Dark Sky Places in Germany -
Best Practice for Sustainable Lighting

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Kommission Lichtverschmutzung der
Astronomischen Gesellschaft

Light pollution in Germany

industrialized nation
population:
100 % polluted sky
44 % see no Milky Way

Large scale protected Areas

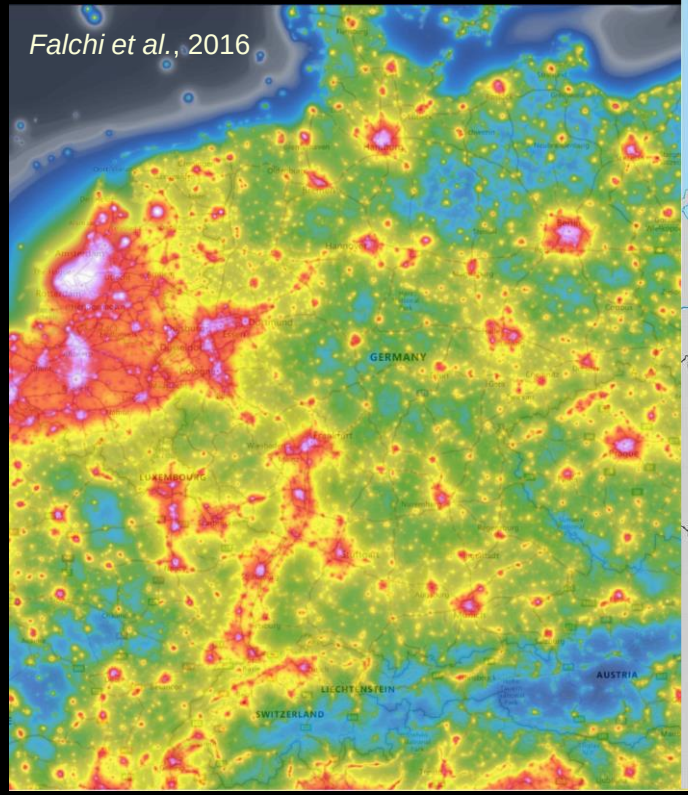
National Parks **0.6%**
Biosphere Reserves **4%**
Nature Parks (black hatched) **28.4%**

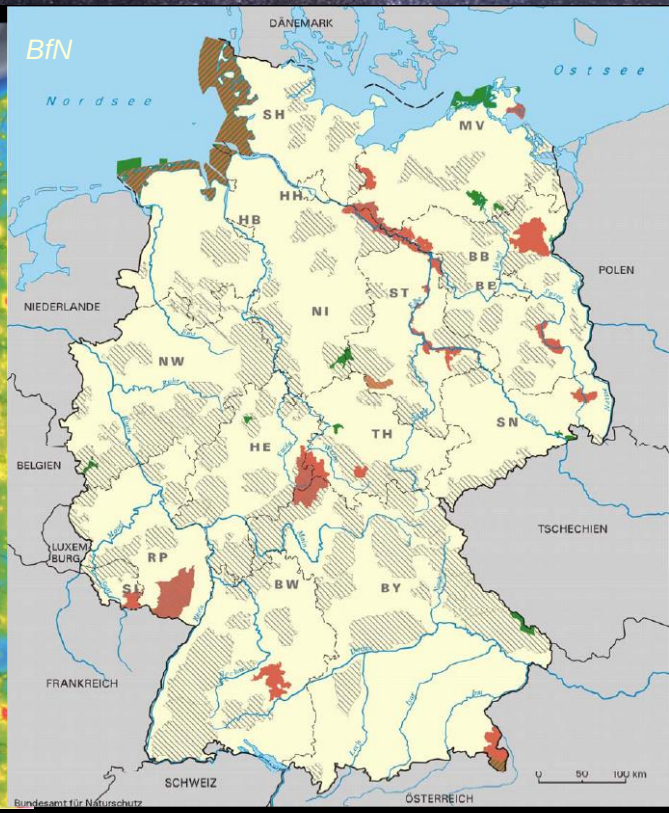
Aim:

to protect the night in the nature protected areas:

