“Ecosystem Services” of urban green under current and future climate conditions

GREEN SPACE IN URBAN AREAS II

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OUTLINE

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- ✓ Introduction & Definitions
- ✓ Effects of urban green on the urban climate – the urban heat island as example
- ✓ Impact of climate change – what should we expect?
- ✓ Conclusion

INTRODUCTION & DEFINITIONS

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- ✓ **urbane green**
  - ➔ all kinds of green spaces and green roofs and facades

INTRODUCTION & DEFINITIONS

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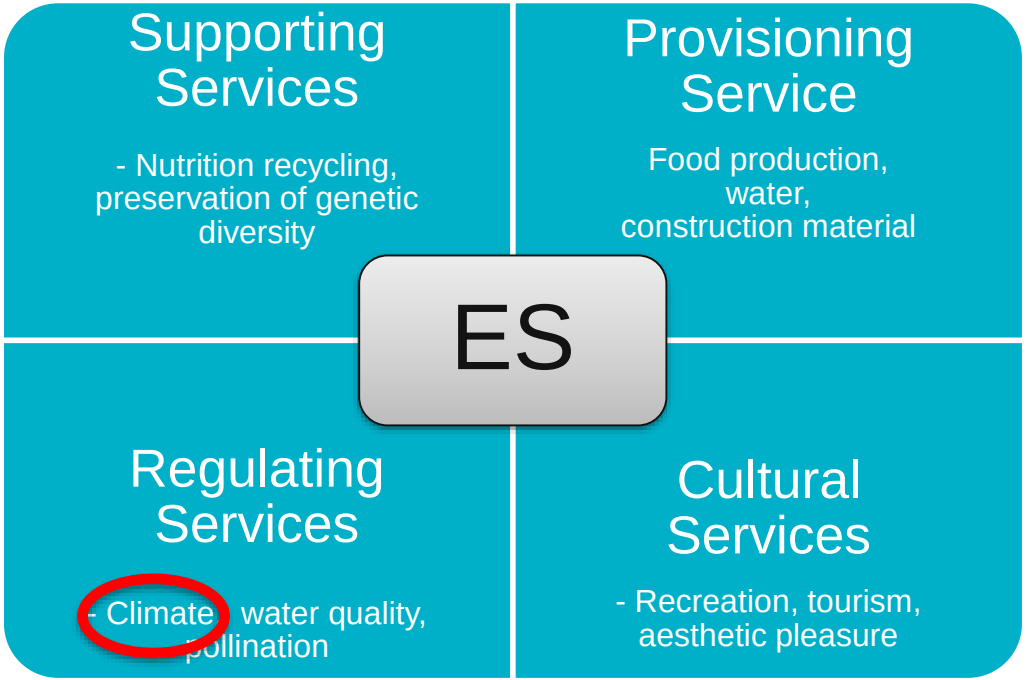
✓ Ecosystem Services (ES) / ökosystemare Diensleistungen

➔ benefits for humans from ecosystems



INTRODUCTION & DEFINITIONS

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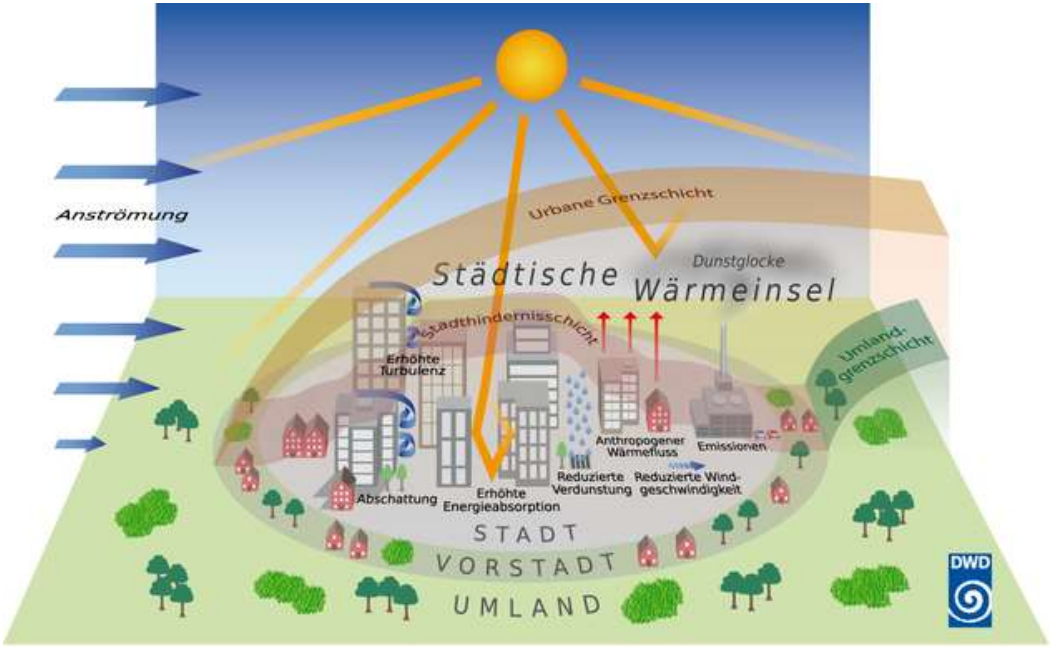
Climate related functions of urban green spaces

