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# Land Degradation and Risk Mapping in Turkey (TULADA)

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# GLADA

Within the UNEP/FAO program *Land Degradation Assessment in Drylands (LADA)*, GLADA uses **remote sensing to identify areas where significant biological change is happening:**

-  **hot spots** of land degradation, and
-  **bright spots** of land improvement



# GLADA Rationale

-  Biomass is an integrated measure of productivity; deviance from the norm may be an indication of land degradation or improvement
-  Biomass can be assessed by the Normalized Difference Vegetation Index (NDVI), a proxy for NPP
-  Deviations from the norm:
  - Negative trend, *hot spots*
  - + Positive trend, *bright spots*



# Procedure:

1. Identify *hot/bright* spots using indicators NDVI/NPP trend
2. Eliminate false alarms using RUE, EUE...
3. Stratify/explain: using phenology, land cover/use change, soil, terrain ...
4. Validate and characterize in field



# Data:



**NDVI** (NIR-red)/(NIR+red): *NASA GIMMS*:

8km resolution, fortnightly since 1981, HANTS-ed

**Climate:** *VASClmO 1.1*: 0.5 degree resolution, monthly precipitation, GPCP/DWD

*CRU TS 3.0* : 0.5 degree resolution, monthly climate

**NPP:** MODIS 8-day NPP, 2000-2006

**Land cover/use:** ESA GlobCover, FAO Land Use System

**Socio-economic: *Population, urban areas and poverty***

***indices:*** The CIESIN Global Rural-Urban Mapping Project provides data for population and urban extent, gridded at 30 arc-second resolution (CIESIN 2004). Rates of infant mortality and child underweight status and the gridded population for 2005 at 2.5 arc-minutes resolution (CIESIN 2007)



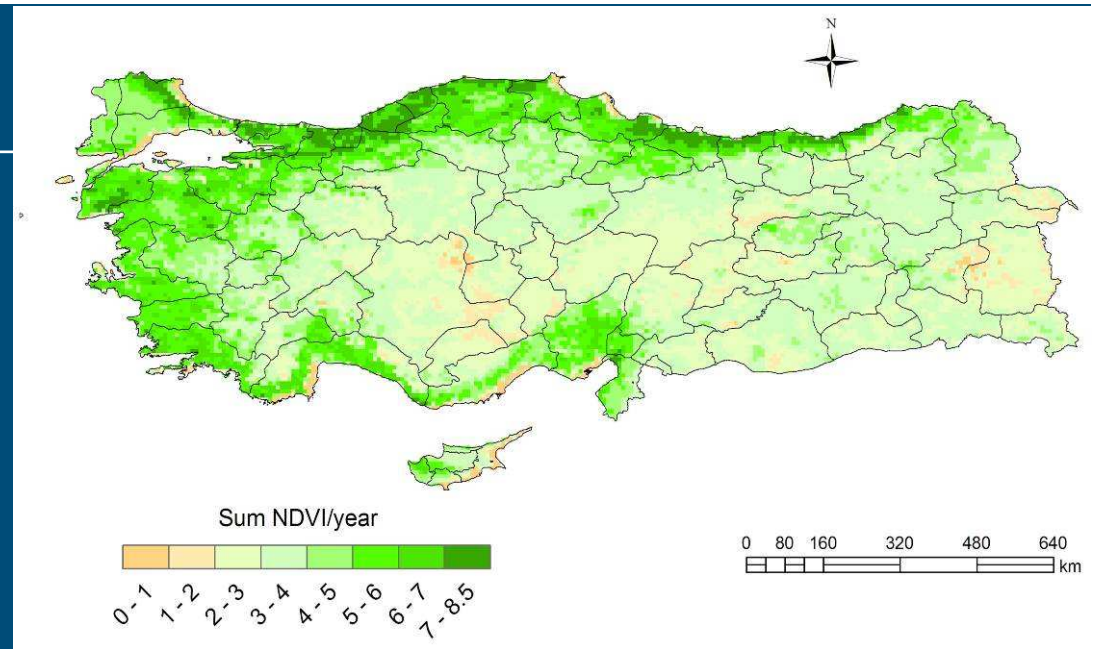
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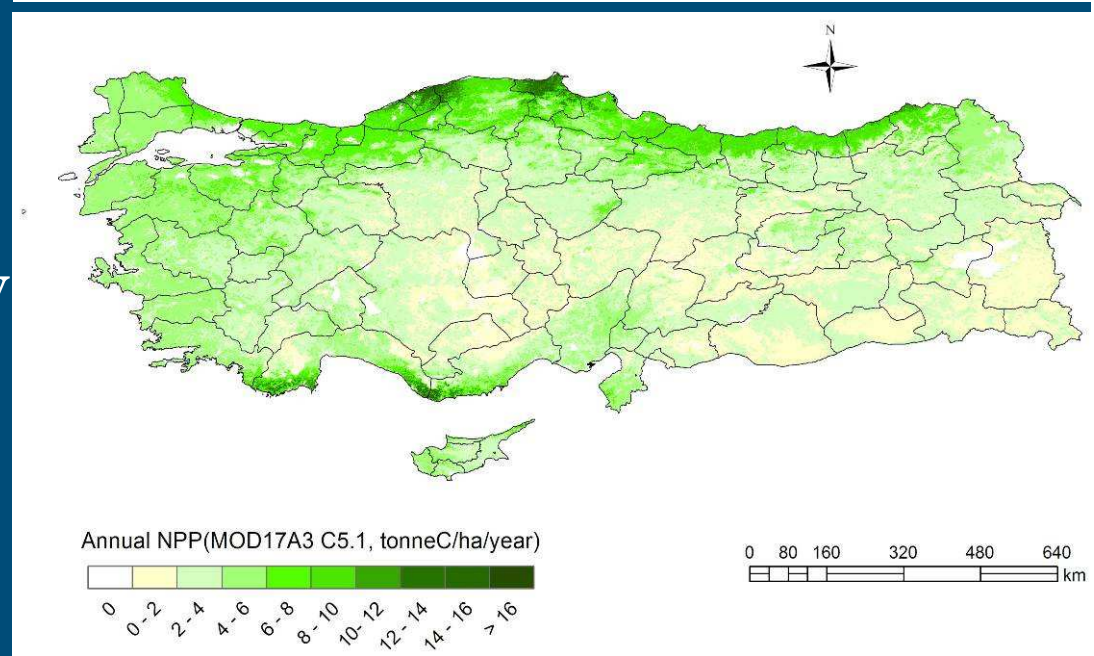
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Turkey: multi-year mean annual sum NDVI, 1981-2006, AVHRR GIMMS NDVI