Certification of Dark Sky Places with International Dark Sky Association IDA:

- IDSPark
- IDSReserve,
- IDSCommunity





Nature Park Westhavelland

60 km West of Berlin

area 1315 km²

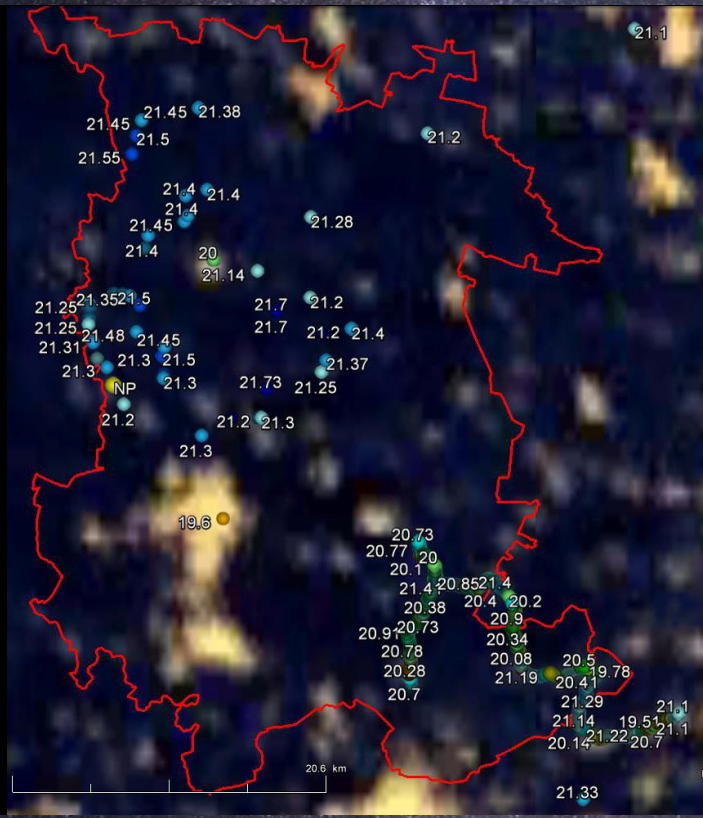
75 300 inhabitants in 10 communities

sky brightness: <21.75 mag/arcsec²

International Dark Sky Reserve

80% (pop. + area) must accept
the Lighting Management Plan (LMP)

**Reduce light pollution in villages
to protect the dark areas!**



sky brightness

Naturpark Westhavelland

Lighting Guidelines (LMP)

Avoid artificial lighting if not necessary!