- ✓ Fresh- and/or cold air production
  ➔ cooling of neighbouring build-up areas
- ✓ Oxygen production and increasing of air humidity
- ✓ Reduction of wind gusts ➔ improved micro climate
- ✓ Shading ➔ protection of direct solar radiation
- ✓ Absorption and filtering of air pollutants especially of fine dust
- ✓ Reduction of direct discharge during (extreme-) precipitation events due to lower levels of land sealing
- ✓ Large scale evapotranspiration ➔ reduction of heat stress in densely built up districts

URBAN GREEN & URBAN CLIMATE

thermal aspects – urban heat island



➔ ↑absorption of construction material, plum of steam/dust,
↑anthropogenic heat emissions

URBAN GREEN & URBAN CLIMATE

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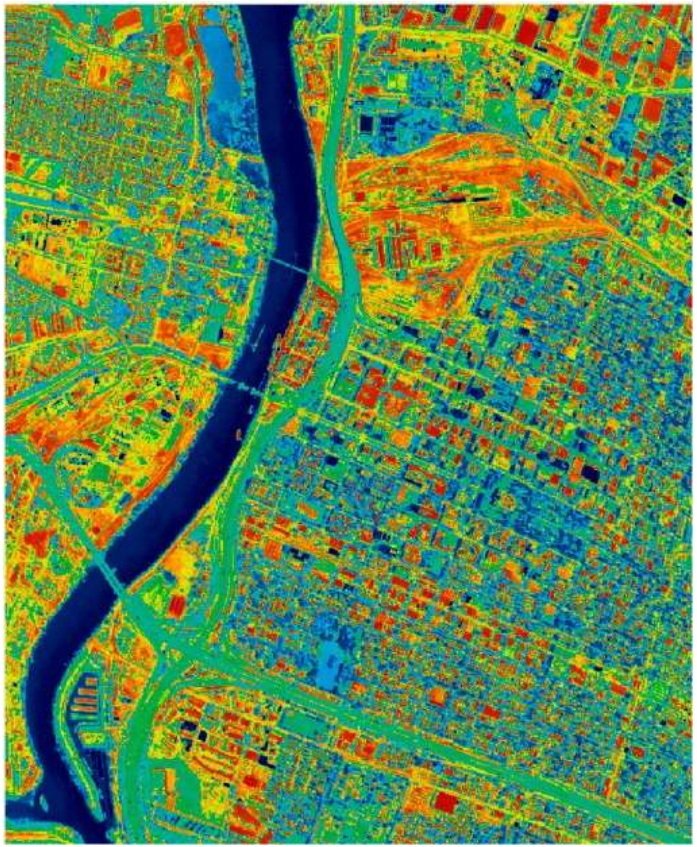
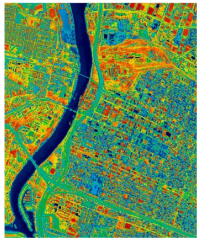
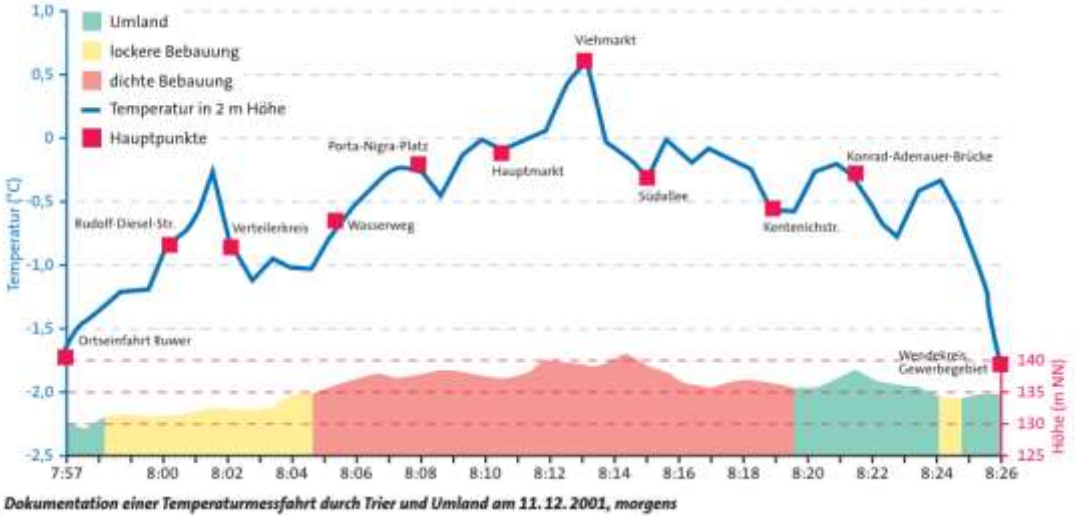


