Photovoltaic solar parks promote land surface cool islands

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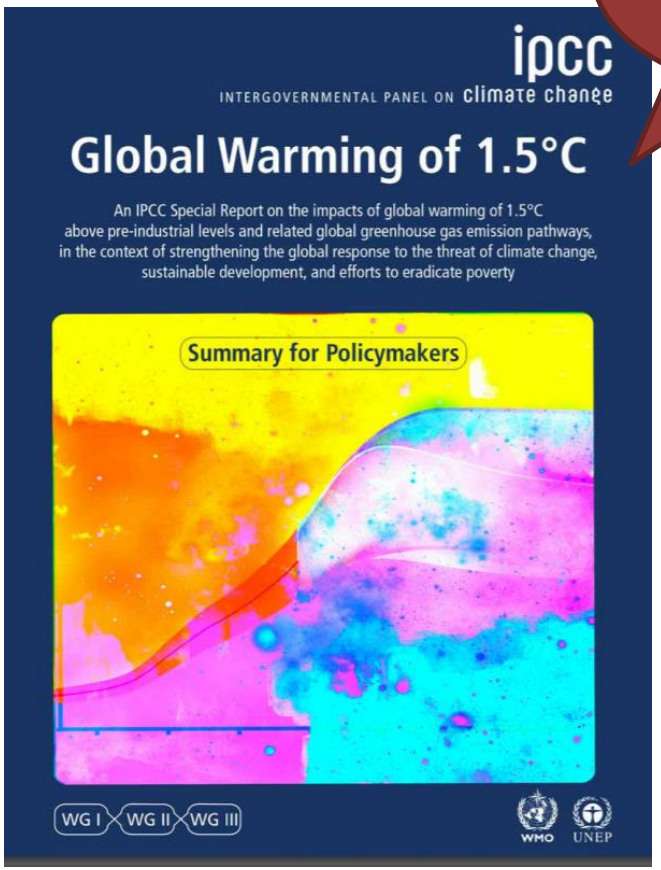
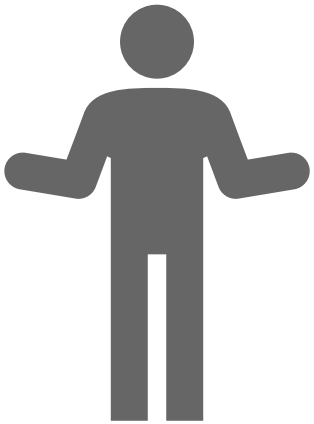
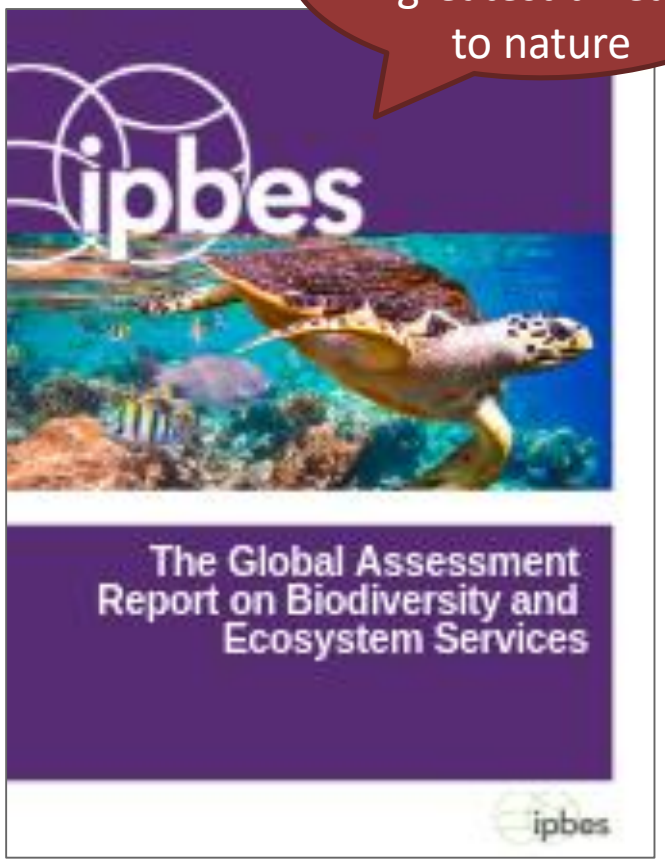
Putting environment into the energy transition

