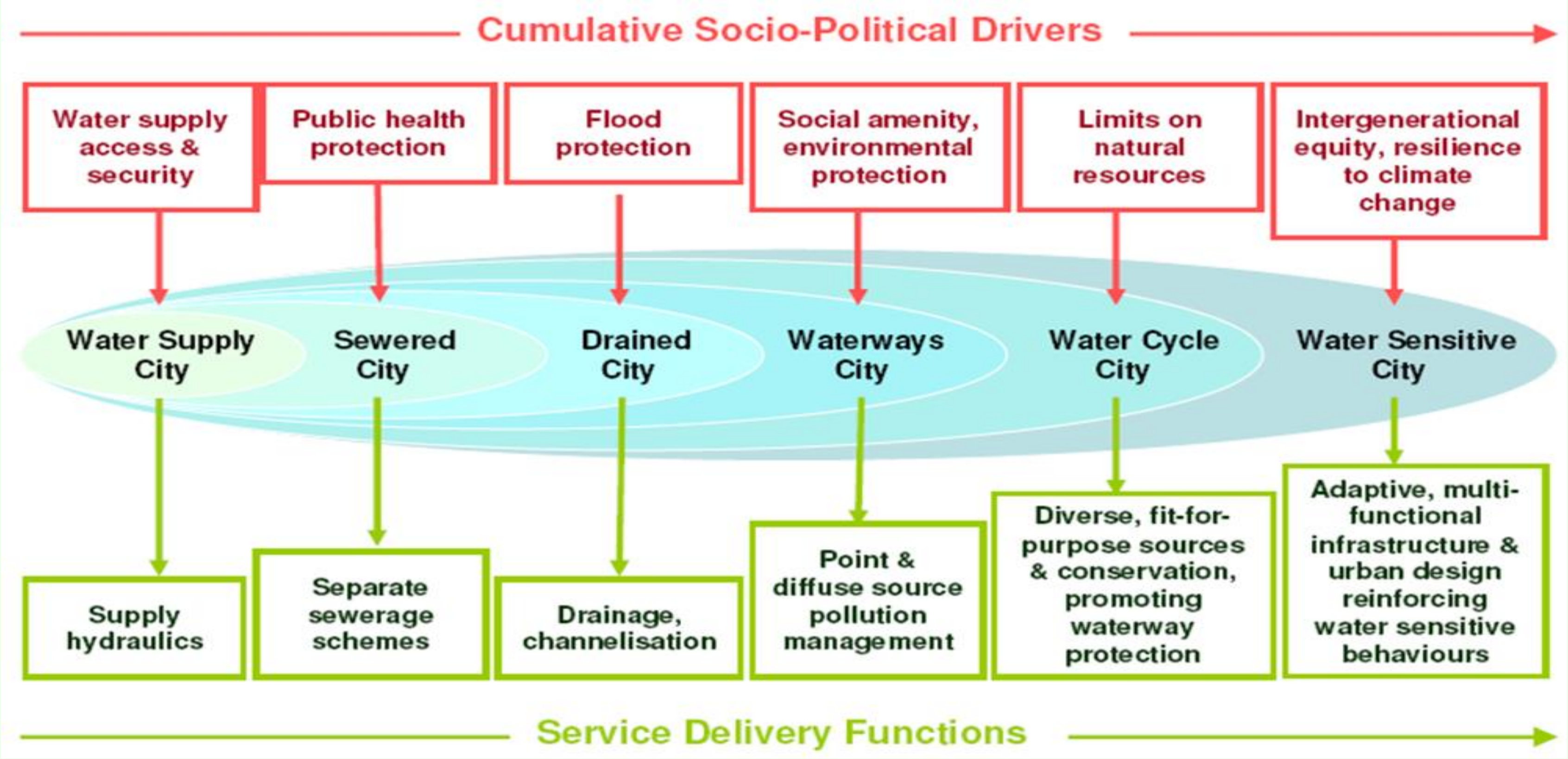
Conventional rainwater management

Consequences

CONCLUSION: Nature is the devil!!!

Alternative paradigms

The water sensitive city model



Urban water management transitions framework *(Brown et al., 2008)*

Alternative paradigms

Chief ideas

Drainage systems:

- Are designed as part of the local environment with which they co-evolve
- Can be easily adapted to changing requirements
- Are adapted to the specifics of each location

- Their collapse is understood as an opportunity to learn
- Interdisciplinary networks are responsible for the decision-making

SuDS

Definition

“Drainage systems that consist of aboveground mechanisms that mimic natural processes to deal with flooding.”

SuDS

Main typologies

Green roofs

Ponds and wetlands

SuDS

Main typologies

Basins

Swales

SuDS

Main typologies

Permeable pavements

Rain barrels

SuDS

SuDS management train

SuDS

3 pillars of action

1
Intervention in the relief

2
Reduction of the degree of soil sealing

3
Implementation of SuDS

In the transition to...

Current reality

- The uptake of SuDS remains slow
- Exception → Demonstration projects at the local level

Not least in:
- Australia
- USA
- Throughout Europe

In the transition to...

Current reality

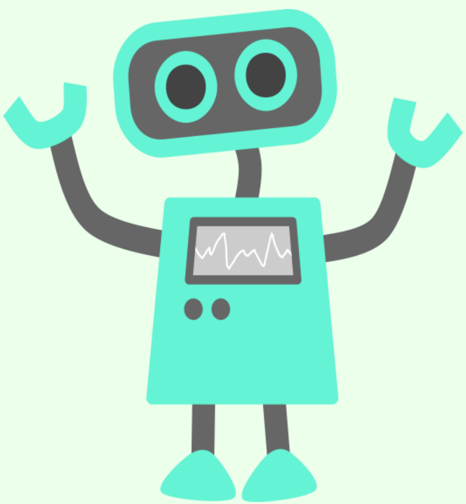
- SuDS concept → Dates back to the 1960s - 1970s in the USA
- In Europe → Introduction in the late 1980s
- In Australia → Introduction in the early 1990s

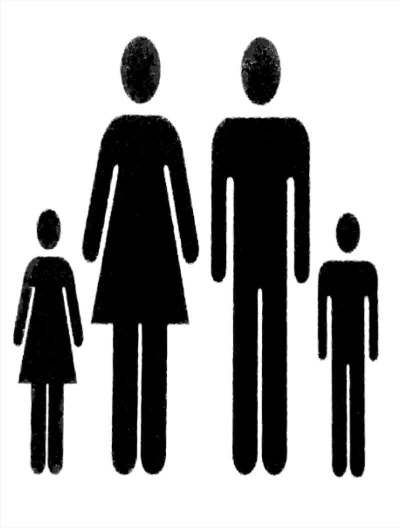
Uneven spread of the concept

In the transition to...

Current reality

- Narrow and technological focus





√

X

In the transition to...

Current reality

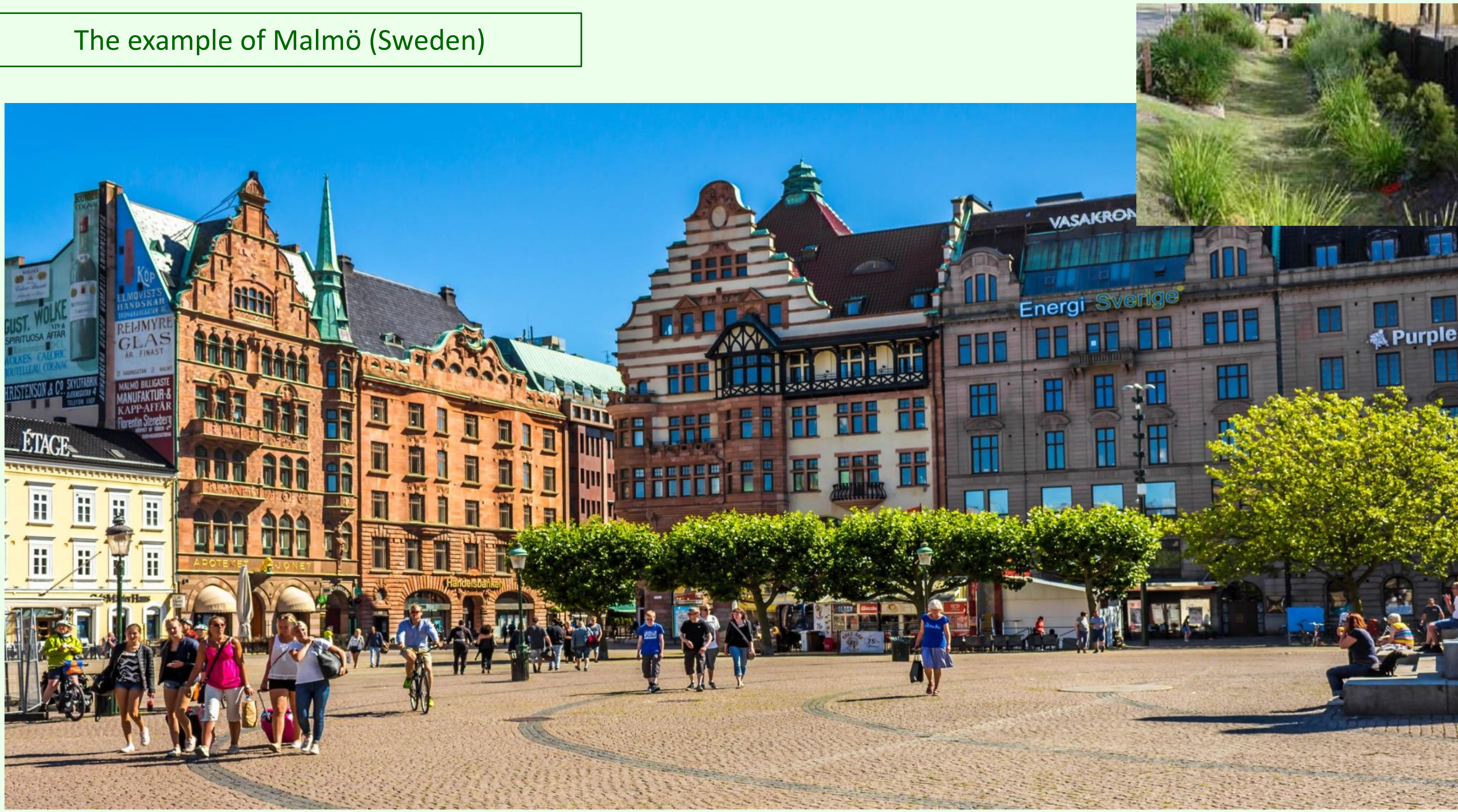
- Certain shift in the prevailing perceptions on rainwater

↓

Awareness is increasing e.g. in Australia and Sweden

In the transition to...

The example of Malmö (Sweden)



In the transition to...

The example of Malmö (Sweden)

Eco-district of Augustenborg

In the transition to...

The example of Malmö (Sweden)

Eco-district of Augustenborg – rainwater

Rainwater system in Augustenborg *(VA SYD, n.d.) (extracted from Kibirige and Tan, 2013)*

Number	Implication	Number	Implication
1	The Augustenborg botanical roof garden area	9	Basketball court, storm water collected here travel to 10
2	Storm water storage pumped underground from storage area	10	Ditch through the park
3	Concrete canal	11	Outlet pond Nr 1
4	Wetland	12	Storage pond
5	Onion gutters	13	Macadam-bottomed ditch
6	Storage pond	14	Storage pond
7	Block flat with green roof	15	Constructed tone canal
8	Cube canal	16	Outlet pond Nr 2

In the transition to...

The example of Malmö (Sweden)

Eco-district of Augustenborg – engagement of citizens

In the transition to...

The example of Linz

In the transition to...

The example of Linz

The SolarCity – rainwater

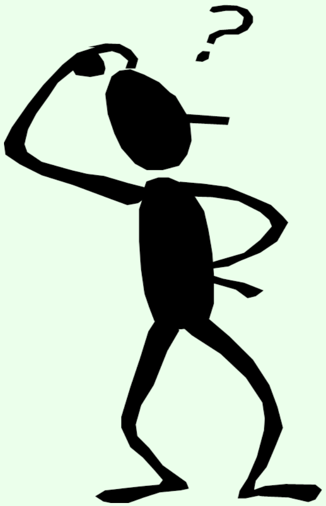
Conventional rainwater management

Exercise

Please gather in groups and discuss on the following task.

1. Look at the orthophotos which have been provided to you on 2 city districts with dissimilar degrees of soil sealing. Afterwards, think of: which measures you would implement in order to manage rainwater in both districts. Take a multi-scalar perspective into account.

Time: 1 hour and 30 minutes



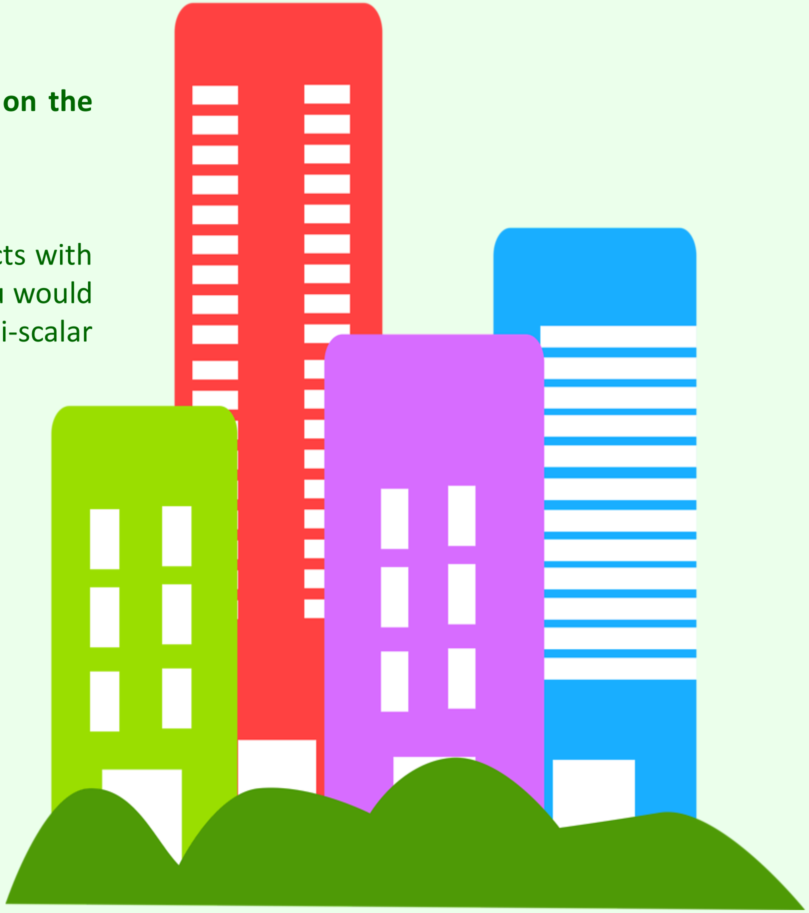
Conventional rainwater management

Oral presentation

It is time to present your results! Please present your results to the class on the following task. Afterwards, discuss on the distinct ideas suggested.

1. Look at the orthophotos which have been provided to you on 2 city districts with dissimilar degrees of soil sealing. Afterwards, think of: which measures you would implement in order to manage rainwater in both districts. Take a multi-scalar perspective into account.

Time: 30 minutes



THANKS FOR YOUR ATTENTION!!

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marc.gimenezmaranges@sbg.ac.at

UNIVERSITÄT SALZBURG

SUNRAISE

Co-funded by the Erasmus+ Programme of the European Union

Mountains

An Introduction

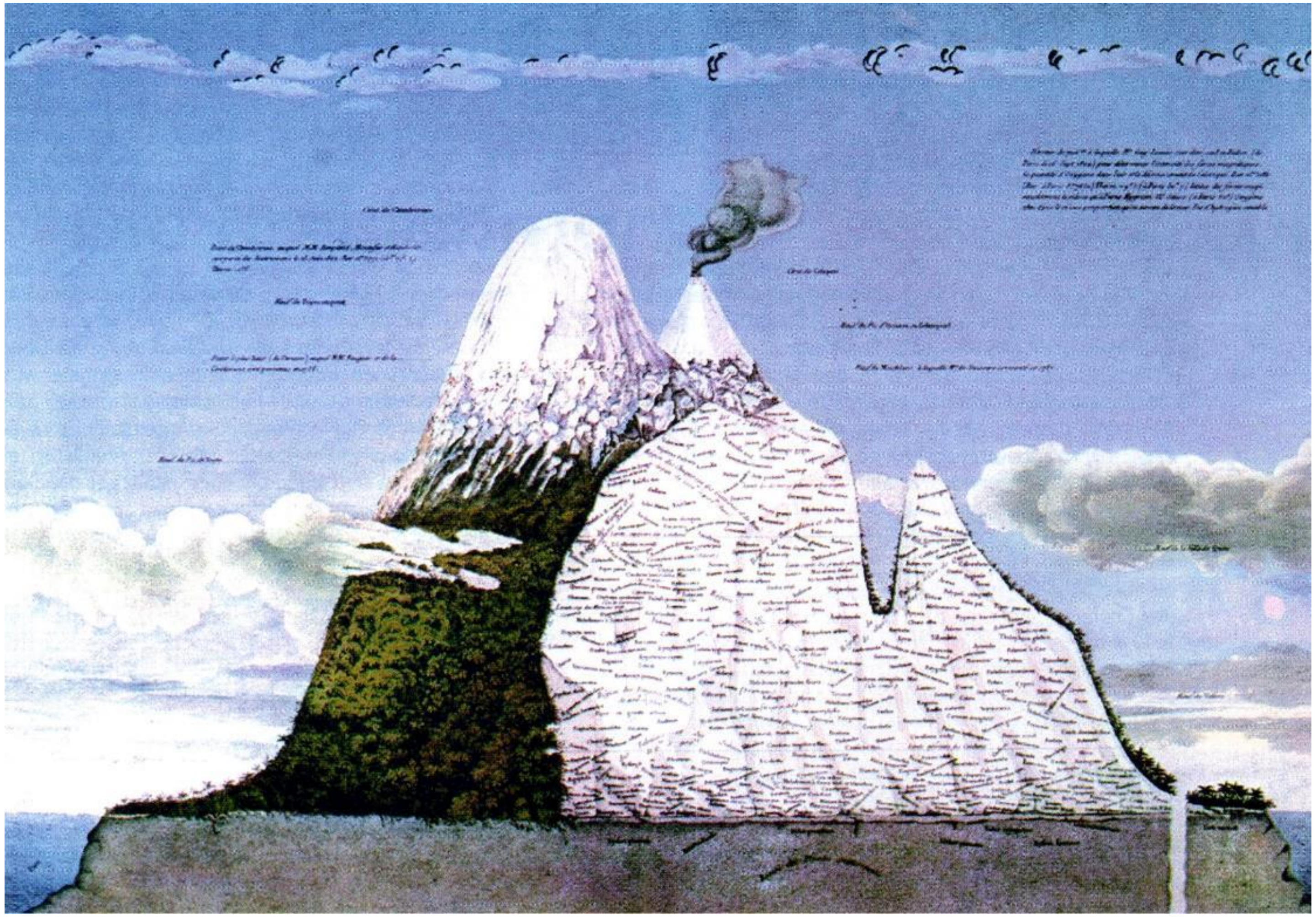
Prof. Dr. Jürgen Breuste

Paris Lodron University Salzburg, Austria

Mountains

… are

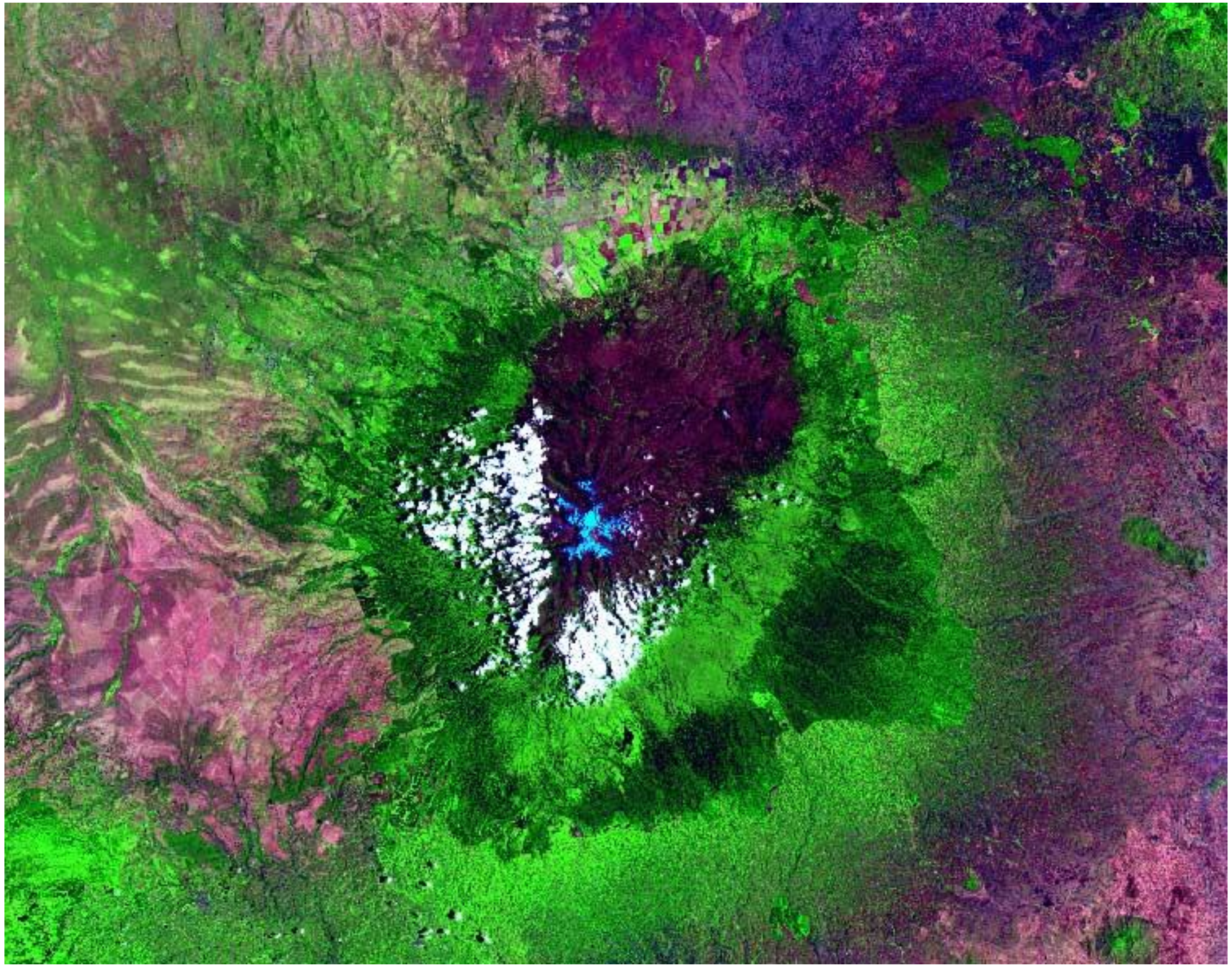
- specific ecosystems,
- diversity and complexity steep topographic, climatic and biological gradients
- sharp seasonal contrasts extreme climatic and geomorphic events
- strongly affect ecological and human environments



Mountain Landscape

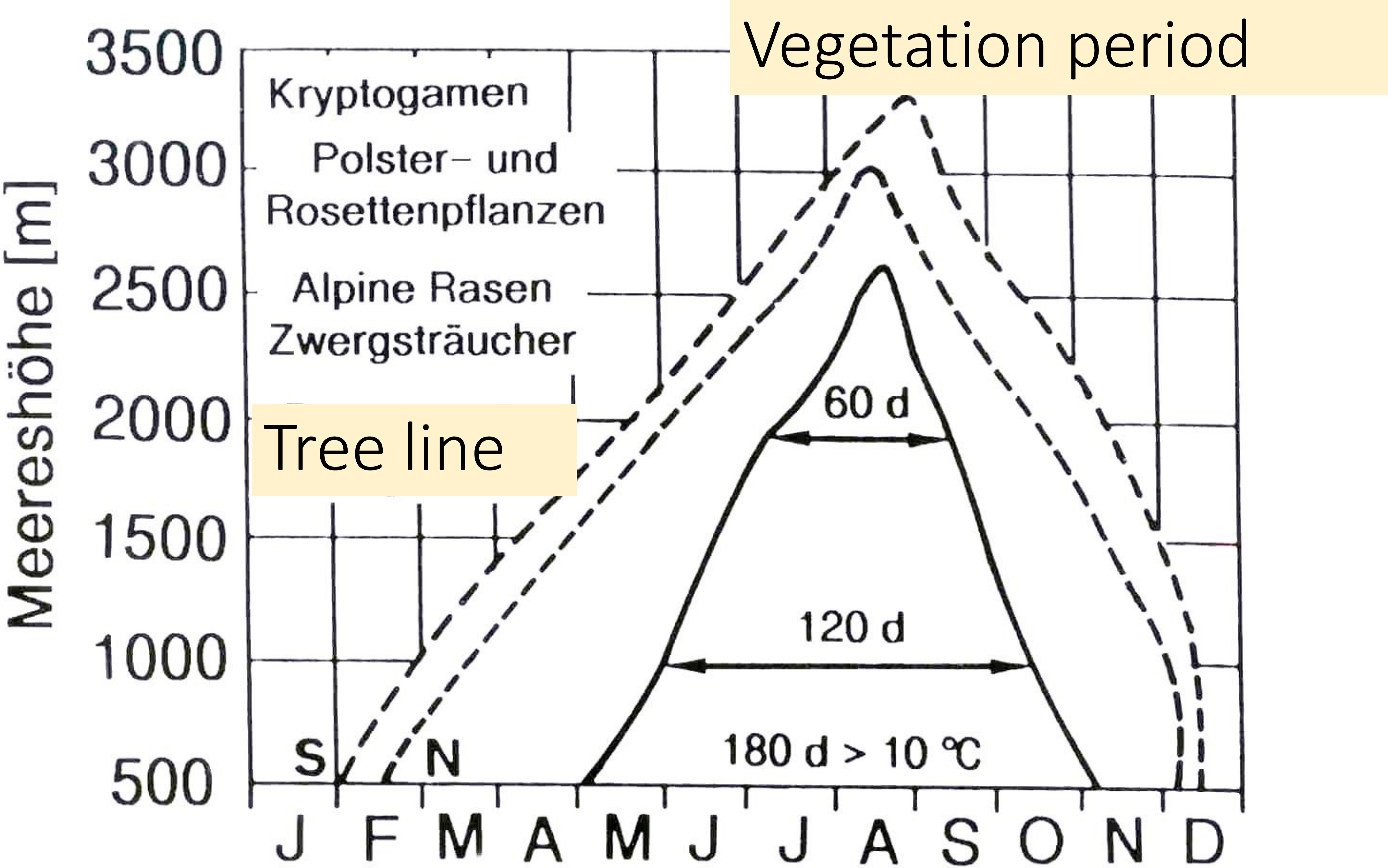
… is characterised by

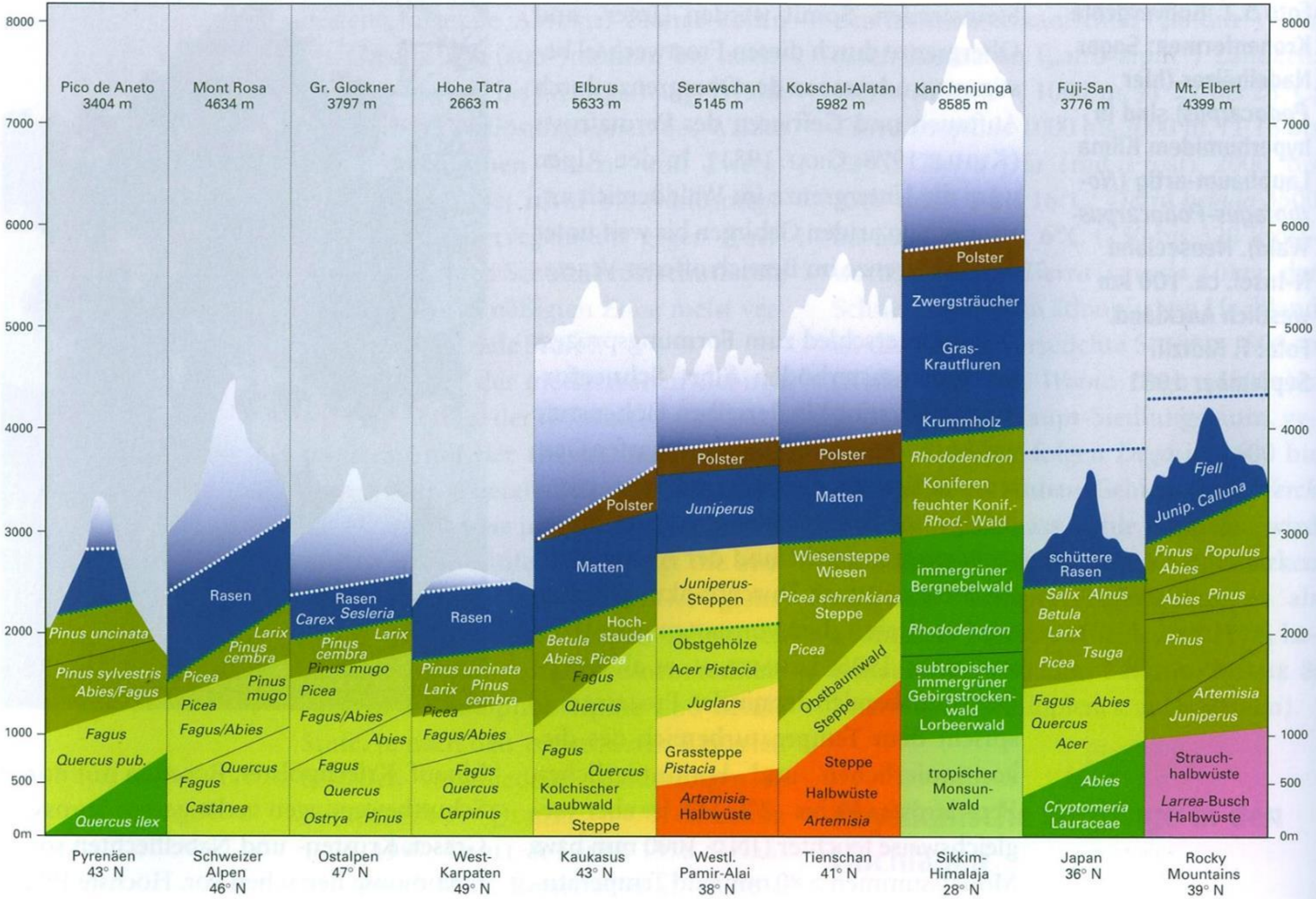
- instability and variability
- rock-strewn surfaces
- rapid physical weathering processes
- earth materials are continually being transported by gravity
- events such as mudflows, landslides, and avalanches



Mountain climates are extremely diverse

- Varied topography
- high contrasts in energy fluxes microclimates.
- Climatic patterns by the orientation, spacing, and steepness of slopes
- presence of snow patches, vegetation, and soil.
- windier
- air is thinner and clearer
- insolation more intense

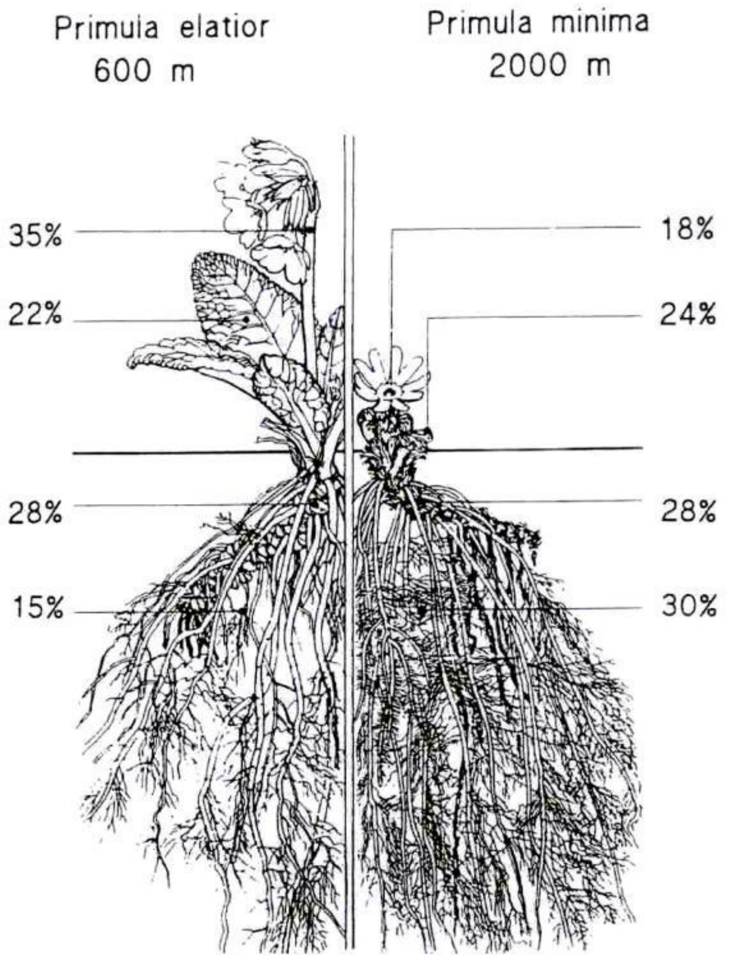

Vegetation period
Tree line
Kryptogamen
Polster- und Rosettenpflanzen
Alpine Rasen Zwergsträucher
60 d
120 d
180 d > 10 °C
S
N
Meereshöhe [m]
3500
3000
2500
2000
1500
1000
500
J F M A M J J A S O N D



8000
7000
6000
5000
4000
3000
2000
1000
500
0m
Pico de Aneto 3404 m
Mont Rosa 4634 m
Gr. Glockner 3797 m
Hohe Tatra 2663 m
Elbrus 5633 m
Serawschan 5145 m
Kokschal-Alatan 5982 m
Kanchenjunga 8585 m
Fuji-San 3776 m
Mt. Elbert 4399 m
Pinus uncinata
Pinus sylvestris
Abies/Fagus
Fagus
Quercus pub.
Quercus ilex
Rasen
Larix
Pinus cembra
Picea
Pinus mugo
Picea
Fagus/Abies
Quercus
Fagus
Castanea
Rasen
Carex
Sesleria
Larix
Pinus cembra
Pinus mugo
Picea
Fagus/Abies
Abies
Fagus
Quercus
Ostrya
Pinus
Rasen
Pinus uncinata
Larix
Pinus cembra
Picea
Fagus/Abies
Fagus
Quercus
Carpinus
Polster
Matten
Hoch-stauden
Betula
Abies, Picea
Fagus
Quercus
Fagus
Quercus
Kolchischer Laubwald
Steppe
Polster
Juniperus
Juniperus-Steppen
Obstgehölze
Acer Pistacia
Juglans
Grassteppe
Pistacia
Artemisia-Halbwüste
Polster
Matten
Wiesensteppe
Wiesen
Picea schrenkiana
Steppe
Picea
Obstbaumwald
Steppe
Steppe
Halbwüste
Artemisia
Polster
Zwergsträucher
Gras-Krautfluren
Krummholz
Rhododendron
Koniferen
feuchter Konif.-Rhod.- Wald
immergrüner Bergnebelwald
Rhododendron
subtropischer immergrüner Gebirgstrocken-wald
Lorbeerwald
tropischer Monsun-wald
schüttere Rasen
Salix
Alnus
Betula
Larix
Tsuga
Picea
Fagus
Abies
Quercus
Acer
Abies
Cryptomeria
Lauraceae
Fjell
Junip. Calluna
Pinus
Populus
Abies
Abies
Pinus
Pinus
Artemisia
Juniperus
Strauch-halbwüste
Larrea-Busch
Halbwüste
Pyrenäen 43° N
Schweizer Alpen 46° N
Ostalpen 47° N
West-Karpaten 49° N
Kaukasus 43° N
Westl. Pamir-Alai 38° N
Tienschan 41° N
Sikkim-Himalaja 28° N
Japan 36° N
Rocky Mountains 39° N

Flora

- most rapid and striking changes in vegetation
- plant-community characteristics occur with increasing altitude, decrease in the number of species.
- Changes also take place in the form and structure of plants and in the assemblage of species
- the general tendency is toward smaller and less elaborate plants with slower growth rates, decreased productivity, decreased plant diversity, and less interspecies competition
- The presence of mountains profoundly influences the biogeography of the Earth through their effects on global climate and their biological role of serving as pathways, barriers, and islands with respect to the migration and evolution of species:

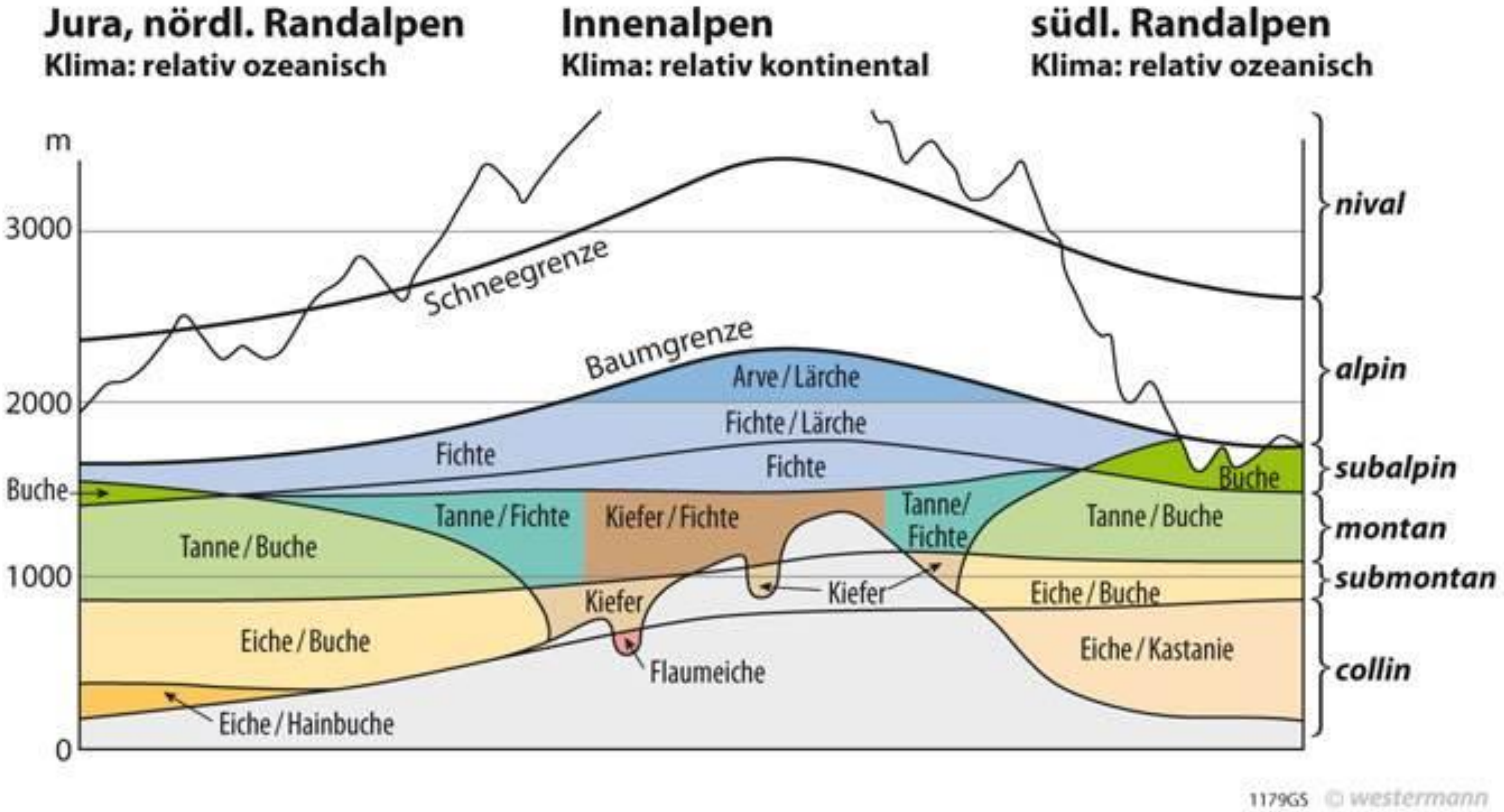


Durchschnittlicher prozentueller Anteil der Blüten, Blätter, Rhizome und Wurzeln an der Gesamtmasse (Trockensubstanz) von ausdauernden krautigen Pflanzen im Tal (z.B. Hohe Schlüsselblume, 600 m) und im Hochgebirge (z.B. Zwergprimel, 2000 m). Die existenzsichernden Pflanzenteile (Blätter, unterirdische Speicherorgane) sind in Tal- und Bergpflanzen prozentuell gleich ausgestattet, hingegen wird im Hochgebirge mehr Trockenmasse in das Wurzelwerk auf Kosten der Blütenbildung investiert. Nach KÖRNER und RENHARDT (1987).