➔ thermal image, good spatial information but only relative differences

URBAN GREEN & URBAN CLIMATE

thermal aspects – urban heat island



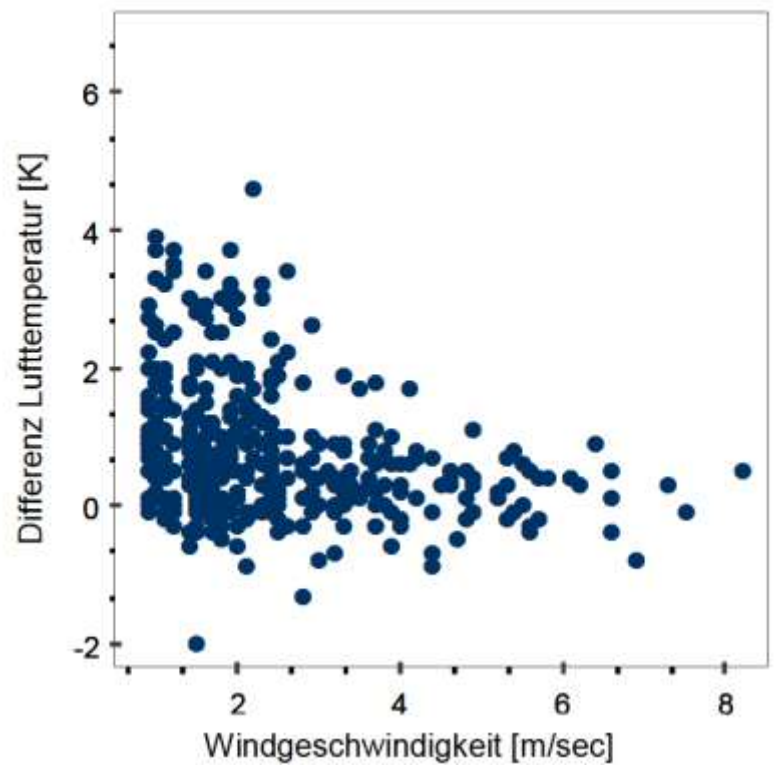


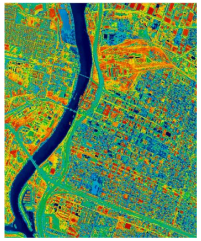
Dokumentation einer Temperaturmessfahrt durch Trier und Umland am 11. 12. 2001, morgens

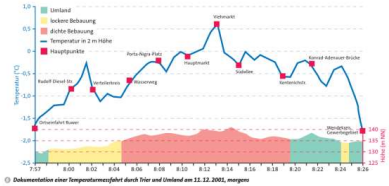
➔ mobile temperature measurements, very precise but only line information

URBAN GREEN & URBAN CLIMATE

thermal aspects – urban heat island







➔ intensity of urban heat island at Trier (Germany) with regard to wind speed

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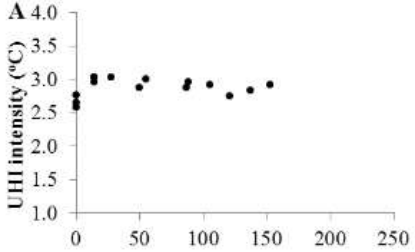
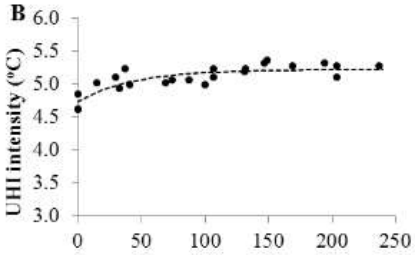
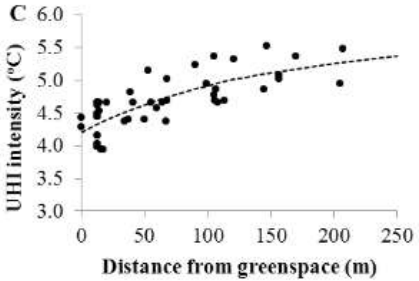