We must decarbonise energy





Land use change is greatest threat to nature



Climate change → Renewable energy → land use change

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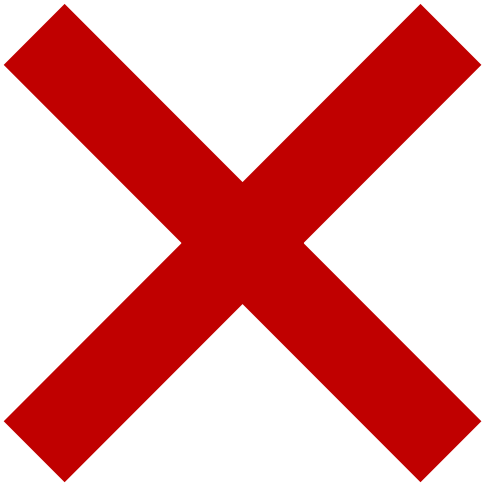
Land use change for renewables



Co-benefits or co-costs

for ecosystem services & natural capital

Potential to address climatological and ecological disasters through renewable energy

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Land use change for renewables

Plethora of ecosystem properties and processes potentially impacted.

How do we best resolve likely impacts?

Understand how renewable energy infrastructure effects the local climate.

Study sites & methods

Two ground-mounted large-scale fixed axis PV solar parks

USGS/NASA Landsat / Public domain

Longyangxia Solar Park,
Qinghai Province, China.

- 850 MW
- Mean annual solar radiation: 15,742 kJ m^{-2} day^{-1}

Stateline Solar Facility
California, USA.