Limit total luminous flux

Full cut-off luminaires for <= 500/1000 Lumen

Limit illumination facades/signs <= 2 / 50 cd/m²

Correlated color temperature cct <= 3000 K

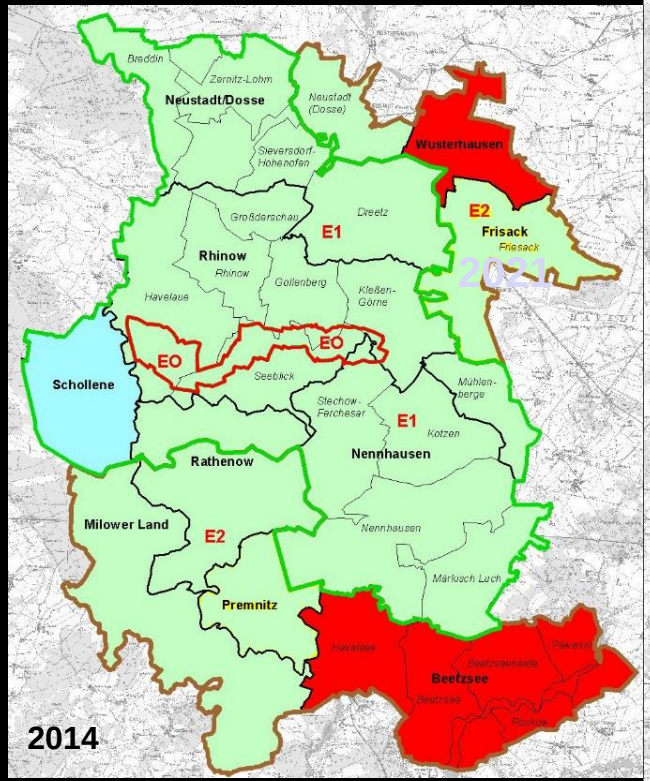
Adaptive lighting

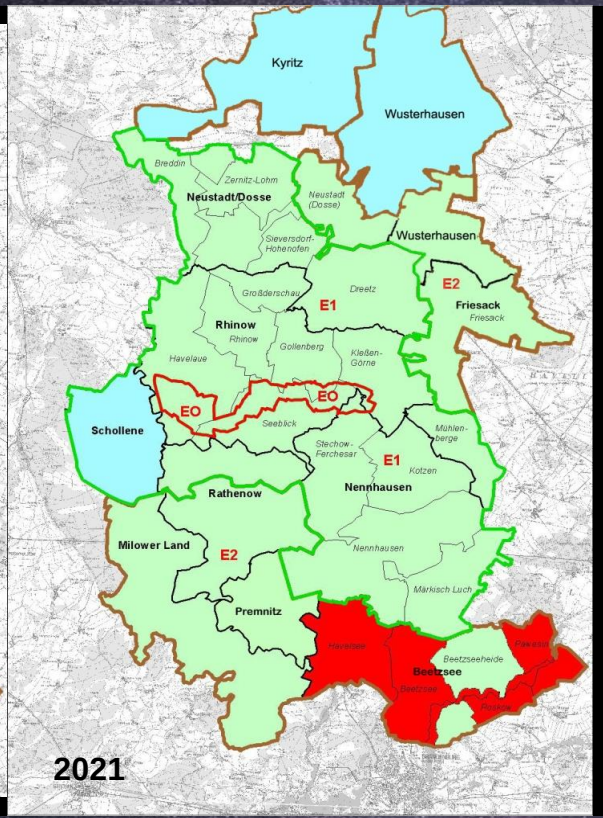
- reduce to 30% (e.g. Dimmlight for sodium)
- switch off

information of responsibles (electricians…) !

Naturpark Westhavelland

More and more communities (blue) want to become part
and follow lighting guidelines!





National Park Eifel

in the West, near to densely populated places in B, NL and cities like Cologne

Area 107 km², no light in National Park!

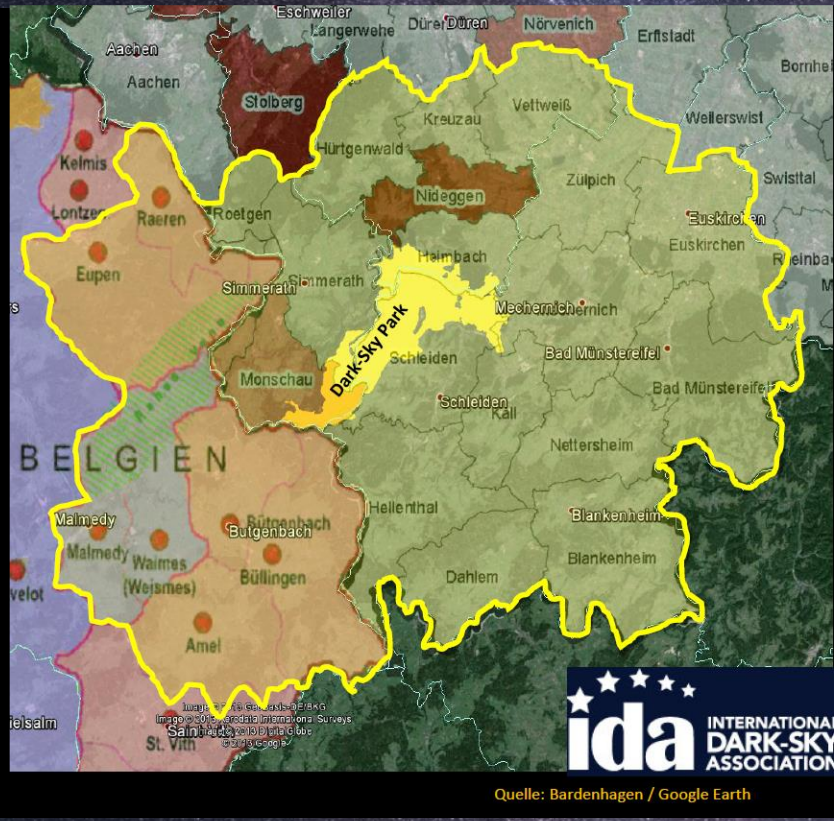
But in the villages around -> reduce light there