green space <0.5 ha ➔ no effect



green space 1-4 ha ➔ -0.4 - -0.8 K
distance up to 30m - 120m

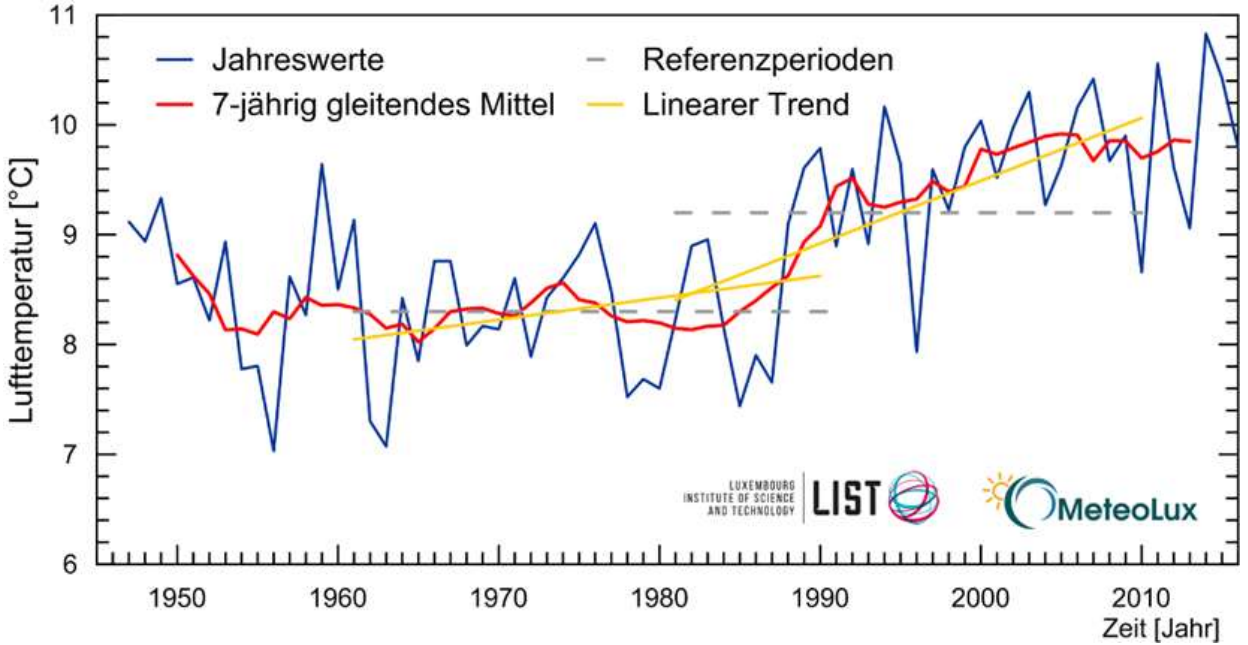


green space 10-12 ha ➔ -0.6 bis -1.0 K
distance up to 180m - 330m

Monteiro V. et al. (2016)

IMPACT OF CLIMATE CHANGE

Luxembourg – what we have to expect?