Turkey: annual net primary productivity 2000-2006 MODIS NPP



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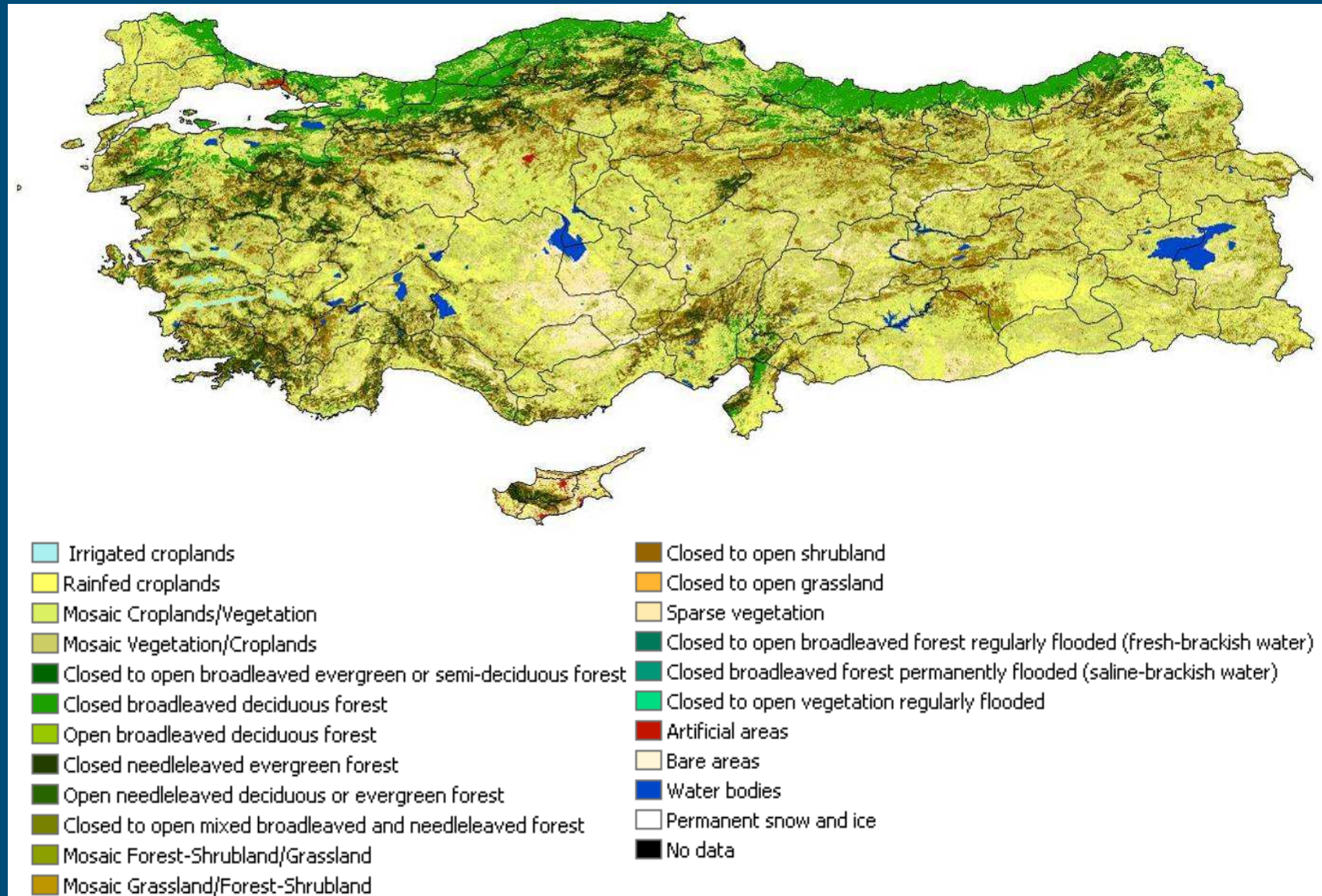


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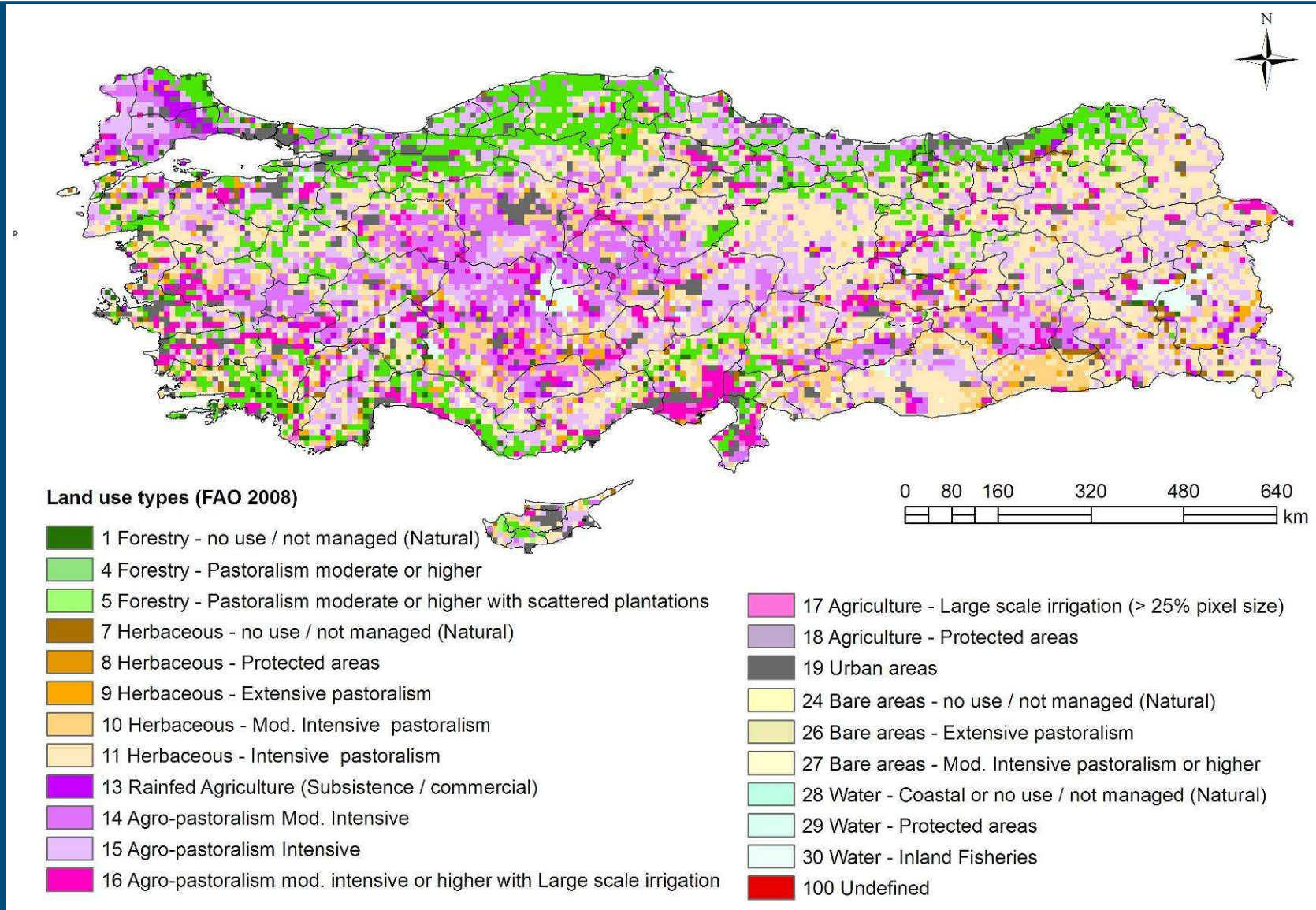
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# Turkey: Land Cover (ESA, 2008, 300m)