IDS Park (<21.5 mag/arcsec²) -> IDS Reserve

National Park -> surrounding

Nature Park with 2500 km²

sun observation



UNESCO MAB Biosphere Reserve Rhön

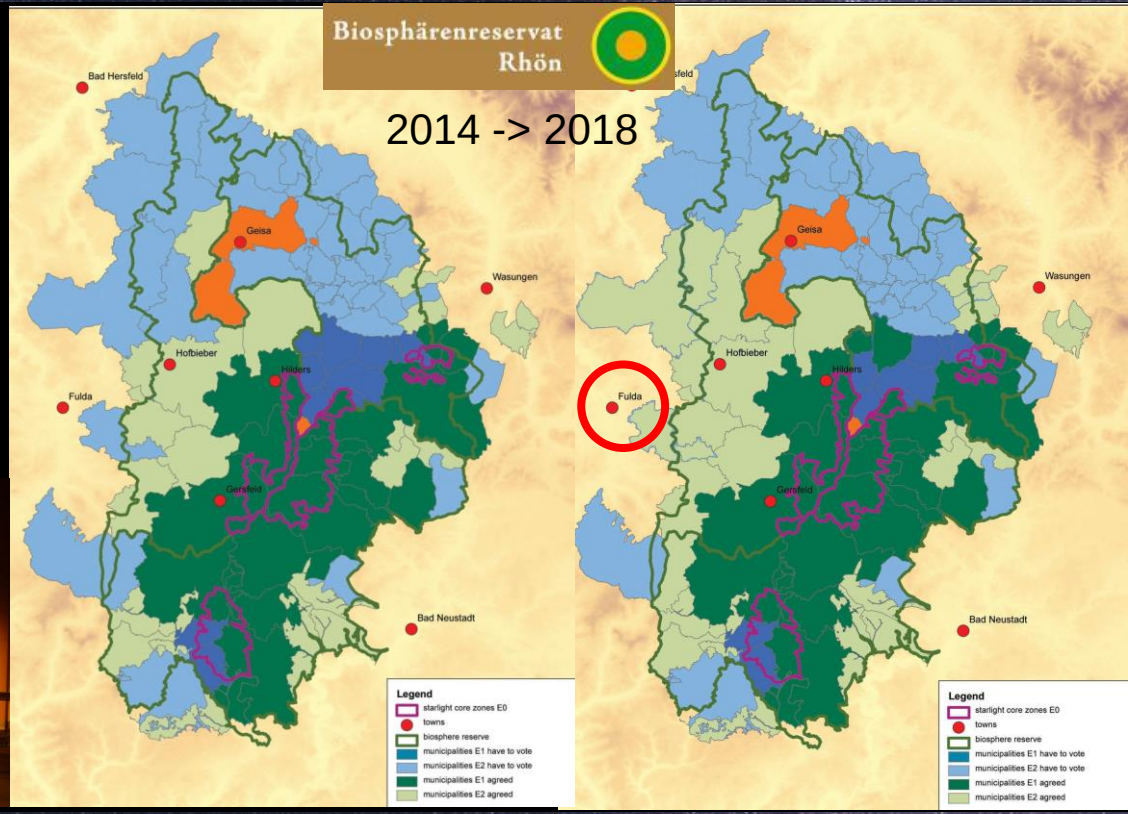
2433 km² with 218 751 inhabitants

in center of Germany, <21.9 mag/arcsec²

International Dark Sky Reserve

more communities sign LMP!