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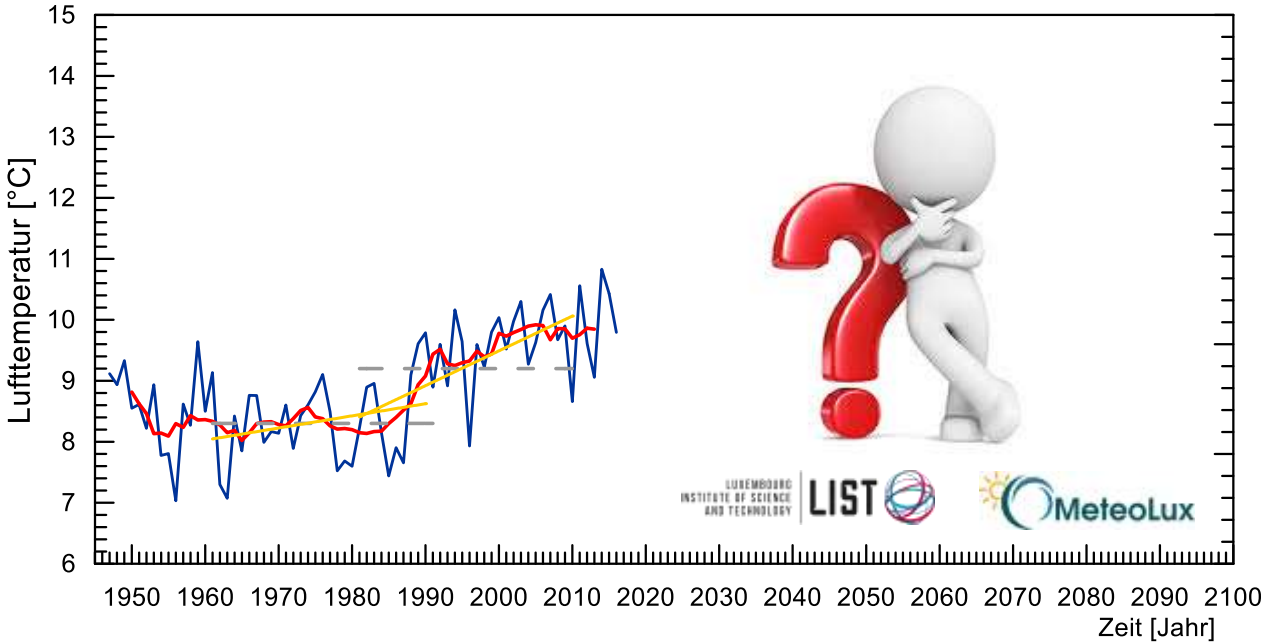

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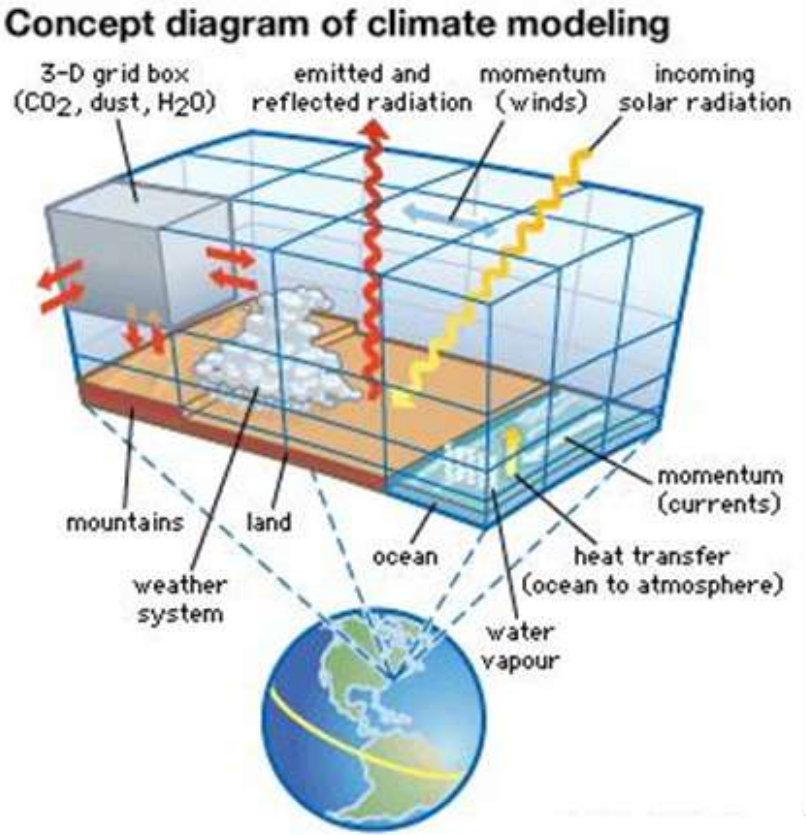