Die Höhenstufen der Vegetation

Vegetation levels

Alps


Jura, nördl. Randalpen
Klima: relativ ozeanisch
Innenalpen
Klima: relativ kontinental
südl. Randalpen
Klima: relativ ozeanisch
m
3000
2000
1000
0
Schneegrenze
Baumgrenze
Arve / Lärche
Fichte / Lärche
Fichte
Fichte
Buche
Buche
Tanne / Fichte
Kiefer / Fichte
Tanne / Fichte
Tanne / Buche
Tanne / Buche
Kiefer
Kiefer
Eiche / Buche
Eiche / Buche
Flaumeiche
Eiche / Kastanie
Eiche / Hainbuche
nival
alpin
subalpin
montan
submontan
collin
1179GS © westermann

Mountains also have important effects

….on

- climate of adjacent regions
- depends upon their location, size and orientation
- with respect to the moisture source and the direction of the prevailing winds
- Himalayas permits tropical climates to extend farther north in India and southeast Asia
- On the north side of the Himalayas, however, there are extensive deserts and the temperatures are abnormally low for the latitude

High mountain ecosystems

… are

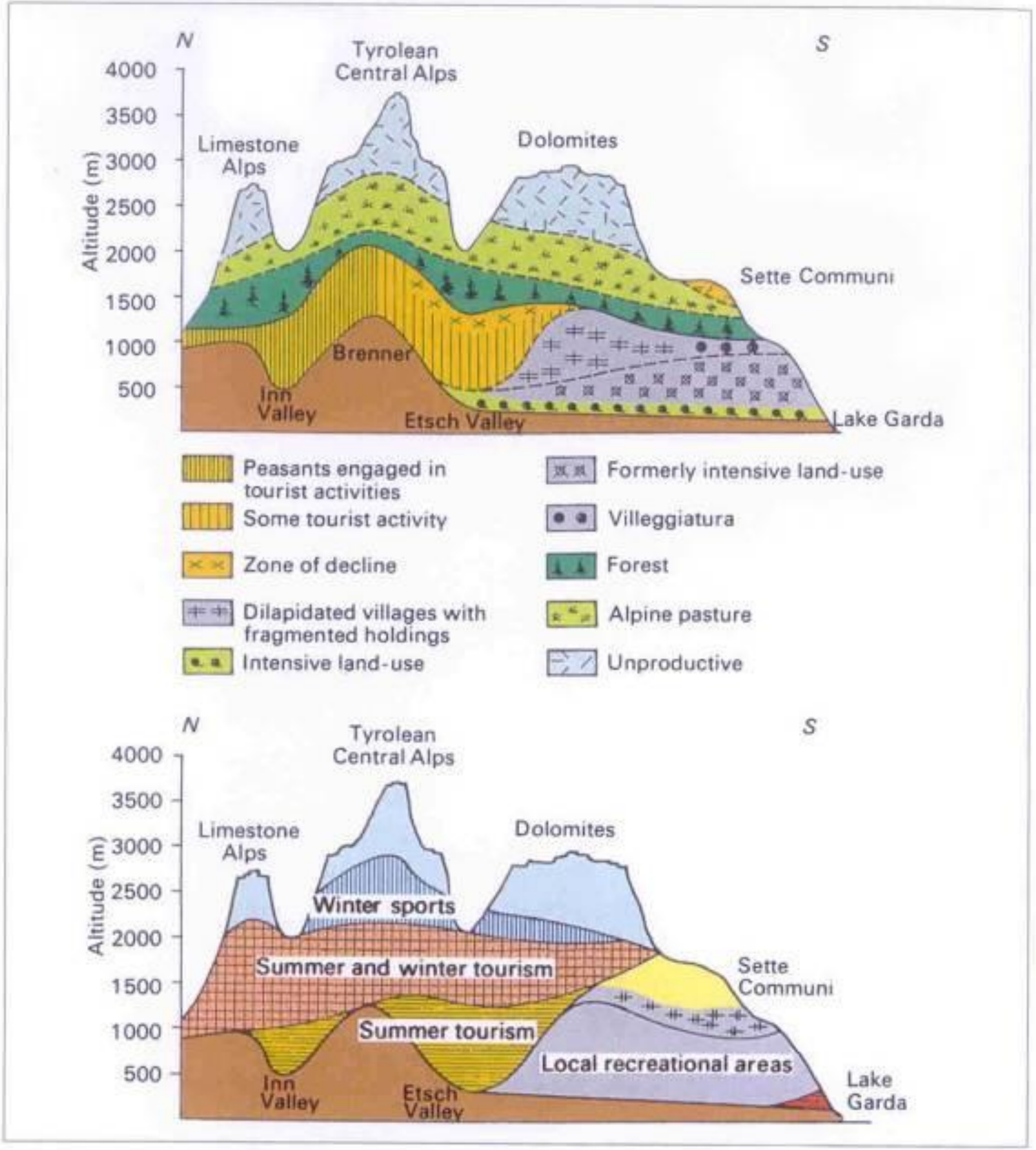
- relatively undeveloped ecosystems
- the majority of ispecies are pioneers
- organisms respond to all environmental stresses by morphological adaptations, physiological adjustments, behaviour patterns, and community relations and interaction

Die Höhenstufen der Vegetation

The Alps

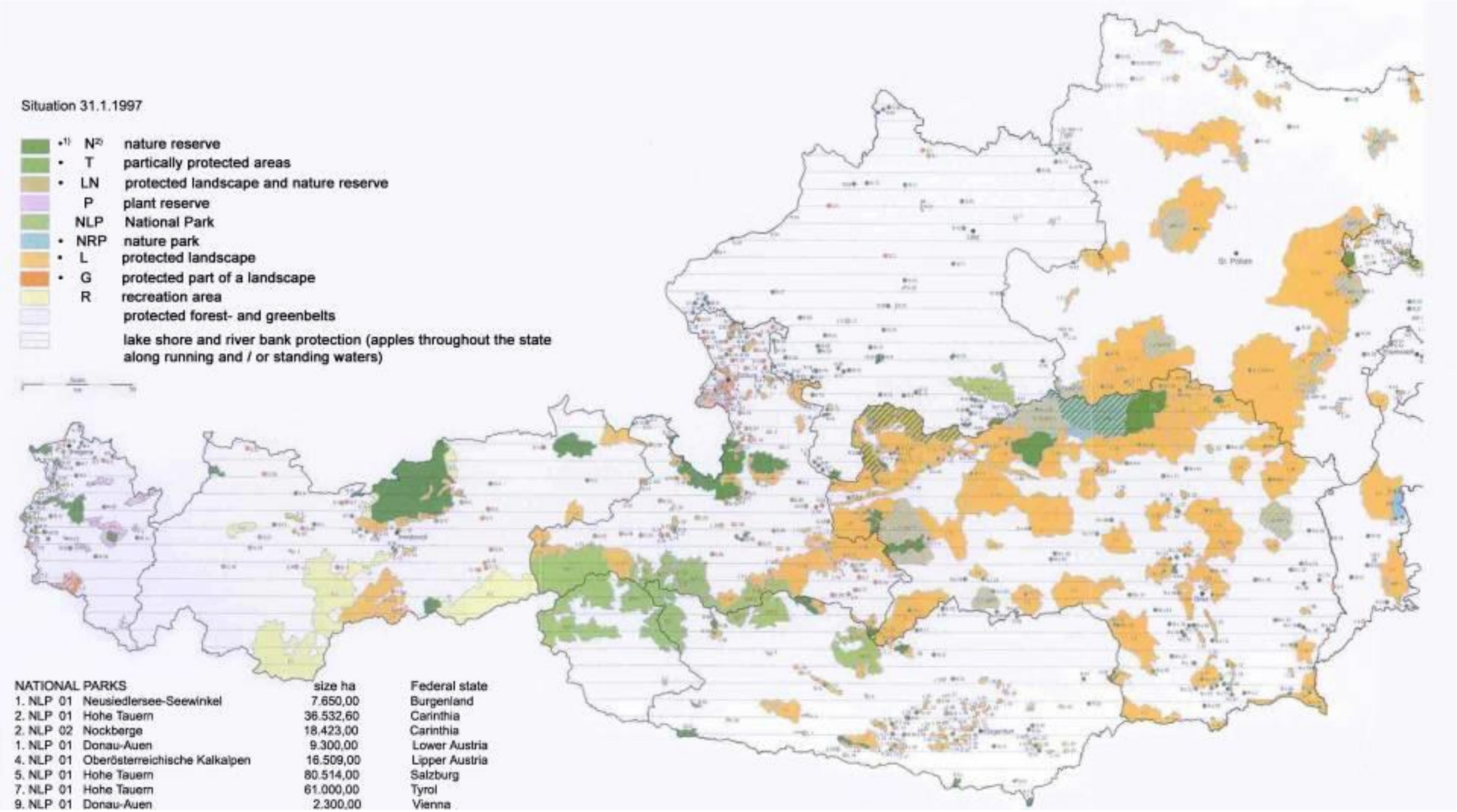
- second highest and most extensive mountain system in Europe
- total area of 240,000 km^2
- length of 1,000 km
- 130 and 250 km wide
- many summits rise above 4,000 m
- most mountain groups exceed 3,000 m and have snow- and ice-capped peaks

Economic Use



Mountain peasants and tourism along a north-south profile through the Eastern Alps

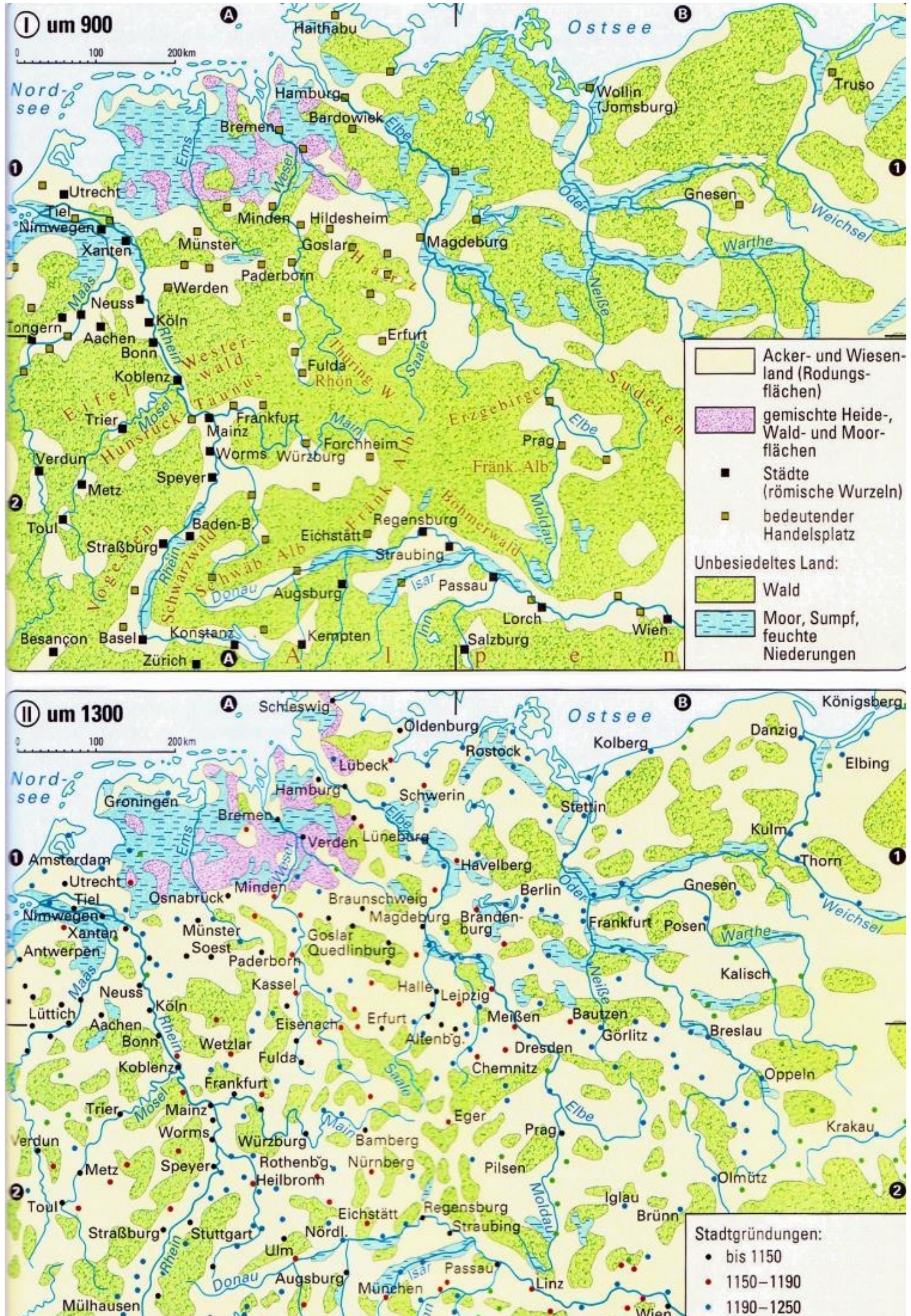
Nature Conservation



Forest development in Austria

- About 50% of Austria is forest! Since 1961 increase by 230.000 ha
- Lost of extensive used agricultural land (meadows, pastures etc.)
- Concurrence of urbanization and agriculture for space
- Agricultural land – goes to urbanization and forest
- Trend: **Lost of forests** in low forested landscapes for urbanization, forest grows, where already forest is

Forest Lost in Cenral Europe



Global Warming

General warming is expected to
lead to an upward shift of the glacier equilibrium line between 60 to 140 m per °C temperature increase
substantial glacier retreat
duration of snow cover is expected to decrease by several weeks for each degree Celsius of warming at middle elevations in the Alps region

Cities in Mountains		
	Altitude in m über N.N.	Inh. in 1.000 Ew.
Cali, Columbia	1.018	2.401
Kaxgar, China	1.270	341
Salt Lake City, USA	1.288	1.124
Ulaanbaatar, Mongolia	1350	1.380
Kathmandu, Nepal	1.400	1.003
Guatemala City	1.533	2.918
Guadalajara, Mexico	1.566	1.495
Maseru, Lesotho	1.600	220
Campos do Jordão, Brasil	1.628	51
Windhoek, Namibia	1.655	326
Almaty, Kirgistan	bis 1.700	1.508
Srinagar, India	1.730	1.193
Kabul, Afghanitan	1.791	4.635
Erzurum, Turke	1.950	762

Touristic Cities in Mountains	
	Altitude in m above N.N.
Chamonix, Frankreich	1.035
Metsovo, Griechenland	1.160
Ischgl, Österreich	1.377
Lech, Österreich	1.444
Campos do Jordão, Brasilien	1.628
Obertauern, Österreich	1.664
Ifrane, Marokko	1.664
Val d'Isere, Frankreich	1.785
St. Moritz, Schweiz	1.822
Obergurgl, Österreich	1.907
Tochal, Iran	1.910
Mussoorie, Indien	2.006
Nainital, Indien	2.084
Shimla, Indien	2.276
Aspen, USA	2.438
Valle Nevado, Chile	3.000
St. Moritz, Schweiz	1.822

Summer Tourism

Winter Tourism

Tasks

- Who lives in mountains?
- Why do people live in mountains?
- From what people live in mountains?
- Is it true?: Mountain people
    - are less intellgent and less celver than lowland people
    - are more traditional
    - suffer under less development
    - are poorer
    - live more sustainable
    - want to live like lowland people
    - are physically and mentaly stronger
    - don‘t like changes
    - Are more social

Co-funded by the Erasmus+ Programme of the European Union

SUNRAISE

Risks, Challenges and Sustainable Development Urban Settlements in Himalaya

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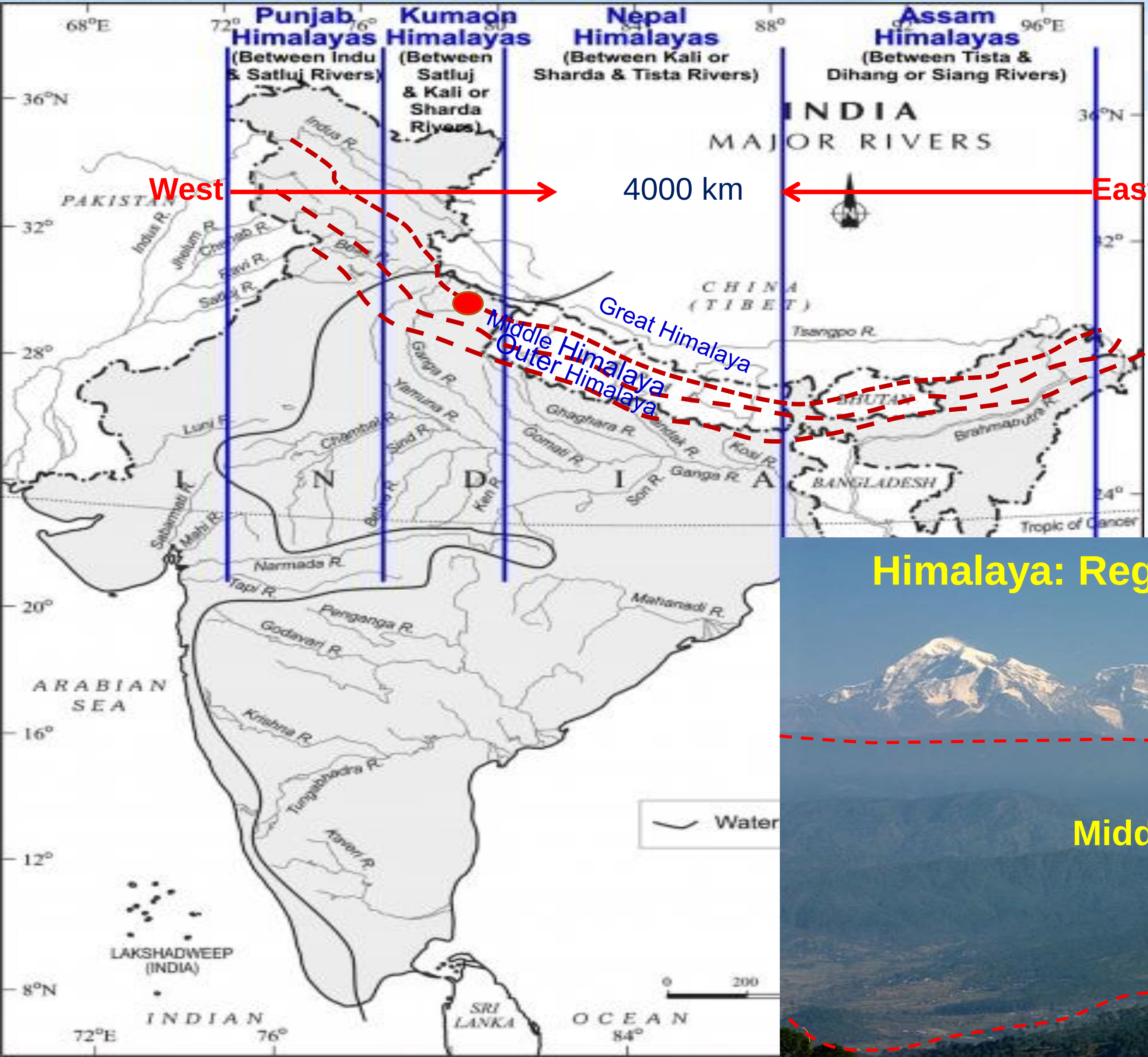
Mountains of the World

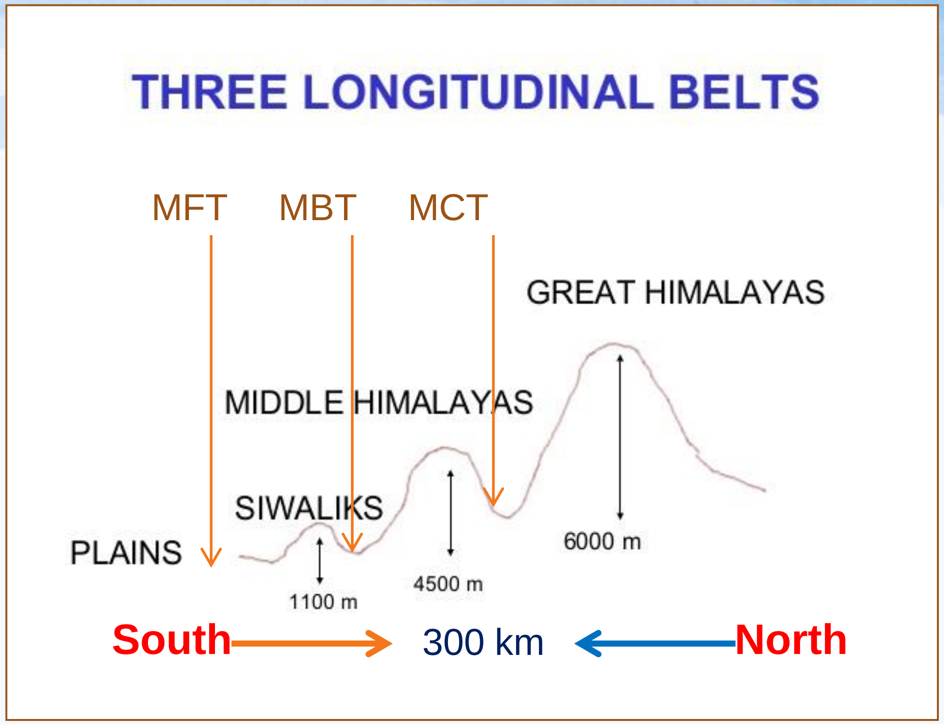
- Areas above 2500 m elevation have been included under mountains [FAO 2008]
- Mountain regions encompass nearly 24% of global land surface and constitute home for approximately 14% of the world's population [FAO 2008]
- Mountains constitute sources of a variety of ecosystems services, including water, biodiversity, soils, natural beauty, recreational opportunities, wilderness and cultural diversity
- Mountains constitute source of the largest trans-boundary river systems of the planet and nearly 70% of the World's population depends on mountains for the supply of freshwater (FAO 2018)
- Mountains have still the largest proportion of world's forests and constitute global biodiversity hot spots

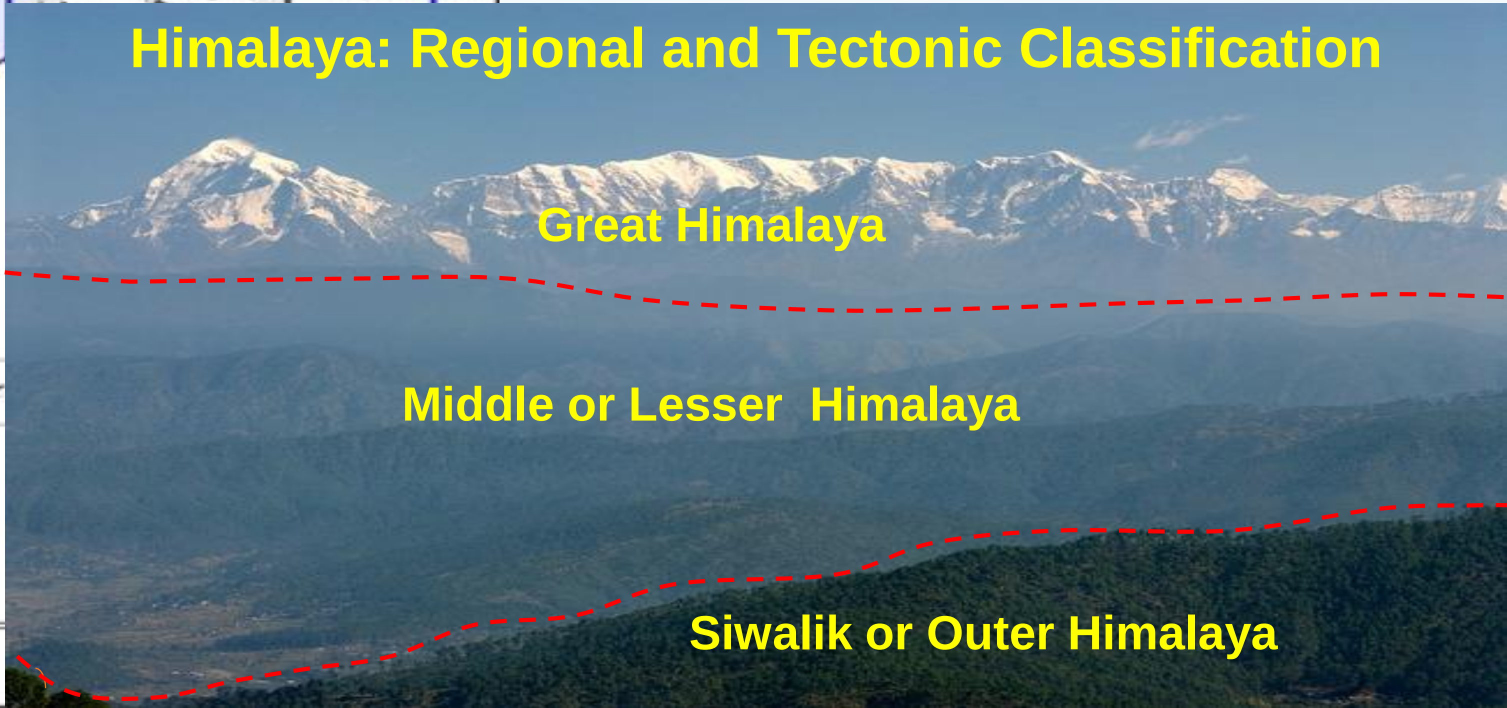
Mountains of the World

- Mountain communities have evolved diversity of cultures that comprise traditional knowledge, resource development and environmental conservation practices, agricultural and food systems, adaptation and coping mechanism, institutions, languages, customs, and traditions
- Mountains are critical from the view point of marginality, environmental sensitivity, climate change, constraints of terrain, resource-productivity, inaccessibility and infrastructural development
- Mountains are inhabited by some of the poorest and most food insecure people of the planet as they have long been marginalized from the view point of sustainable development of their resources and inhabitants
- Currently, mountain ecosystems as well as mountain communities are particularly threatened by the ongoing processes of environmental global change, particularly climate change, population dynamics, rapid urbanization and globalizing economy and resultant exploitation of mountain resources

Himalaya: Regional and Tectonic Classification







Himalaya: Highly Vulnerable to Global Environmental Changes

Natural Vulnerability

- Young Mountains
- Geo-tectonically Alive
- High Seismicity
- High Altitude
- Steep and Fragile Slopes
- Large Number of Glacial Lakes

Human Induced Vulnerability

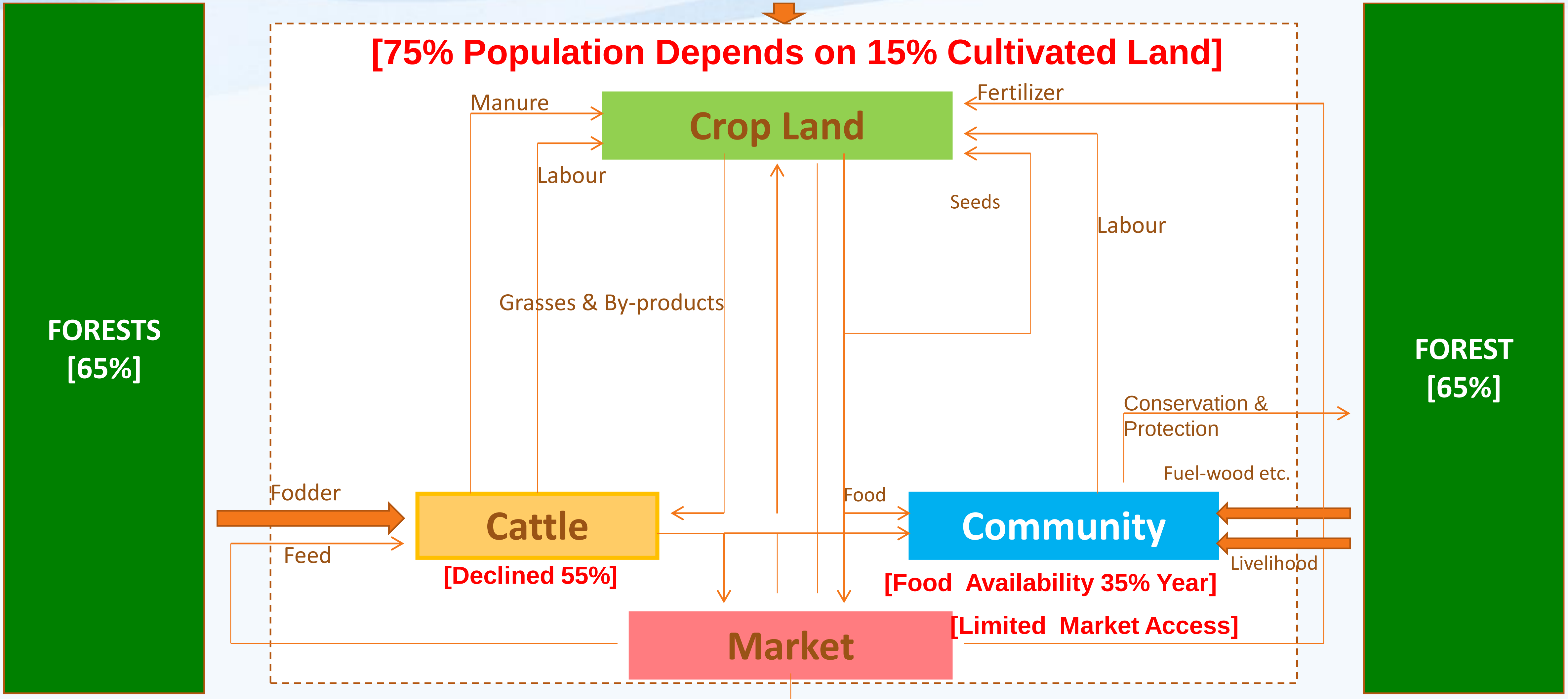
- Densely Populated
- Livelihood Constraints
- Poverty and Marginalization
- High Food Deficit
- Constraints of Infrastructure
- Rapid Urban Growth

Himalaya: Global Climate Change Hot Spot

- The most densely populated mountain inhibited by the poorest people
- Constitute headwaters of some of the largest trans-boundary river basins on the earth that sustain more than 44% global population in the South Asia
- Climate change is likely to cause disruption of hydrological regimes of the Himalayan watershed and change the discharge, volume and availability of water and increase frequency and severity of extreme events both in mountains and lowland
- This will increase vulnerability of large population to water, food, health and livelihood insecurity
- Will have enormous regional implications for all range of ongoing developmental programmes and also to peace and security in South Asia