changes to PCAmber (1800 K):
public and industrial lighting

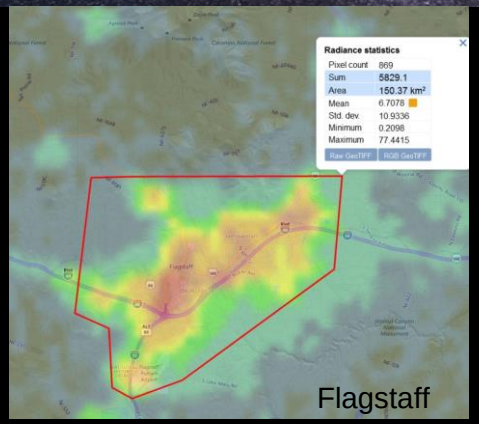


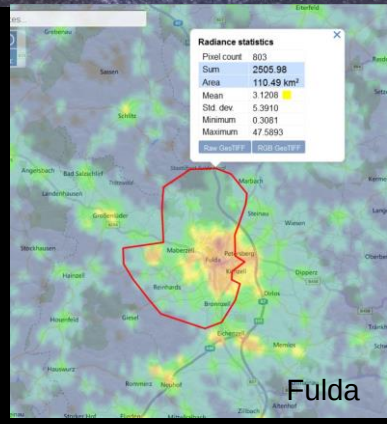
Fulda compared to Flagstaff

Flagstaff: 1st Dark Sky Community 2001

Comparison VIIRS data 2017 (lightpollutionmap.info):

- same population 65 000 inhabitants
- Flagstaff has 2-3 times upward light than Fulda
- Flagstaff brighter on panoramas than Fulda





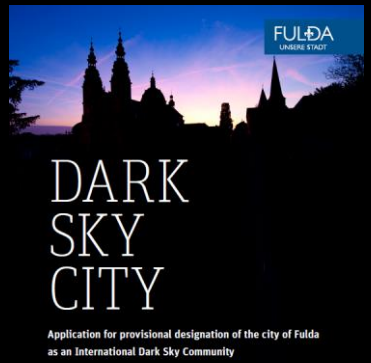
Could Fulda become IDS Community?

Fulda

- 500 historic lanterns have been changed to full cut-off (fco)
- 7500 luminaires will be exchanged to fco in 6 years
- demonstration street (fco, cct<3000 K)