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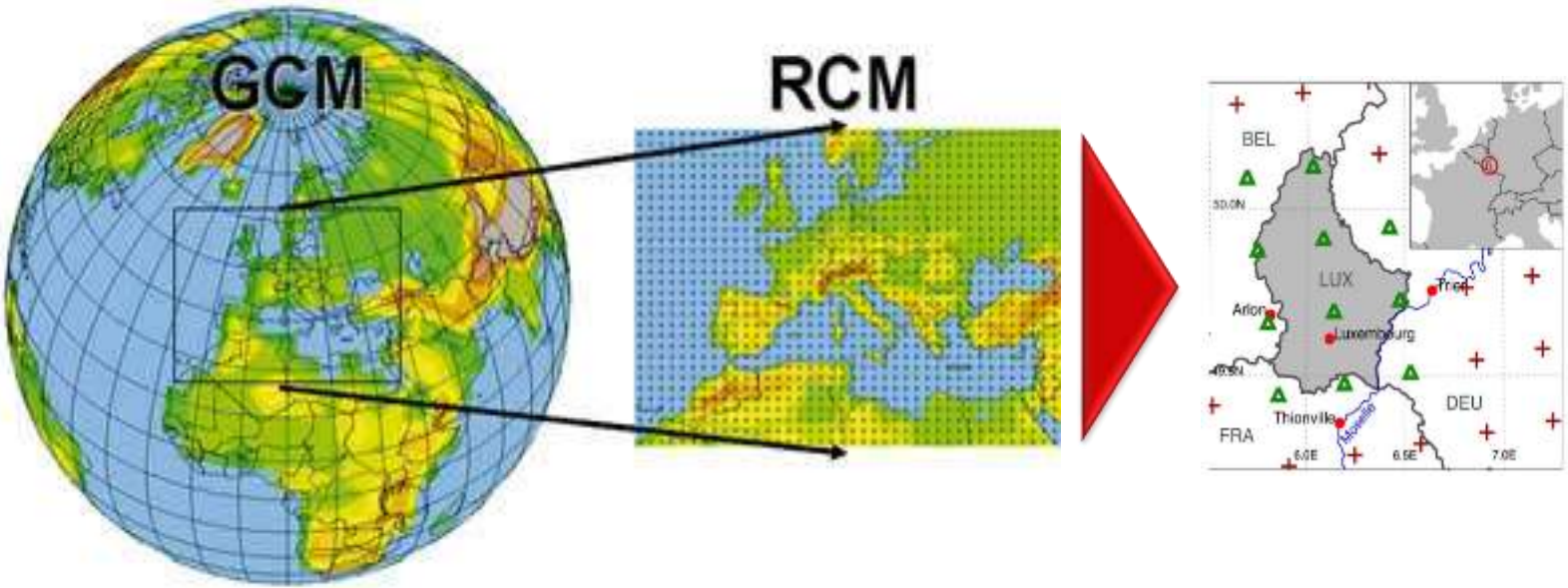

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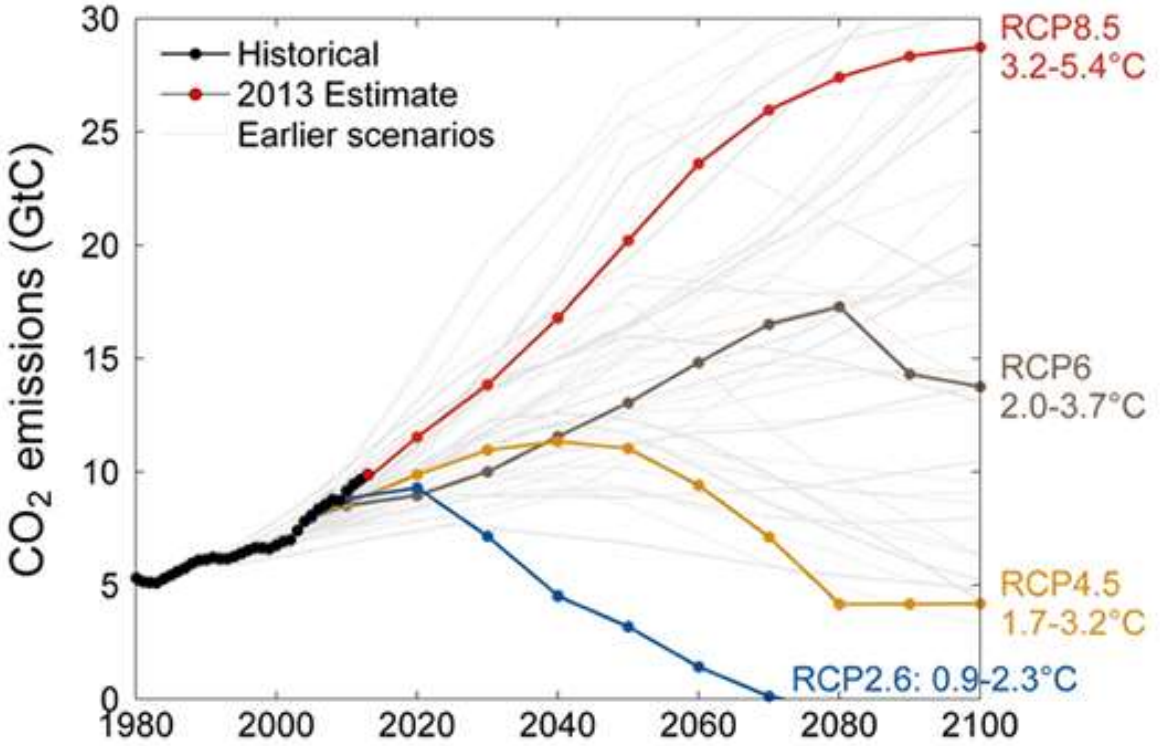
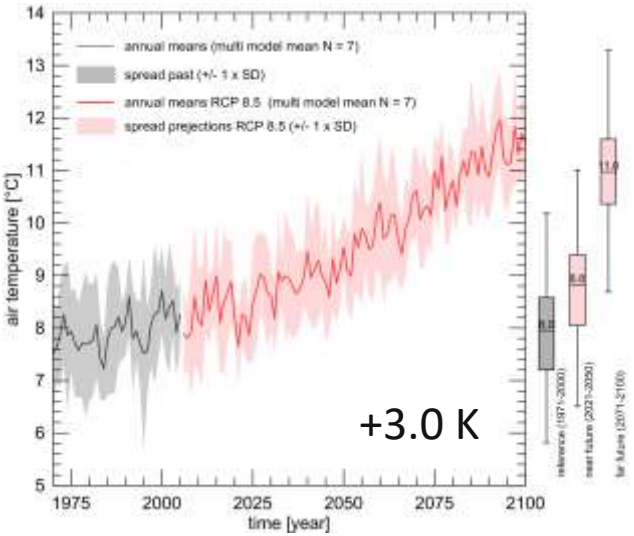