Integrated Farming System in Himalaya

[Rainfall 15 % Declined and Rainy Days Decreased 10]



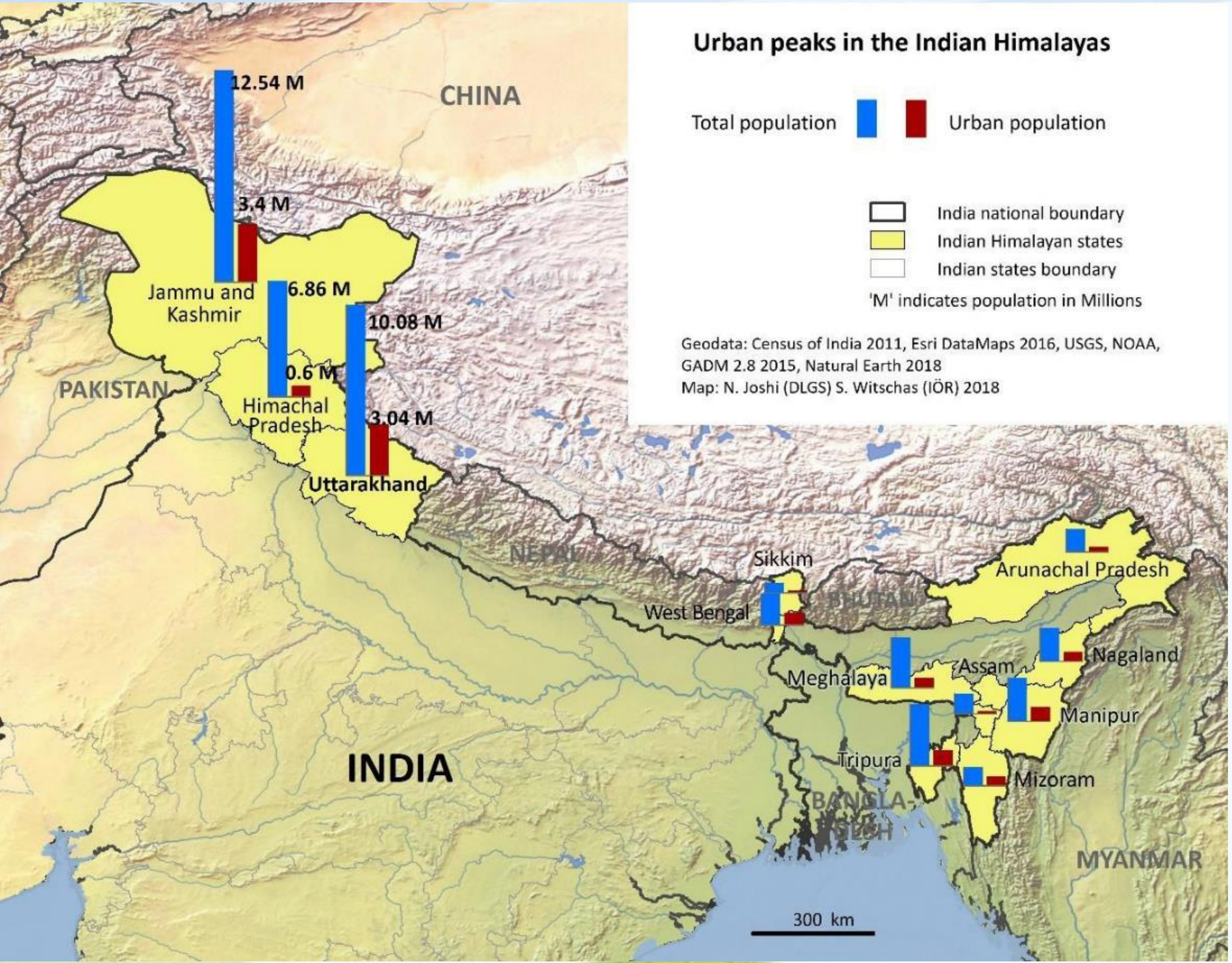
[Only 11% Agricultural Land is Irrigated and Irrigation Potential is Declining]

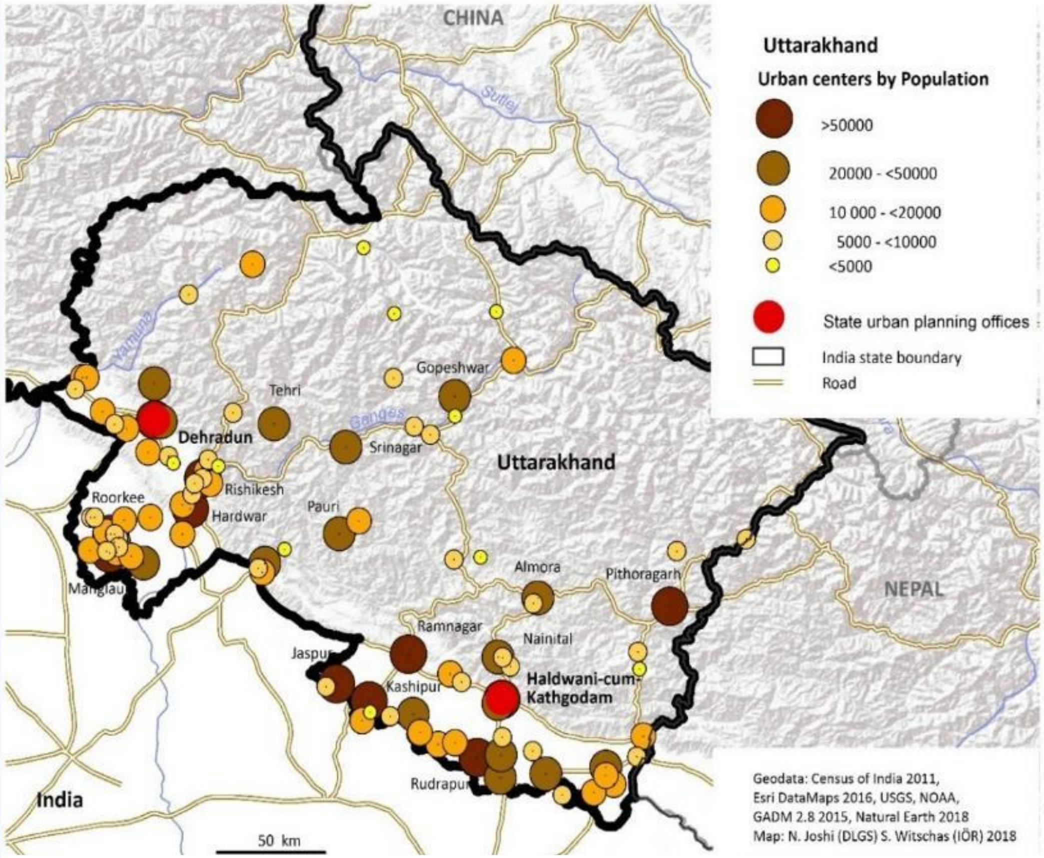
Due to Constraints of Subsistence Economy Large Proportion of Male Population Out-migrates and this Leads to Feminization of Resource Development Process and Agriculture in Himalaya

Specificity of Himalayan Urbanization

- Himalaya is the most rapidly urbanizing mountain, and urbanization has emerged as one of the major drivers of environmental change
- Himalaya and Andes are the only high mountains where urban centres have developed above 2500 m
- However, the urban growth is the highest in Himalaya
- We have fast growing towns even in Great Himalaya
- Urbanization in Himalaya is primarily an outcome of livelihood induced rural out-migration; but climate change is accelerating the trends
- Process of urbanization is most unplanned and unregulated

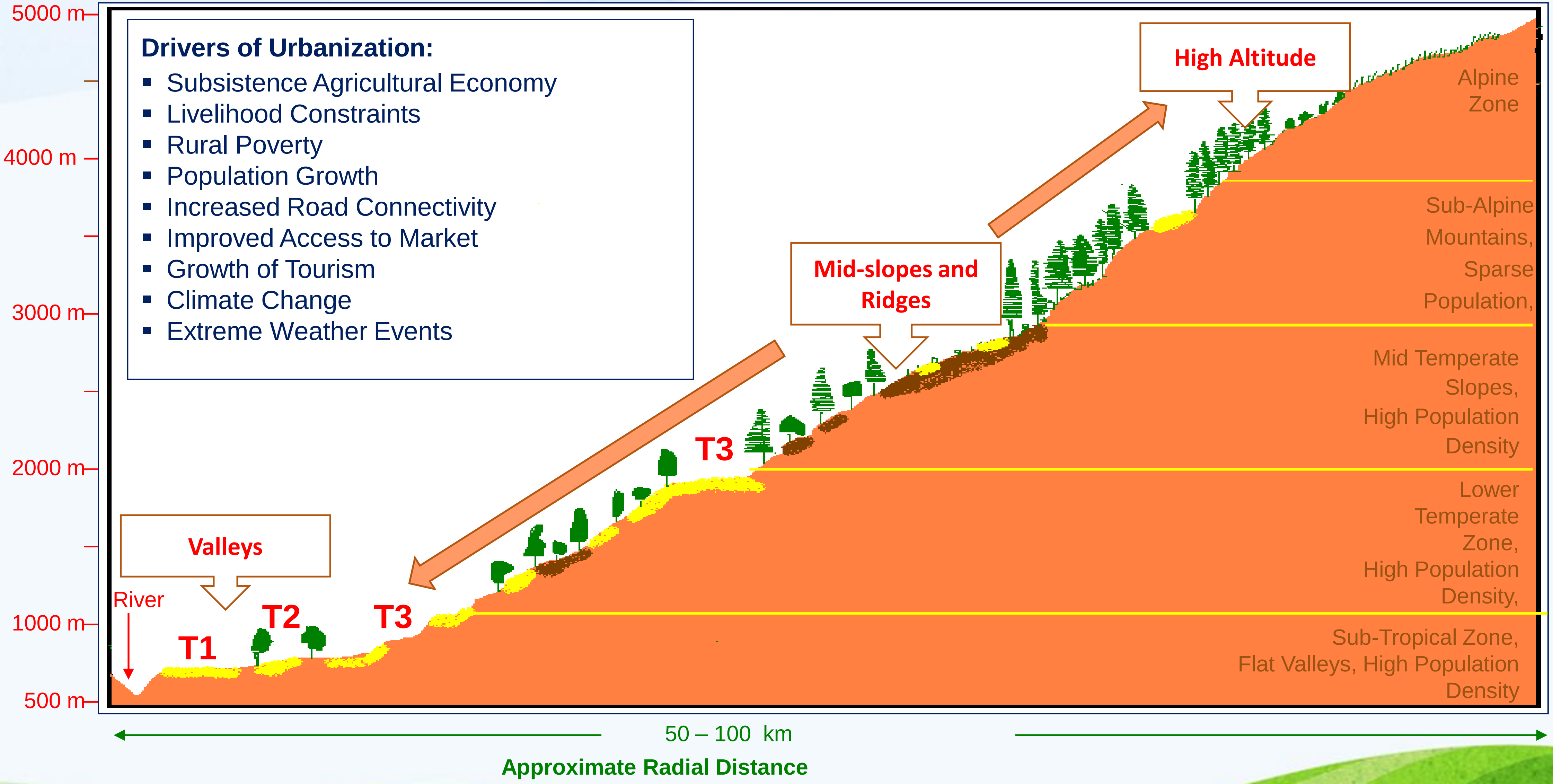
Recent Trends of Urbanization in Himalaya



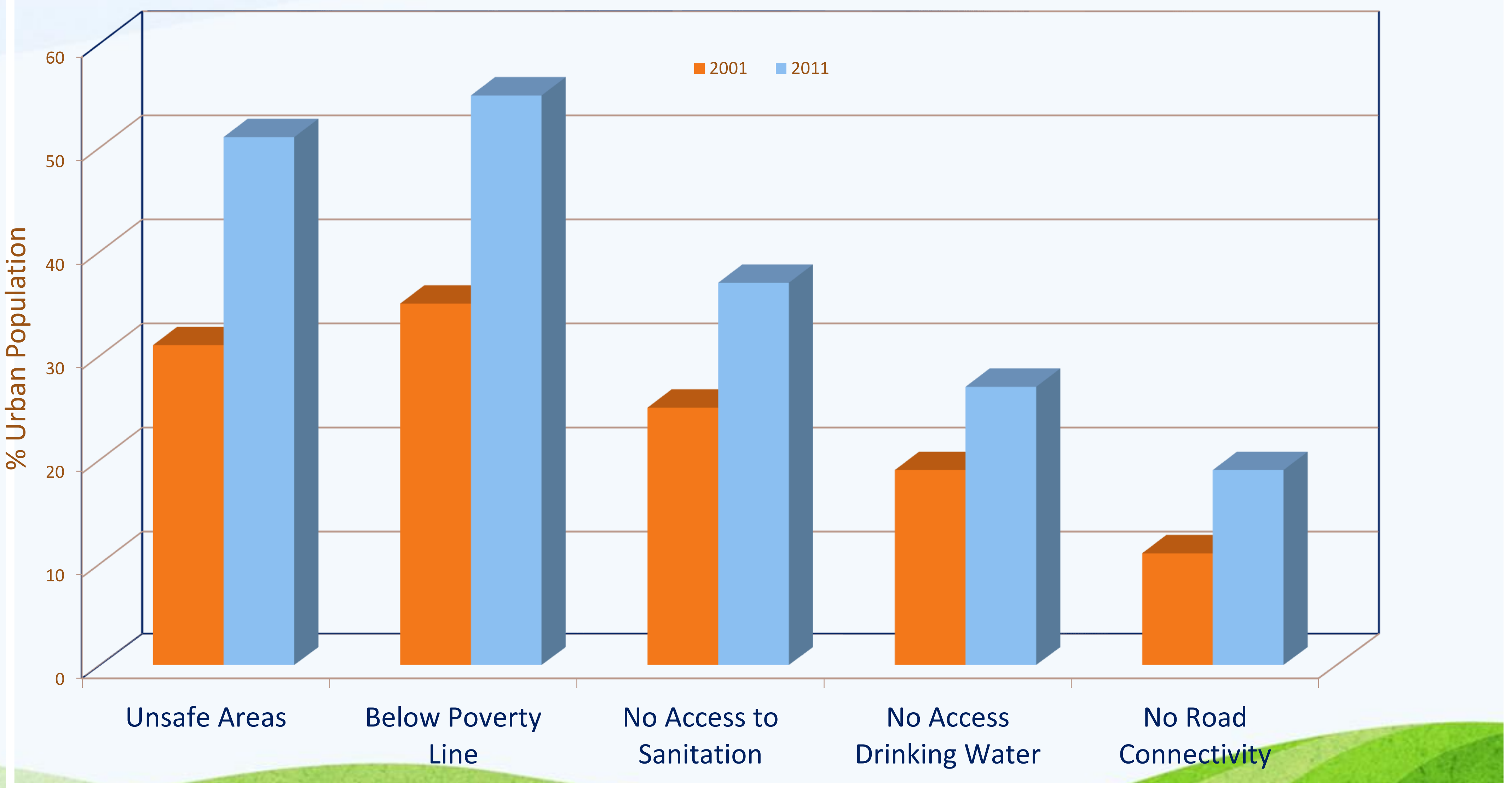


	Total population (in millions)		Urban population (in millions)		% Urban
	2001	2011	2001	2011	2011
Indian Himalayas	38	46	8.5	12	26
Uttarakhand	8.5	10.1	2.1	3	30

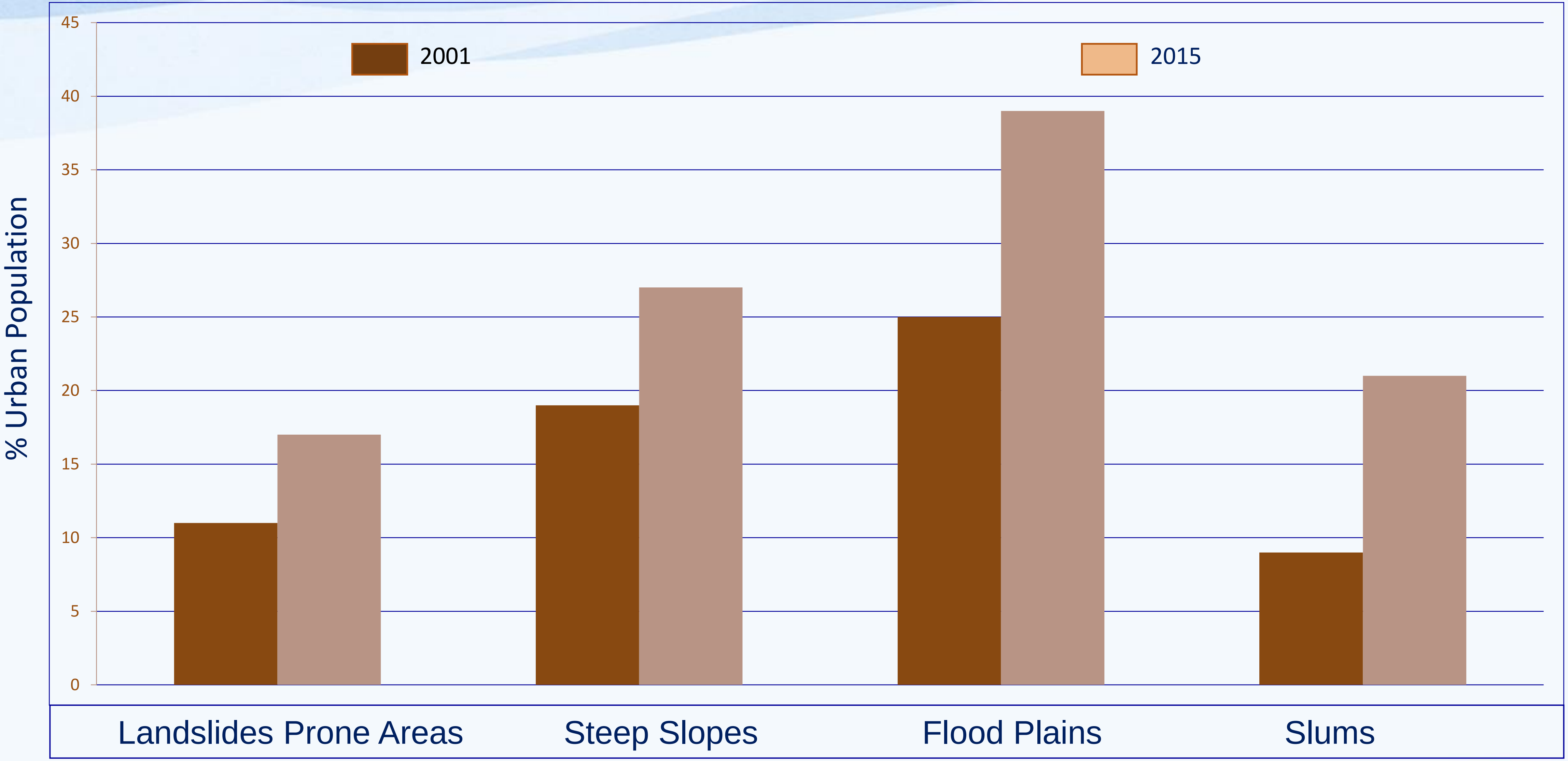
The Recent Trends of Urbanization in Himalaya



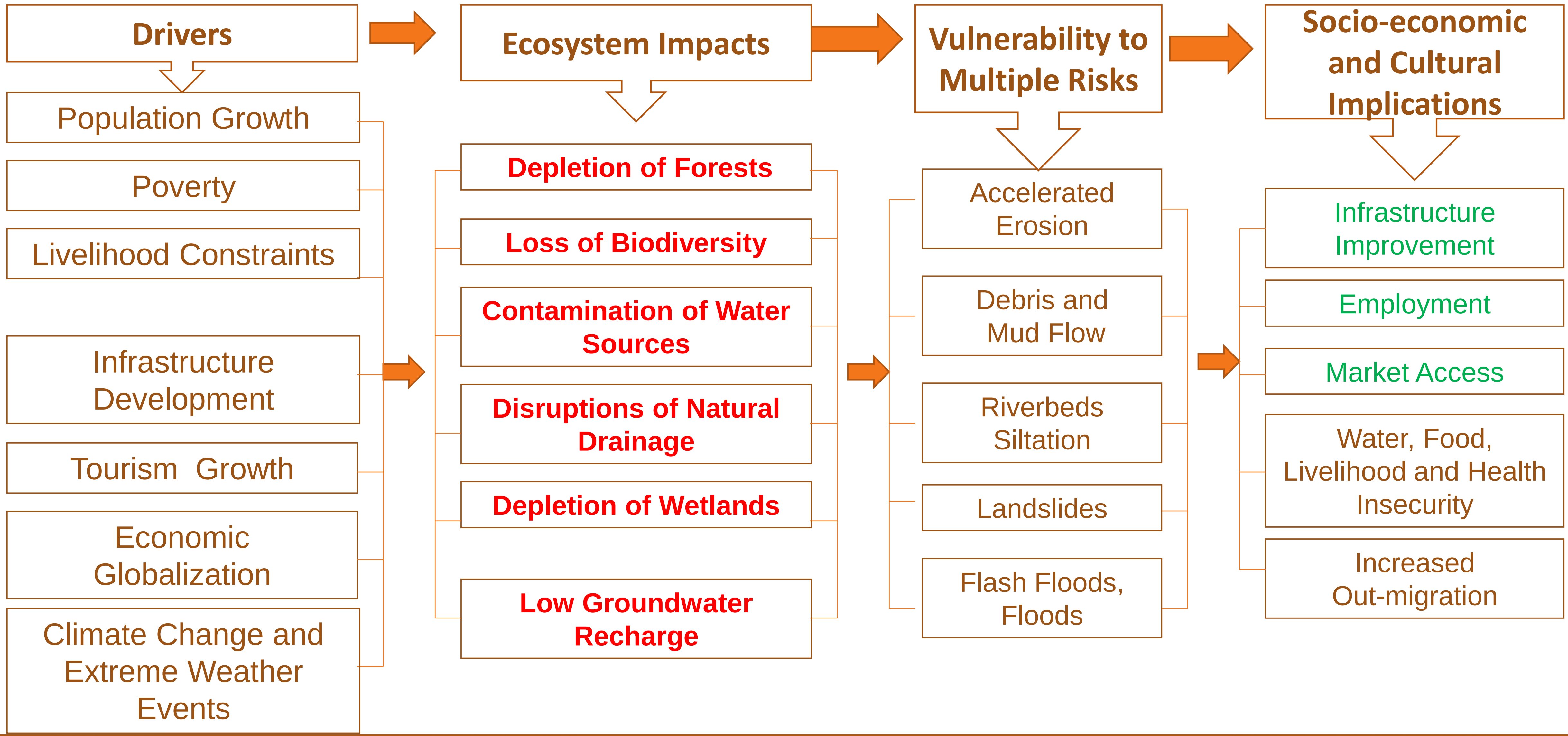
Growing Urban Inequalities in Himalaya



Environmental Implications of Unplanned Urban Growth in Himalaya



Environmental and Socio-economic Risks of Urban Growth in Himalaya



Status of Urban Freshwater Ecosystem Services in Western Himalaya (1985 – 2015)

State	Town	% Natural Springs Dried	% Water Discharge Declined	% Depletion of Traditional Water Sources	% Water Availability Declined	% Increase in Landslides
Himachal Pradesh	Shimla	25	11	65	50	15
Himachal Pradesh	Hamirpur	31	15	70	45	11
Himachal Pradesh	Solan	39	25	75	50	15
Uttarakhand	Almora	41	47	90	55	12
Uttarakhand	Pauri	35	37	71	57	17
Uttarakhand	Ranikhet	40	41	65	51	21

Unplanned Urban Growth in Almora [Uttarakhand]

Urban Sprawl in and Around Shimla and Dharamshala [Himachal Pradesh]

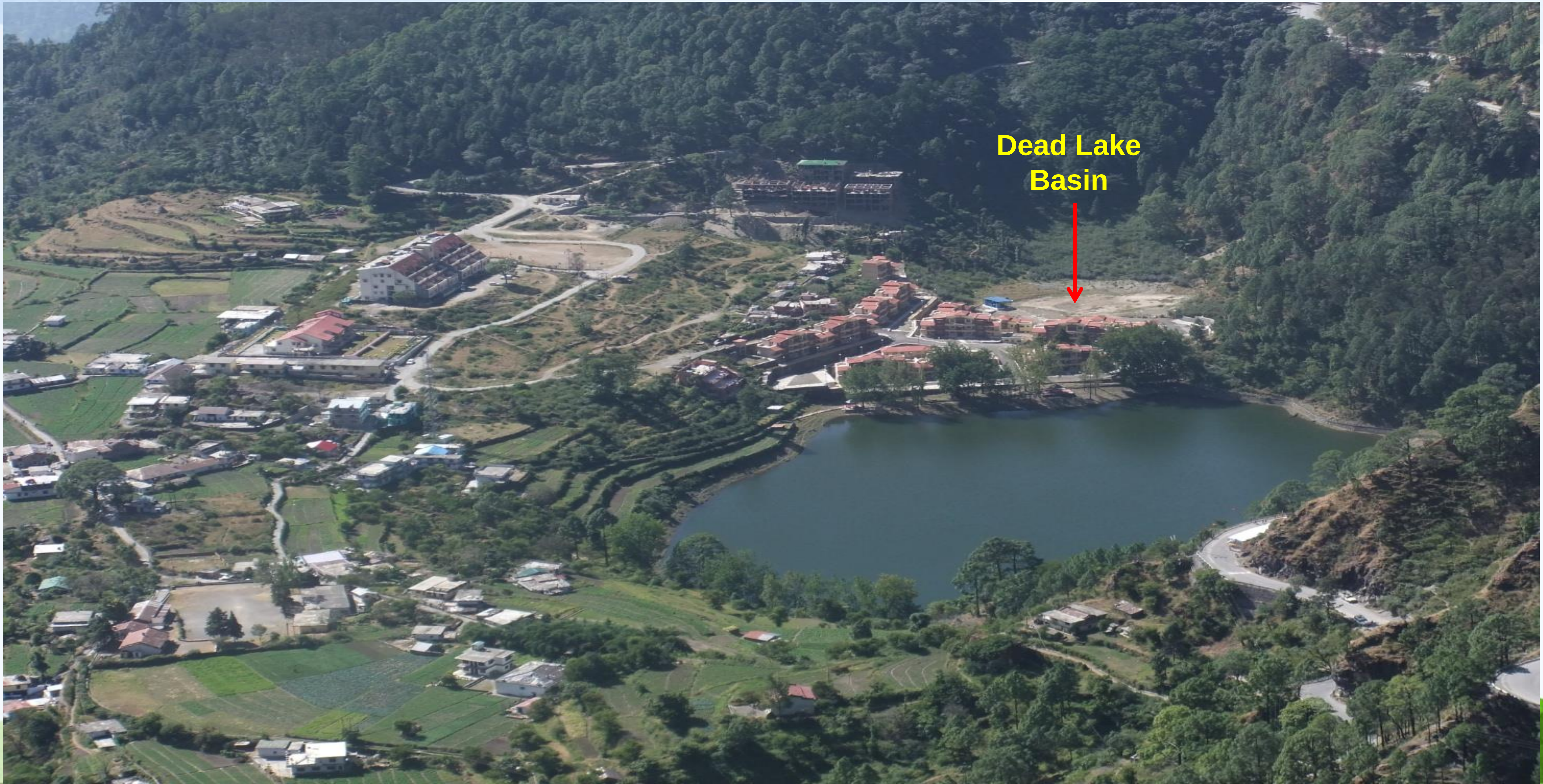
Impacts of Urban Growth on Agricultural Resources

District	Urban Area	Impacts of Expansion of Urban Land Use (1971 – 2015)		
		% Loss of Agricultural Land	% Loss of Forest	% Decline in Irrigated Land
Uttarkashi	Uttarkashi	05.37	03.17	15.22
Chamoli	Gopeshwer	04.71	05.14	21.07
Rudrapryag	Rudrapryag	05.27	05.22	17.73
Pauri Garhwal	Srinagar	10.15	06.49	05.22
Tehri Garhwal	New Tehri	06.22	03.54	04.34
Pithoragarh	Pithoragarh	12.97	09.63	11.91
Bageshwer	Bageshwer	11.36	07.92	15.44
Champawat	Champawat	07.14	03.44	07.15
Almora	Almora	11.21	02.21	09.71
Nainital	Lake Region	09.12	02.06	07.92

Impacts of Urban Growth on Agricultural and Food Systems

Name of District	Name of Urban Area	% Decline in Local Food Production	% Increase in Local Food Deficit	% Loss of Rural Livelihood Opportunities	% Decline in Food Purchasing Power
Uttarkashi	Uttarkashi	31.17	71.00	67.00	07.00
Chamoli	Gopeshwer	35.22	65.00	74.00	11.00
Rudrapryag	Rudrapryag	21.14	74.00	42.00	09.00
Pauri	Srinagar	41.45	76.00	61.00	05.00
Tehri	New Tehri	19.00	85.00	65.00	12.00
Pithoragarh	Pithoragarh	37.23	86.00	45.00	08.00
Bageshwer	Bageshwer	44.17	79.00	87.00	11.00
Champawat	Champawat	31.77	67.00	64.00	07.00
Almora	Almora	55.00	95.00	81.00	12.00
Nainital	Lake Region	39.00	85.00	73.00	06.00

Urbanization in Khurpatal [Nainital]

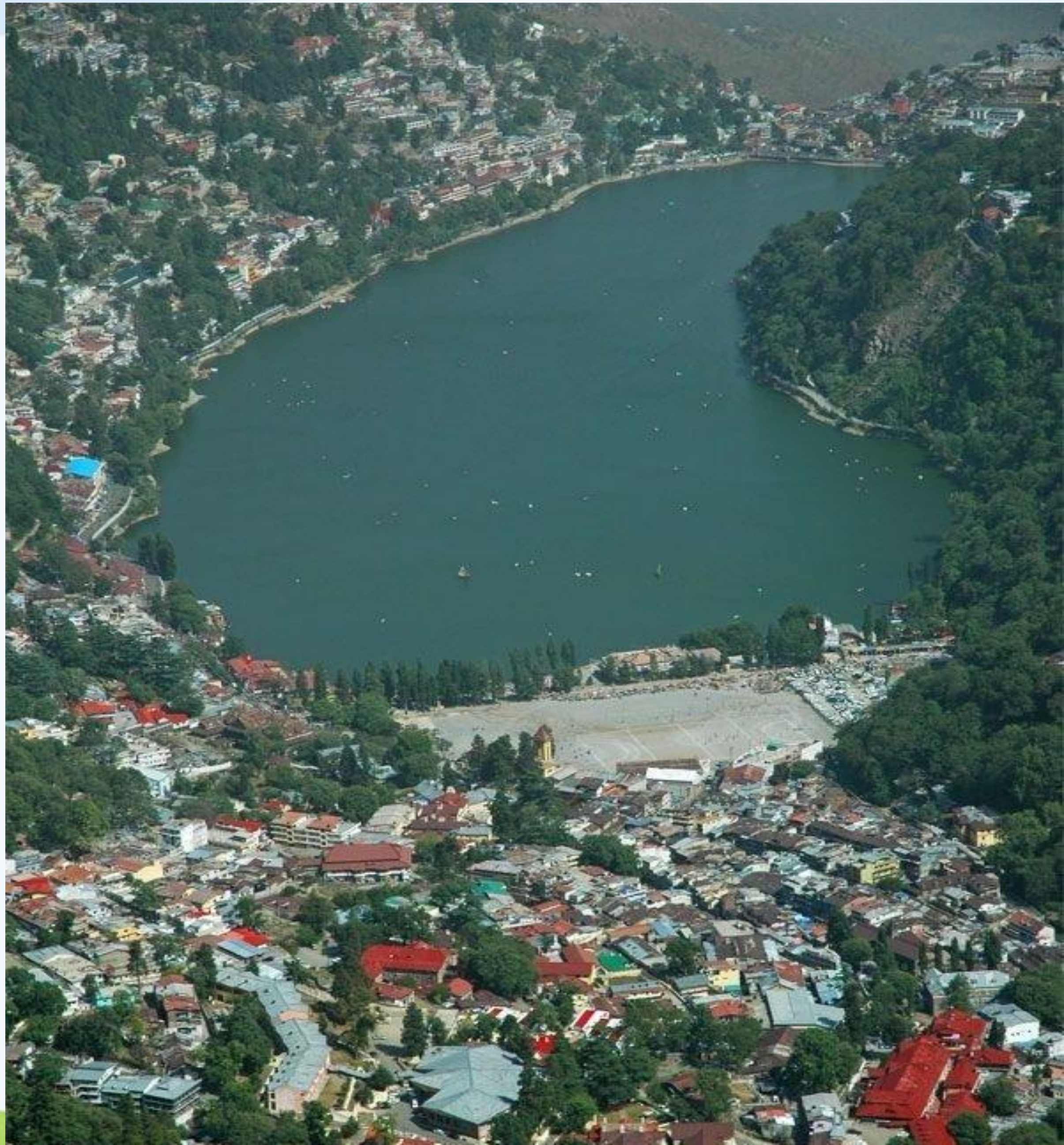


Urbanized Lakes of Himalaya

Nainital: A Depleting Urban Lake

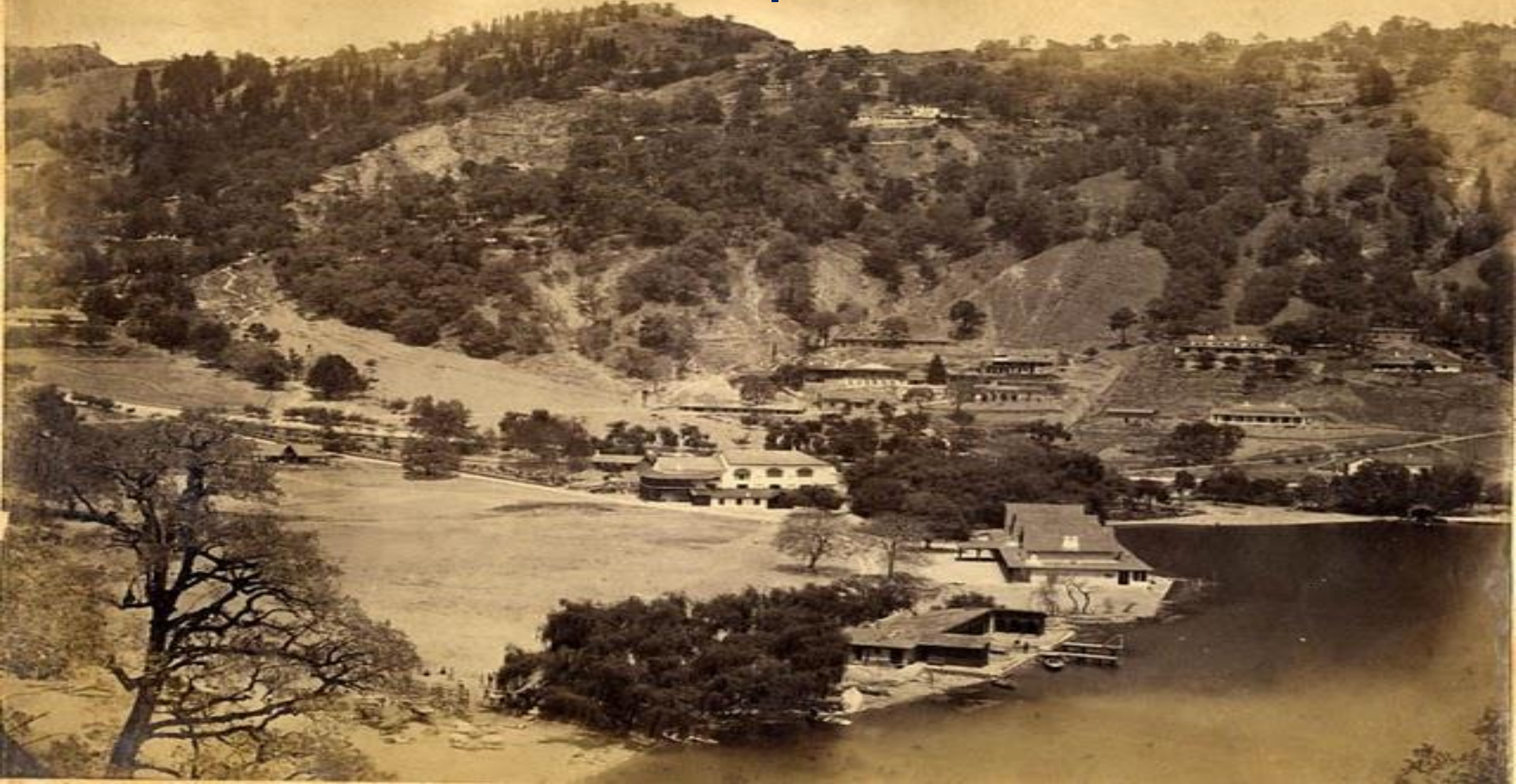
Parameters	Year of Monitoring		
	1995	2005	2015
Maximum Depth	27.45	26.75	25.70
Mean Depth	21.43	20.64	18.55
Water Volume	31699.45 m^3	26978.42 m^3	26202.04 m^2