app for children

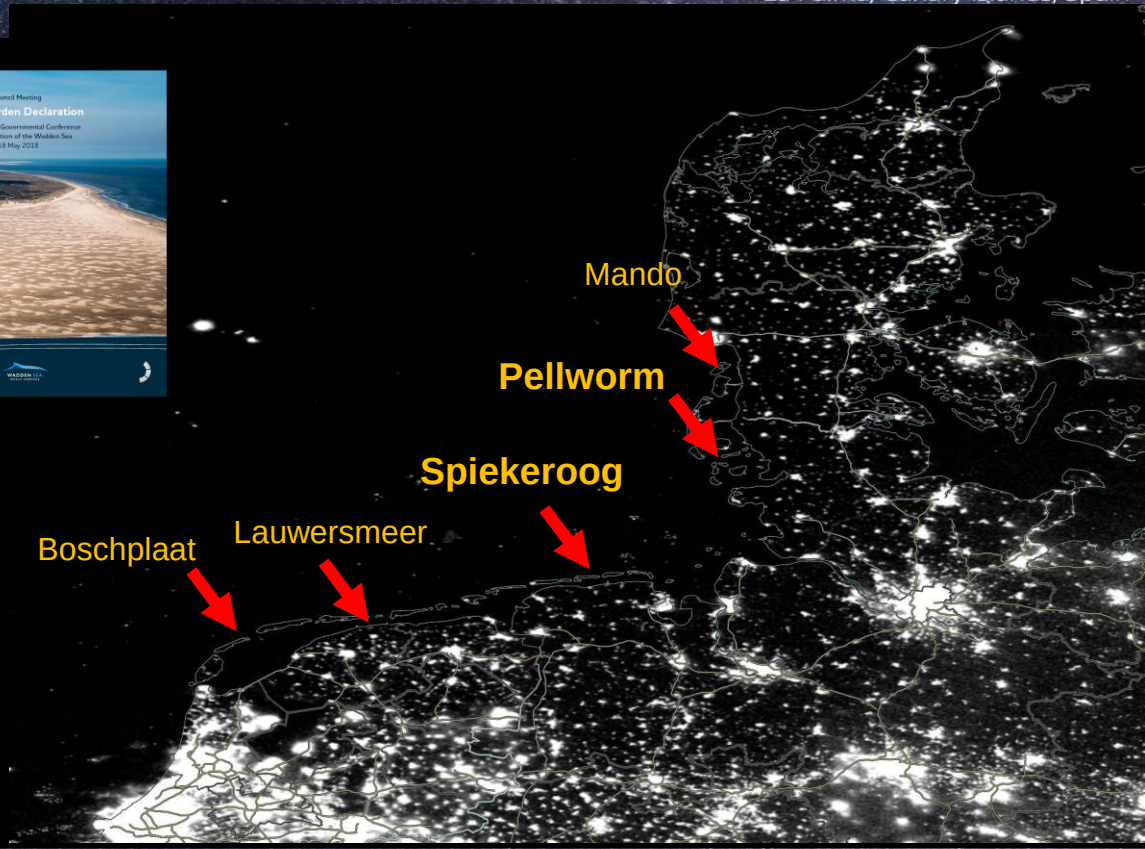
other cities interested!



UNESCO World Heritage Waddensea

The environmental ministers NL, D, DK asked to reduce light emissions in the Leeuwarden Declaration, 2018:

- 11 400 km² area
- 10 mio. visitors + 30-40 mio. day visitors
- harbors
- 4/5 IDA Dark Sky Places



Pellworm, North Frisian islands

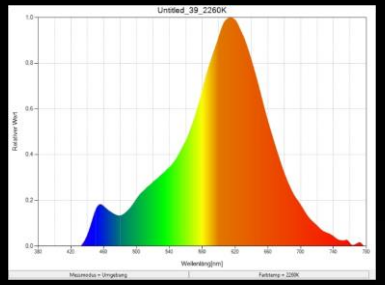
6 x 7 km², -1m -> dyke!, 1160 inh.