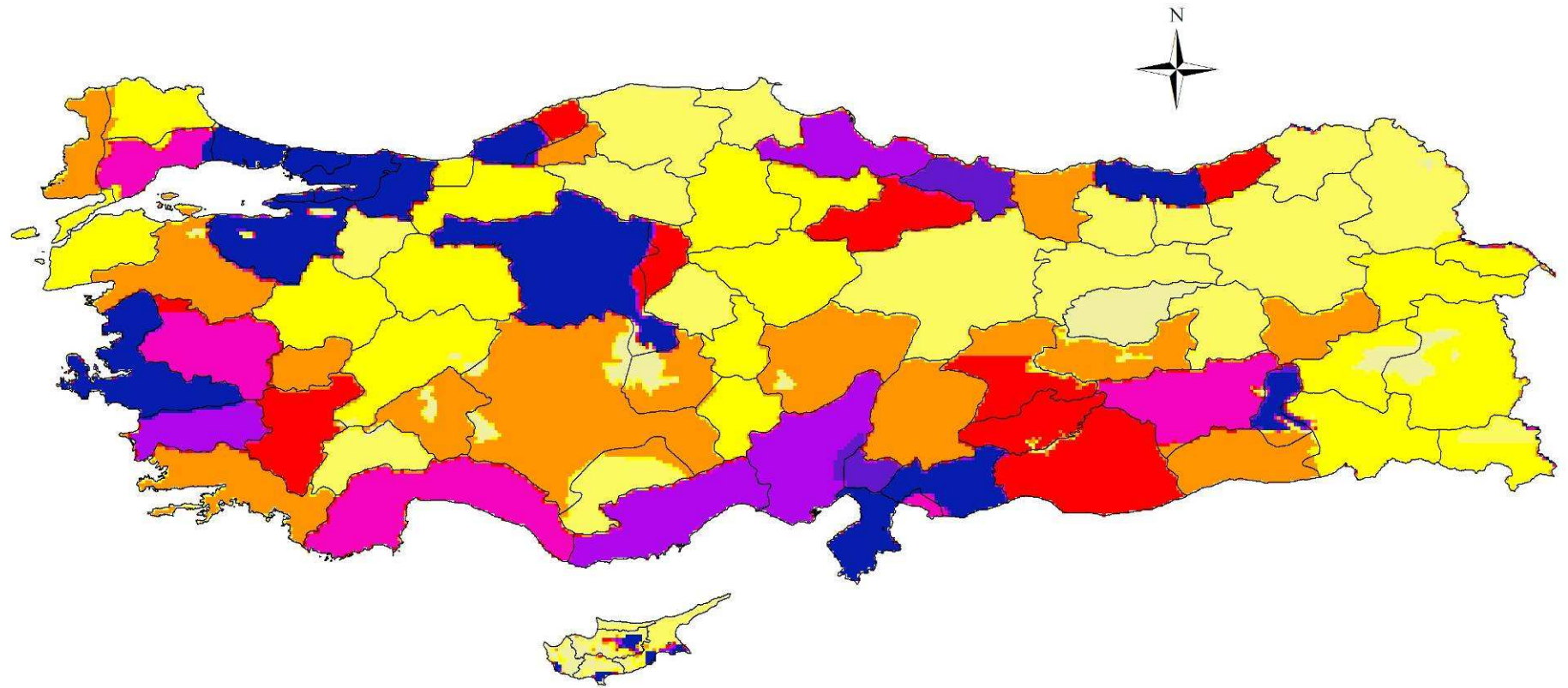


# Turkey: Land Use Systems (FAO 2008)

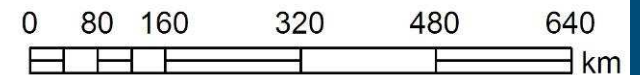
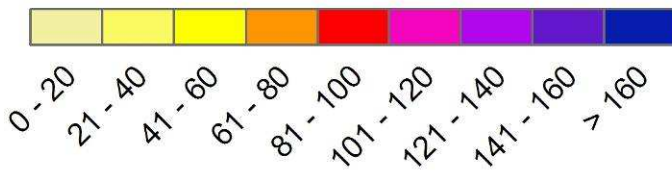




# Turkey: population density



Person/km<sup>2</sup> (GRUMP GPW v3)



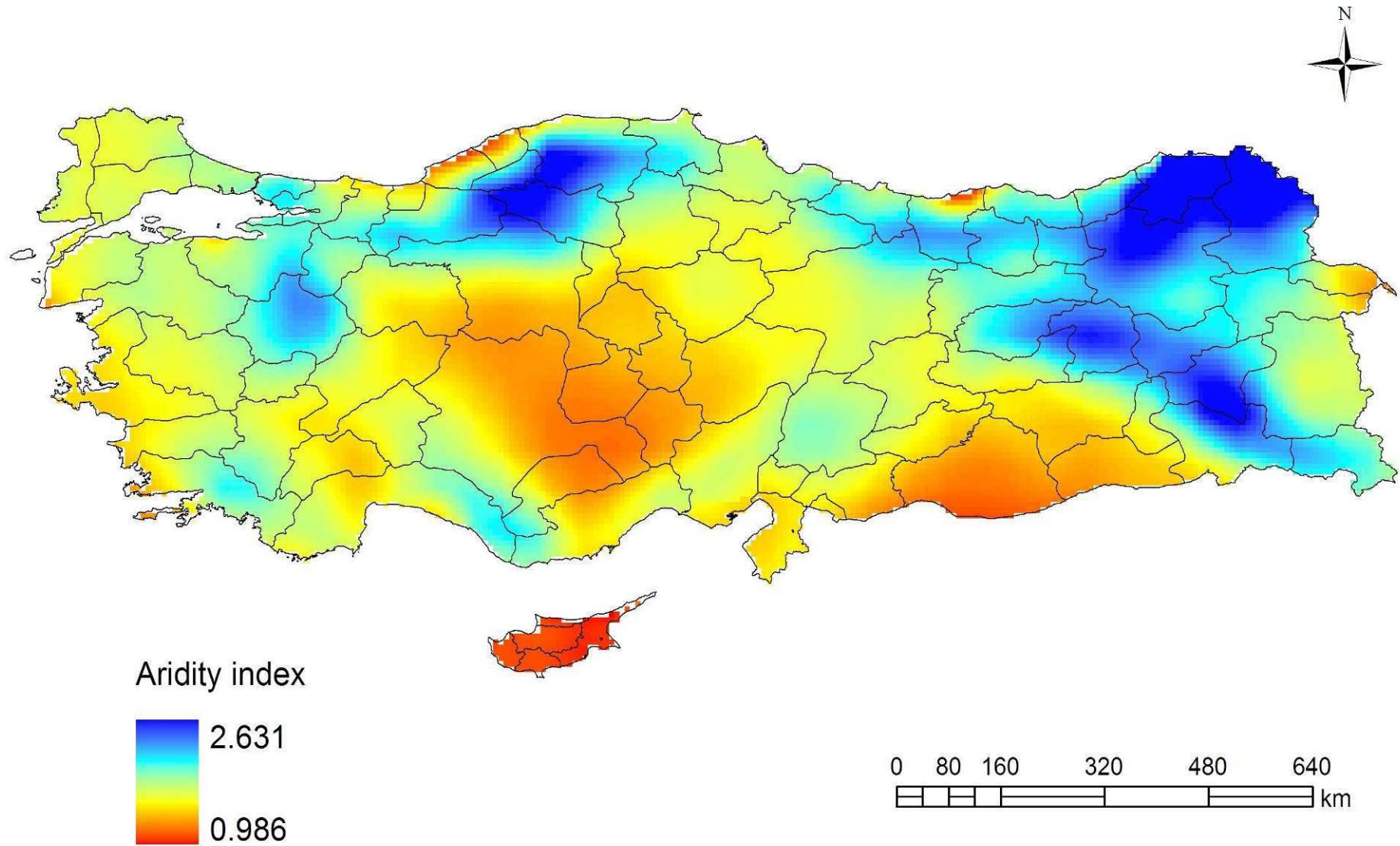
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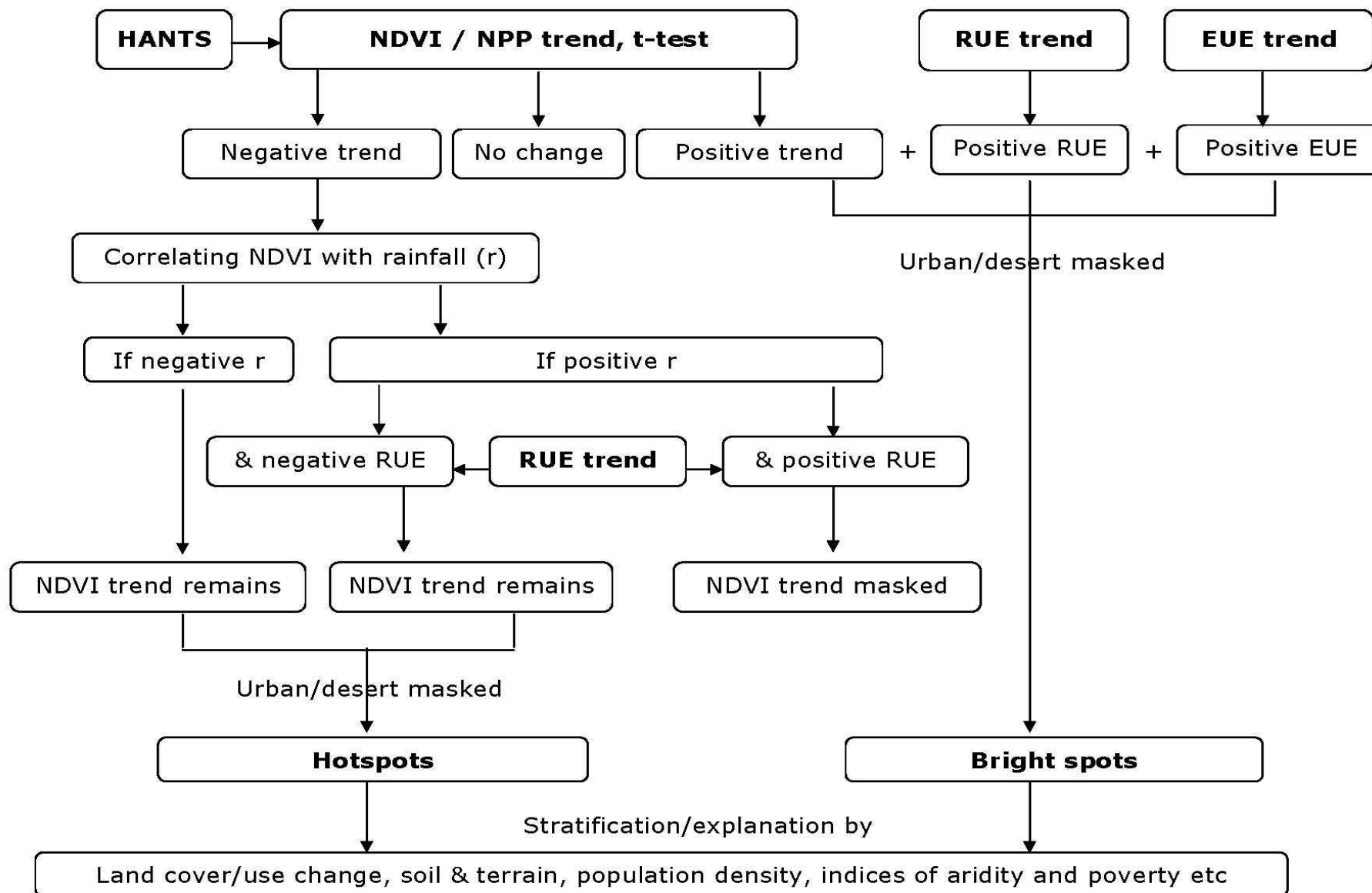