- The mean depth of Lake reduced by 2.09 m between 1995 and 2015 (20 Years)
- The water storing capacity of the Lake also reduced by 5797 m^3 between 1995 and 2015 (20 Years)
- Nearly 5797 m^3 of sediment including sand, silt and mud was filled in the Lake bed between 1995 and 2015 (20 Years) at an average rate of 289.85 m^3
- This indicates that the Lake will be completely filled up in about next 150 years
- The current rate of siltation in Nainital Lake is 21.50 mm/year



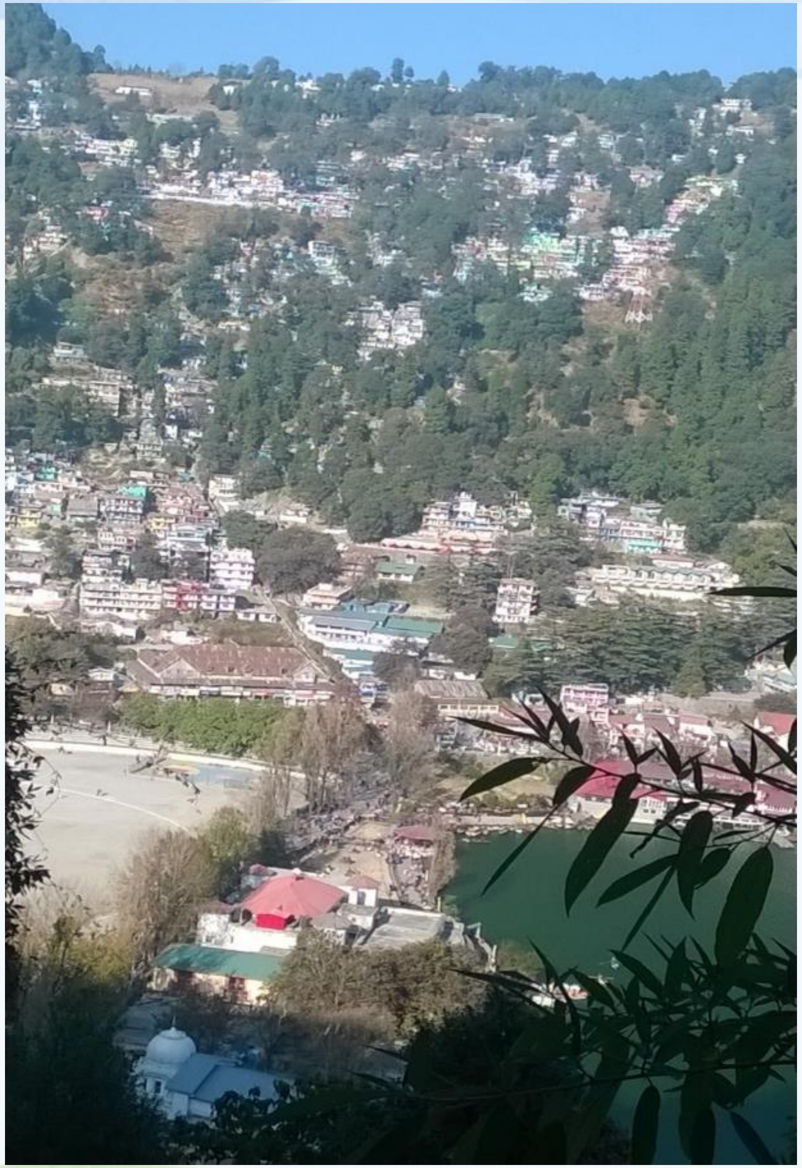
Urban Encroachment in Fertile Agricultural Land [Bageshwer, Uttarakhand]

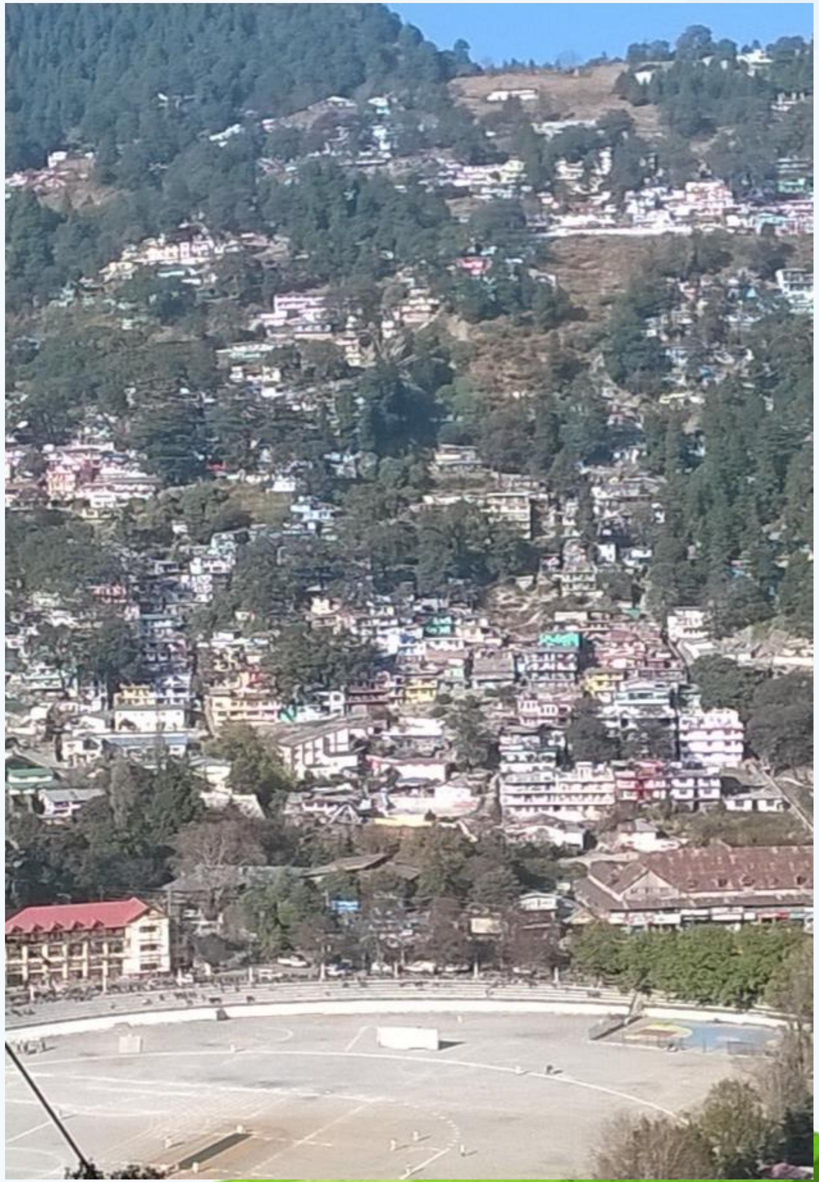
Nainital: 17 September 1880



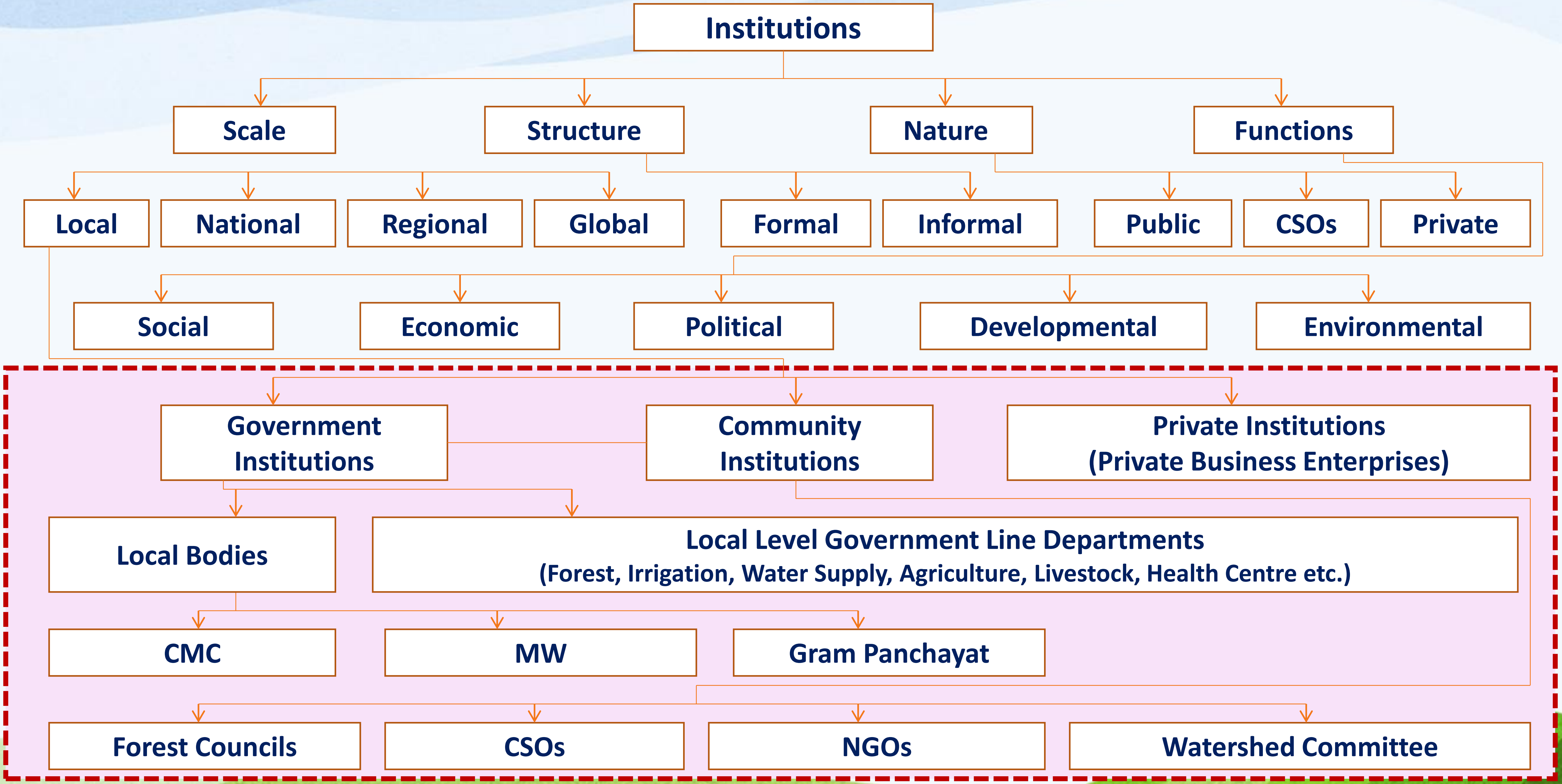
Nainital: 18 September 1880

Nainital: Today [2019]





Institutions: Key Actors in Urban Risk Governance



Way Forward

- Improved Understanding of Urban Systems, and Urban environmental impact assessment and planning
- Developing comprehensive understanding of urban ecosystem responses
- Comprehensive land use policy and integrated urban land use planning
- Mainstreaming Climate Change Adaptation and Disaster Risk Reduction into Integrated Urban Development Planning
- Improved Hydro-meteorological observations
- This would require a complete policy transformation and improved science-policy interface

Thanks!

Research Group
Urban and Landscape Ecology

Urban and Landscape Ecology

Eco-Cities

SMART approaches for a sustainable future?

Jürgen Breuste
SURE President,
Salzburg

*The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

UNIVERSITÄT SALZBURG

SUNRAISE

Co-funded by the Erasmus+ Programme of the European Union

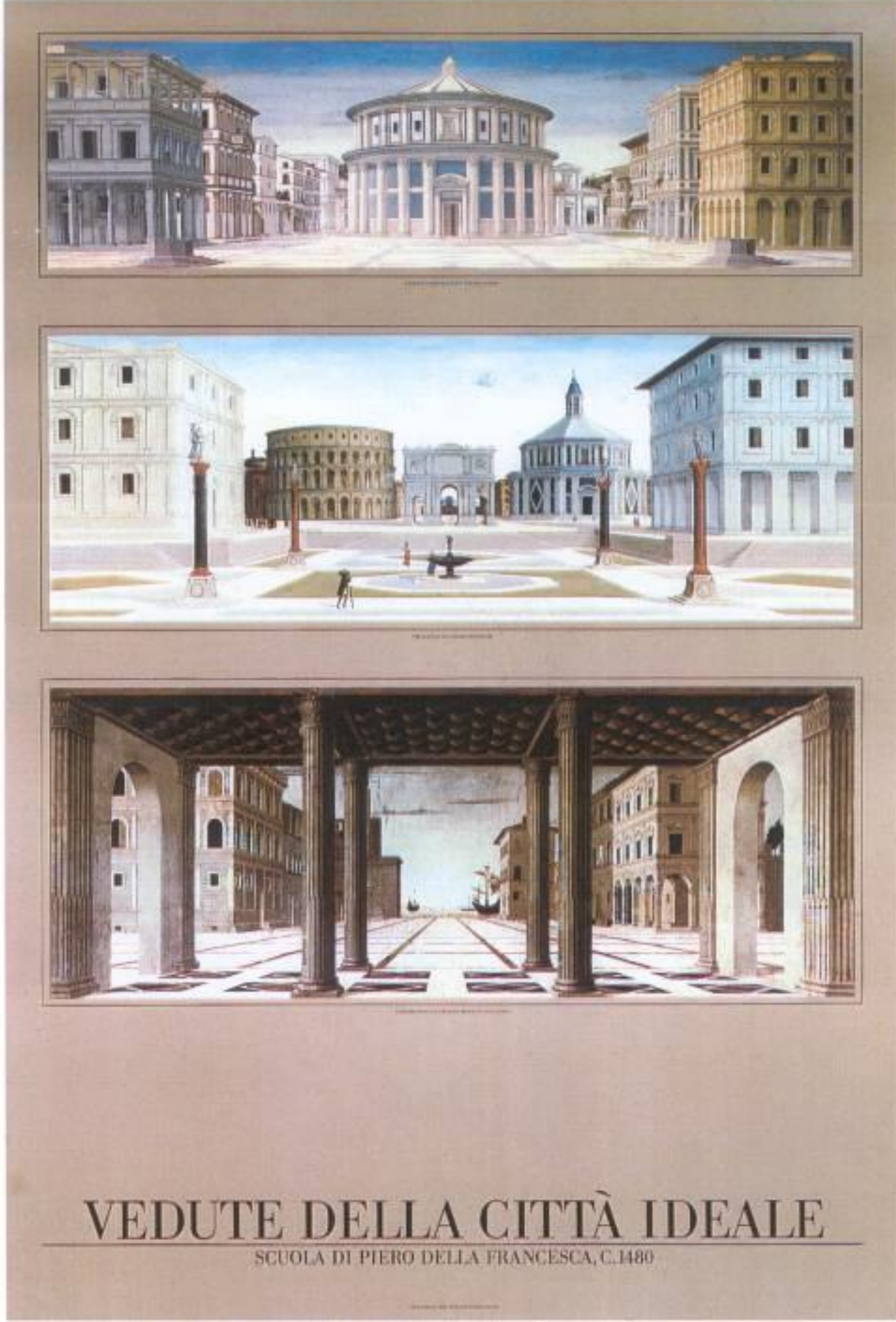
Disconnections

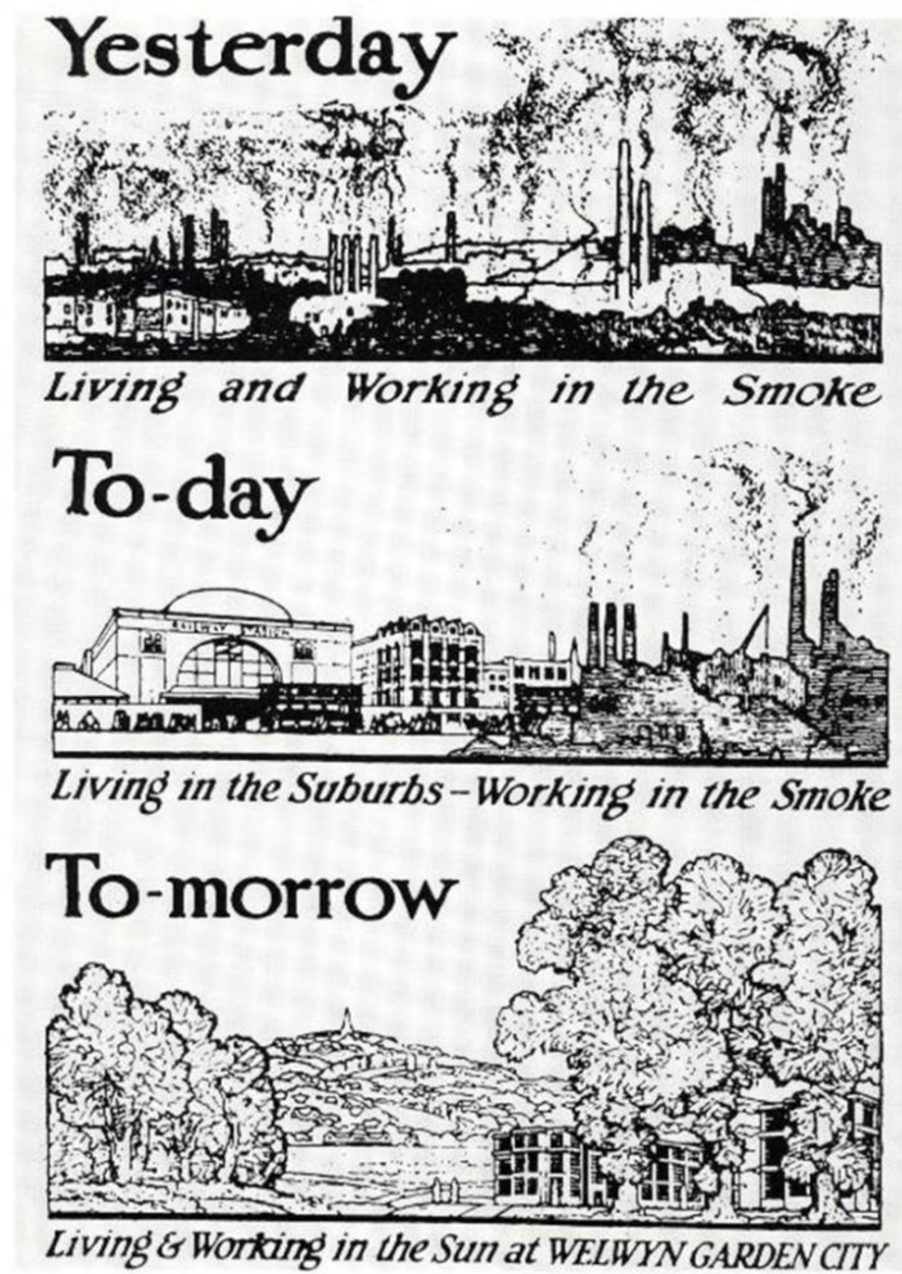
- Millennium Ecosystem Assessment (2005) – the world's largest assessment of ecosystems largely **left out urban areas**
- World Development Report - World Bank (2008) – the world's largest assessment of urbanization **left out ecosystems**

Shanghai, Yanzhong Greenery 2000-2001

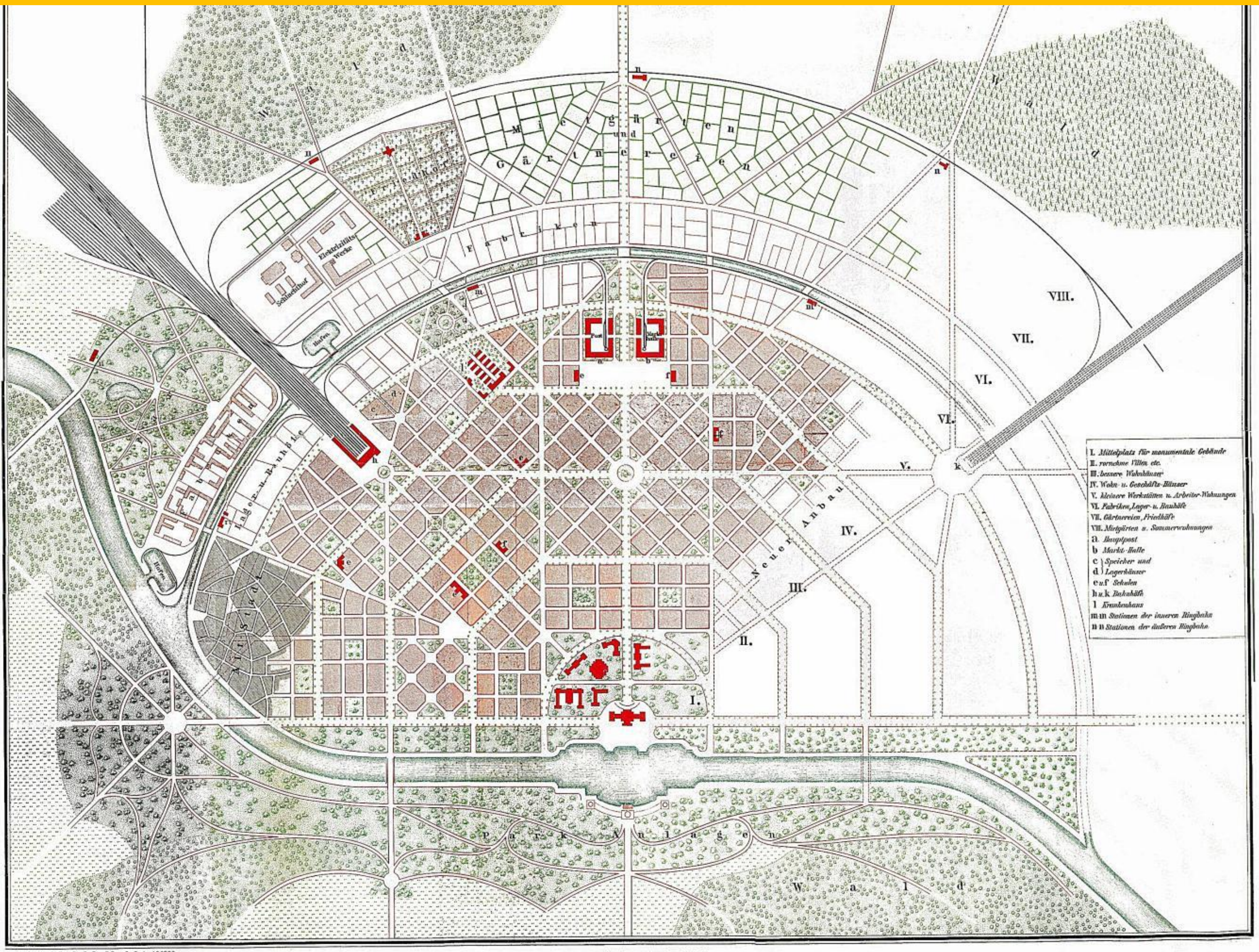
17,07 ha built-up land was changed into 11,85 ha green area, 4.837 families were settled elsewhere

The Ideal City





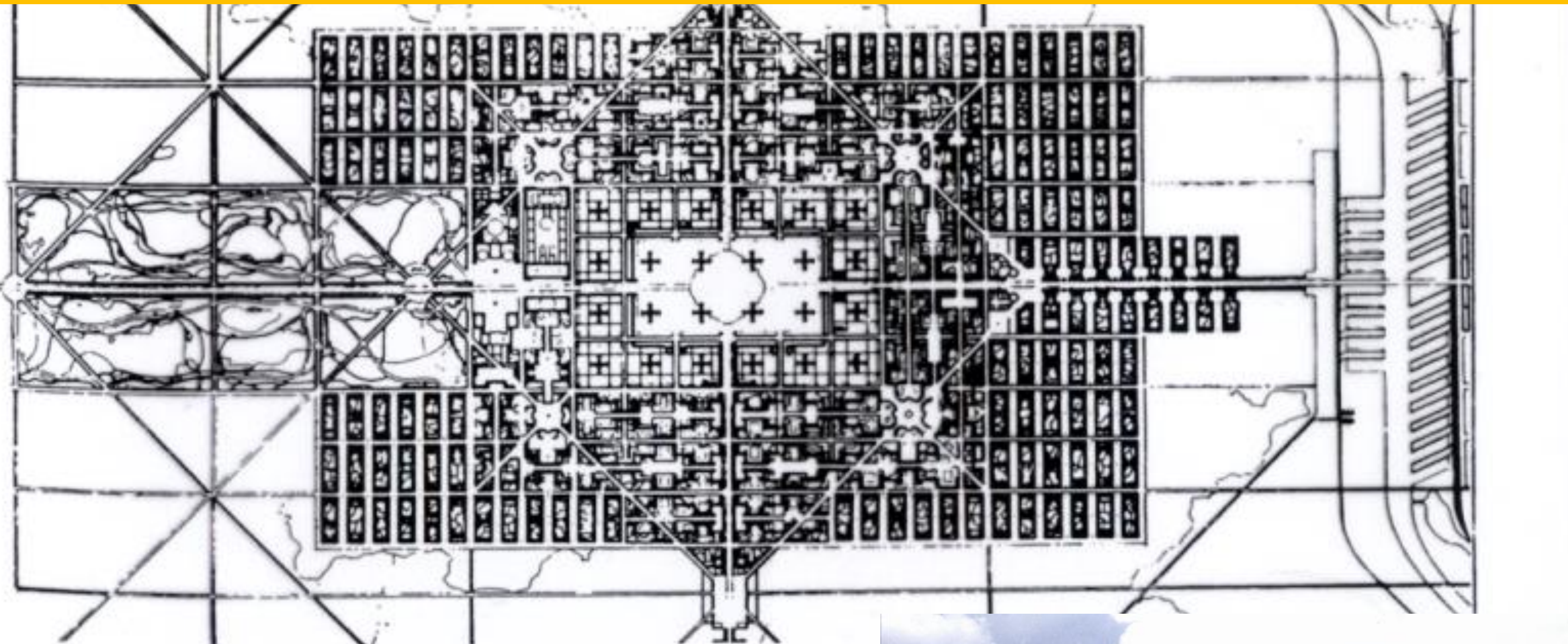
Theodor Fritsch (Germany): Plan of a future city (1905)

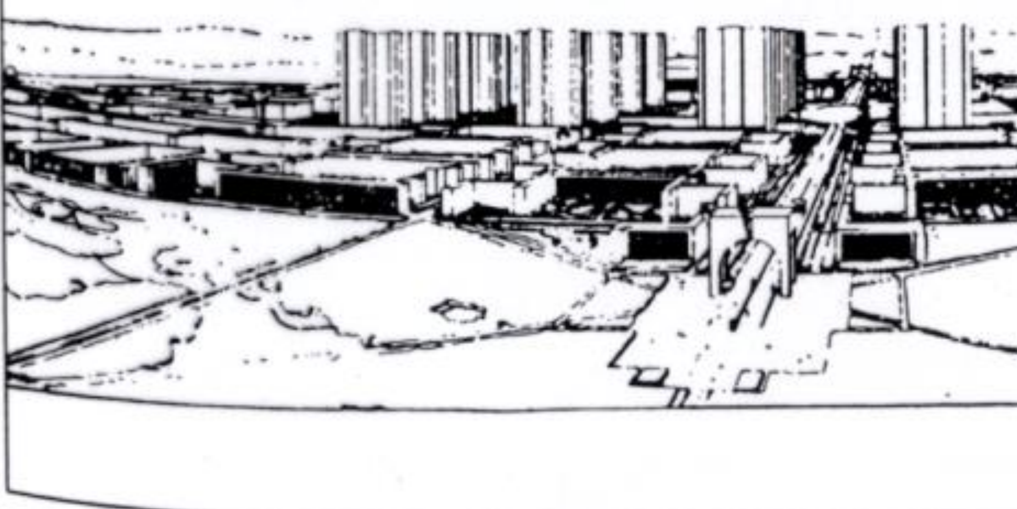


Theod. Fritsch: Die Stadt der Zukunft, Leipzig 1896.

Körner & Dietrich, Geogr. Anstalt, Leipzig.

Planners and architects always to realize the ideal city!

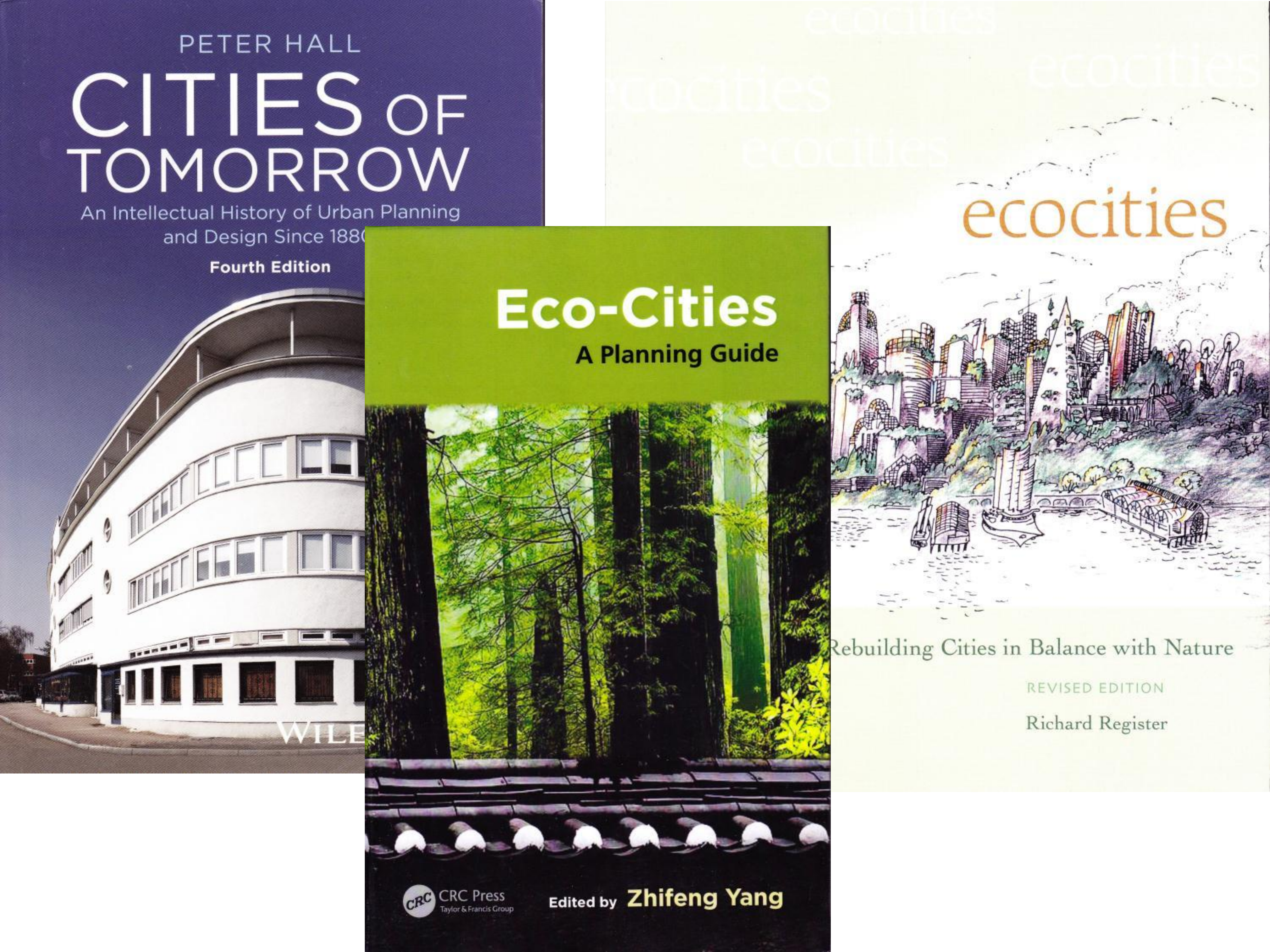




LE CORBUSIER: *La ville contemporaine* (1934)

??