- 300 MW
- Mean annual solar radiation: 19,616 kJ m^{-2} day^{-1}

Methods

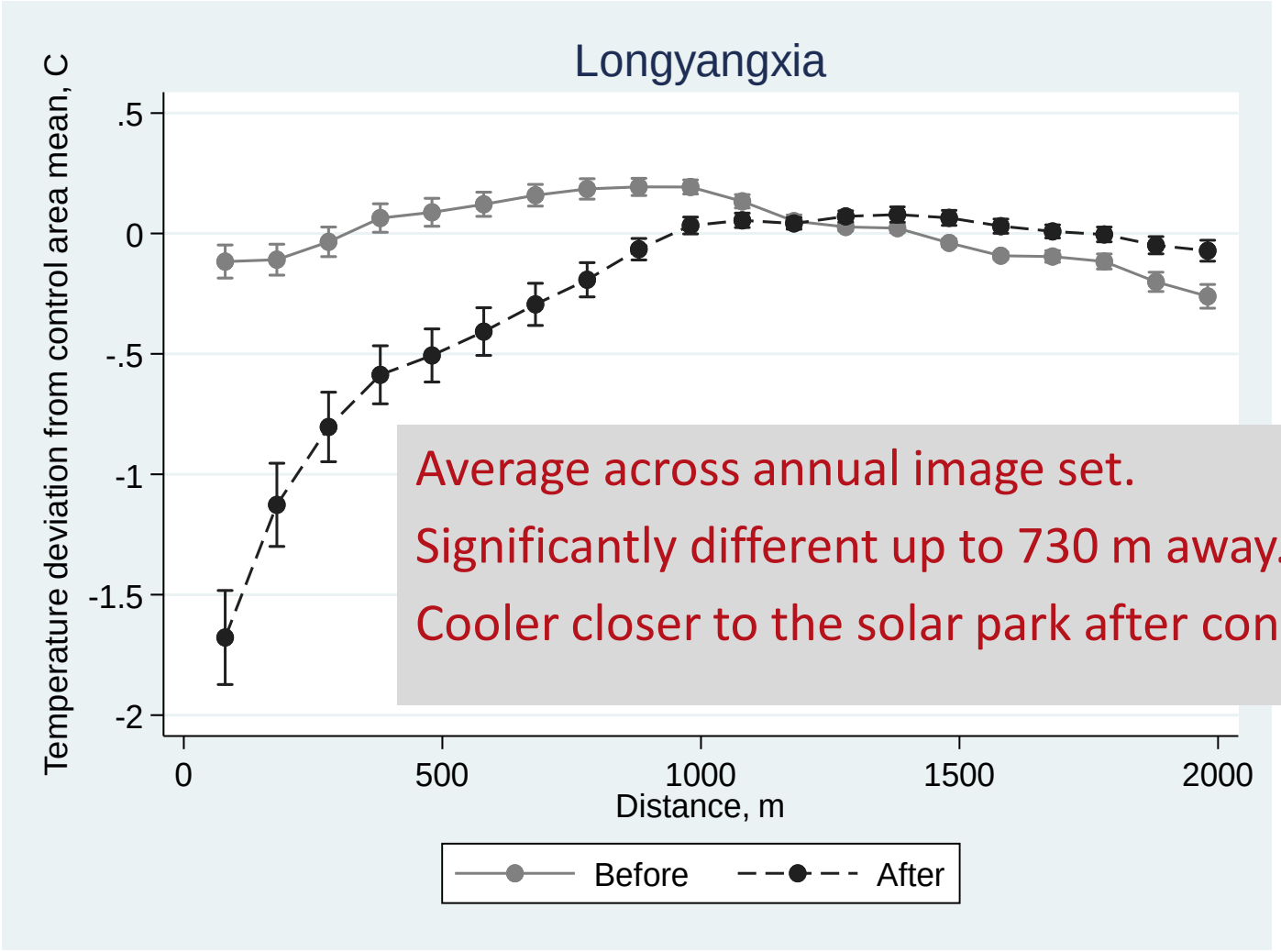
Landsat:

- One image per month before and after construction (n=24). Processed using google earth engine.

Field data (Stateline only):

- Evening transects using a infrared thermometer gun every 10 m.