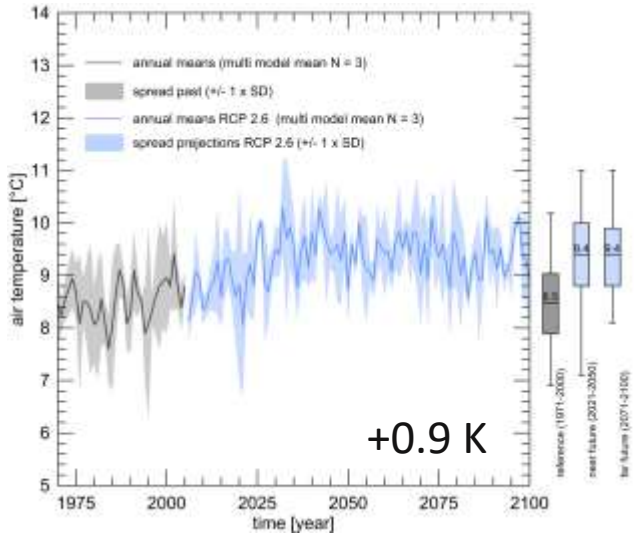
IMPACT OF CLIMATE CHANGE

Luxembourg – what we have to expect?

RCP8.5



RCP2.6



Junk J. et al. (2017)

IMPACT OF CLIMATE CHANGE

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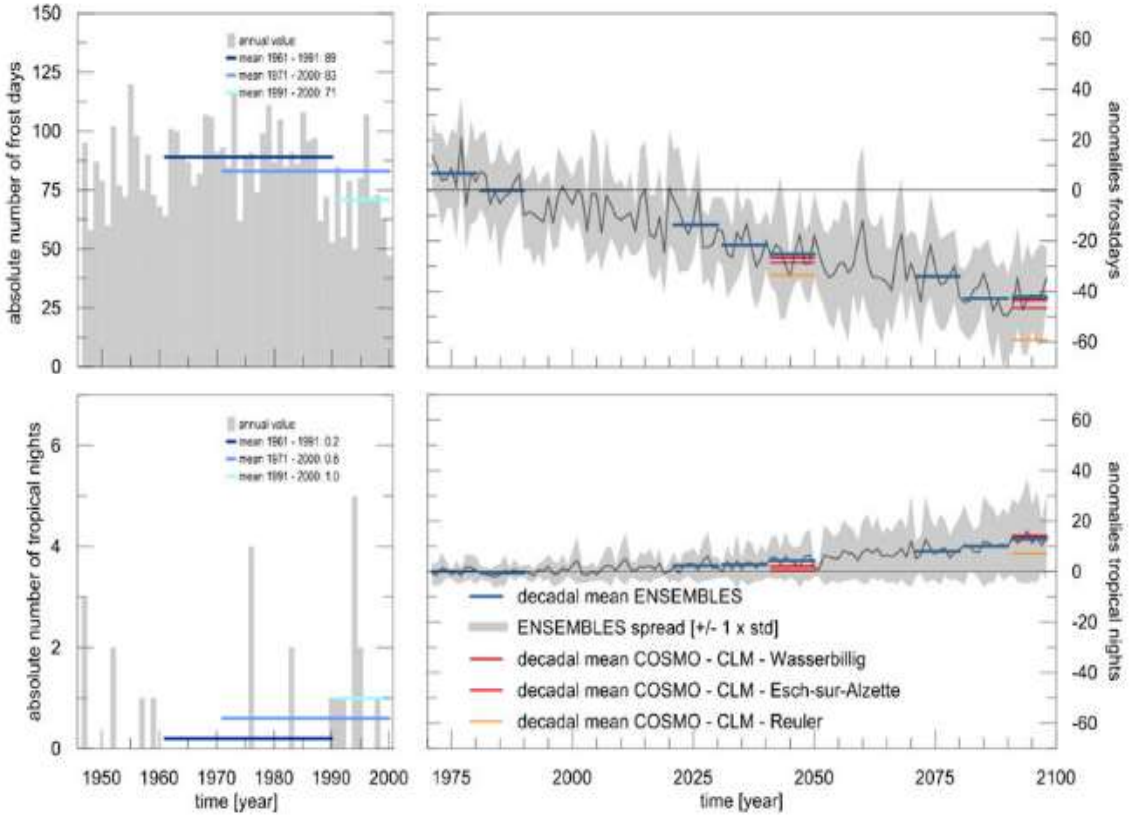