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# Turkey: aridity index





NDVI = Normalized Difference Vegetation Index; NPP = Net Primary Productivity; RUE = Rain-Use Efficiency; EUE = Energy-Use Efficiency



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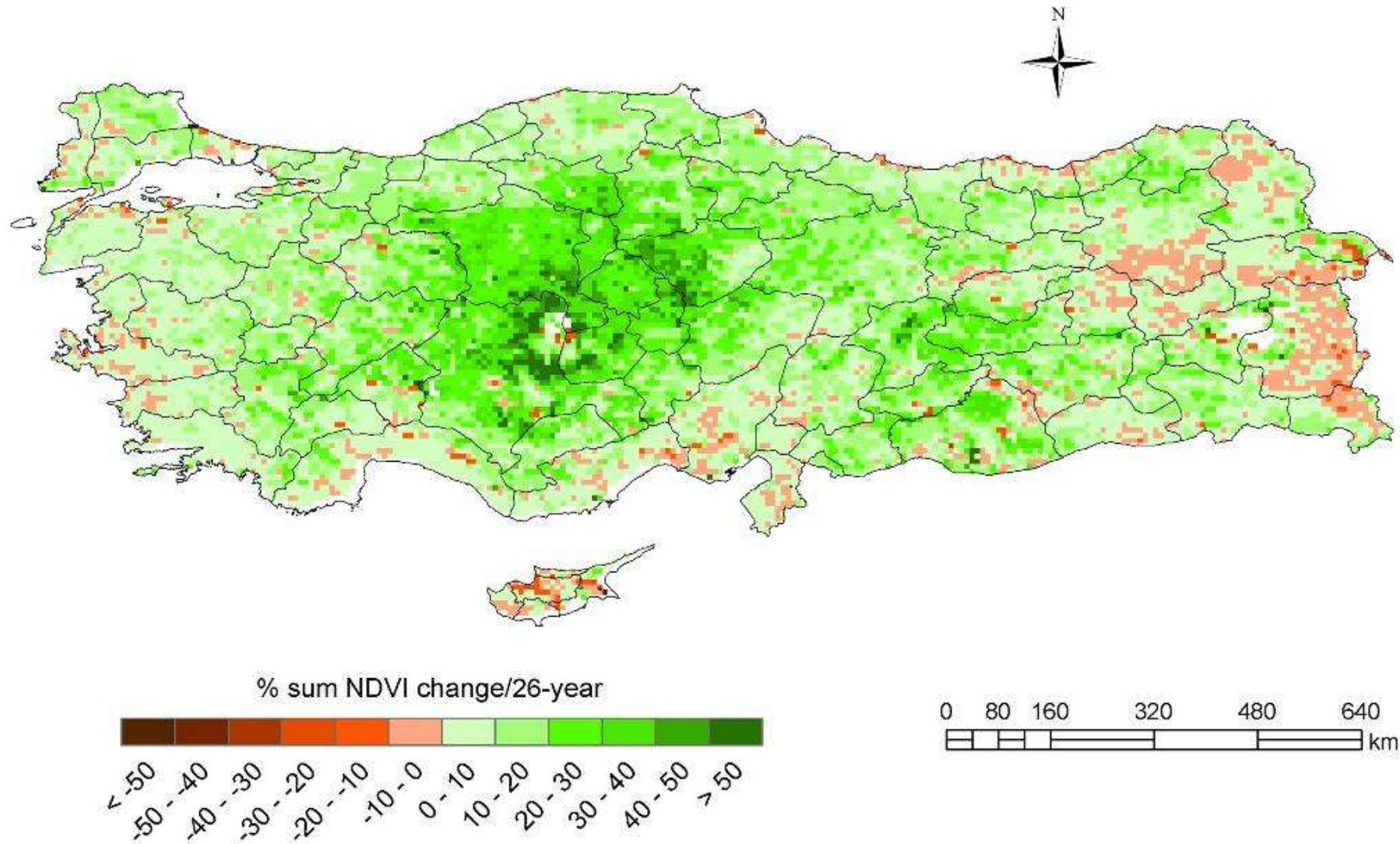


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# Turkey: change in annual sum NDVI 1981-2006