Longyangxia - Landsat



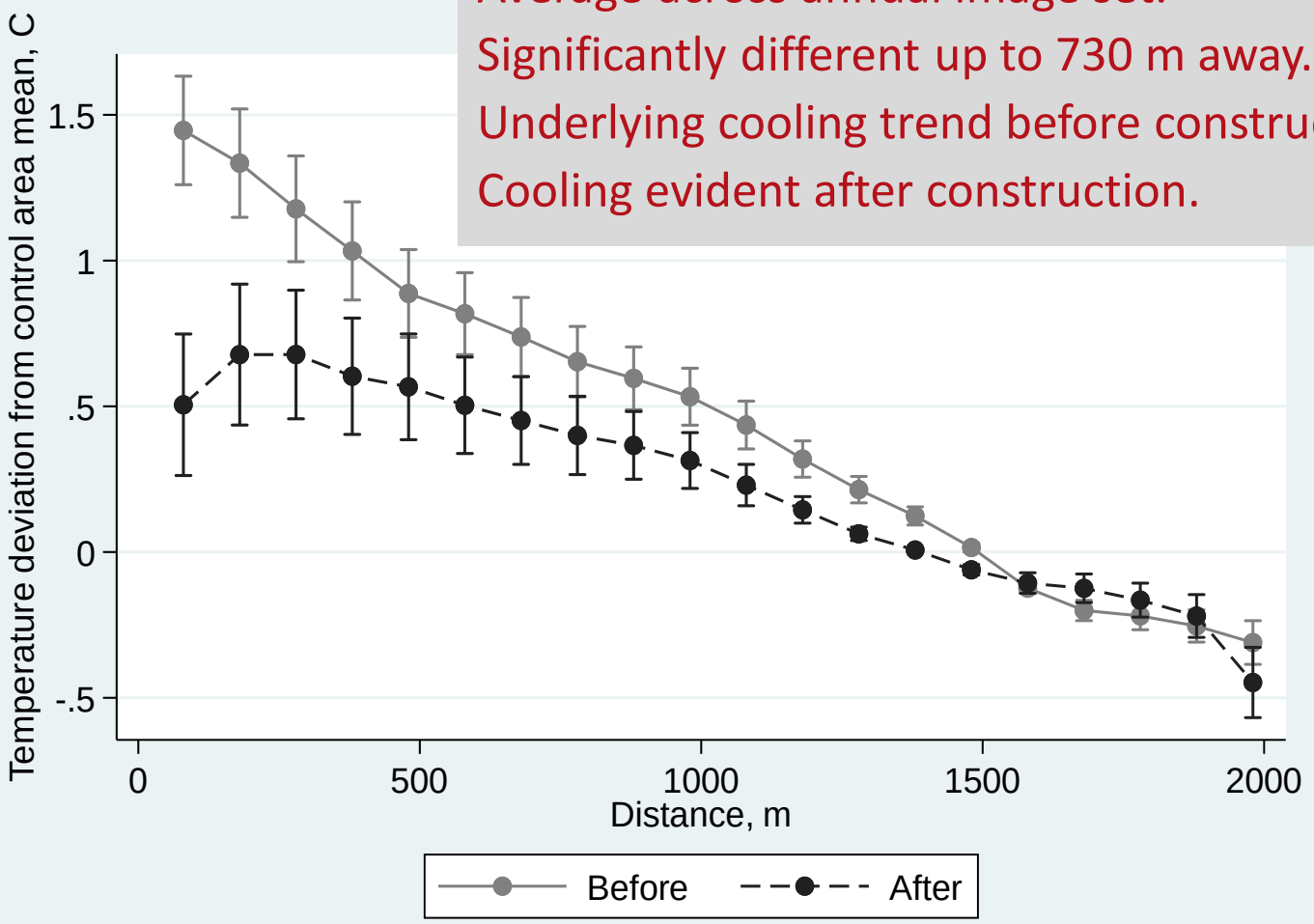
Average across annual image set.

Significantly different up to 730 m away.

Cooler closer to the solar park after construction.