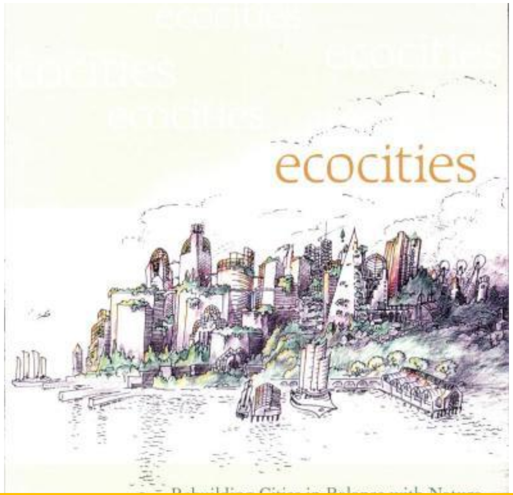
New Orleans September 2005


PETER HALL
CITIES OF TOMORROW
An Intellectual History of Urban Planning
and Design Since 188
Fourth Edition
WILE
Eco-Cities
A Planning Guide
CRC Press
Taylor & Francis Group
Edited by Zhifeng Yang
ecocities
Rebuilding Cities in Balance with Nature
REVISED EDITION
Richard Register

An Ecocity is…

- An **ecologically healthy** human settlement modeled on the **self-sustaining resilient structure and function** of natural ecosystems and living organisms.
- An entity that includes its **inhabitants and their ecological impacts.**
- A **subsystem of the ecosystems** of which it is part — of its watershed, bioregion, and ultimately, of the planet.
- A **subsystem of the regional, national and world economic system**. http://www.ecocitybuilders.org/

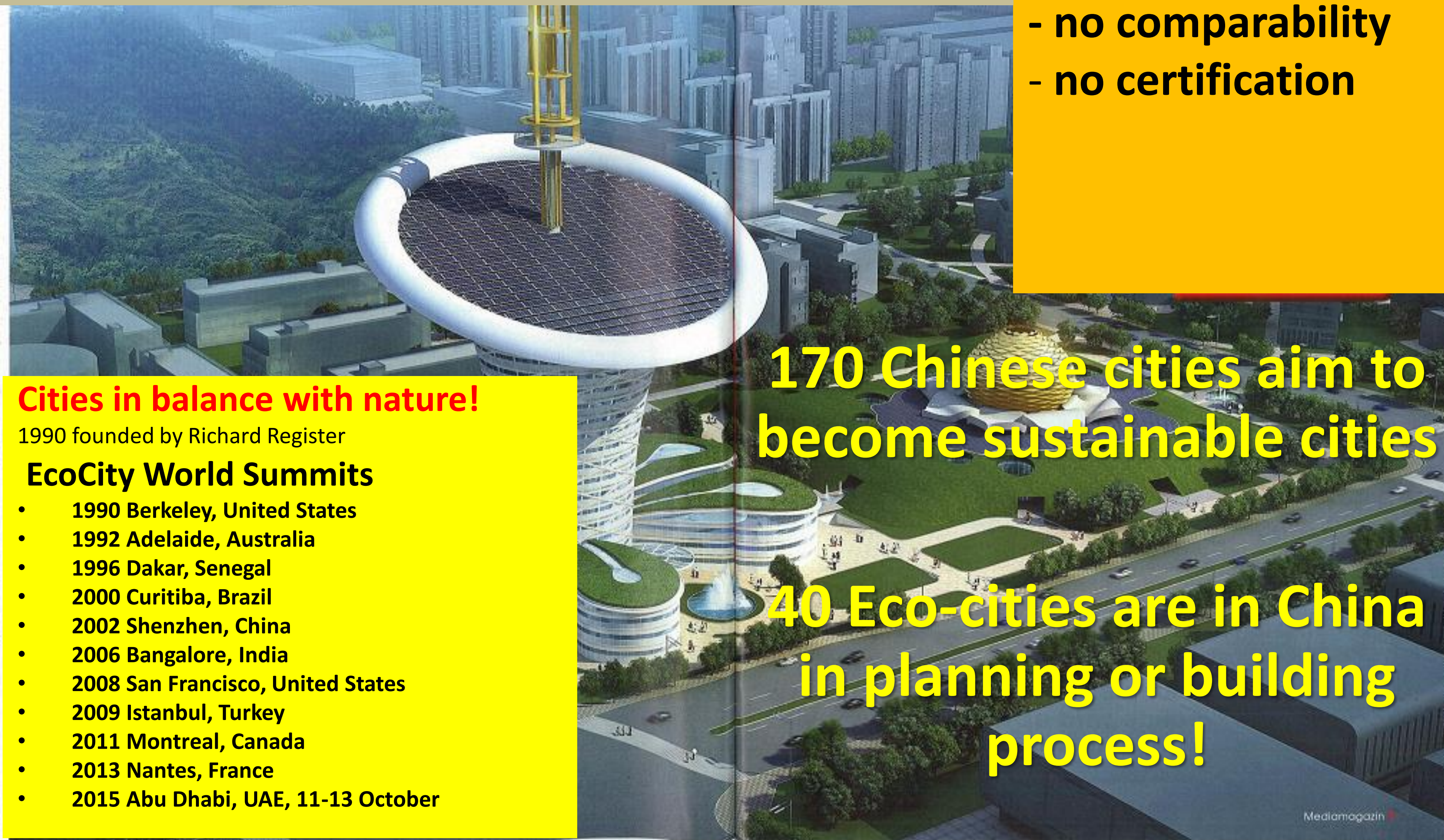
"**No such city exists.** There are **bits and pieces** of the ecocity scattered about **in present-day cities** and sprinkled through history, but **the concept**– and hopefully, the reality– **is just beginning to germinate**."
EcoCity Builders



Type of eco-city development
I—new development
II—expansion of urban area
III—retro-fit development
Development phase
1—pilot/planning stage
2—under construction
3—implemented
Key implementation mode
a—technological innovation
b—integrated sustainability vision/planning
c—civic empowerment/involvement
Eco City Report 2011

Needs:
- Definition of criteria as targets
- Indicators to measure the status
- Nature based - not only technical – solutions

Problems:
- Many eco-cities
- no clear eco-targets
- no comparability
- no certification



170 Chinese cities aim to become sustainable cities

40 Eco-cities are in China in planning or building process!

Cities in balance with nature!

1990 founded by Richard Register

EcoCity World Summits
- 1990 Berkeley, United States
- 1992 Adelaide, Australia
- 1996 Dakar, Senegal
- 2000 Curitiba, Brazil
- 2002 Shenzhen, China
- 2006 Bangalore, India
- 2008 San Francisco, United States
- 2009 Istanbul, Turkey
- 2011 Montreal, Canada
- 2013 Nantes, France
- 2015 Abu Dhabi, UAE, 11-13 October

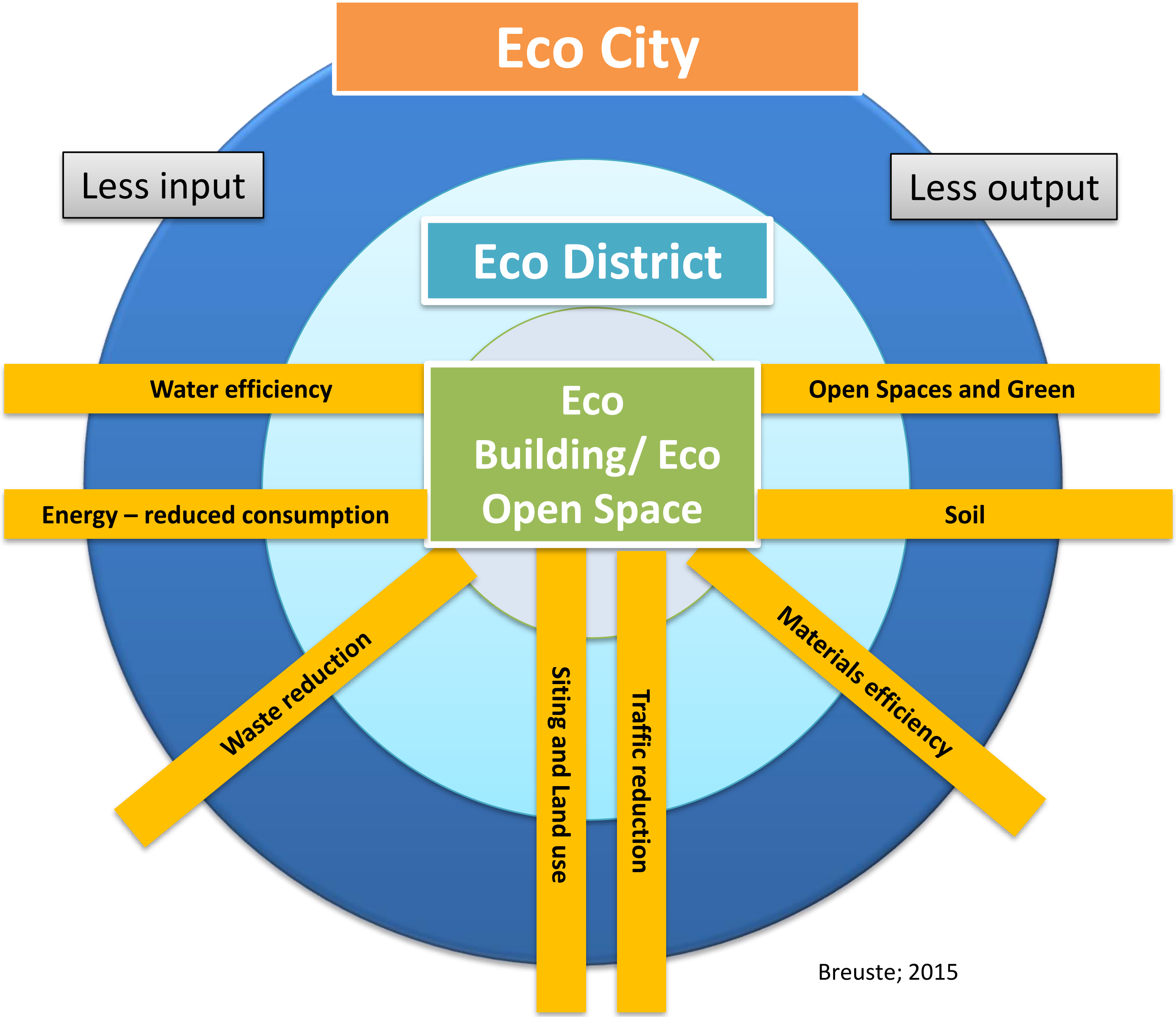
RG Urban and Landscape Ecology

Term	Comment
Sustainable city	Synonymous with 'eco-city/town' (in any of the four meanings in Table 3). The UN-Habitat *Sustainable Cities* Programme has been promoting this concept since the early 1990s.
Sustainable community	Synonymous with 'eco-community' (see Table 3).
Smart city	Used to emphasise hi-tech aspects of development – smart energy grids, IT networks, and related efficiencies in utility and service provision.
Slim city	World Economic Forum knowledge transfer initiative to encourage cities to increase efficiency across a variety of sectors, eg energy, transport, construction work.
Compact city	Use of this term typically implies an opposition to urban sprawl. It is an influential urban design concept whose guiding principles include high residential density and the discouragement of private car use.
Zero energy city / zero net energy city	Uses no more energy than it is able to generate locally. This is achieved through a combination of measures to reduce current consumption and the introduction of new renewable energy sources.
Low carbon city	The reference to carbon (in this and the following two terms) may reflect national aspirations to create 'low carbon economies' – often as part of policies designed to mitigate climate change. The focus is on the physical aspects of cities: energy, transportation, infrastructure and buildings. 'Carbon' is sometimes used as shorthand for all greenhouse gases.
Carbon neutral city / net zero city	Similar to 'low carbon city' – except defined more strictly as a city which offsets carbon /greenhouse gas emissions such that its net emissions are zero.
Zero carbon city	More specifically still, a city which produces no greenhouse gases and is run exclusively on energy from renewable sources.
Solar city	May have a relatively narrow focus on replacing fossil fuels with solar energy, and is in some cases limited in its ambitions. The Indian Government's *Solar Cities* programme aims to reduce conventional energy use by 10%, with solar energy being part of a mix of renewable energy generation to be promoted.
Oekostadt / Ökostadt	As well as being a direct German translation of the term 'eco-city', Ökostadt also refers more specifically to a series of Austrian, German and Swiss towns and cities which declared their intention to introduce principles of sound environmental management and sustainable development in the 1990s – often as part of an *Agenda 21* programme.
Transition town	The Transition Town movement, which originated in the UK and Ireland, is a growing international phenomenon. Transition Town activities are typically organised at grass-roots level rather than embedded in policies. The aim is to build up local communities' social and environmental resilience to the effects of climate change and fossil fuel shortages – both of which are assumed to be inevitable in future.
Eco-municipality	The label 'Eco-Municipality' describes a local authority which has adopted a particular series of values related to environmental and social sustainability, to guide policy making. The movement is most strongly associated with Sweden (where it has its roots in the 1980s), but has also gained recent ground in the USA.

6 Dimensions of Smart cities

- **economy**
- **mobility**
- **environment**
- **people**
- **living**
- **governance**

Joss S (2011) Eco-Cities: The Mainstreaming of Urban Sustainability: Key Characteristics and Driving Factors. International Journal of Sustainable Development and Planning 6(3):268-285



Breuste; 2015

Sustainable Seattle

Indicators of Sustainable Community

1 9 9 8

MAIN FEATURES OF AN ECOCITY

ECOCITY

- City of accessibility for everyone
- City with public space for everyday life
- City in balance with nature
- City with integrated green areas
- City of bioclimatic comfort
- City of minimised land consumption
- City for pedestrians, cyclists and public transport
- City of reduction, re-use and recycling of waste
- City contributing to closed water cycle
- City of balanced mixed use
- City of short distances
- City with new balance of concentration and decentralisation
- City as network of urban quarters
- City as powerstation of renewable energies
- City of health, safety and well-being
- City of sustainable lifestyle
- City of qualified density
- City of human scale and urbanity
- City for strong local economy
- City built and managed with the inhabitants
- City of concentrating development at suitable sites
- City integrated into the surrounding region
- City of minimised energy consumption
- City integrated in global communication networks
- City of a cultural identity and social diversity

Environment

SUSTAINABILITY TRENDS

Wild Salmon	*Local wild salmon runs have dramatically declined since the 1980s, but have leveled off at dangerously low levels over the last six years.*	↔
Ecological Health	*Decreasing natural vegetative cover reflects the spread of human influence and a broader decline in ecological health countywide.*	?
Soil Erosion	*Sampled turbidity levels have returned to previous levels, but the complexity of the erosion processes makes it difficult to determine human activity impacts.*	↔
Air Quality	*Seattle's air quality continues to improve; the number of "good" air quality days has increased to 89%.*	↑
Pedestrian- & Bicycle-Friendly Streets	*Lack of data highlights the need to focus on improving pedestrian and bicycle networks.*	?
Open Space near Urban Villages	*Currently 87% of Seattle's residents lives within about three blocks of the city's open spaces.*	?
Impervious Surfaces	*Nearly one third of drainage lands are now impervious to surface water.*	?

RG Urban and Landscape Ecology

Ecological Criteria Catalogue (Breuste & Riepel 2007)

1. Open Space	2. Energy	3. Traffic
Use existing vegetation and landforms to moderate climate conditions and provide protection for native habitats	**Energy-Conscious Urban Planning**	**Settlements should be located around or close to public transport nodes and frequently used routes**
Plant native or well-adapted species	**Energy Conservation**	**Settlements should be planned around a network of pedestrian routes which encourage walking and cycling**
Use greenbelts and protected wetlands to create a continuous web of native habitats	**Use renewable energy sources**	**Limit on-site parking**
Restore the native landscape	**Passive Heating and Cooling**	**Use porous alternatives to traditional paving for roads and walkways and reduce street width**
Open space for recreation and child's play	**Insulation**	**Carpooling strategies should be encouraged in addition to mass-transit use**
	Alternate Sources of Energy	**Use existing vehicular transportation networks to minimize the need for new Infrastructure**
Roof gardens can be established on the flat roofs of buildings using potted trees, shrubs and plants	**Daylighting**	**Minimize noise disturbance**
	Energy Efficient Equipment and Appliances	

Breuste, Jürgen, Riepel, Jürgen (2007): Solarcity Linz/Austria – a European example for urban ecological settlements and its ecological evaluation. In: Warsaw, Univ., Faculty of Geography and Regional Studies (ed.): The Role of Landscape Studies for Sustainable Development, p. 627 - 640

KENNEDY, M. (Hrsg.) (1984): Öko-Stadt. Prinzipien einer Stadtökologie. Materialien zur Internationalen Bauausstellung Berlin (IBA). Band 1. Frankfurt am Main

KENNEDY, M. (Hrsg.) (1984): Öko-Stadt. Mit der Natur die Stadt planen. Materialien zur Internationalen Bauausstellung Berlin (IBA). Band 2. Frankfurt am Main

KENNEDY, M. und D. KENNEDY (Hrsg.) (1998): Handbuch ökologischer Siedlungs(um)bau. Neubau- und Stadterneuerungsprojekte in Europa. Berlin

Ecological Criteria Catalogue (Breuste & Riepel 2007)

4. Water	5. Waste	7. Siting and Land Use	8. Soil
Use permeable surfaces	Minimize use of resources - Reuse Existing Buildings	Renovate older buildings	Minimize pavement area
Collect and use harvested” water	Minimize waste generated from construction, renovation and demolition of buildings	Create community	Emphasize preservation of mature vegetated soils
Collect and use rainwater	Minimize waste generated during building occupancy	Encourage in-fill and mixed-use development	Minimize earthwork and clearing
Design an appropriate harvesting and storage system	**6. Material**	Minimize automobile dependence	Minimize use of landscape irrigation, herbicides, pesticides, and fertilizers
Reduce overall water use	Design for future reuse and adaptability	Value site resources	Consider use of permeable paving materials
Utilize greywater for nonpotable purposes	Use durable products and materials	Existing planted vegetation that has to remain on site needs to be protected during construction	Build pedestrian surfaces with loose aggregate, wooden decks, or well-spaced paving stones
Use constructed wetlands	Choose low-maintenance building materials	Situate buildings to benefit from existing vegetation	
Treat brownwater from toilet-flushing with on-site systems	Avoid materials that will offgas pollutants	Building smaller is better	
Use reclaimed water for purposes such as toilet-flushing	Choose building materials with low embodied energy	Design for durability	
	Buy locally produced building materials		
	Use salvaged building materials when possible		
	Minimize packaging waste		

Breuste, Jürgen, Riepel, Jürgen (2007): Solarcity Linz/Austria – a European example for urban ecological settlements and its ecological evaluation. In: Warsaw, Univ., Faculty of Geography and Regional Studies (ed.): The Role of Landscape Studies for Sustainable Development, p. 627 - 640

Scales,levels and approaches

Spatial scale

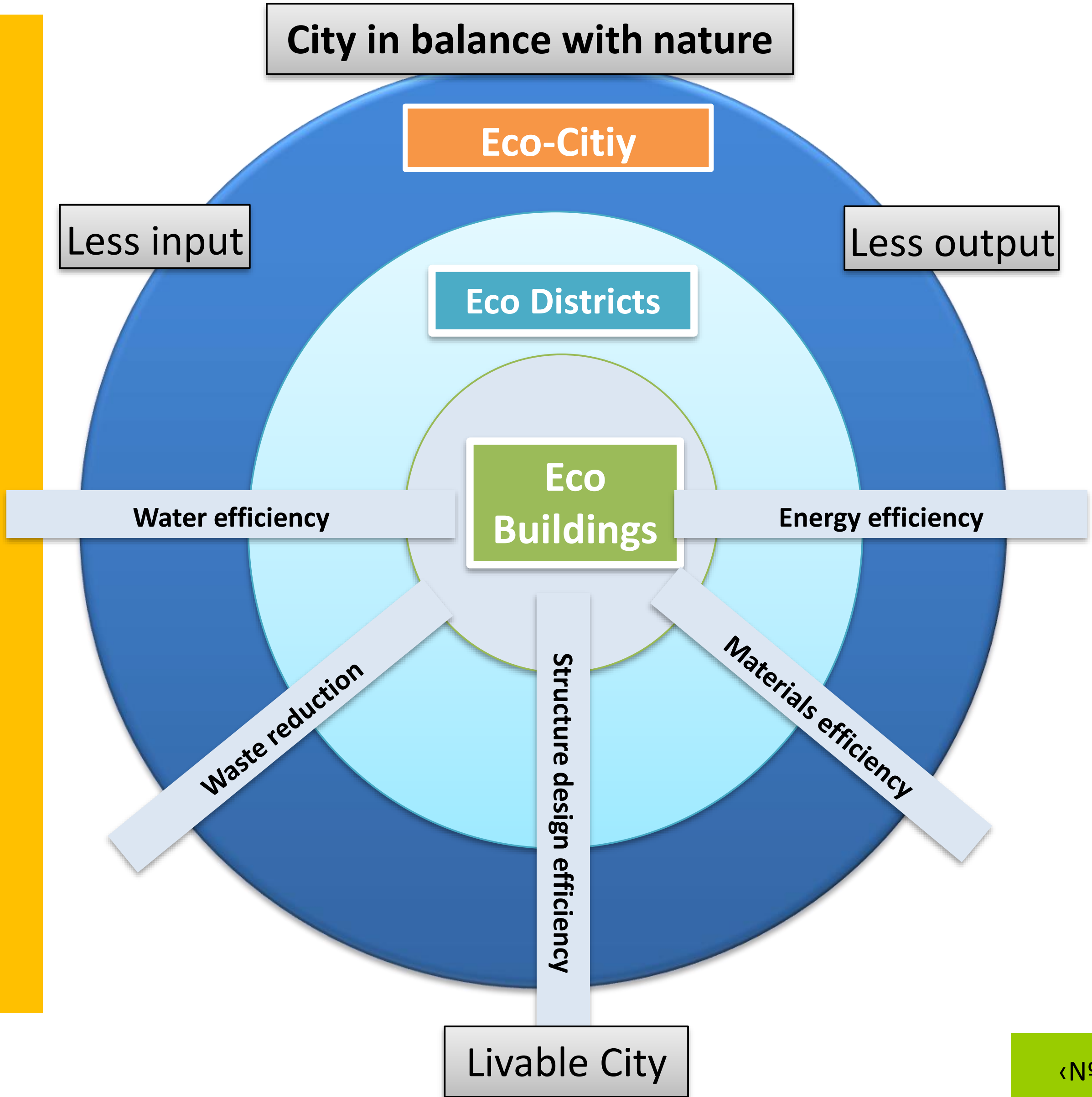
- ***EcoDistricts***, EcoNeigborhoods
- ***EcoCitiy (whole city)***

Adoptation level

- Starting with the ***existing urban pattern***
- Starting with completly ***new urban pattern***

Selective approaches

- ***Ecosystems, energy, traffic etc.***



LifeCycle Tower I

The buildings

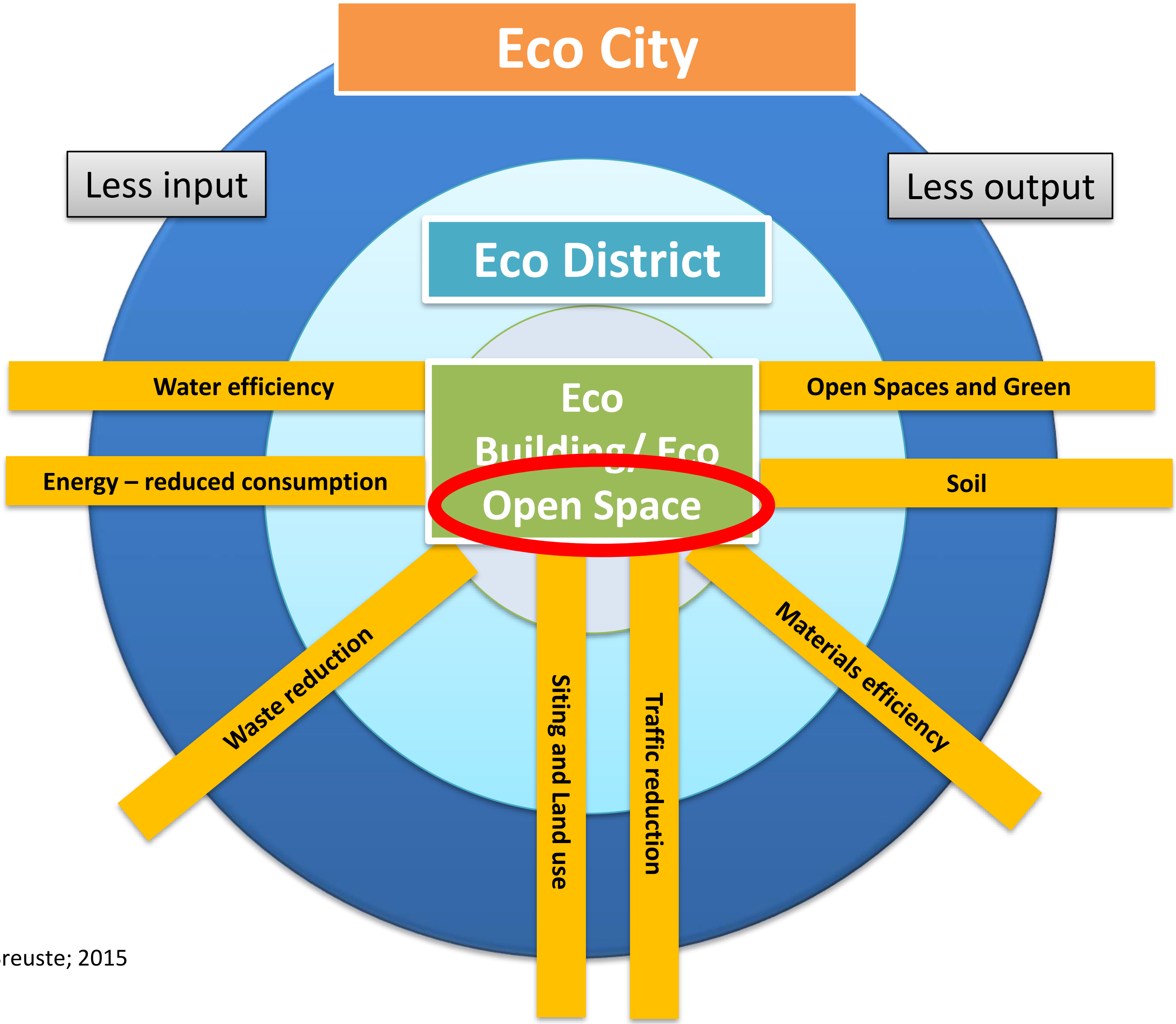
http://www.rhombergbau.at/de/home/allgemein_informati
ompetenzen/bau/lifecycle_tower.html

http://www.creebyrhomberg.com/en/

Green Buildings

Vertical Farms. Green Towers etc.

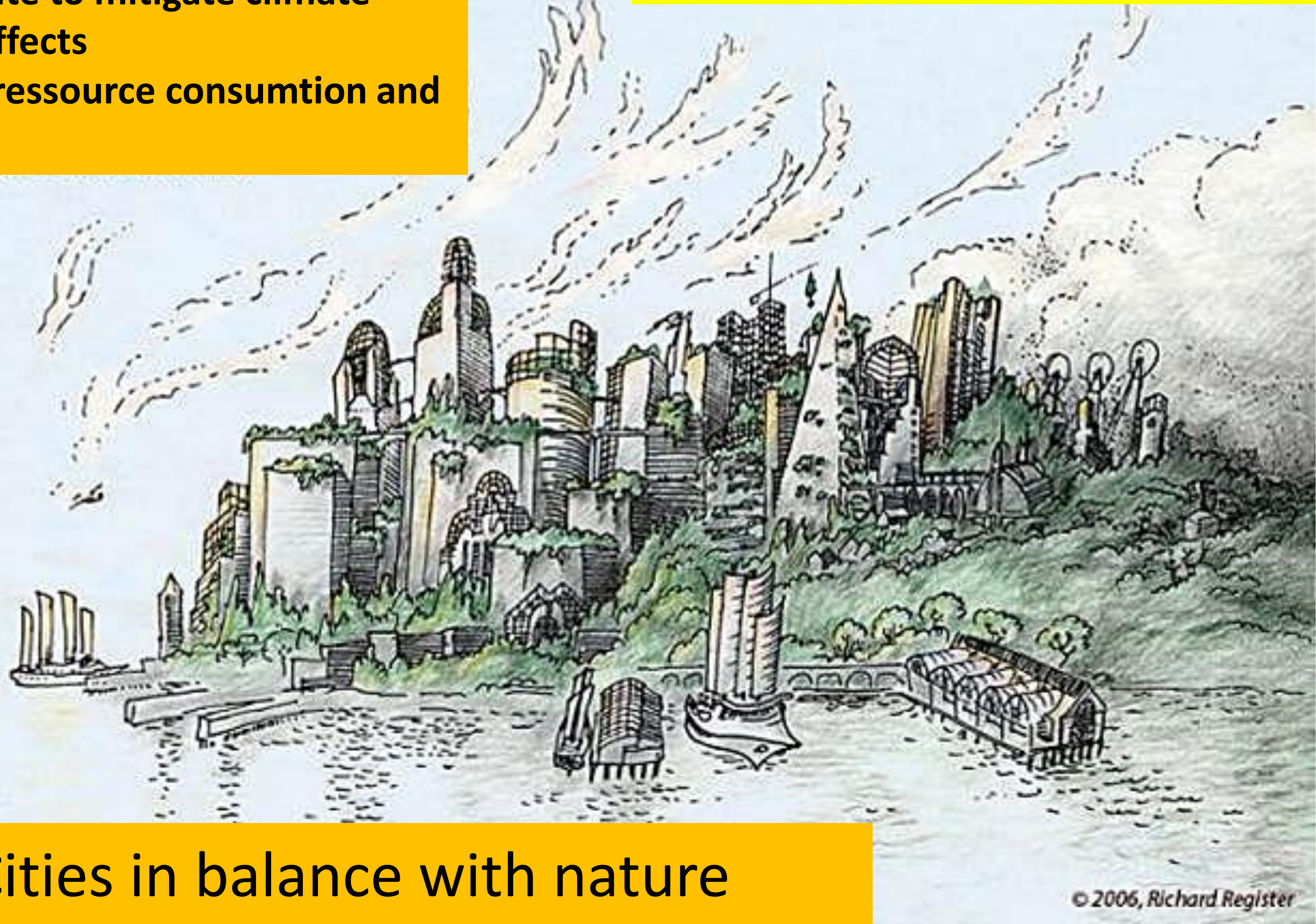
The Urban Ecological Approach



Breuste; 2015

- **Profiting from ecosystem services**
- **Reduce transport needs of food and recreation**
- **Contribute to mitigate climate change effects**
- **Reduce ressource consumtion and emission**

Benefiting from nature – innovative uses of urban ecosystems



Cities in balance with nature

URBAN ECOSYSTEM

OPEN SPACE SYSTEM

- Parks
- Street trees
- Gardens (House, Institutional, Other private)
- Agricultural areas
- Rehabilitated areas
- Fragmented natural areas in city
- Natural areas surrounding city (Including nature reserves)
- Other open areas

ECOSYSTEM SERVICES AND FUNCTIONS

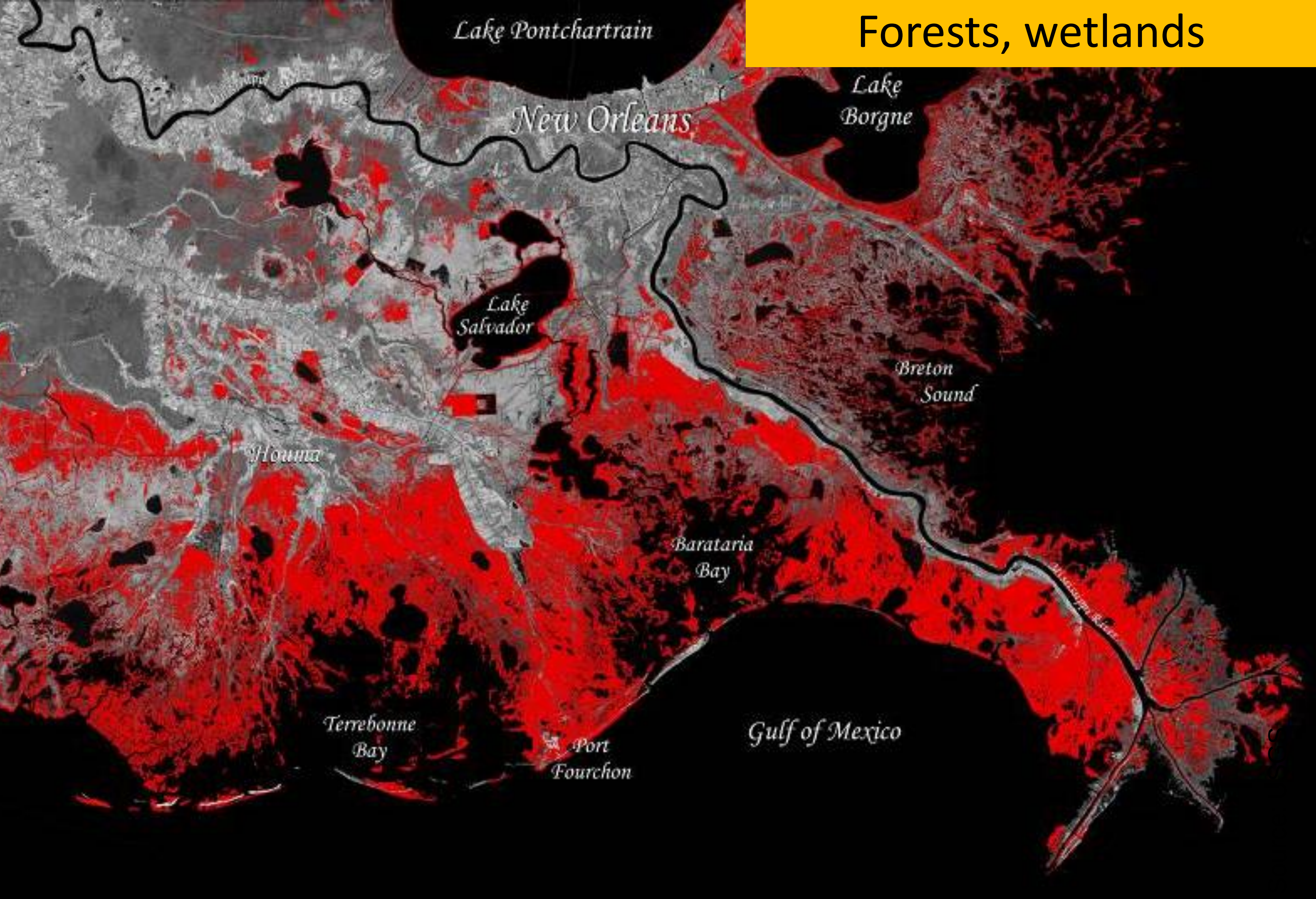
- Provisioning
  - Food
  - Wood and fibres
  - Genetic resources
  - Clean water
  - Habitat
  - Natural medicine
- Regulating
  - Air purification
  - Climate regulation
  - Mineral cycling
  - Water purification
  - Erosion regulation
  - Waste treatment
- Supporting
  - Soil formation
  - Primary production
  - Photosynthesis
- Cultural
  - Aesthetics
  - Education
  - Ecotourism
  - Spiritual values
  - Recreation

ECOSYSTEM HEALTH

- Air quality
- Water quality
- Soil structure
- Habitat and species diversity
- Ecosystem resilience

- *First type of nature*: remains of the original natural landscape such as forests and wetlands
- *Second type of nature:* cultural landscapes formed by agriculture mit meadows, pastures, fields, hedges, drifts, dry grasslands*,*
- *Third type of nature*: horticultural designed green spaces such as parks, road trees, front gardens, green buffers or potted plants,
- *Fourth type of nature:* specific urban industrial nature such as ruderal urban forests, spontaneous vegetation, waste land etc. (Kowarik 1992)

Forests, wetlands



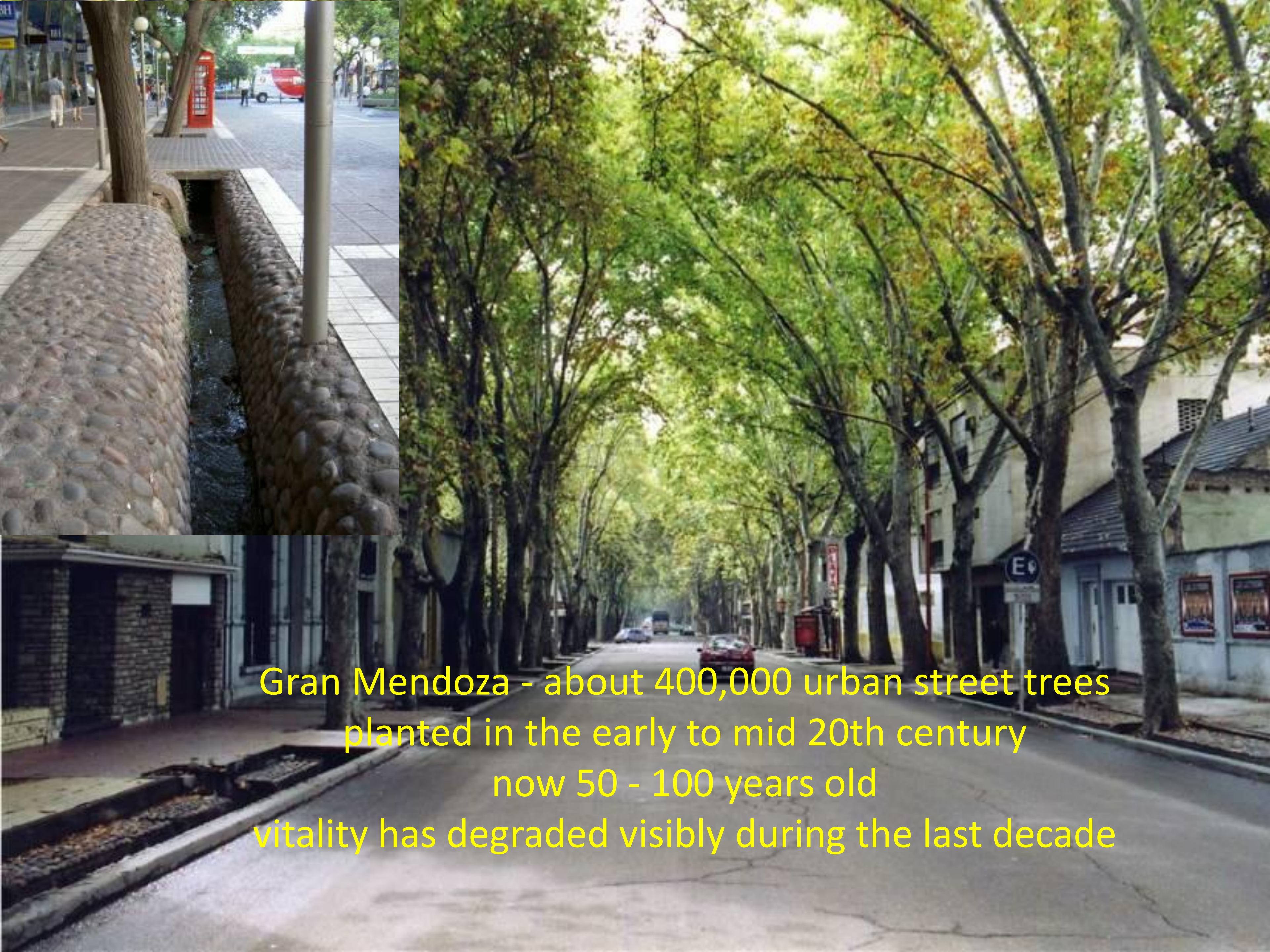
Every km of wetland reduce wave height by 1 m

Wetland/water conversions 1932-present

Target: Ecosystem services of forests and trees

„Forest City“ Silberhöhe, Halle/Saale, Germany

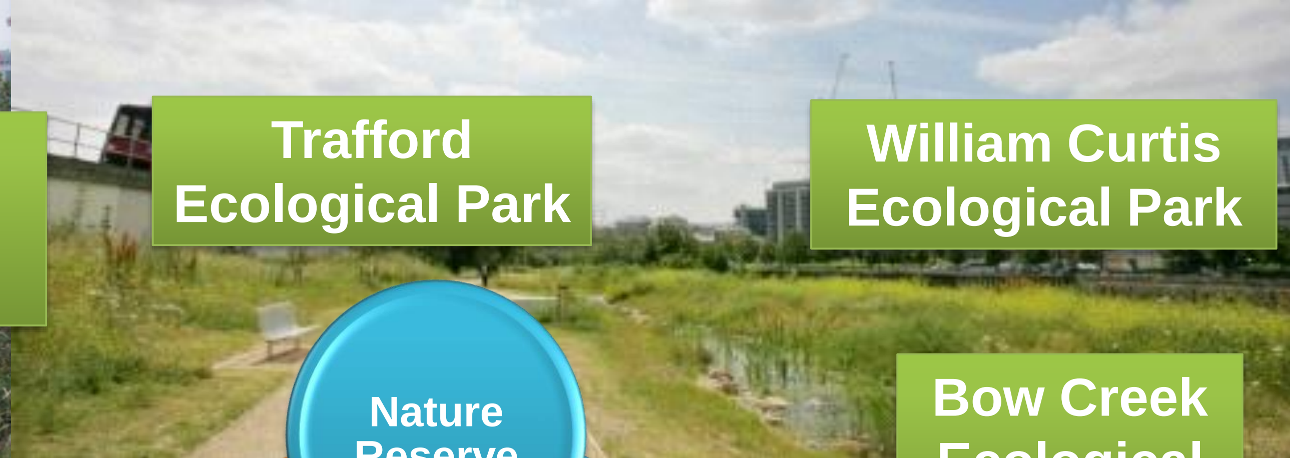
- 1989: 40.000 residents
- 2008: 15.000 residents
- 2010: 10.000 residents
- Development plan untill 2015: „forest to grow into the city “


Gran Mendoza - about 400,000 urban street trees
planted in the early to mid 20th century
now 50 - 100 years old
vitality has degraded visibly during the last decade

Parks and Gardens

Urban nature as tourist attraction: New York High Line

Urban Gardening and Urban Agriculture



Nature Reserve

Place of Recreation

Ecological Parks

Education al Facility

Research Area

...eturne... to the ... ...ner (Lo...don Doc...
...rpor...tion)
...-88 ... Ecol... ...rk

...d became the 2... ... Counc...