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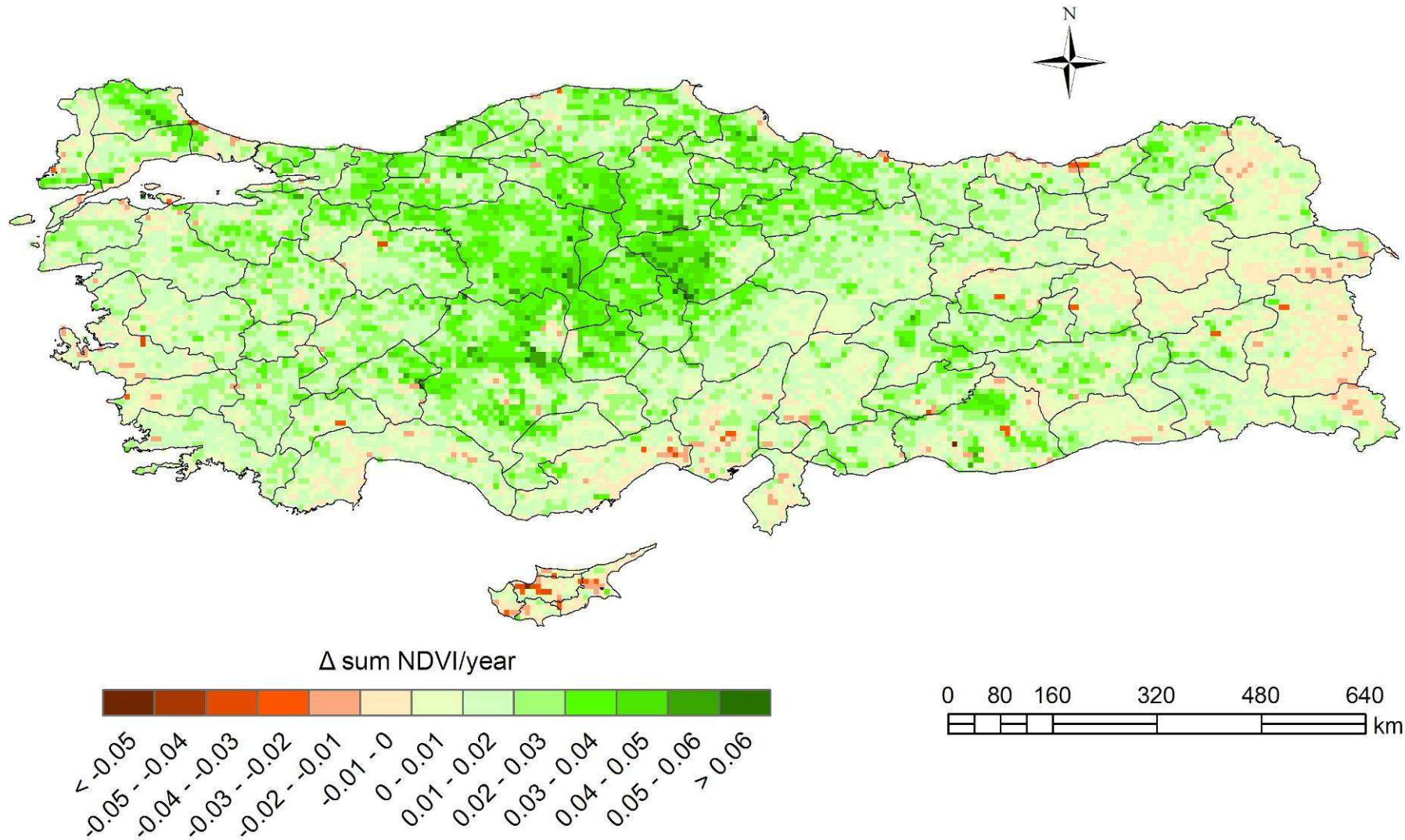


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# Turkey: change in annual sum NDVI 1981-2006



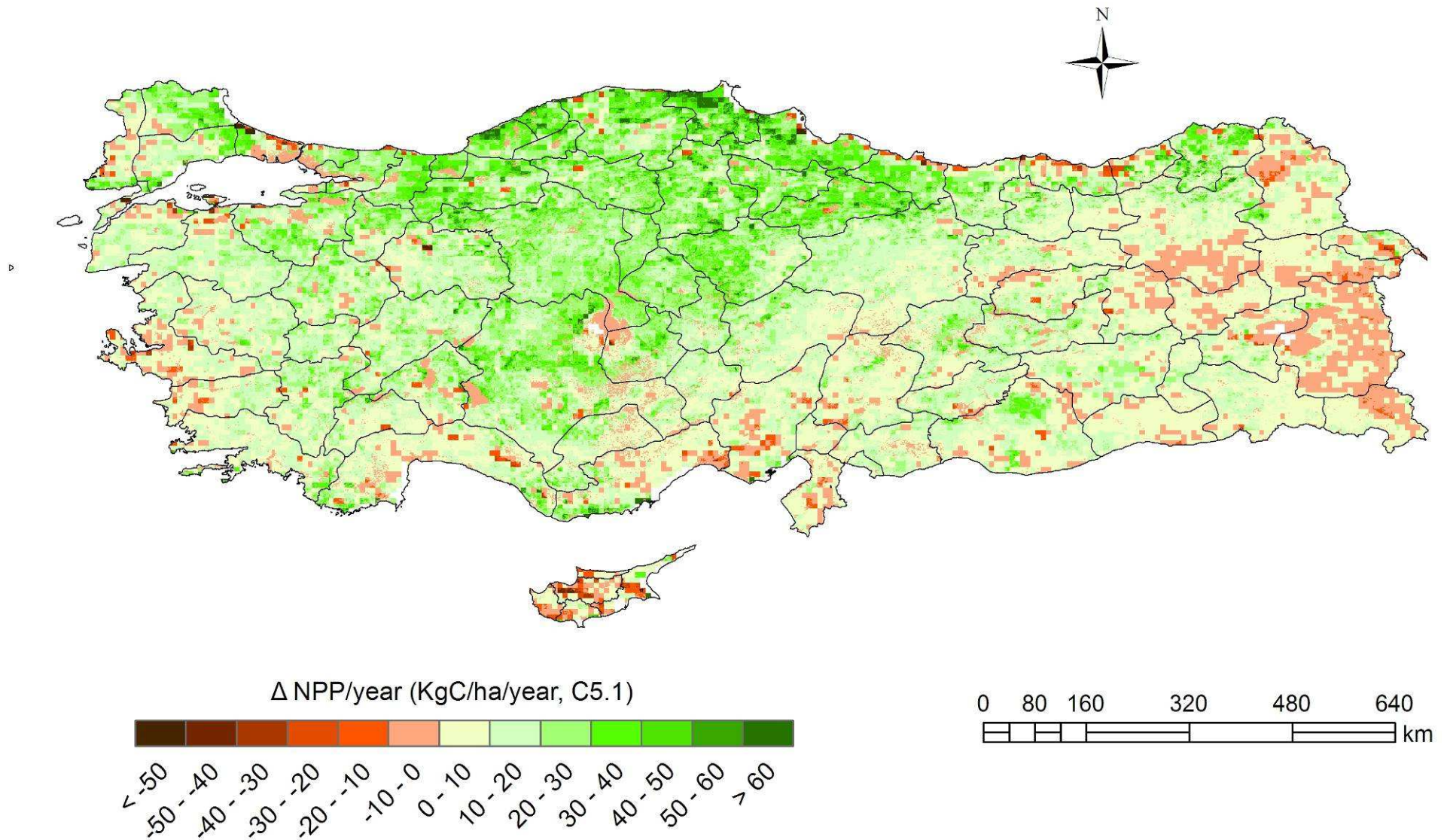
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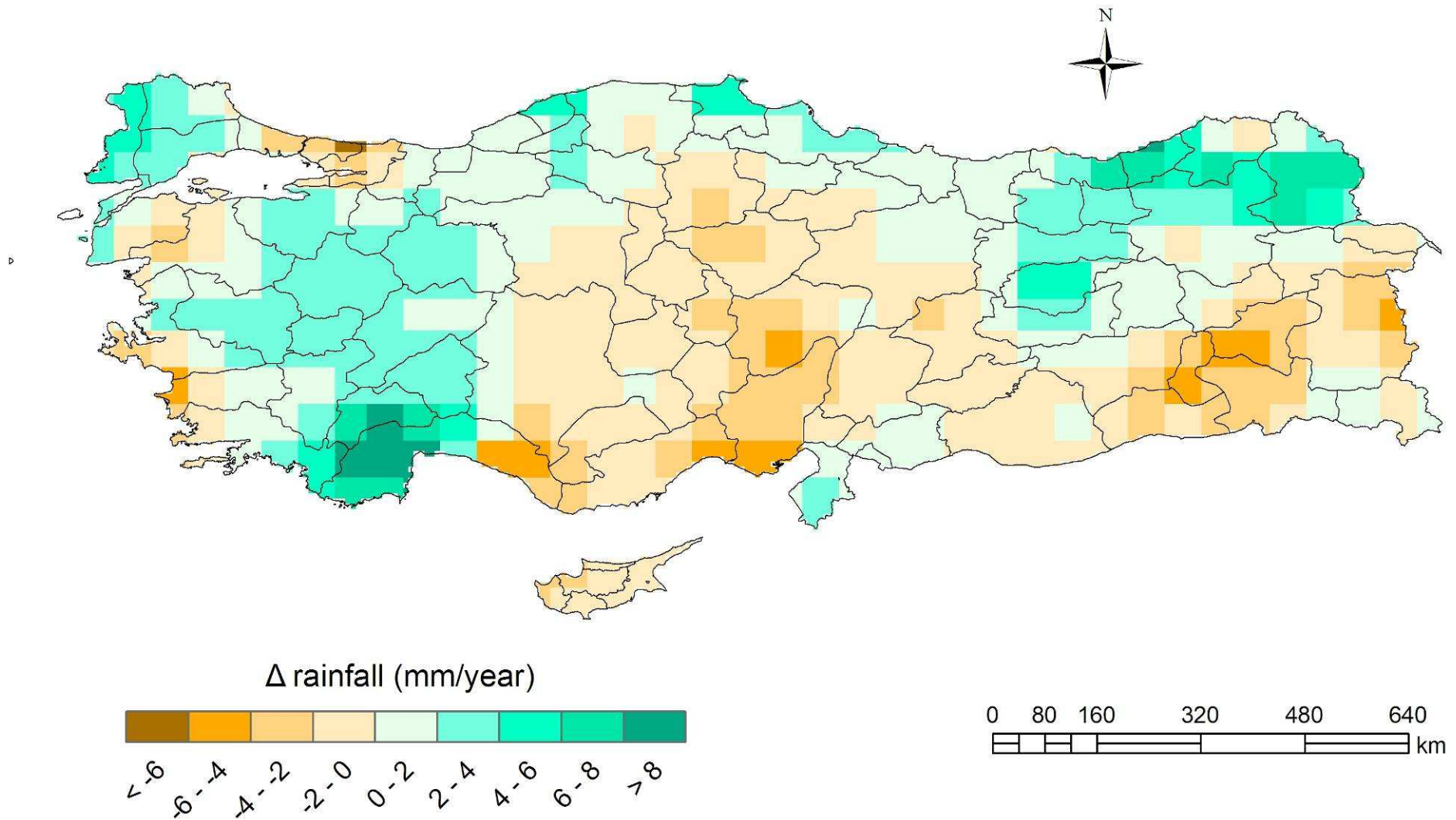
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# Turkey: changes in net primary productivity 1981-2006