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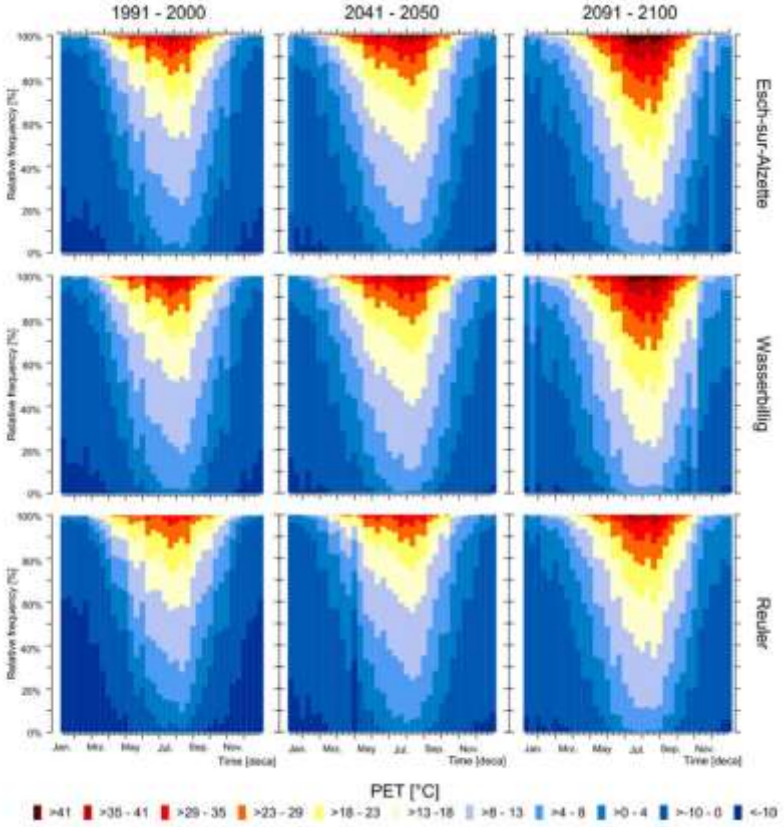

Junk J. et al. (2014)

CONCLUSIONS

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- ✓ Urban green can be classified as an adaptation but also as an mitigation measure against climate change
- ✓ Urban green can make a contribution to foster the resilience of cities in the future
- ✓ Urban green as a direct sink for CO_2 (trees) or sequestration in the soil

BUT

- ✓ potential of conflicts in urban planning e.g.
  - Shading (service) due to urban green in streets ⇔ good ventilation leading to a reduction (dilution) for air pollutants
  - Cold air corridors for temperature reduction during night time in the inner city centre ⇔ temperature reduction due to shading by tress in daytime

CONCLUSIONS

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✓ Spatial- and urban planning has to take into account the different scales:

a) Regional scale ➔ outside the cities cold/fresh air production areas must be secured

b) Urban scale ➔ Creation and maintenance of green belts (cold)/fresh air corridors

➔ Creation of green space with appropriate sizes as well as their interconnection

c) Inner city scale ➔ Reduction of direct solar radiation (shading) versus perfect ventilation conditions (dilution of air pollutants)