...g ...wns.

Max Nicholson

(www.urbanecology.org.uk/; 08.09.10)

- Species richness (1432 species)
- Important part of alien species (41%; Neophyts 30%)

Inner City Berlin, Embassies Quarter 1990


Dry grassland
Habitat for birds
Steinschmätzer
Wiesenpieper

Berlin, Germany: Natur-Park Südgelände

Free nature development and succession

ndscape Ecology

SolarCity Linz-Pichling (Austria)

- 2005 completed
- 35 ha
- 3.500 Inh.,
- 1.300 apartments

Solar City Linz – Key principles of sustainable framework

- **Energy efficiency and sustainable energy usage**
- **Recreational infrastructure** and pedestrian routes
- **Open spaces and landscape as planning focus**
- **Nature protection and people's contact with nature**
- **Innovative building concepts**
- **Management of ressources**
- **Social stability** (ownership and rental, age groups etc.)
- **Urban district and mobility management**
- **Sustanability - Monitoring** – focusing particularly on urban development, architecture, energy management, climate protection, material management and user satiffaction

The Approaches:
Selection of Eco-City for Evaluation

KENNEDY 1984, 1998 – ECOCITY PRINCIPLES

REFERENCES:
KENNEDY, M. (Hrsg.) (1984): Öko-Stadt. Prinzipien einer Stadtökologie. Materialien zur Internationalen Bauausstellung Berlin (IBA). Band 1. Frankfurt am Main

KENNEDY, M. (Hrsg.) (1984): Öko-Stadt. Mit der Natur die Stadt planen. Materialien zur Internationalen Bauausstellung Berlin (IBA). Band 2. Frankfurt am Main

KENNEDY, M. und D. KENNEDY (Hrsg.) (1998): Handbuch ökologischer Siedlungs(um)bau. Neubau- und Stadterneuerungsprojekte in Europa. Berlin

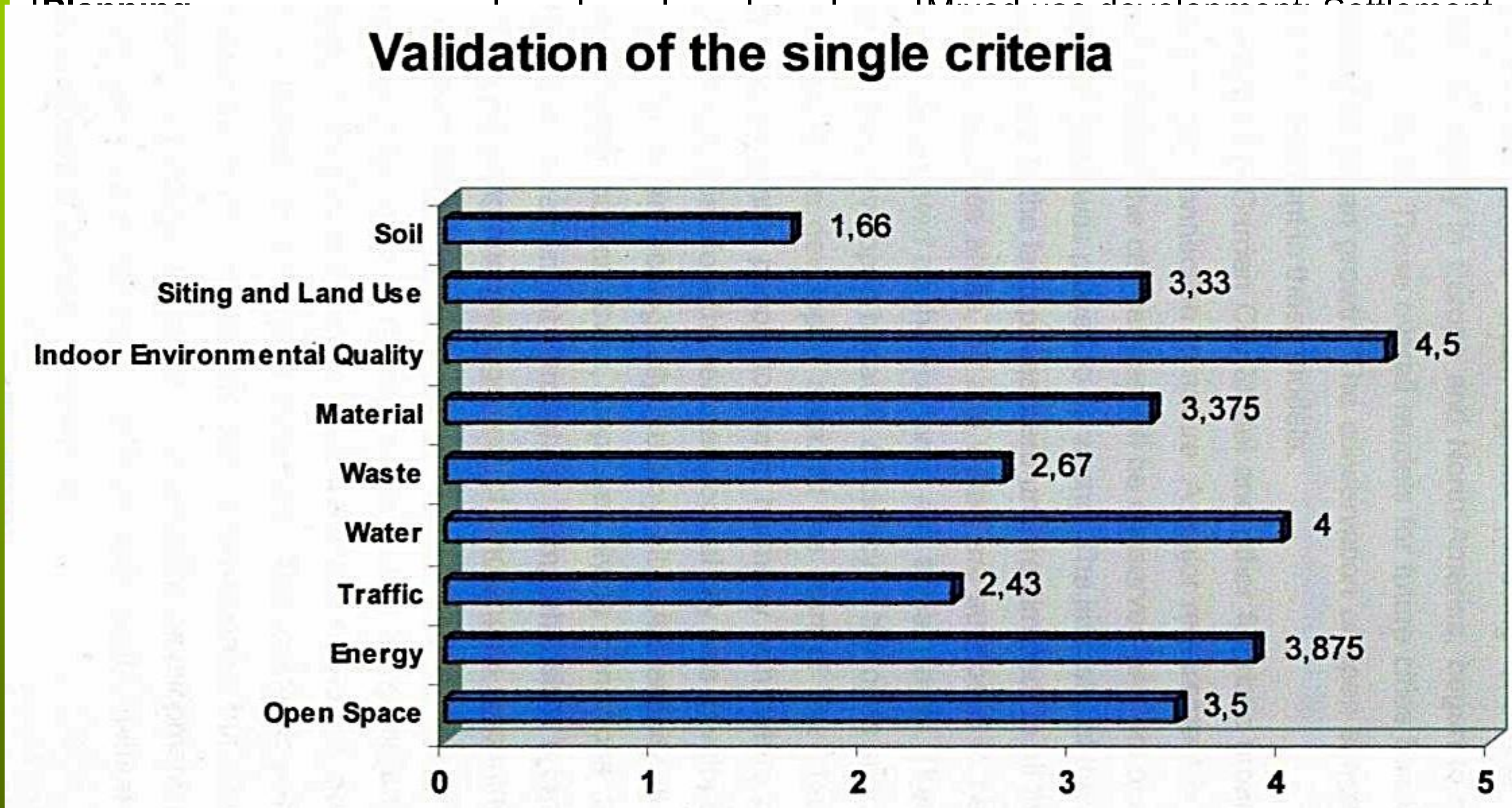
- Siting and Land Use
- Open Space
- Soil
- Material
- Indoor Environmental Quality
- Energy
- Traffic
- Waters
- Waste

RG Urban and Landscape Ecology

Criteria	1	2	3	4	5	Measures in the solarCity Linz
1. Open Space						
Use existing vegetation and landforms to moderate climate conditions and provide protection for native habitats			XX			Traun-Danube Riverside, park landscape
Plant native or well-adapted species			XX			Revitalisation of the Aumühlbach, Plantings in the park landscape
Use greenbelts and protected wetlands to create a continuous web of native habitats				XX		Traun-Danube Riverside; Aumühlbach
Restore the native landscape				XX		Revitalisation of the Aumühlbach
Create open space for recreation and child's play					XX	Playgrounds for children; Local recreation in the Traun-Danube Riverside; Park landscape and Weikerlsee for recreation (sports, bathing)
Green the buildings (roof gardens etc.)		XX				Only a small part of the buildings have roof gardens

RG Urban and Landscape Ecology

Criteria	1	2	3	4	5	Measures in the solarCity Linz
2. Energy						
Energy-Conscious Urban						Orientation of the buildings; Atria;
				XX		surface to enhance comfort and growth of plants
Energy Efficient Equipment and Appliances	XX					



SolarCity Linz - City in balance with nature


fairkehr

RG Urban and Landscape Ecology

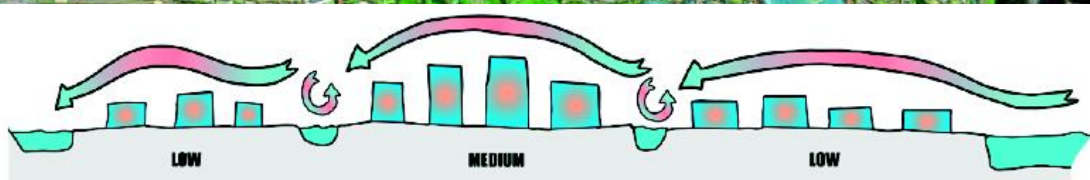
Salzburg Stadtwerke Area – New urban development (left)

Selected Eco-City Projects in China

Projekt:	Foreign Partner	Status
Beijing Mentougou Eco-City	Finnland	Signing of Sino-Finland Ecological Valley in May 2010. **currently in the planning phase**
Beijing Changxing International Eco-City	England (Arup)	**Planning phase**
Tangshan Caofeidian International Eco-City	Schweden (Sweco)	Start of the construction in September 2008; **Start in March 2010 with 10 big projects** (Total investment: 11,6 Mrd. RMB)
Shanghai Chongming Dongtan Eco-City	England (Arup)	MoU-Signing in January 2008; **Start in the second part of the year 2008; currently not in progress**
Suzhou Western Eco-City	-	**Construction began in February 2010**
Langfang Wanzhuang Eco-City	-	**Construction began in Jun 2008**
Wuxi National Low-Carbon Eco City Demonstration Zone, Wuxi Sino Swedish Low-Carbon Eco-city	Schweden (Tengbom)	**Construction began in July 2010**
Tianjin Sino-Singapone International Eco-City	Singapur (Keppel)	**Construction began in 2008.** Until the end 2009: realised Investment 8,0 Mrd. RMB, The total planned investment by the end of 2010: 17,0 Mrd RMB
Zhangjiagang Sino-Danmark Ecological Science & Technology Park	Dänemark	**Planning phase**
Hubei Xianning Eco-City	Deutschland (Siemens)	Signing the „Strategic Partnership Fremework Agreement" in October 2009; **currently in the planning phase**

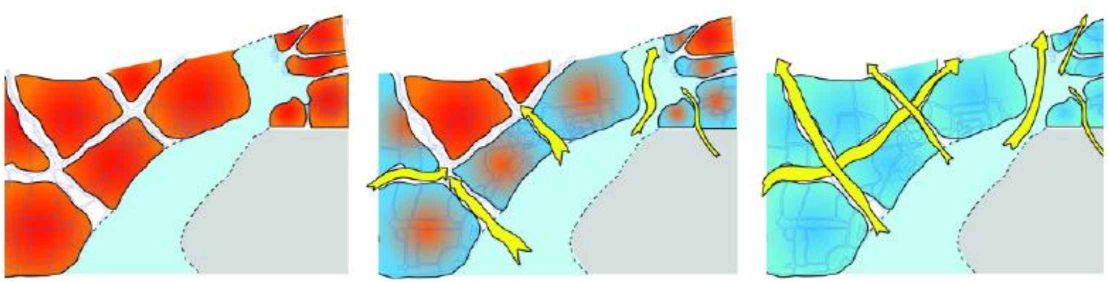
Suzhou Eco-Town, China

4 main headings:
- *Preserve the natural environment*
- *Socio-economic aspects*
- *Reduction of ecological footprint*
- *Governance*



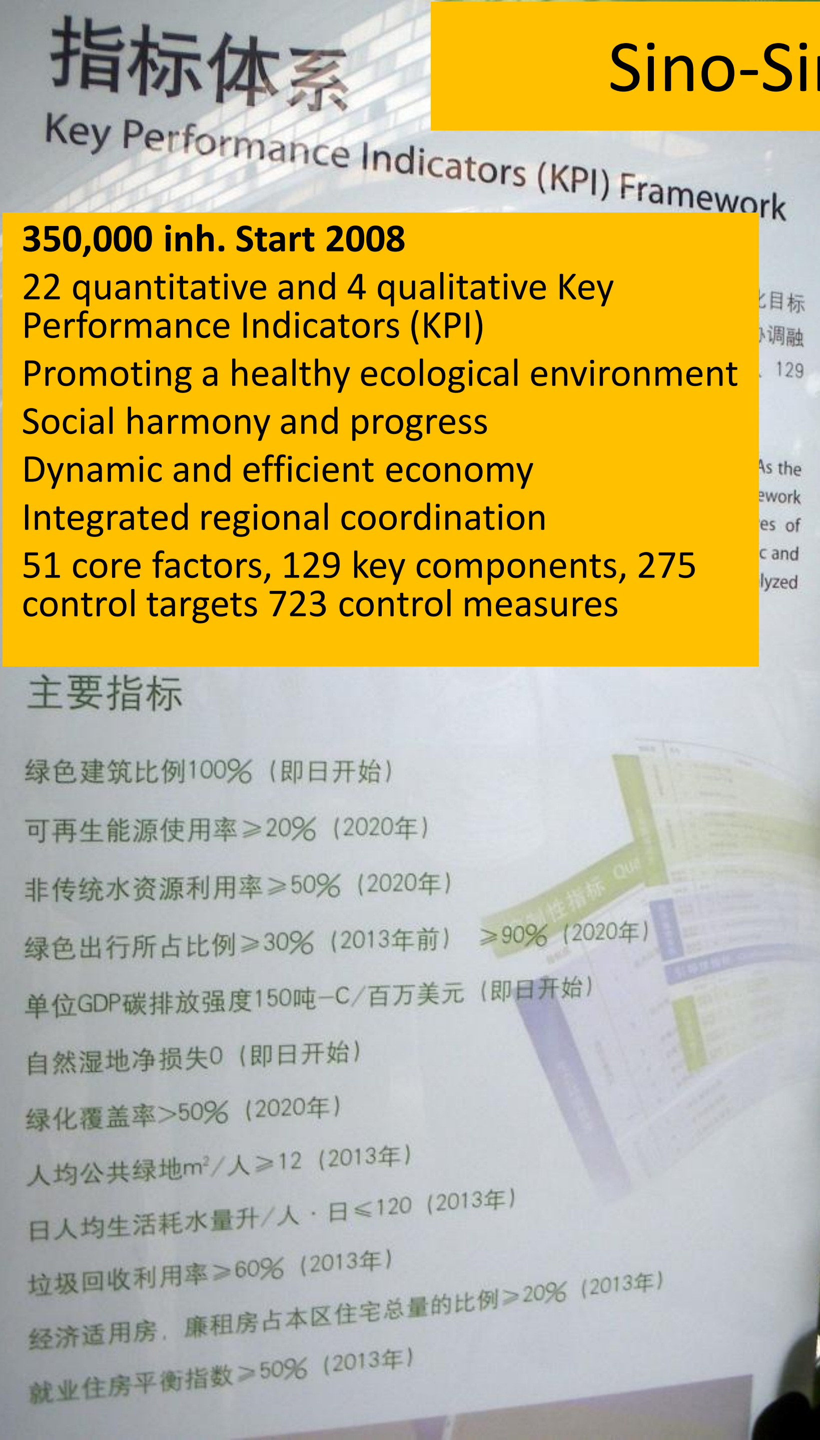
- Agro-urbanism (Functional inter-relationship between the production, distribution and consumption of food by connecting urban areas to agricultural land)
- Low Carbon Design

A New Eco-District: Integrating Planning Processes with Bioclimatic Design



"An approach to urban design based on integrated planning processes - combining local context, tradition, and an understanding of local conditions and climate with principles of European Urbanism."

Sino-Singapore Tianjin Eco-City, China



350,000 inh. Start 2008

22 quantitative and 4 qualitative Key Performance Indicators (KPI)

Promoting a healthy ecological environment

Social harmony and progress

Dynamic and efficient economy

Integrated regional coordination

51 core factors, 129 key components, 275 control targets 723 control measures

Key Performance Indicators (KPI)

Quantitative Indicators

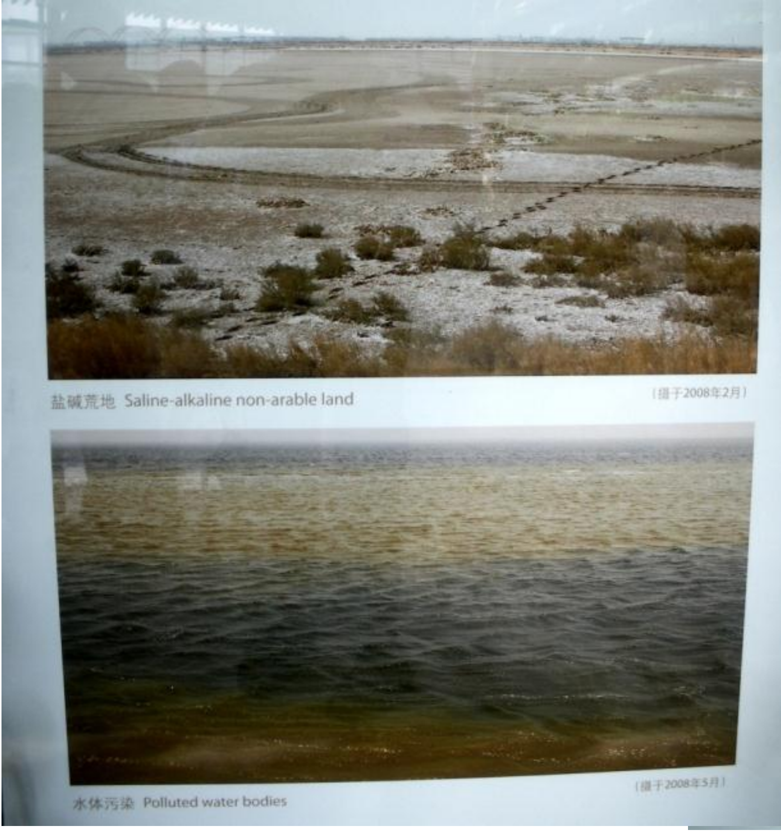
	KPI Area	S/ No	KPI details	Units	Indicative Value	Timeframe
Healthy Ecological Environment	Go[illegible] Na[illegible]ral En[illegible]ronment	1	Ambient air quality	Days	No. of days per year in which ambient air quality meets or exceeds China's National Ambient Air Quality Grade II Standard ≥310 (i.e. 85% of 365 days)	Immediate
				Da[illegible]	No. of days per year in which SO2 and NOx content in the ambient air should not exceed the limits stipulated for China National Ambient Air Quality Grade I standard ≥155 (i.e. 50% of 310 days)	Immediate
					To meet the standard stated in the PRC's National Standard GB 3095-1996	By 2013
		2	Quality of water bodies within the Eco-city		To meet Grade IV surface water quality standard stated in the latest PRC's National Standard GB 3838-2002	By 2020
		3	Water from taps attaining drinking water (potable) standards	%	100	Immediate
		4	Noise pollution levels must satisfy the stipulated standards for different functional zones	%	100	Immediate
		5	Carbon emission per unit GDP	tonne-C per one million US dollars	150	Immediat
		6	Net loss of natural wetlands		0	Immediat
	Balance[illegible]f Man-ma[illegible] Environment	7	Proportion of green buildings	%	100	Immediat
		8	Local / Native plants index		≥0.7	Immediat
		[illegible]	Public green space per capita	[illegible] per capita	≥12	By 2013
Social Harmony & Progress	Social Harmony & Progress	10	[illegible] capita do[illegible] consumption	litres per day per capita	≤120	By 2013
		[illegible]	Per capita domes[illegible] waste generation	kg per day per capita	≤0.8	By 2013
		12	Proportion of green trips	%	≥30	Before 20[illegible]
					≥90	By 2020
	Comprehensive Infrastructure	13	[illegible] rate	%	≥60	By 2013
		14	Provision of free recreational and sports facilities within walking distance of 500m	%	100	By 2013

	KPI Area	S/ No	KPI details	Units	Indicative Value	Timeframe
		15	Treatment to render solid waste non-hazardous	%	100	Immediate
		16	Barrier-Free Accessibility	%	100	Immediate
		17	Services network coverage	%	100	By 2013
	Sound Management Mechanism	18	Proportion of public housing	%	≥20	By 2013
Dynamic and Efficient Economy	Sustainable Economic Development	19	Renewable energy usage	%	≥20	By 2020
		20	Water supply from non-traditional sources	%	≥50	By 2020
	Vibrant Technological Innovation	21	Number of R&D scientists and engineers per 10,000 labour force	man-years	≥50	By 2020
	Overall Balanced Employment	22	Employment-Housing Equilibrium Index	%	≥50	By 2013

Qualitative Indicators

	KPI Area	S/ No	KPI	KPI Description
Integrated Regional Coordination	Coordinated natural ecology	1	Healthy ecological safety, advocating green consumption, low carbon operations	To maintain an integrated regional ecology, strengthen ecological safety and establish a sound regional ecological security system within the Eco-city, from the perspective of the optimum usage of regional resources and energy, and the capacity of the environment.
	Coordinated regional policies	2	Advance innovative policies, united anti-pollution policies in place	Actively participate in and promote regional cooperation, and implement the principle of uniformity of public services. Regional policies should ensure regional policy coherence. Establish a sound regional policy system to ensure the improvement of the surrounding areas.
	Social and cultural coordination	3	(Give) prominence to the river estuarine cultural character	Urban planning and architectural designs should preserve history and cultural heritage; manifest the uniqueness, while protecting ethnic, cultural and scenic resources. Also, to ensure safe production and social order.
	Regional coordinated economy	4	Supplementing the recycling economySupplementing the recycling economy	Sound market mechanism to overcome the limitations of administrative divisions, drive the orderly development of the surrounding region, promote a reasonable division of functions at the regional level, as well as an orderly market, and relatively balanced economic development and living standards.

New city in the marsh land



One third of the land

- Deserted salt pans
- Saline - alkaline non-arable land
- Polluted water bodies

The EcoCity cleans water and don‘t occupay arable land

Smart City

Sino-German Ecopark Qingdao

“With “**green** and integration” as the core, the planning aims to achieve the coordination and **harmony**…”

- ecological concept
- based on natural conditions
- 11.6 square kilometers
- ecological green land 30%.

1. 环境空气质量提升	Improving Air Quality
2. 园区智能化系统高水平建设	High-level Delivery of Intelligent System on site
3. 海洋新兴产业发展优先	Priority of New Marine Industry
4. 本地产业共生与配套完善	Local Industrial Symbiosis and Encourage of Service Facilities for Key Industries
5. 绿色设计理念推广	Promotion of Green Design
6. 海洋文化特色突出	Outstanding Features of Marine Culture

		2015	2020	单位
1. 人均公园绿地面积	Area of Green Space Per Capita	30	30	平方米/人 m^2percapita
2. 区内地表水环境质量达标率	The Reaching Standard Rate of Surface Water Quality	100%	100%	
3. 区域噪声平均值	Average Value of Regional Noise	昼间均值≤55，夜间均值≤45 Daytime mean≤55，night mean≤45	昼间均值≤55，夜间均值≤45 Daytime mean≤55，night mean≤45	dB(A)
4. 城市室外照明功能区达标率	The Reaching Standard Rate of Exterior Lighting	100%	100%	
5. 园区范围内原有地貌和肌理保护比例	Proportion of Preserving the Original Terrain Features	≥40%	≥40%	
6. 绿色施工比例	Proportion of Green Construction	100%	100%	
7. 鸟类食源树种植株比例	Proportion of Tree Species Suitable for Birds Habitat	30%	35%	

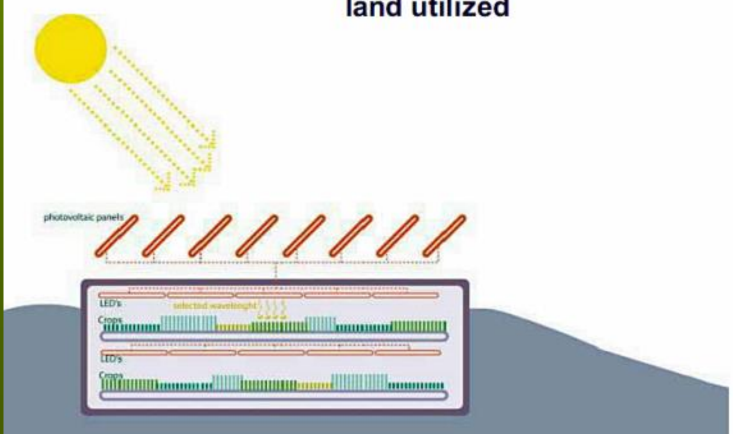
Dongtan Eco-City

d Landscape Ecology

Linear City

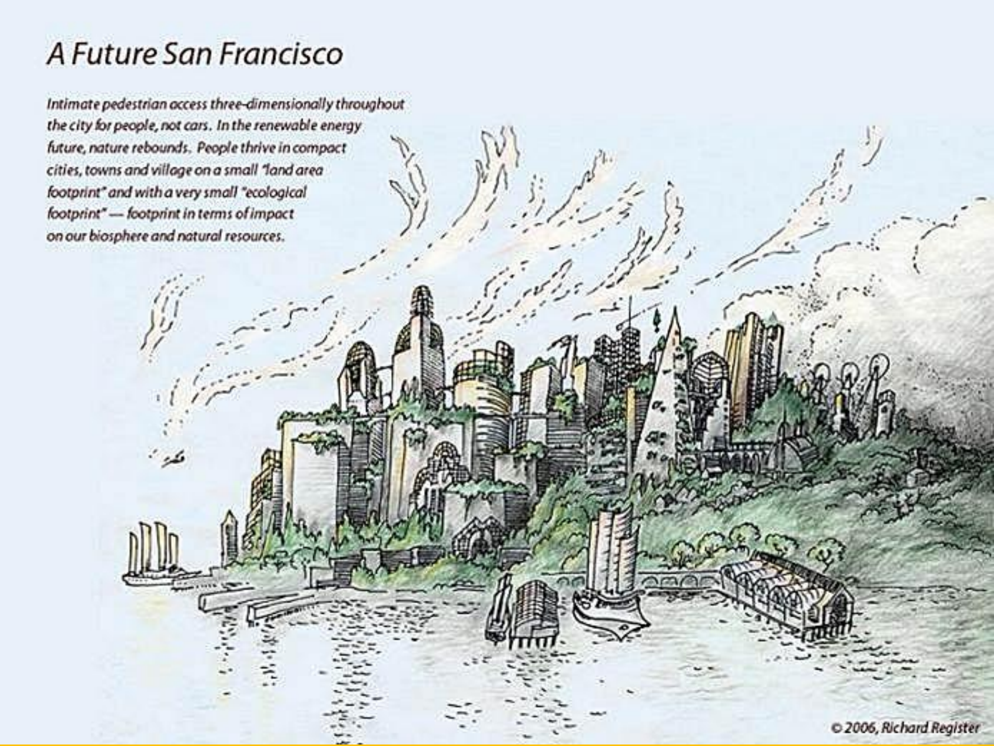
- Buffer city /linear city
- Protecting and enhancing the bird habitat
- Energy from renewables
- Zero emission transport
- Water treatment and recycling
- Low traffic noise
- Light pollution control
- Near zero landfill
- Biodiversity in landscape

no loss of productive land, by providing 9 hectares of plant factories per 1,000 ha of productive land utilized



RG Urban and Landscape Ecology

The new eco-city will be the *existing city* changed to a more sustainable status!



What can be done?

1. Make eco-city development measurable by definition of targets by **criteria**
2. Target to **open spaces and buildings**
3. Use **indicators** to measure reached status
4. Use **monitoring** and **improve** the status
5. Use **ecosystem services** based on nature processes of **green and water**

There is always a chance to built an eco-city – just start small and concrete!

SE 1: Quiz “strategies for the sustainability of cities” -

Conceiving the city of the future -

from the diffused to the eco-city model

MSc. Marc Giménez Maranges – Department of geography and geology – University of Salzburg

The diffused city model

1

Cities have a key role in the battle of sustainability.

a. True

b. False

1

Cities have a key role in the battle of sustainability.

a. True

b. False

2

Match the pairs.

1. City and limits	a. are to deploy uses and functions in the territory in a dispersed manner.
2. The current tendencies to produce urbanization	b. are two concepts that do not go together anymore
3. Urban complexities are not dependent on the space and proximity offered by multi-functionality in a small space, but	c. are replaced by mechanical or telecommunication means.

2

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Co-funded by the Erasmus+ Programme of the European Union

3

Choose the correct words.

The combination of the diffusion of buildings and the need for transport of people, matter and energy results in a (little use/ massive use/ reasonable use) of the means of locomotion. The mobility network is saturated, and attempts to free it from congestion with more kilometres of network result in an increase in congestion and the related variables. The resolution of transport conflicts generated by the diffused city can only be addressed (making cities more compact/ increasing the infrastructure/ increasing the number of traffic lights) to restore the lost speed or to solve network saturation. This process, generally, is the precursor of (new dispersed urban settlements/ new supermarkets/ new sustainability solutions), which will be make any extension of the network insufficient, and will transfer the problem of congestion and the variables that accompany it to ever greater areas.

3

Choose the correct words.

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4

The specialisation of the space entails:

a. Option “b” and a reduced use of the monofunctional polygons

b. The impoverishment of the contact, the exchange and the communication between people, different activities and institutions

c. The enrichment of the contact, the exchange and the communication between people, different activities and institutions

SE 1: Quiz “strategies for the sustainability of cities”

4

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Responses to the environmental crisis

5

The main responses given to the environmental crisis so far are:

a. Response of the United Nations (international consensus); and response of the priviate sector (to respond to the pressures of the environmental agenda)

b. Response provided by the proponents of the “radical ecologism”

c. Both option “a” and option “b” are correct

SE 1: Quiz “strategies for the sustainability of cities”

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6

To which city model are we referring?
See the clues:

- Public space is conceived as the main protagonist of social interaction
- Neighbourhoods are not simple dormitory areas, but they reflect the identity of their inhabitants
- Residential use is mixed with activities that have traditionally characterized the neighbourhood idea: commerce, etc.
- Several centres exist where numerous functions are concentrated

6

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The “decentralized concentration” model

7

Put the words in correct order:

The new urbanism called "urbanism of the three levels" is one three that projects not urbanism but plans, with the same detail and on the same scale that current city planners project the city-planning plan on the surface. Surface designing from and a in plan a in plan height the apart subsoil , plan, allows the set of variables of the current challenges to be shaped in one way or another.

7

Put the words in correct order:

The new urbanism called "urbanism of the three levels" is one three that projects not urbanism but plans (urbanism that projects not one but three plans), with the same detail and on the same scale that current city planners project the city-planning plan on the surface. Surface designing from and a in plan a in plan height the apart subsoil , plan (Designing a plan in height and a plan in the subsoil, apart from the surface plan), allows the set of variables of the current challenges to be shaped in one way or another.

8

Which of the following statements on the urbanism of the three levels is not correct?

a. Two levels of urban green should be created (one in the surface and one in height). This can be connected to other interesting programs, such as the creation of sound landscapes linked to insectivorous birds (cantora)

b. Massive private transport networks in the subsoil and on the surface should be promoted, and the mobility infrastructure with public transport should be minimised

c. Cities should increase in complexity, which attracts new knowledgeable legal and natural persons

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9

Choose the correct words.

The first example of Bosco Verticale has been realized in the city of (Rome/ Vienna/ Milan). It involved the construction of two towers of 80 and 112 m, capable of accommodating 480 large and medium-height trees, 250 small-sized trees, 5,000 shrubs, and 11,000 floral plants: a total of (100,000/ 10,000/ 9,000) square meters of forest. The buildings' biodiversity is expected to attract new species to the city. Vegetation is also used to moderate temperatures in the building and protects the interior spaces from noise pollution and dust from street-level traffic. The building itself is self-sufficient by using renewable energy from solar panels and filtered waste water to sustain the buildings’ (plant life/ washings facilities/ toilets).

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10

Match the pairs.

1. The idea of “ecological modernization”	a. is embedded in the concept of ecological modernisation.
2. After the 1980s and 1990s, sustainability advocates learned that it	b. posits that a market-based system of consumption and production does not automatically lead to more environmental devastation
3. The eco-city approach	c. is necessary to engage with business and use business language

10

Match the pairs.

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The eco-cty concept

11

When was the idea of eco-city first mentioned?

11

When was the idea of eco-city first mentioned?