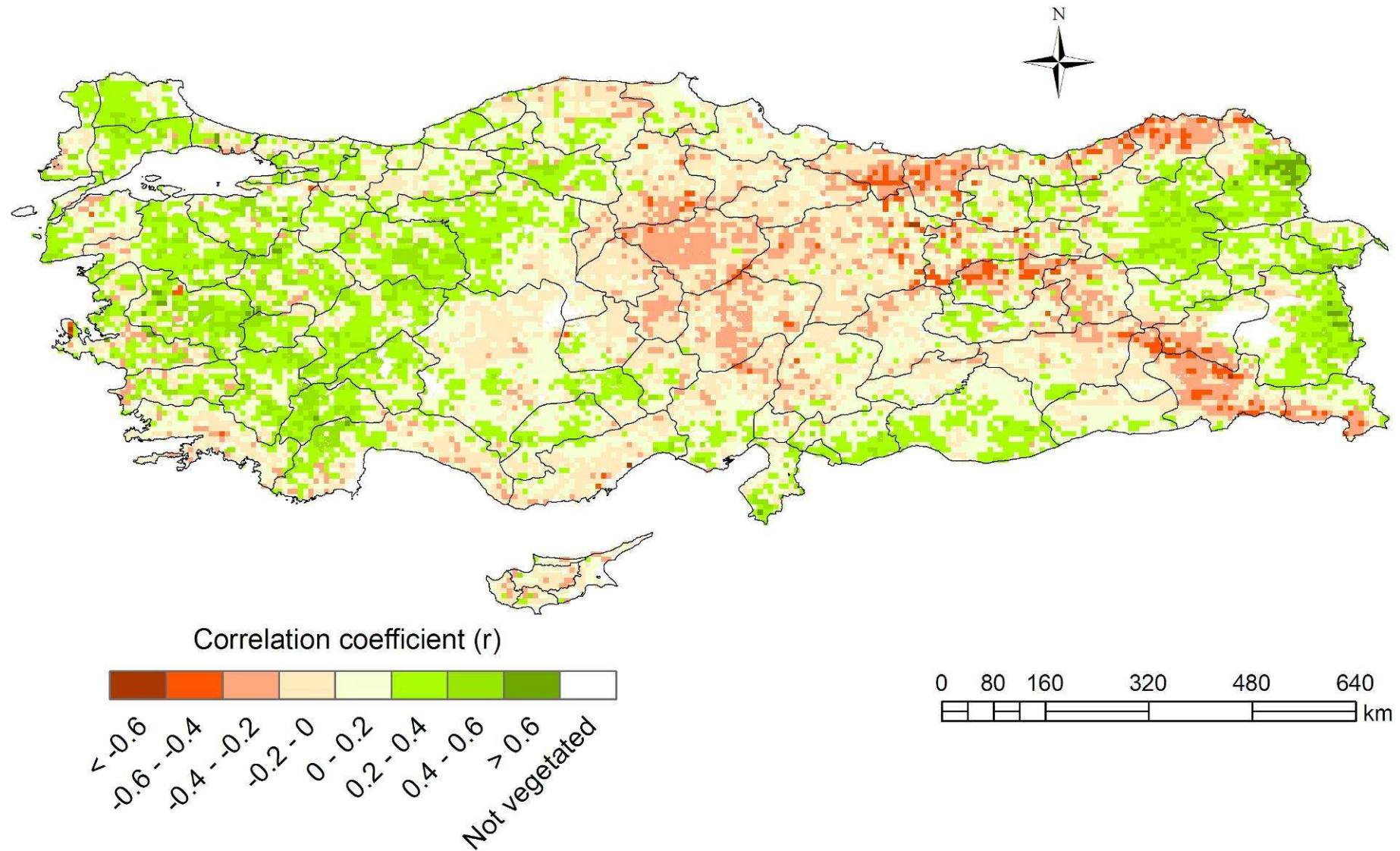




# Turkey: change in annual rainfall 1981-2006

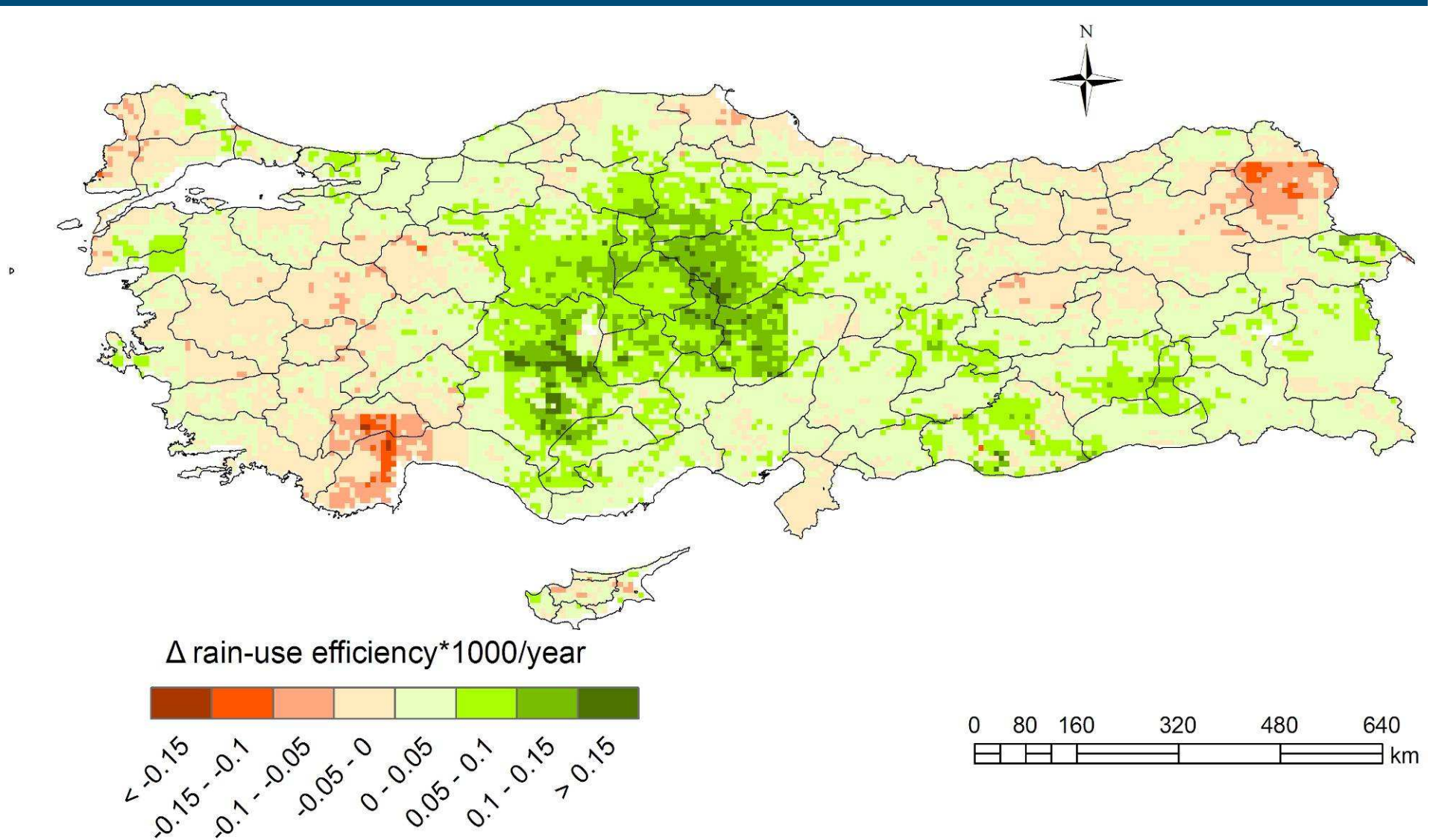


# Turkey: correlation between NDVI and rainfall 