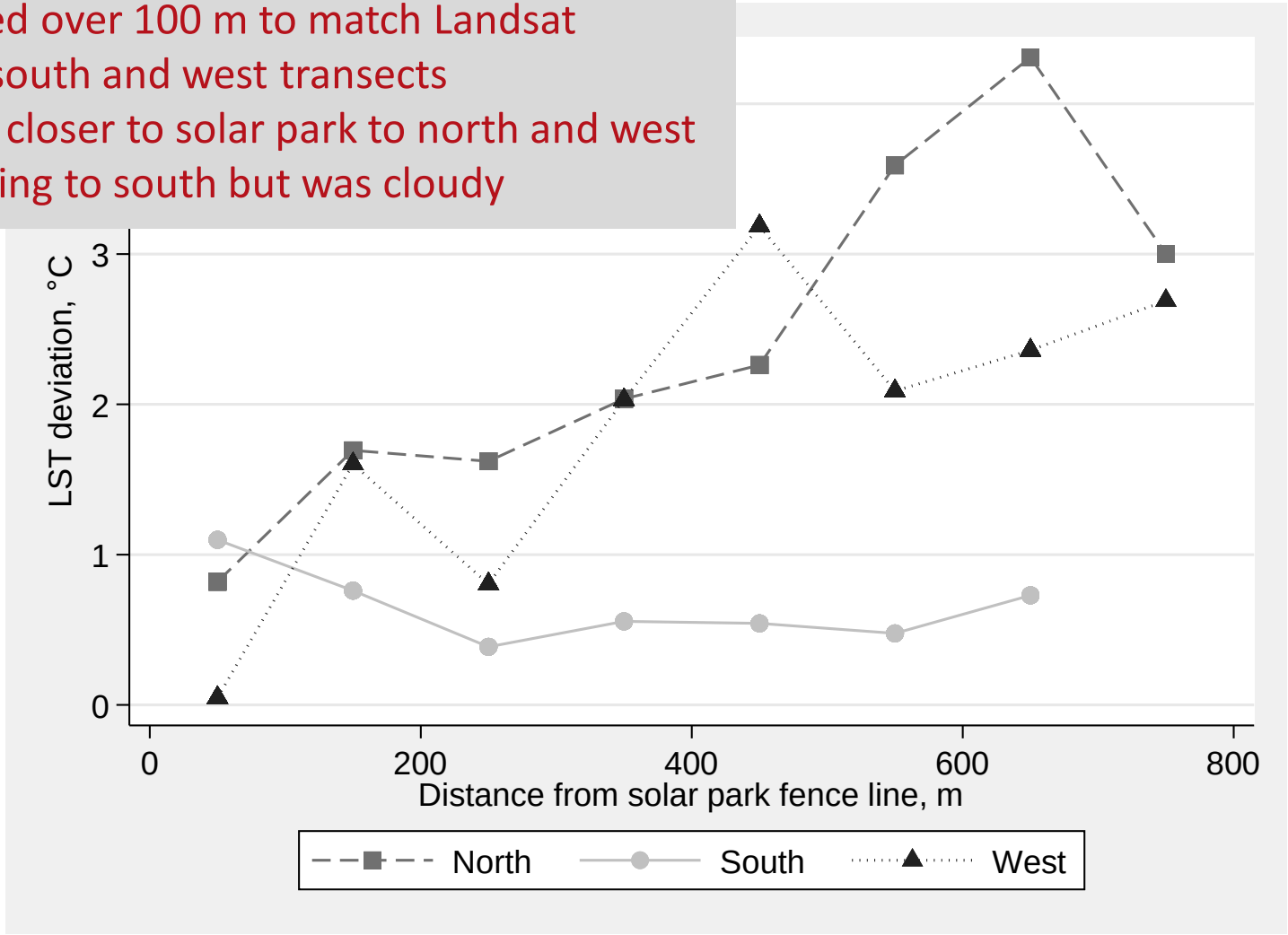
Stateline - Landsat

Average across annual image set.
Significantly different up to 730 m away.
Underlying cooling trend before construction
Cooling evident after construction.