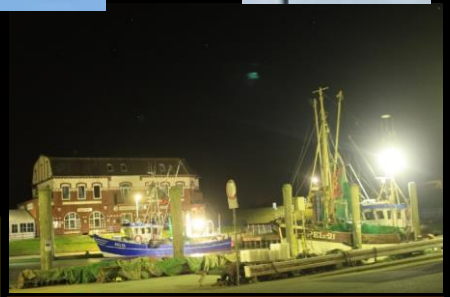
switch-off at 22:00

change to 2200 K LED: heads and retrofits

low luminous flux: 1000 lm in streets

<22.0 mag/arcsec²





IDSCommunity
Starry Island

Spiekeroog, East Frisian islands

10 x 2 km², 800 inhabitants, touristic

darkest sky by bike: 22.15 mag/arcsec²

switch-off at 00:30

reduction luminous flux
by re-programming:
3300 lm -> 30% -> **990 lm**

IDSCommunity
Starry Island

Luminaires changed
to full cut-off 2200 K

East: National Park

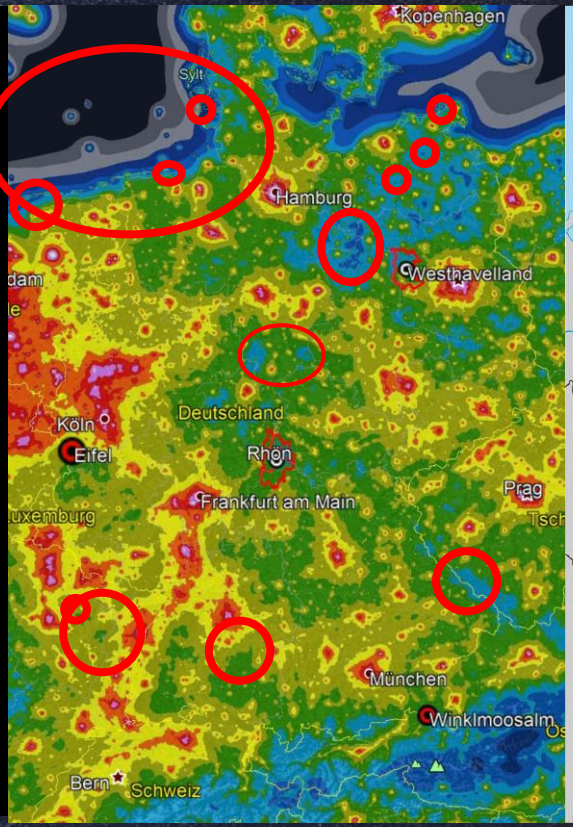
West: Path to beach: bad

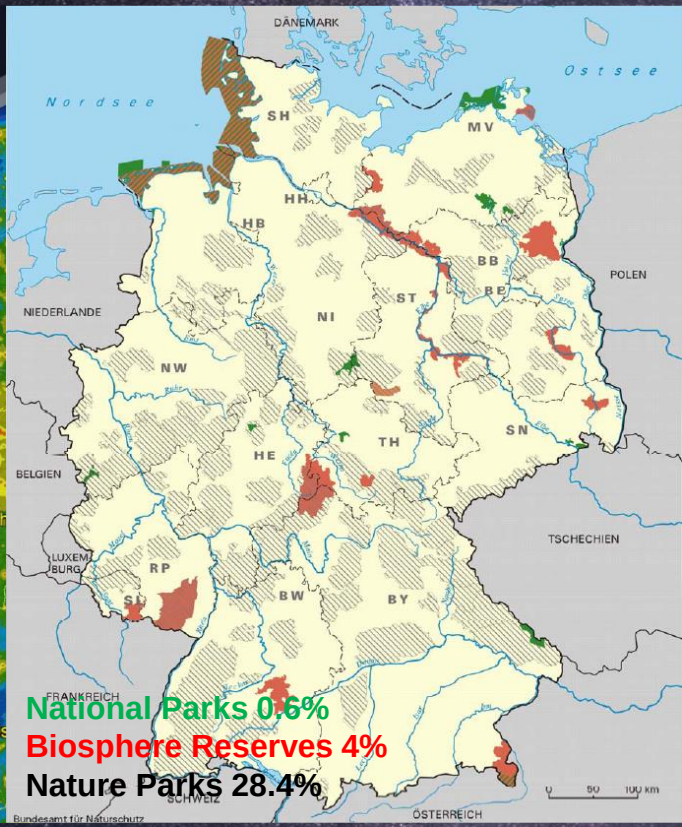
Retrofitted

Dark Sky Places in all categories of protected areas

Best Practice for:

- light only, where absolutely necessary!
- protecting the night by avoiding light pollution
- supporting sustainable lighting
  - low lighting levels
  - good directional light (fully shielded)
  - low blue content
  - adaptive lighting
- influencing industry to
  - develop 1800 K / 2200 K
  - market of these ccts
- motivating other municipalities
  - reduced costs for lighting
  - astrotourism through darker skies
- influence legislation with experience?





DARK & QUIET SKIES

Thank you for your attention!

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Eduardo Robaina, Wikimedia