1981-2006

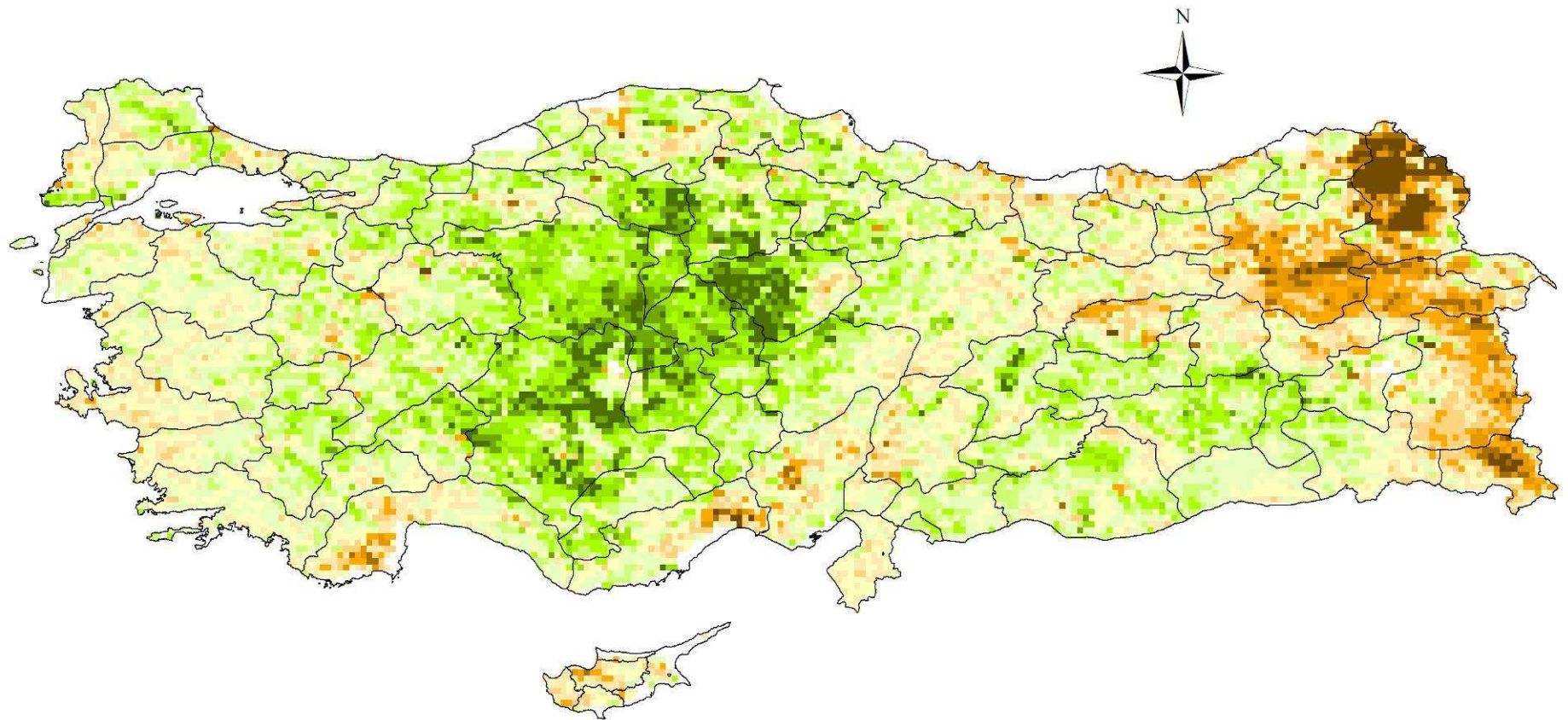




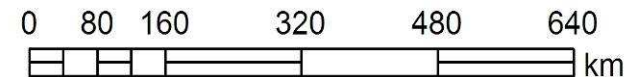
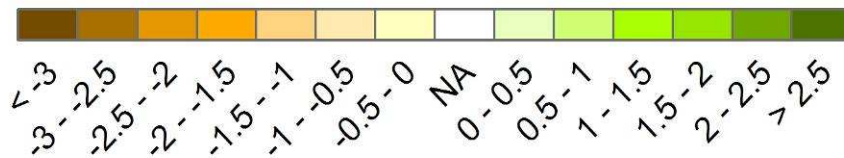
# Turkey: change in rain-use efficiency 1981-2006