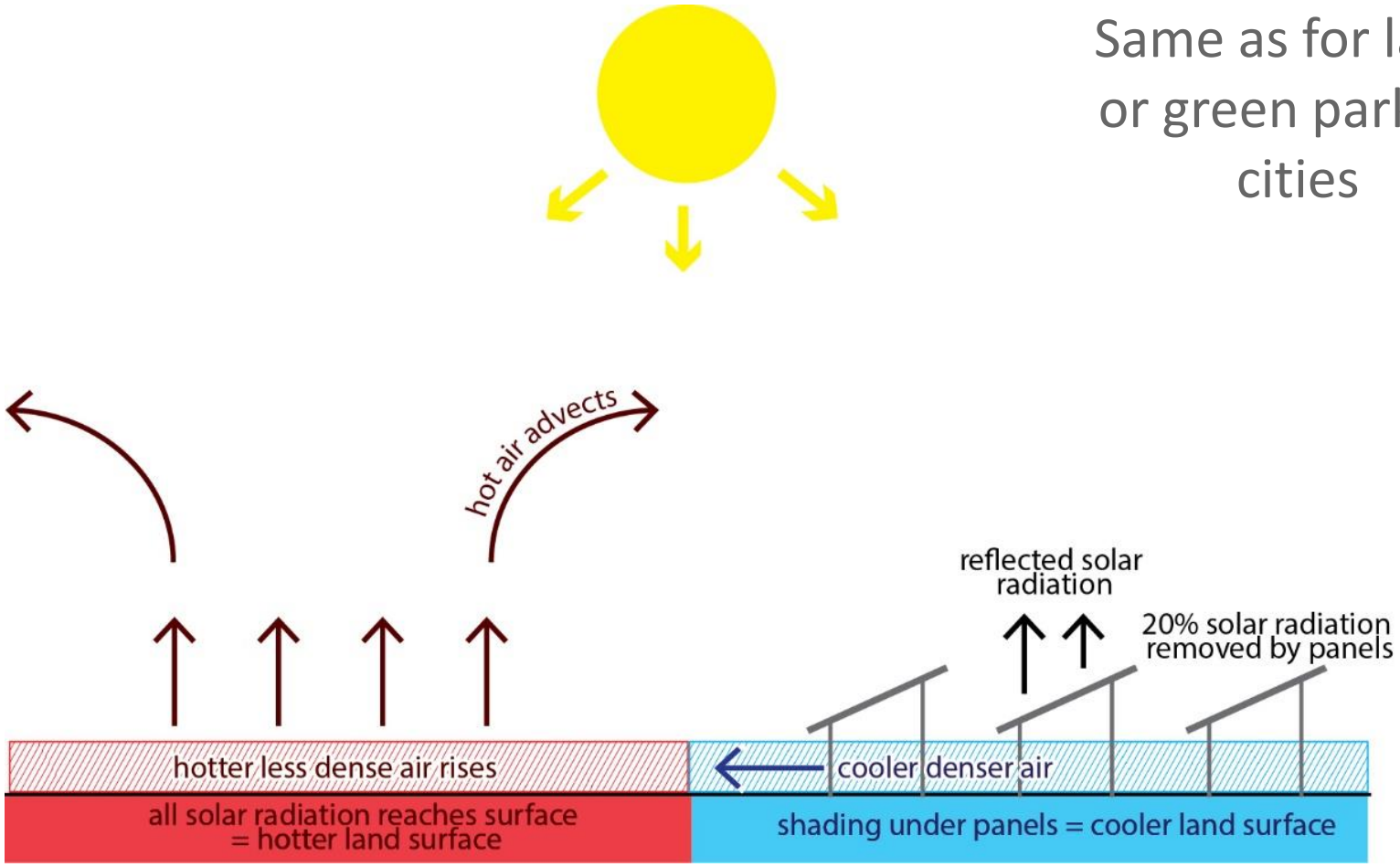


Stateline - field

Averaged over 100 m to match Landsat
North, south and west transects
Cooling closer to solar park to north and west
No cooling to south but was cloudy



Mechanism



Same as for lakes or green parks in cities

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Conclusions

- A measurable LST cool island effect:
  - Extended up to 730 m away from the solar park boundary
  - Cooling of up to several degrees Celsius
  - Evident in Landsat data and field data
- Microclimate impacts extend well beyond the site boundary
- Potential implications for ecosystem processes in surrounding landscape

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Thank you

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Find out more here: www.energyenvironment.co.uk

Acknowledgements:

LG received financial support from the National Natural Science Fund of China (grant number: 41601598), the Talent Project of Ludong University (grant number: LY2014020), the Higher Education Science and Technology Program of Shandong Province (grant number: J16LH51).
AA was supported by an NERC Industrial Innovation Fellowship (grant number: NE/R013489/1).
We thank Sarahi Lynneth Vargas Garcia for her assistance in typing up the field data.

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