In the 1970s

12

The concept of eco-city:

a. is an evolving term, which is being refined and improved, through the physical, ecological, technological, economic, psychological and social changes that are occurring in societies

b. is a term used as a synonymous of diffused city, when in each of the monofunctional units of the diffused city ecologically-oriented techniques are implemented

c. was first mentioned by the United Nation, when the Local Agenda 21 was launched

12

The concept of eco-city:

a. is an evolving term, which is being refined and improved, through the physical, ecological, technological, economic, psychological and social changes that are occurring in societies

b. is a term used as a synonymous of diffused city, when in each of the monofunctional units of the diffused city ecologically-oriented techniques are implemented

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13

The requirement to be met by an eco-city are:

a. Both option “b” and option “c” are correct

b. Ecological security, ecological sanitation, and ecological industrial metabolism

c. Ecoscape (ecological-landscape) integrity, and ecological awareness

13

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14

To which requirement to be met by an eco-city are we referring?
See the clues:

- Materials re-use
- Life-cycle production
- Renewable energy
- Efficient transportation

14

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- Renewable energy
- Efficient transportation

Ecological industrial metabolism

15

Put the words in correct order:

Some actions necessary for the eco-city development include:

- Safe building use transport cities and safe for non-motorized pedestrian transport
- Lessons , development sharing eco-city and resources experiences in

15

Put the words in correct order:

Some actions necessary for the eco-city development include:

- Safe building use transport cities and safe for non-motorized pedestrian transport (Building cities for safe pedestrian and non-motorized transport use)
- Lessons , development sharing eco-city and resources experiences in (Sharing experiences, lessons and resources in eco-city development)

16

Joss (2009) identified 100 eco-city initiatives around the globe (status autumn 2009)

a. True

b. False

16

Joss (2009) identified 100 eco-city initiatives around the globe (status autumn 2009)

a. True

b. False

17

Match the pairs.

1. Earlier models of eco-cities	a. is were implemented by governments to showcase their commitment to establish sustainable development
2. The projects of eco-city of the 1990s	b. gained considerable momentum and become embedded in mainstream policy-making
3. In the mid 2000s this phenomenon	c. were mostly community level, alternative movement initiatives

17

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18

Choose the correct words.

The majority of the eco-cities are located in Europe, with Scandinavian countries, (France/ Austria/ the United Kingdom) and Germany heading the table. The second largest concentration is found in (North America/ Asia and Australasia/ Antarctica), followed by (North America/ Asia and Australasia/ South America), Africa, Latin America, and the Middle East.

18

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19

To which country are we referring?
See the clues:

- More than 40 eco-town/eco-city projects were initiated already by 2009
- These projects are different in the initiation and development processes and frameworks in comparison with their European counterparts
- Efforts to improve their urban planning and implementation policies are being increasingly based upon lessons from the experiences in e.g. Dongtan eco-town

19

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China

The case of Freiburg (Germany)

20

Choose the correct words.

To improve energy efficiency in existing buildings, Freiburg established a support program for housing (isolation/ insulation/ remediation) and energy modernization. Many municipal buildings were also modernized. Between 2009 and 2011 a standard of (9/ 15/ 30) kWh / m2 / year was implemented, intending to approach the passive house model. I was promoted that houses were very well insulated from the outside, but had more (toilets/ shelters/ openings) than conventional ones, in such a way that they naturally obtain and conserve heat energy. Insulating materials protect them from outside temperature and keep the temperature generated inside.

20

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21

The most commonly used renewable energy in Freiburg is:

a. Solar energy

b. Nuclear energy

c. Biomass

21

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22

In Freiburg there are:

a. Approximately 400 photovoltaic installations and the first building in the world that has been sustained in a self-sufficient way with solar energy

b. The first football stadium and harbour of the world that have their own solar production plant

c. The first part of option “a” (400 photovoltaic installations) and the second part of option “b” (harbour with its own solar production plant) are correct

22

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23

Match the pairs.

1. Urban development should take place	a. around the main public transport arteries
2. Priority is given to	b. above the construction of supermarkets in non-urbanized areas
3. The construction of neighbourhood centres and local markets is prioritised	c. centralized development, above peripheral development

23

Match the pairs.

1. Urban development should take place

a. around the main public transport arteries

2. Priority is given to

b. above the construction of supermarkets in non-urbanized areas

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24

Match the pairs.

1. Freiburg CO_2 Diet	a. environmental centre where seminars, guided tours and activities are provided on solar energy, etc.
2. Freiburg eco-station	b. Allow sensitised citizens to invest directly in renewable energies
3. Population associations	c. tool given to citizens so that they can calculate their contribution to CO_2 emissions

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24

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25

Put the words in correct order:

In the Vauban district it is obligatory that buildings comply with requirements of low energy consumption. At the same time, in most buildings criteria criteria , , energy energy positive solar energy 0 requirements positive balance and have been applied.

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25

Put the words in correct order:

In the Vauban district it is obligatory that buildings comply with requirements of low energy consumption. At the same time, in most buildings criteria criteria , , energy energy positive solar energy 0 requirements positive balance and (0 energy balance criteria, positive energy criteria, and solar energy requirements) have been applied.

26

In the district of Vauban (Freiburg), 2 car-free areas have been created, and the majority of householders have no car.

a. True

b. False

26

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a. True

b. False

27

Why did people settle in Vauban (Freiburg)?
Select the most suitable picture

a. (nice new apartments)

b. (chance to participate in the decision-making)

c. (crazy parties)

27

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The case of Linz (Austria)

28

Which of the following measures have been applied in the solarCity (Linz, Austria)?

a. Low-energy construction is compulsory, as well as the use of solar panels for creating hot water

b. There is a system of urine separation and the whole district has been conceived as a car-free area

c. Option “a” and the first part of option “b” are correct

28

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THANKS FOR YOUR PREPARATION!!

MSc. Marc Giménez Maranges
Department of geography and geology – University of Salzburg
marc.gimenezmaranges@sbg.ac.at

SE 2: Exercise “eco-cities and grassroots initiatives” -

Conceiving the city of the future -

transitioning towards a more sustainable urban paradigm

MSc. Marc Giménez Maranges – Department of geography and geology – University of Salzburg

Co-funded by the Erasmus+ Programme of the European Union

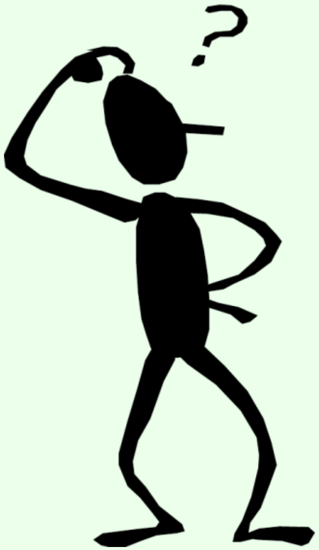
SE 2: Exercise “eco-cities and grassroots initiatives”

In-class discussion 1

Now, it is time to discuss! Please gather in groups and discuss on your conclusions. Afterwards, discuss your ideas with the rest of your classmates.

1. Do you think that the eco-city approach suffices for the attainment of a more sustainable urban paradigm? Think on the strengths and weaknesses of the eco-city concept.

Time: 30 minutes



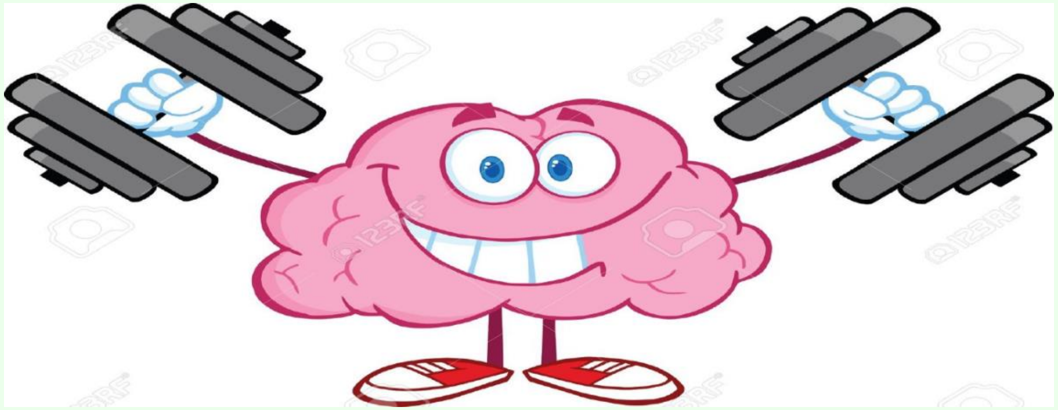
SE 2: Exercise “eco-cities and grassroots initiatives”

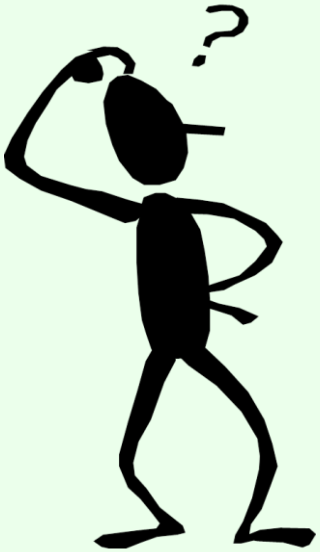
In-class discussion 2

Please gather in groups and discuss on the following question. Develop your arguments on the basis of the knowledge gained through the video on the transition towns network that you have previously watched.

1. You are very environmentally engaged and want to start with a grassroots initiative for the transformation of the urban area where you live. Think of how you would start a grassroots initiative, for a more sustainable urban development. Not least, think of: 1) the topic which you would like to develop (energy, etc.); 2) how you would start with the grassroots process (gathering of people); 3) how you would arrange the decision process; 4) how you would keep people engaged, etc.

Time: 1 hour and 30 minutes



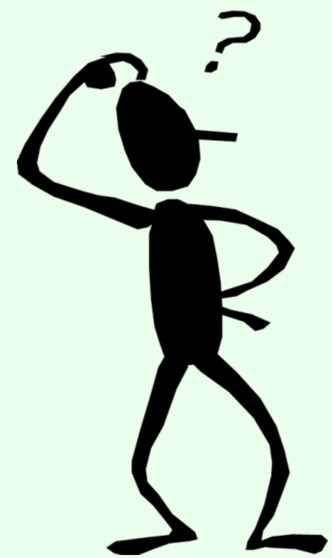


SE 2: Exercise “eco-cities and grassroots initiatives”

Oral presentation

It is time to present your results! Please present your results to the class on the following question. Afterwards, discuss on the distinct ideas suggested.

1. You are very environmentally engaged and want to start with a grassroots initiative for the transformation of the urban area where you live. Think of how you would start a grassroots initiative, for a more sustainable urban development. Not least, think of: 1) the topic which you would like to develop (energy, etc.); 2) how you would start with the grassroots process (gathering of people); 3) how you would arrange the decision process; 4) how you would keep people engaged, etc.



THANKS FOR YOUR PREPARATION!!

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marc.gimenezmaranges@sbg.ac.at

Urban Biodiversity

Co-funded by the Erasmus+ Programme of the European Union

Univ.-Prof. Dr. Jürgen Breuste
Paris Lodron Universität
Chair Urban and Landscape Ecology
Salzburg, Austria

RG Urban and Landscape Ecology

Urban biodiversity – some facts.......

❖Today 25% of the world's protected areas are within 17 km of an urban area - in 10 years 15 km

❖ Urban sprawl is rapidly transforming and endangering critical habitats of global value e.g. in the Atlantic Forest Region of Brazil, the Cape of South Africa and coastal Central America

❖Urbanization is also viewed as a driving force for increased homogenization of fauna and flora

But........

❖Urbanization in some areas result in reduced pressure on land an considerable regrowth and increase in biodiversity

❖Cities may also be very rich in biodiversity and a remarkable amount of native species diversity is known to exist in and around large cities, such as Singapore, Canberra, Rio de Janeiro, Chicago, Berlin, New Delhi and Stockholm

95 **% of native species occur in Metropolitan Chicago**

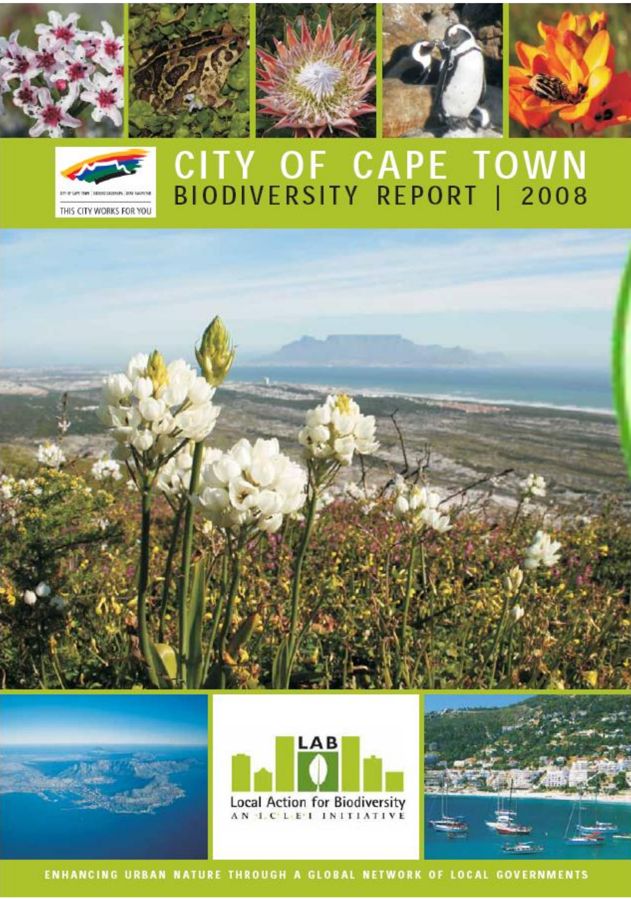
National Urban Park Stockholm, Sweden

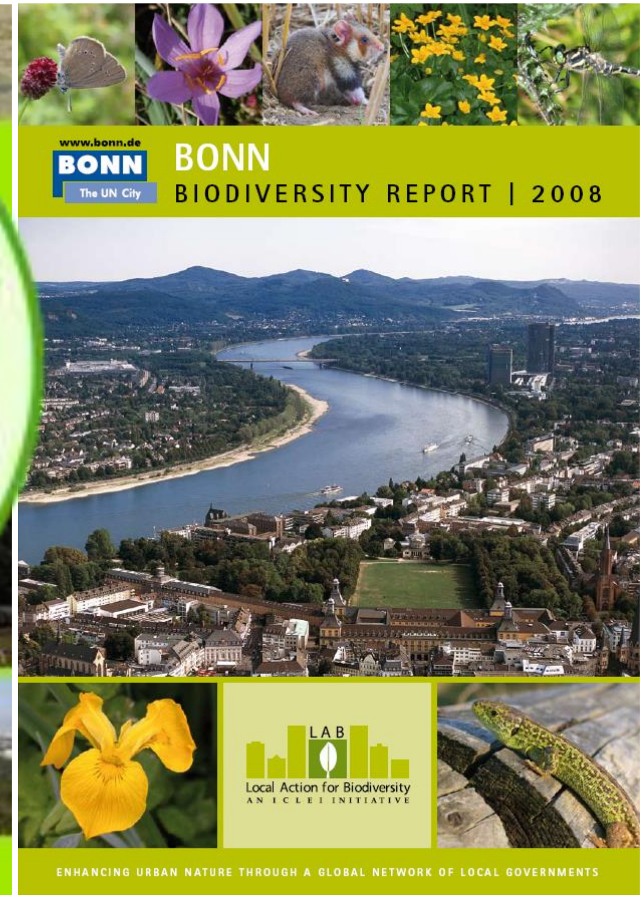
No other area in Sweden (of same size) have similar high species richness:

- >1.000 sp. of butterflies,
- 1.500 beetles,
- 250 bird species
- 112 red-listed species

Largest population of large oak trees (*Quercus robur*) in Europe

Biodiversity is …





Species-, Habitat- and genetic diversity, and is also political target and regional advertiser

Shanghai, Yanzhong Greenery 2000-2001

17,07 ha built-up land was changed into 11,85 ha green area, 4.837 families were settled elsewhere

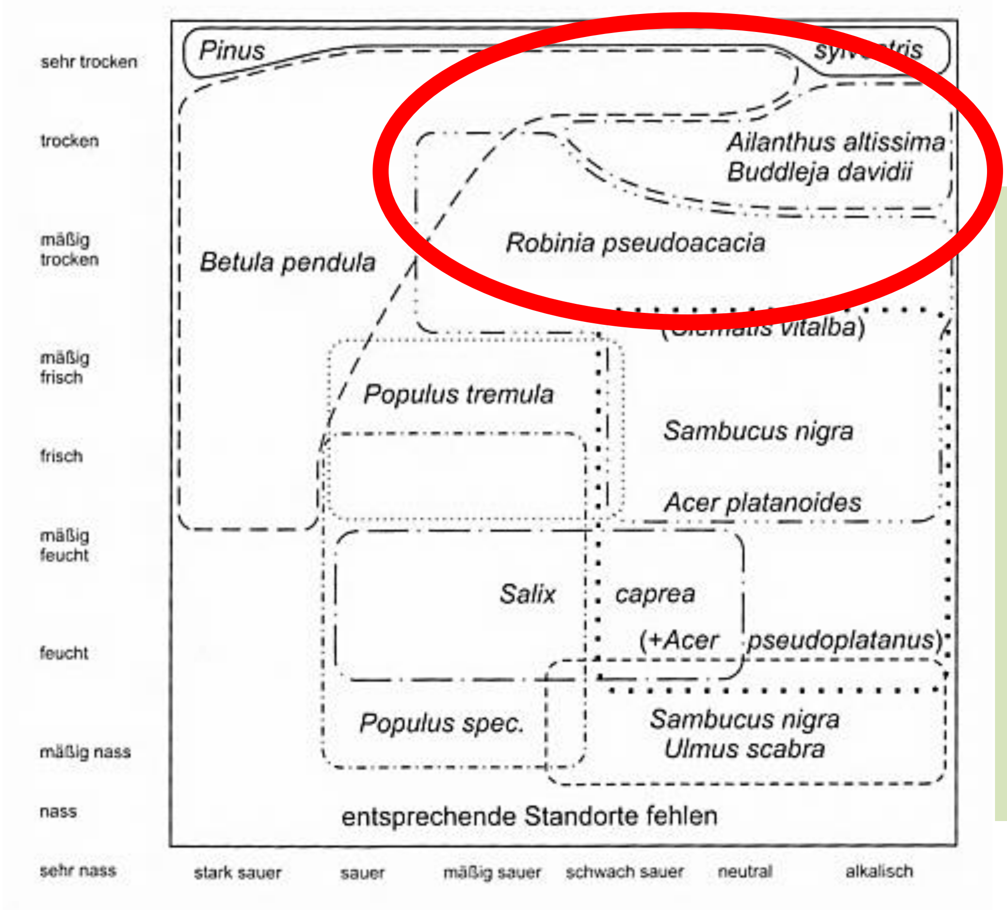
- *First type of nature*: remains of the original natural landscape such as forests and wetlands

- *Second type of nature:* cultural landscapes formed by agriculture with meadows, pastures, fields, hedges, drifts, dry grasslands*,*

- *Third type of nature*: horticultural designed green spaces such as parks, road trees, front gardens, green buffers or potted plants,

- *Fourth type of nature:* specific urban industrial nature such as ruderal urban forests, spontaneous vegetation, waste land etc. (Kowarik 1992)

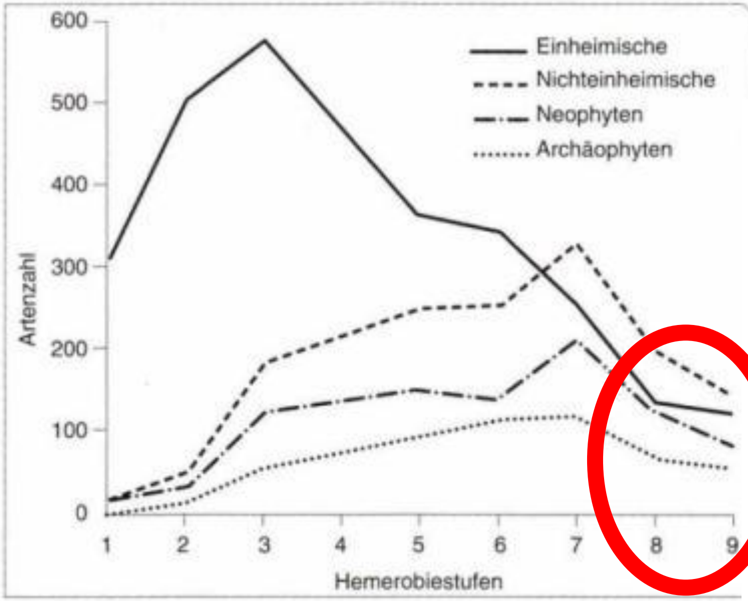
Cities offer many and special conditions
Who is more competitive?



- Heterogeneity und diversity
- Different utilization conditions
- Different disturbance intensities
- Dryer and warmer climate
- Alkaline soils

RG Urban and Landscape Ecology

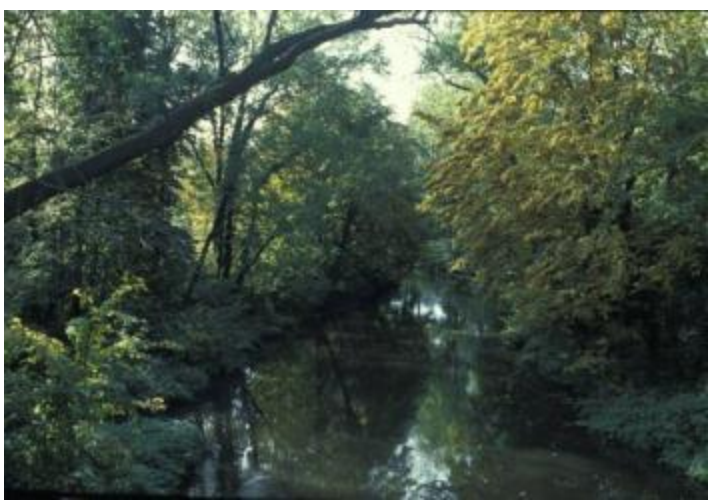
Urban Biodiversity only for Natives?



Berlin, Kowarik 1988 aus Kowarik 2010, S. 112

Table 3. Percentage of native and alien species (archeophytes, neophytes) in city zones of Berlin (West) and in the floras of surrounding rural districts of Brandenburg. Sources for 1: Auhagen and Sukopp (1982, number of neophytes changed by Kowarik, 1988); 2–5: Kunick (1974, 1982); 6–10: Klemm (1975).

	area (km^2)	species (n)	percentage of natives	archeophytes	neophytes
1 Berlin (West)	480	1432	58.6	11.7	29.7
City zones Berlin					
2 zone 1 (inner city)		380/km^2	50.2	15.2	34.6
3 zone 2		424/km^2	53.1	14.1	32.8
4 zone 3		415/km^2	56.6	14.5	28.9
5 zone 4 (outer fringe)		357/km^2	71.5	10.2	18.3
Brandenburg districts					
6 Spremberg	370	982	74.8	8.1	17.1
7 Ruppiner Land	1740	1092	75.7	8.9	15.4
8 Priegnitz	3350	1114	77.5	9.1	13.4
9 Dahme	120	771	78.4	10.6	11.0
10 Spreewald	180	745	79.3	10.4	10.3



- Most native species are sensitive again disturbances
- Intensive disturbances (urban conditions) = low number of native species
- Urban biodiversity only on non-typical urban sites?

61 years succsession – from herbal to woody vegetation

366 species of ferns and flowering plants, 49 of mushroom, 49 of birds, 14 of grasshoppers, 57 of spiders, and 95 of bees, 60 of them endangered.

Do we have to shift the biodiveristy paradigm in cities?

ELSEVIER

Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

Review

Novel urban ecosystems, biodiversity, and conservation

Ingo Kowarik

Department of Ecology, Technische Universität Berlin, Rothenburgstr. 12, D 12165 Berlin, Germany

This paper reviews the ways in which biodiversity is affected by urbanization and argues for expanding urban conservation approaches.

The pradigm shifting

„While many conservation approaches tend to focus on such relict habitats and native species in urban settings, this paper argues for a **paradigm shift towards considering the whole range of urban ecosystems**. Although conservation attitudes may be challenged by the **novelty of some urban ecosystems**, which are often linked to **high numbers of nonnative species**, it is **promising to consider their associated ecosystem services, social benefits, and possible contribution to biodiversity conservation** “ (Kowarik 2011, p. 1)

Kowarik, I. (2011): Novel urban ecosystems, biodiversity, and conservation. Environmental Pollution (2011) 1-10

Urban is rich on exotics

Tree of Heaven

(*Ailanthus altissima*)

Origin: China

Urban species diversity in a urban-rural comparison

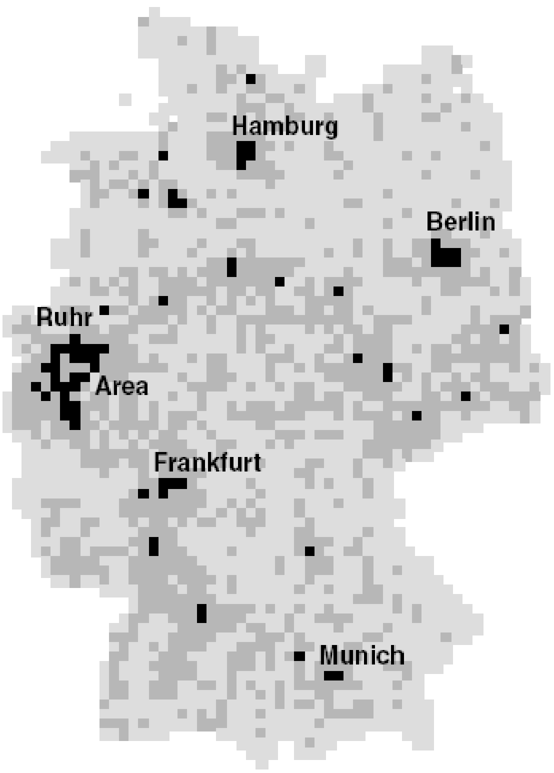
More often **less** species among butterflies, carabides, birds, lichens, mosses

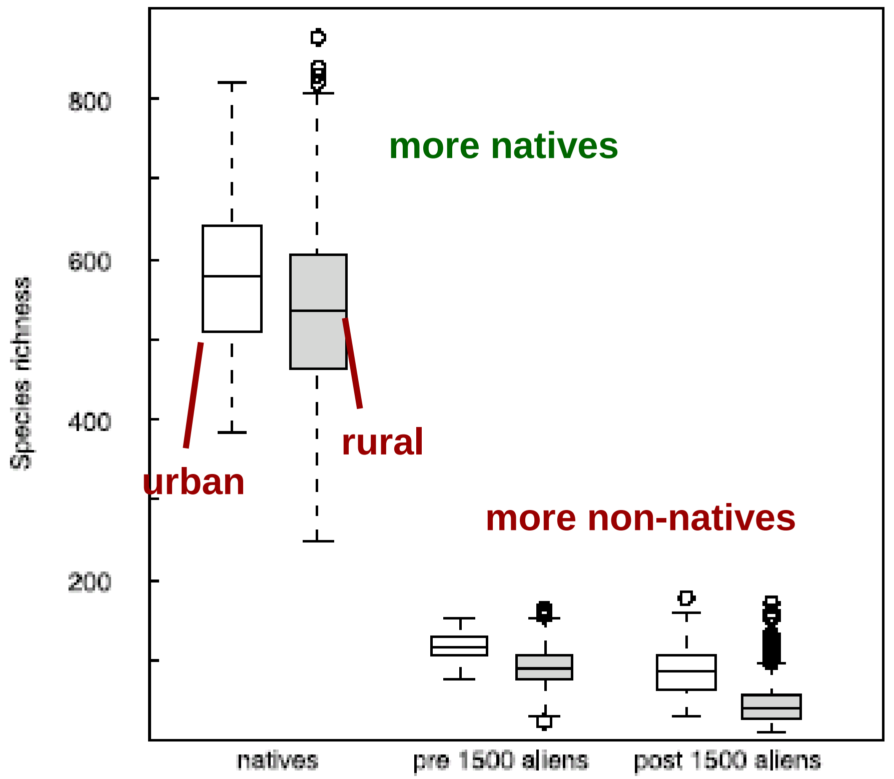
(e.g. Seaward 1982, Blair 1999, Marzluff 2001, Clergeau et al. 2006, Niemelä & Kotze 2009)

More often **more** species among higher plants

(e.g. Kunick 1982, Kowarik 1990, Hope et al. 2003, Kühn & Klotz 2004, Celesti-Grapow et al. 2006, Knapp et al. 2009)

More non-native **and native** plants in cities than in the counrtryside !





Kühn, I, R. Brandl and Klotz , S. (2004). The flora of German cities is naturally species rich. Evolutionary Ecology Research, 2004, 6: 749–764

RG Urban and Landscape Ecology

Cities are richer in species, but numbers of species don‘t say anything about the survival of species …

Climate change

- **decline of rare species**
- especially of wetlands
  and sites low in nutrients

Important reasons

- changes of sites / lost of sites
- Effects of isolation

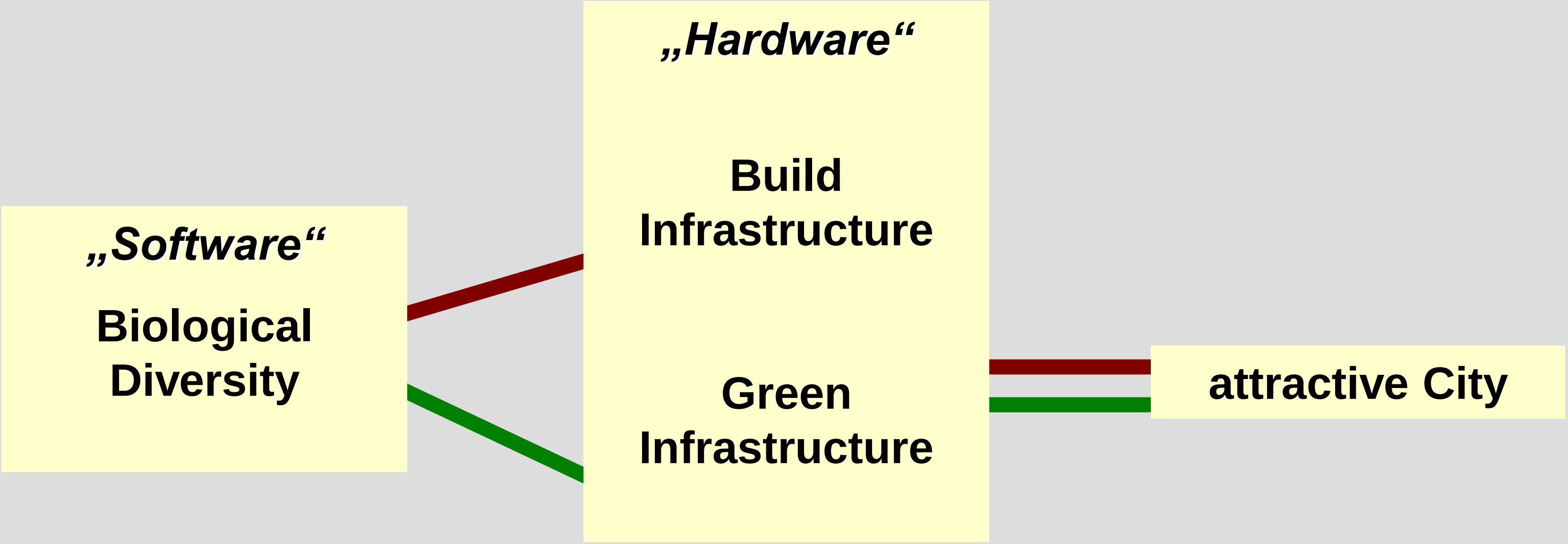
Alauda arvensis, 25% of the Berlin stock on in this area

“Invention” of urbaner Biodiversity

Tempelhofer Feld, Berlin

Biological diversity as part of the providing of one‘s live

Protection – sustainable utilization – fair access



The Potentials: Ecosystem Services

Reduction of risks by regulation,
Improvement of potentials for cultural anfd habitat services

Sustainability dimension	Urban Ecosystem Service	Quality of life indicator
Ecology	Air filtration **Climate regulation** Noise reduction **Rain water drainage** **Water supply** **Habitat service**	Health (clean air, protection against respiratory diseases, protection against heat and cold death) Safety Drinking water **Food**
Social sphere	**Harmonious Landscape** **Recreation** **Cultural values** **Sense of identity** **Nature experience**	**Beauty of the environment** **Recreation and stress reduction** **Intellectual endowment** Communication Place to live
Economy	Provision of land for economic and commercial activities and housing **Food production**	Accessibility Income

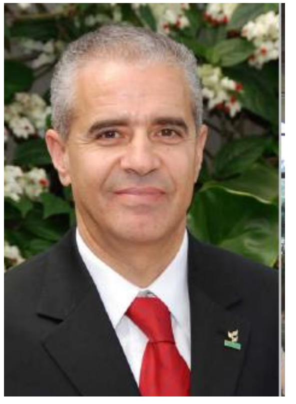
Estrangement from nature and „screen - nature“

Curitiba-Meeting, Brazil (2007)

„The battle for life on earth will be won or lost in cities“

Dr. Ahmed Djiglaf

Executive Secretary CBD



Cities become prime places of nature experiences

Increasing dependency of urban dwellers from ecosystem services within cities

Mainz, Germany

Spaces for Nature Experiences

The function of nature conservation in the city is… maintenance of species and biocenosis‘ as a basis for direct contact of the citizens with the natural elements of their environment (Sukopp & Weiler 1986, p. 25).

Berlin
Senatsverwaltung für Stadtentwicklung

Ingo Kowarik und Robert Bartz

BERLINER STRATEGIE ZUR BIOLOGISCHEN VIELFALT

Begründung – Struktur – Themenfelder – Ziele

-Entwurf-

i.d.F. der Diskussionsergebnisse bis 14.Januar 2011

vorgelegt von der

Arbeitsgruppe „Berliner Strategie zur Biologischen Vielfalt“
der Senatsverwaltung für Stadtentwicklung

Berlin 2011

Urban Biodiversity Strategies

- Protection and support of biodiversity
- Participation of people
- To fill stakeholders and actors with enthusiasm

NATIONAL PARKS
NATIONAL PARKS BOARD SINGAPORE

Structure

Part I: Profile of the City (Qualitative)

- Indigenous ecosystems found in the city
- Native species found in the city
- Quantitative data on populations of key biodiversity indicators
- Other relevant biodiversity data

Part II: Indicators (Quantitative)

- Native Biodiversity in the City → 10 Indicators
- Ecosystem Services Provided by Biodiversity in the CIty → 4 Indicators
- Governance and Management of Biodiversity in the City → 9 Indicators

Example Study Linz, Austria

Frequency – Number of species (breeding birds) and number of individuals in different biotopes in Linz

Forest	3
Parks	3
Single House Districts	3
Built-up areas	2
Commercial areas	2
Greenland	1
Agricultural land	1

Frequency

1	low	under 50 species, under 5,000 individuals
2	medium	50 – 60 species, 5,000 to 11,000 individuals
3	high	More than 60 species, more than 10,000 individuals

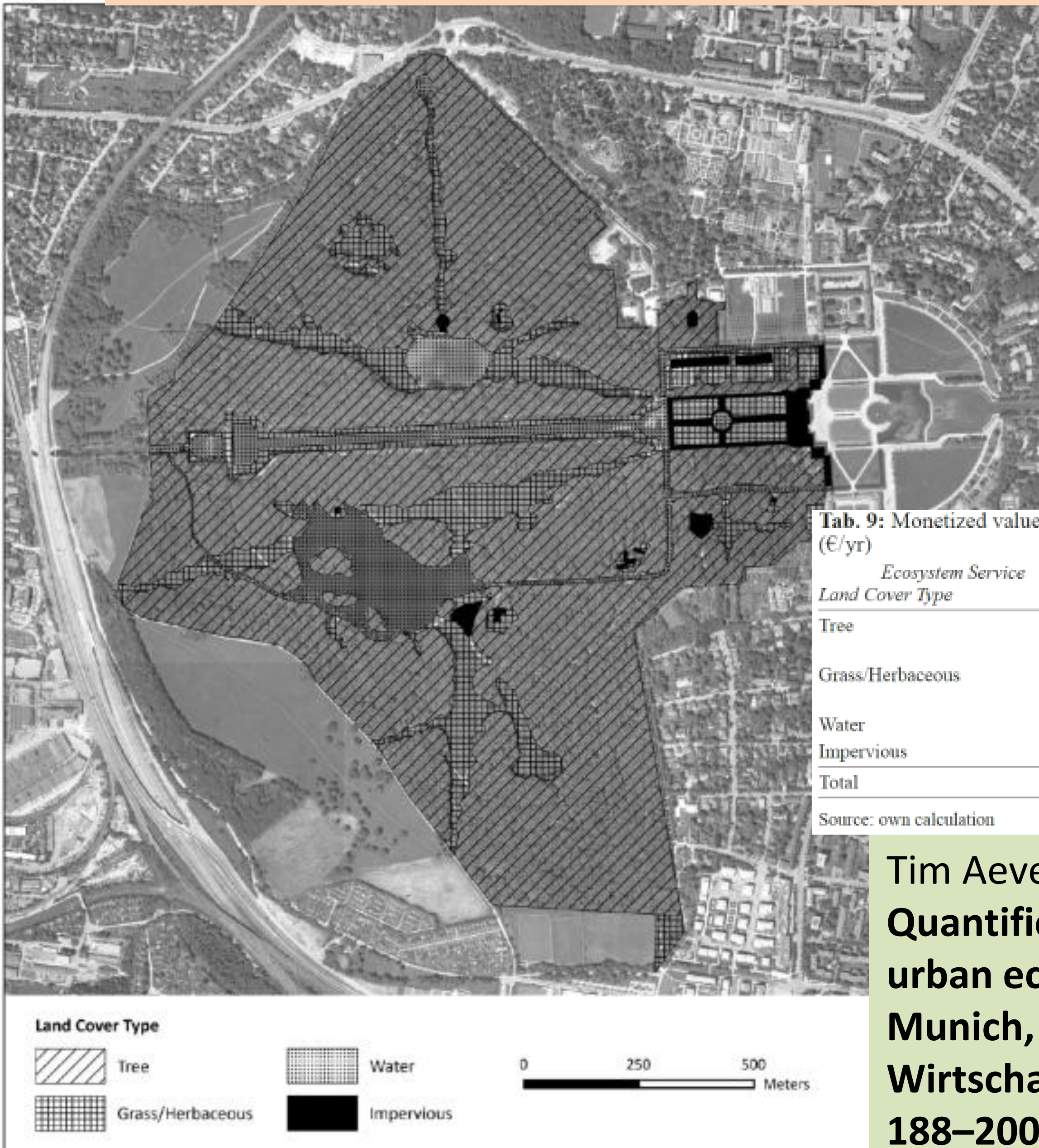
RG Urban and Landscape Ecology

Biodiversity (birds as indicators) correlates with size, structural diversity, dominant structural elements and disturbances

Parks	Size In ha	Struktural diversity	Dominant struktures B = Trees R = Lawn	Intensity of disturbances	Number of breeding birds
1. Wasserwald	70,86	3	B	2	22
2. Bauernberg	9,54	3	B	2	37
3. Freinberg Aroboretum	9,0	2	R/B	2	24
4. Hummelhofwald	7,81	3	B	3	31
5. Erholungspark Urfahr	7,73	1	R	2	7
6. Donaupark	7,57	2	R/B	3	21
7. Freinberg West-Ost	6,5	3	B	2	3[illegible]
8. Universitätspark	4,1	3	R	1	16
9. Bergschlössl	2,79	1	R	2	25
10. Pöstlingsberg	2,61	3	R	2	15
11. Volksgarten	2,6	2	B	3	19
12. Wag-Park	1,67	1	R	3	10
13. Panuliwiese	1,5	2	R	3	24
14. Harbachpark	1,39	2	B	3	1
15. J.W.Kleinstrasse	1,35	2	R	3	10
16. Ökopark	1,12	1	B	1	10
17. Schlossberg	1,1	2	B	2	23
18. Peuerbachstrasse	1,07	1	R	2	4
19. Ing.Stern.Strasse	1,02	1	R	3	9

Breuste et al. 2013b. Struktural diversity: 3 = high, 2 = medium, 1 = low, Sintensity of disturbances (noise, visitors): 3 = high, 2 = medium, 1 = low

Does green cost more than it spends?



Tab. 10: Administrative costs of Schlosspark Nymphenburg 2011

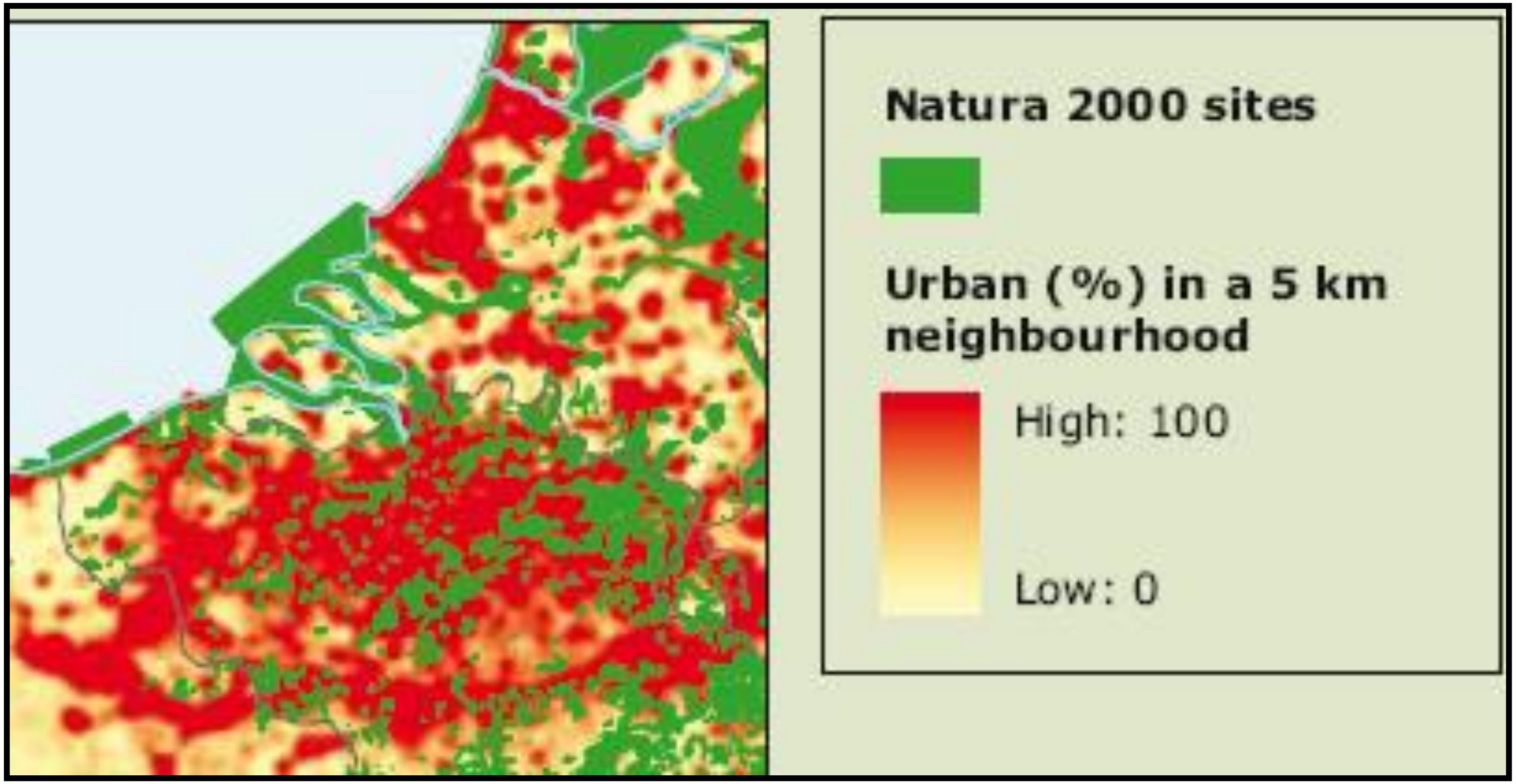
Type of Costs	Costs (€/yr)
Material Costs:	
– Equipment and Machines	30 000
– Maintenance of Vehicles, Equipment, Safety Equipment etc.	130 000
– Maintenance of Immovable Assets (Land, Pathway Surfaces, Water Bodies, Bank Reinforcement etc.)	140 000
Labor Costs for 28 Workers (Gardeners, Supervisors etc.)	850 000
Total	1 150 000

Tab. 9: Monetized values of ecosystem services for Schlosspark Nymphenburg by land cover types (€/yr)

Ecosystem Service / *Land Cover Type*	*Carbon Sequestration and Storage*	*Air Pollution Removal*	*Runoff Reduction*	*Groundwater Recharge*	*Total*
Tree	15 080 (673 316)	392 170	155 824	14 070	577 144
Grass/Herbaceous	0 (2 211)	0	30 464	2 751	33 215
Water	0	0	17 227	0	17 227
Impervious	0	0	0	0	0
Total	15 080	392 170	203 515	16 821	627 586

Source: own calculation

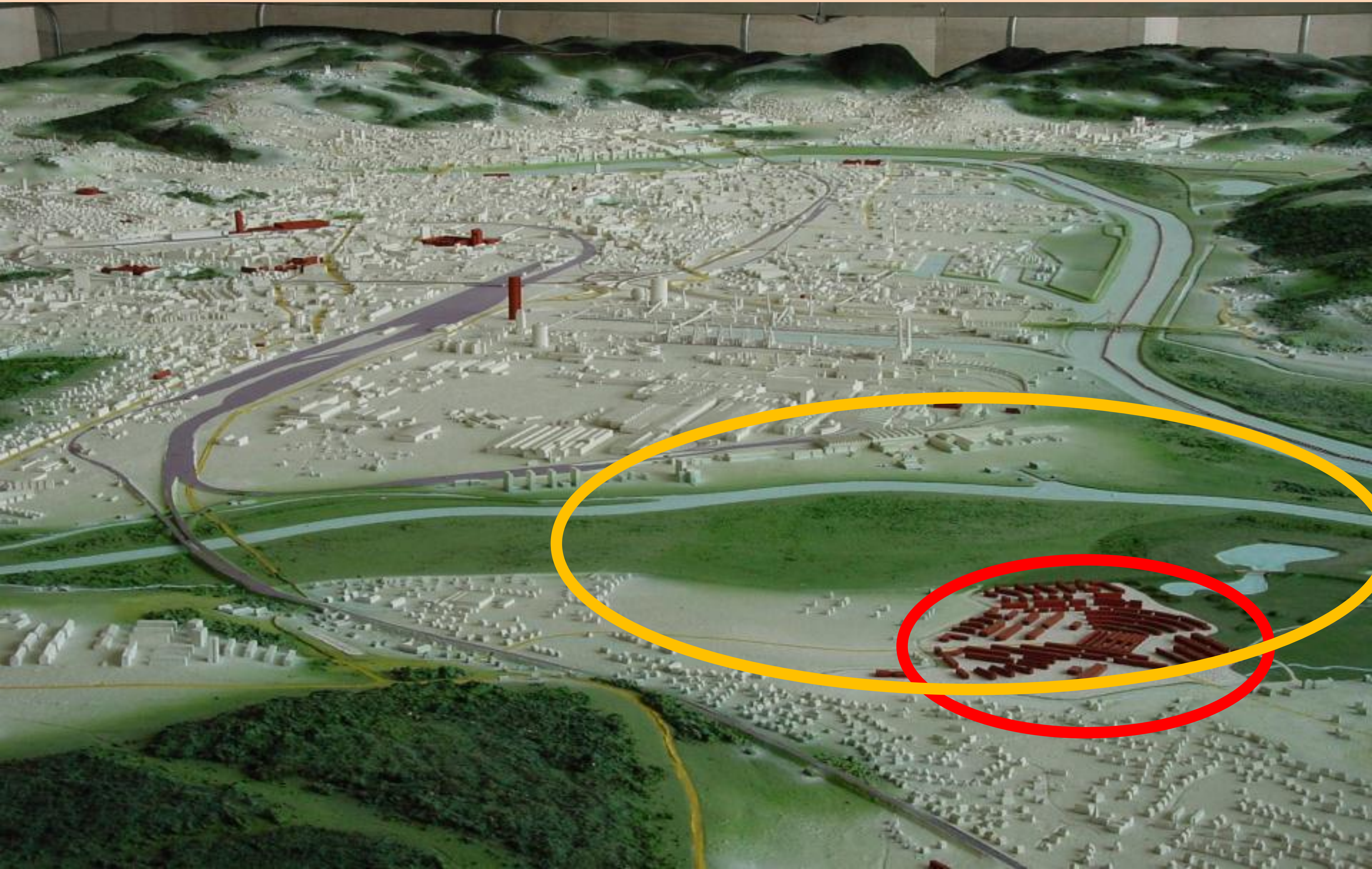
Tim Aevermann / Jürgen Schmude, Munich
Quantification and monetary valuation of urban ecosystem services in Munich, Germany. Zeitschrift für Wirtschaftsgeographie Jg. 59 (2015) Heft 3, S. 188–200



Central and northern Belgium composed of highly urbanized areas and Natura 2000 areas only.

Source: European Environment Agency 2007

Example Area Linz



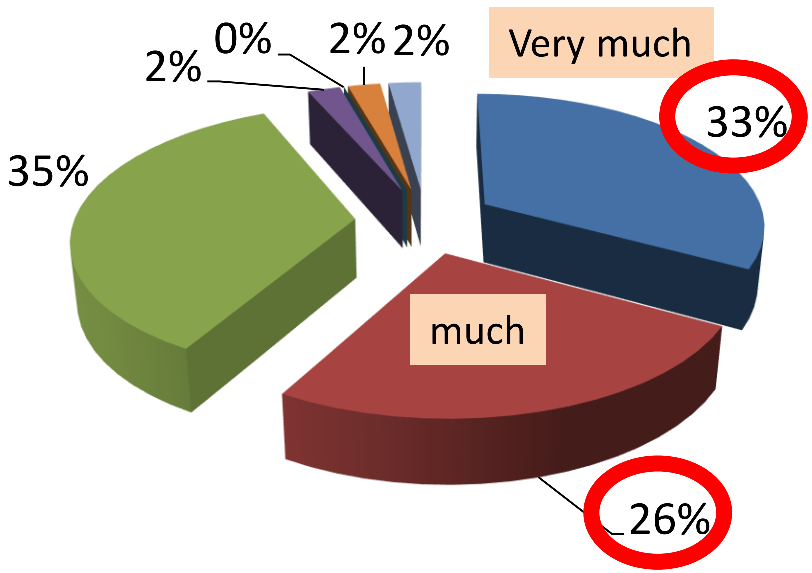
Practical Application of Nature Conservation

Example: Visitor Management in the Nature 2000 Area Alluvial Forest of Danube/Traun **(„Enjoying nature without disturbing nature“)**

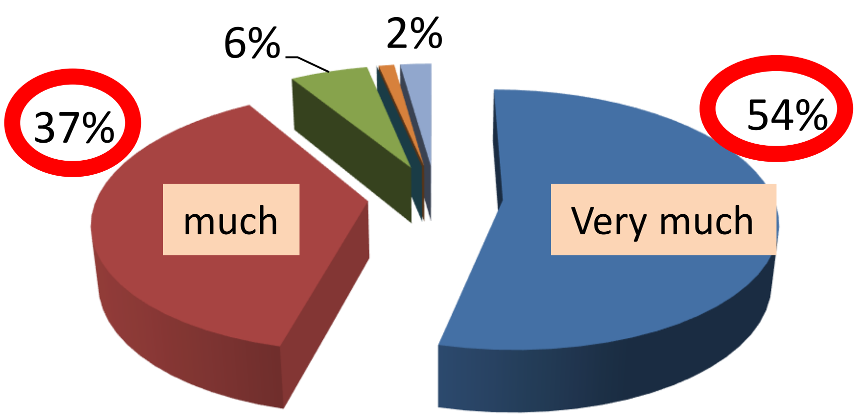
Diversity is valued

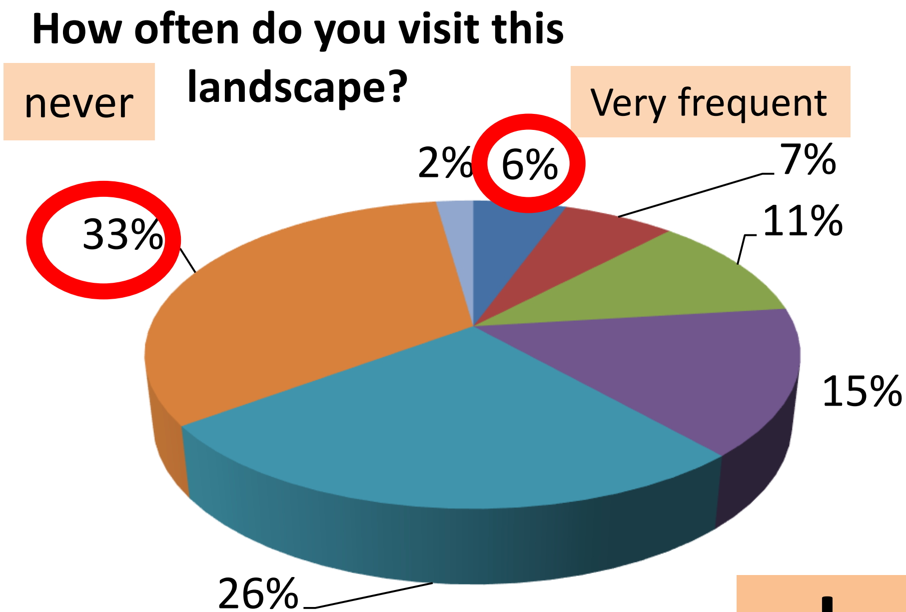
93 Visitors of the Nature 2000 Area

How do you like this landscape 1?

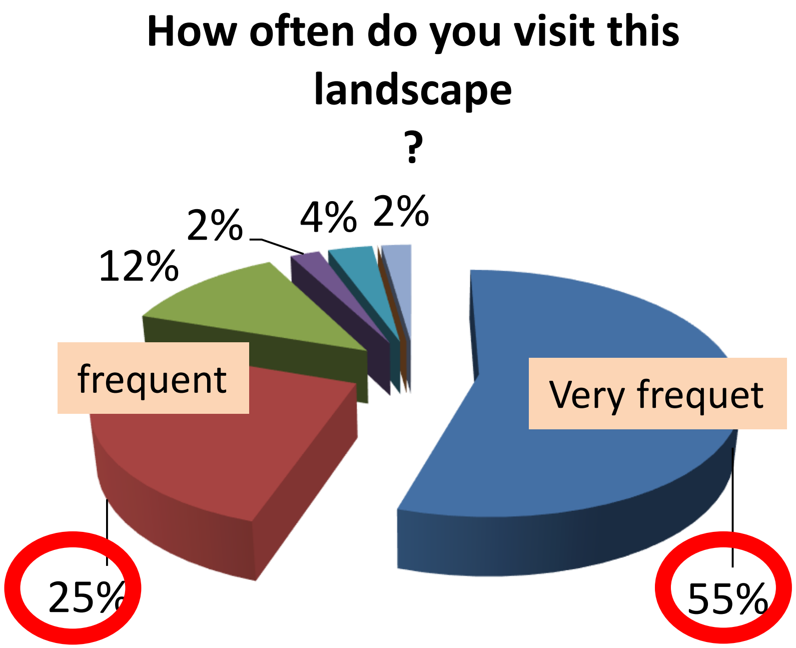


How do you like this landscape 8?





...but not visited!



Vatentina León, 13 years old about her uURBAN NATURE along Matanza-Riachulelo, river in Buenos Aires

Urbane Biodiversity can be developed!


…let‘s start!

SE 4: Exercise “rainwater management at the district scale” -

Conceiving the city of the future -

the case of urban rainwater management

MSc. Marc Giménez Maranges – Department of geography and geology – University of Salzburg

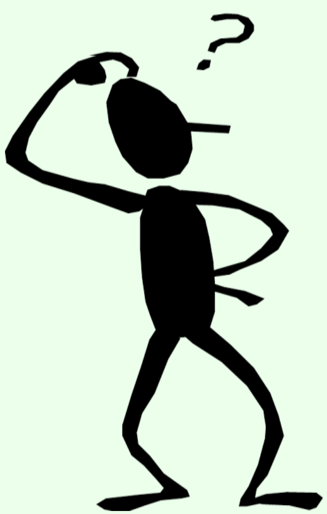
SE 4: Exercise “rainwater management at the district scale”

Discussion

Please gather in groups and discuss on the following task.

1. Look at the orthophotos which have been provided to you on 2 city districts with dissimilar degrees of soil sealing. Afterwards, think of: which measures you would implement in order to manage rainwater in both districts. Take a multi-scalar perspective into account.

Time: 1 hour and 30 minutes



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SE 4: Exercise “rainwater management at the district scale”

Oral presentation

It is time to present your results! Please present your results to the class on the following task. Afterwards, discuss on the distinct ideas suggested.

1. Look at the orthophotos which have been provided to you on 2 city districts with dissimilar degrees of soil sealing. Afterwards, think of: which measures you would implement in order to manage rainwater in both districts. Take a multi-scalar perspective into account.

Time: 30 minutes

Study site 1

Study site 2

THANKS FOR YOUR PARTICIPATION!!

MSc. Marc Giménez Maranges
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Tasks

- Who lives in mountains?
- Why do people live in mountains?
- From what people live in mountains?
- Is it true?: Mountain people
    - are less intellgent and less celver than lowland people
    - are more traditional
    - suffer under less development
    - are poorer
    - live more sustainable
    - want to live like lowland people
    - are physically and mentaly stronger
    - don‘t like changes
    - Are more social

Co-funded by the Erasmus+ Programme of the European Union

SUNRAISE

Climate Vulnerability Assessment of Urban Settlements in Himalaya

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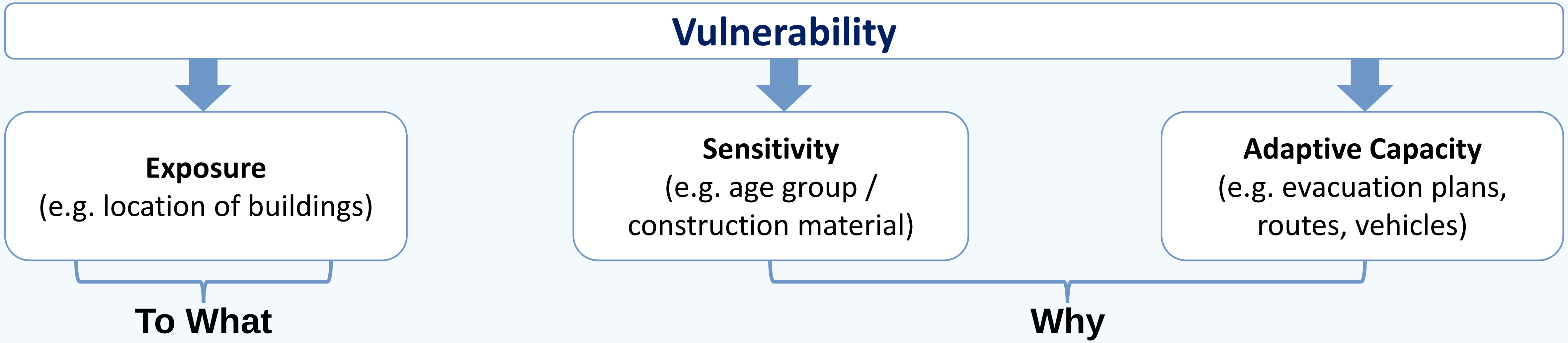
Definitions: Climate Impacts

Vulnerability: Degree to which a system is susceptible to the adverse effects of climate change, including climate variability, climate extremes and related direct and indirect impacts

Exposure	Sensitivity	Adaptive Capacity
Nature and degree to which a system is exposed to significant climatic variations and/or its consequences and impacts **Ex:** slums in flood prone areas, steep slopes, landslides	The degree to which a system is affected either adversely or beneficially, by climate related stimuli **Ex:** infants, children, elderly and sick people, poor, women	Ability to adjust to climate change, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences **Ex:** Inability to move to a safer location, resources, information, awareness, poverty

Vulnerability Assessment

Who or What is vulnerable to What and Why?



- **Who or What:** Population groups, zones/wards, and sectors (e.g. infrastructure for water supply etc.)
- **To What:** Impacts of climatic threats (e.g. flood, drought, water scarcity, spread of vector borne diseases etc.)
- **Why:** Capacities and resources to deal with the impacts of climatic hazards

Identifying Vulnerable Urban Systems

Q1: Which are the vulnerable systems that need to be strengthened?

- What does the interpretation of data and information from the situation indicate and suggests
- What are the key concerns problems and priorities raised by the community

Q2: Why these systems are vulnerable to climate change impacts?

Q3: How likely the climate change impacts affect these urban systems?

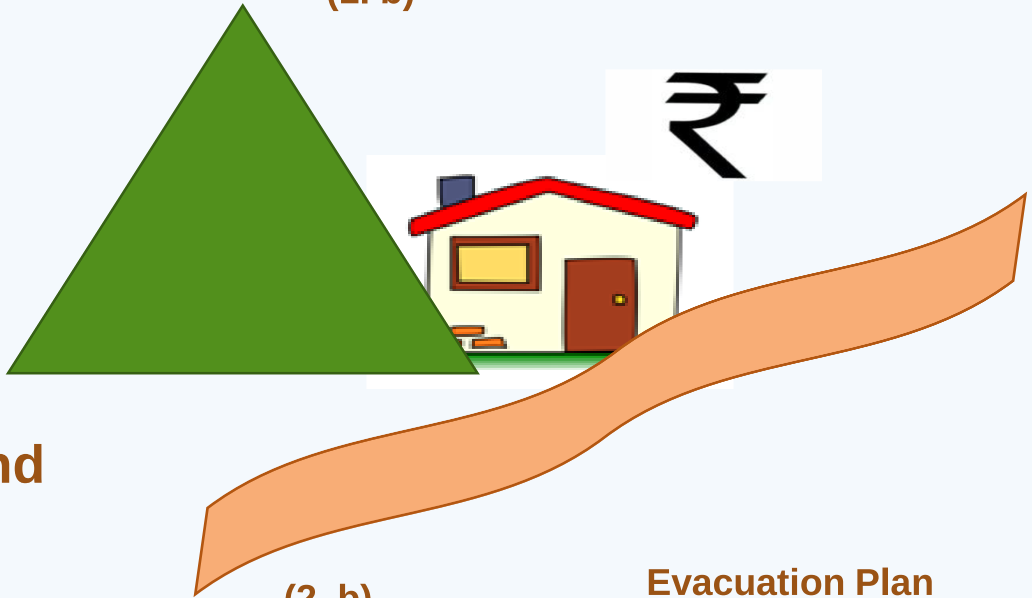
- Expected impacts of projected climate events: they may increase/decrease/not affect the vulnerability of the urban systems

Vulnerability Assessment

Hazard: Flood

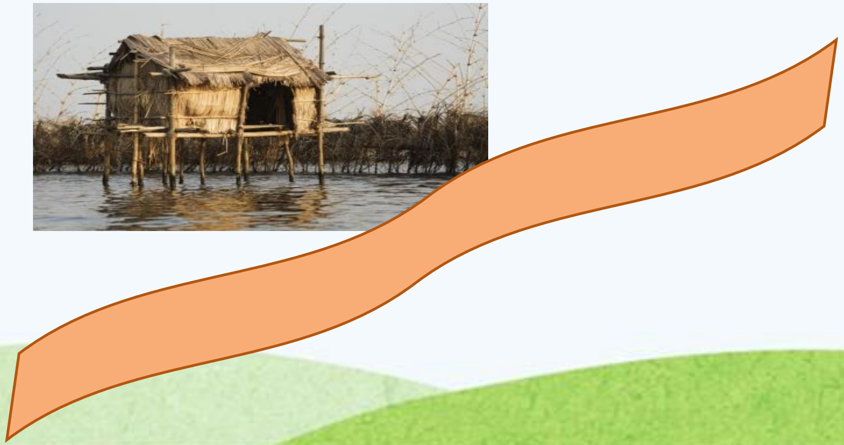
(1.a)

(1. b)



Which area is more vulnerable to flood and why?

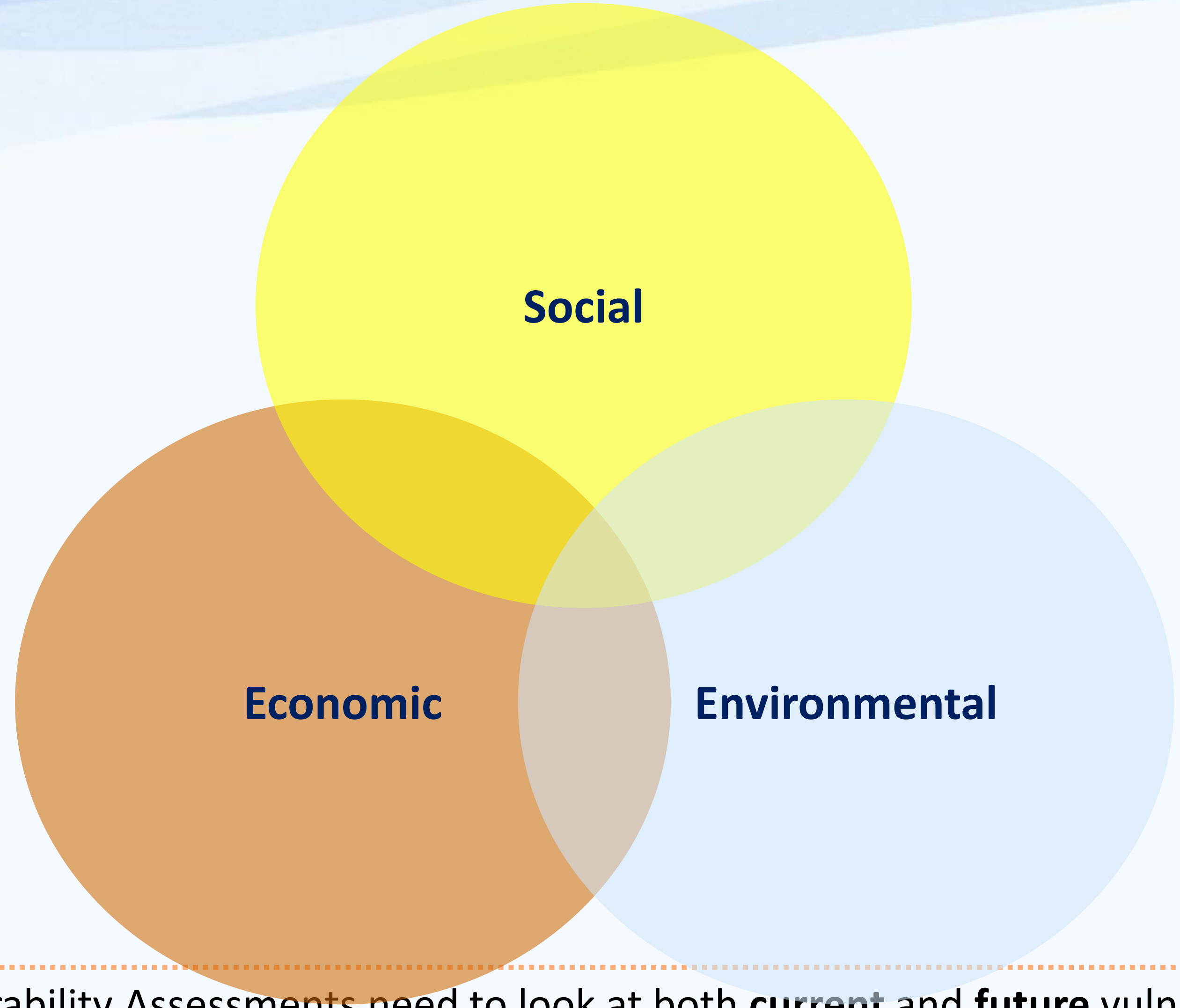
(2. a)



(2. b)

Evacuation Plan

Vulnerability Assessment



While undertaking Vulnerability Assessments need to look at both **current** and **future** vulnerabilities:

- **Assess** current vulnerabilities under current climatic conditions
- **Estimate** future vulnerabilities under projected climate conditions

Vulnerability Assessment

Exposure to Climate Change Stressors	Level of Exposures (Rank 1 to 5)	Parameters of Sensitivity to Climate Change	Level of Sensitivity (Rank 1 to 5)	Parameters of Adaptive Capacity to Climate Change	Level of Adaptive Capacity (Rank 1 to 5)
Temperature Rise		Geology		Education and Knowledge	
Erratic Rainfall		Terrain Characteristics		Information	
Increased Rainy Days		Drainage System		Communication	
Decreased Rainy Days		Age of Building		Awareness	
Flash Floods		Building Code		Skill and Training,	
Floods		Access to Road		Scientific Reliability	
Heavy Snowfall		Population Density		Technology	
Windstorm		Poverty Level		Livelihood Options	
Hailstorm		Water Availability		Climate Change Adaptation	
Severe Icing		Slums		Institutions	
Fire and Forest Fire		Women and Elderly Population		Equity and Access	
Landslides		Open/Congested		Access and Connectivity	
Total Score					
Average Score					

Exposure: Highest Exposure – 5 and Least Exposure – 1

Sensitivity: Highest Sensitivity – 5 and Least Sensitivity – 5

Adaptive Capacity: Highest Adaptive Capacity – 5 and Least Adaptive Capacity – 1

Vulnerability Index: (i) Add all the ranks of Exposure, Sensitivity and Adaptive Capacity, and take their averages separately, (ii) add the averages of Exposure and Sensitivity, and (iii) to obtain the vulnerability index subtract the average rank of adaptive capacity from the added average ranks of exposure and sensitivity

Identification of Key Vulnerabilities and Potential Adaptation Measures

Critical Climate Stressors	Critical Sensitivity Parameters	Critical Adaptation Parameters	Priority Adaptation Options	Key Institutions
High Intensity Rainfall	Steep Slope	Lack of Information and Awareness	Improved Access	Public Work Department
Flash Floods	Unstable Zone	Lack of Institutional Capacity	Improved Information	Municipal Council
Landslides	High Density Built Up Area	Lack of Institutional Coordination	Improved Institutional Coordination	Municipal Council NGOs, CSOs
Droughts	Poor Access	Lack of Rescue Resources	Availability of Rescue Resources	Municipal Council
Fire	Old Structures	Poverty	Reliable Information	Meteorological Department

Potential Adaptation Measures

Climate Change Events	Potential Adaptation Measures
Increased Temperatures	▪ Green and blue spaces ▪ Reduction in paved surfaces ▪ Enforce building codes ▪ Rooftop gardens ▪ Assisting vulnerable population groups
Increased Rainfall	▪ Hazard Zone Mapping ▪ Improvement in drainage system ▪ Green spaces ▪ Restoring wetlands ▪ Reducing impervious surfaces ▪ Relocate families living in vulnerable sites
Reduced Rainfall	▪ Rain water storage tanks ▪ Rooftop water harvesting ▪ Grey water recycling ▪ Water retention ponds ▪ Systems for equitable water distribution

Thanks!