# Turkey: change in annual energy-use efficiency 1981-2006



$\Delta$  engery-use efficiency\*10000/year



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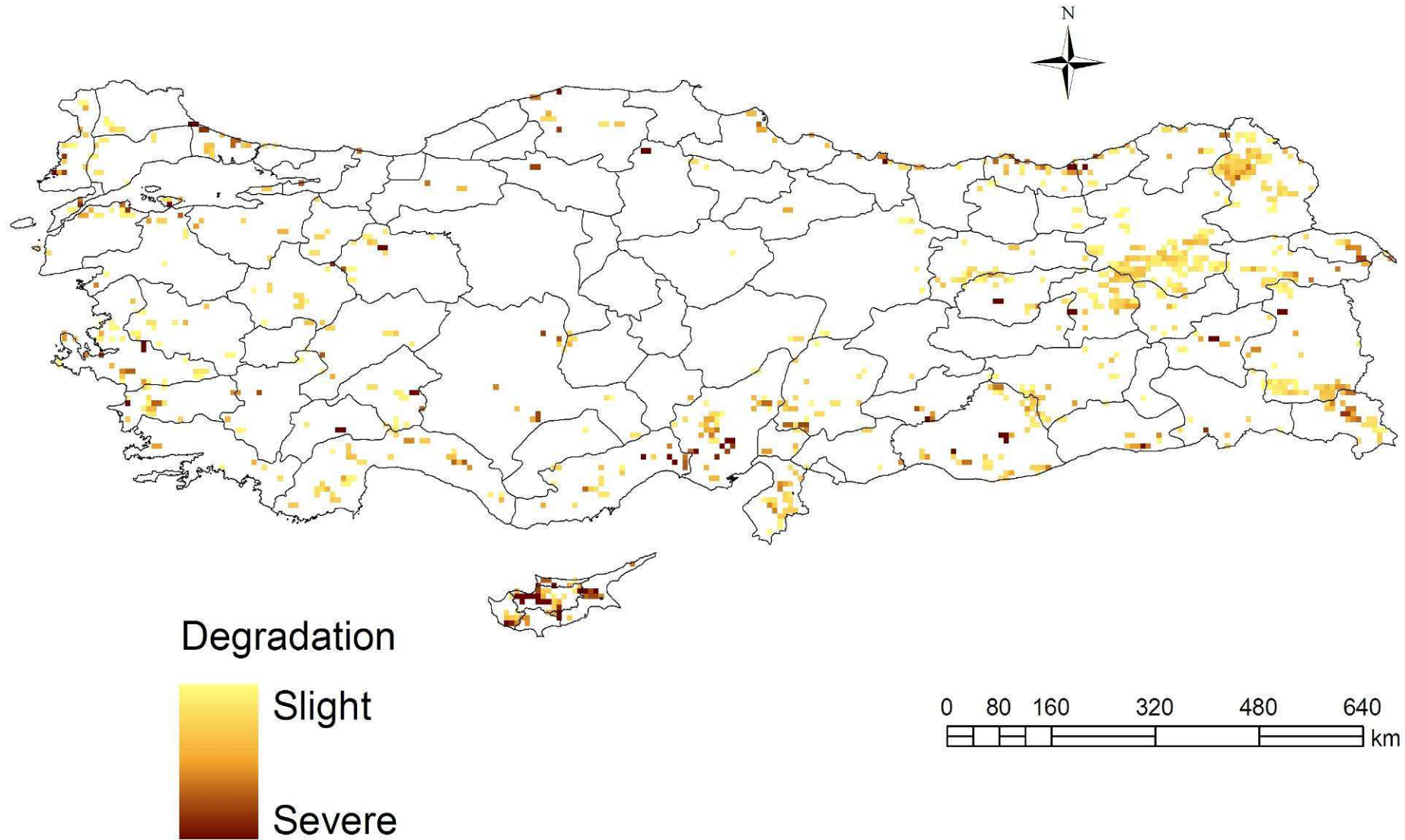


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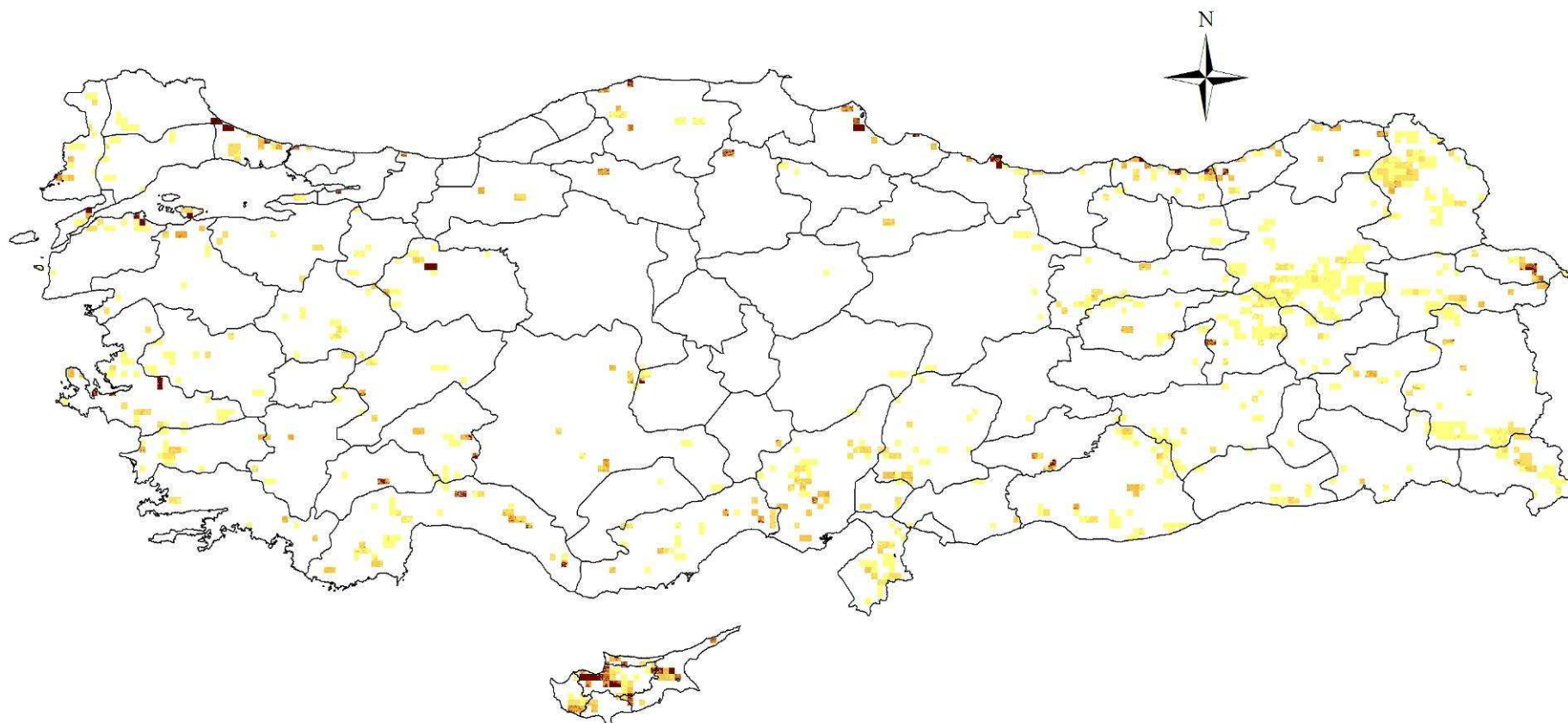
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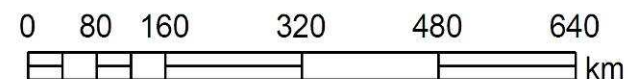
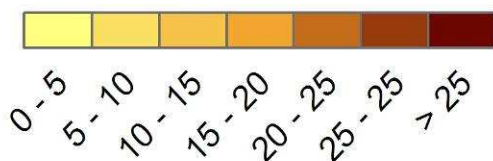
# Negative trend in biomass productivity 1981-2006, climate-related



# Turkey: loss of NPP 1981-2006, climate-adjusted



NPP loss (KgC/ha/year)



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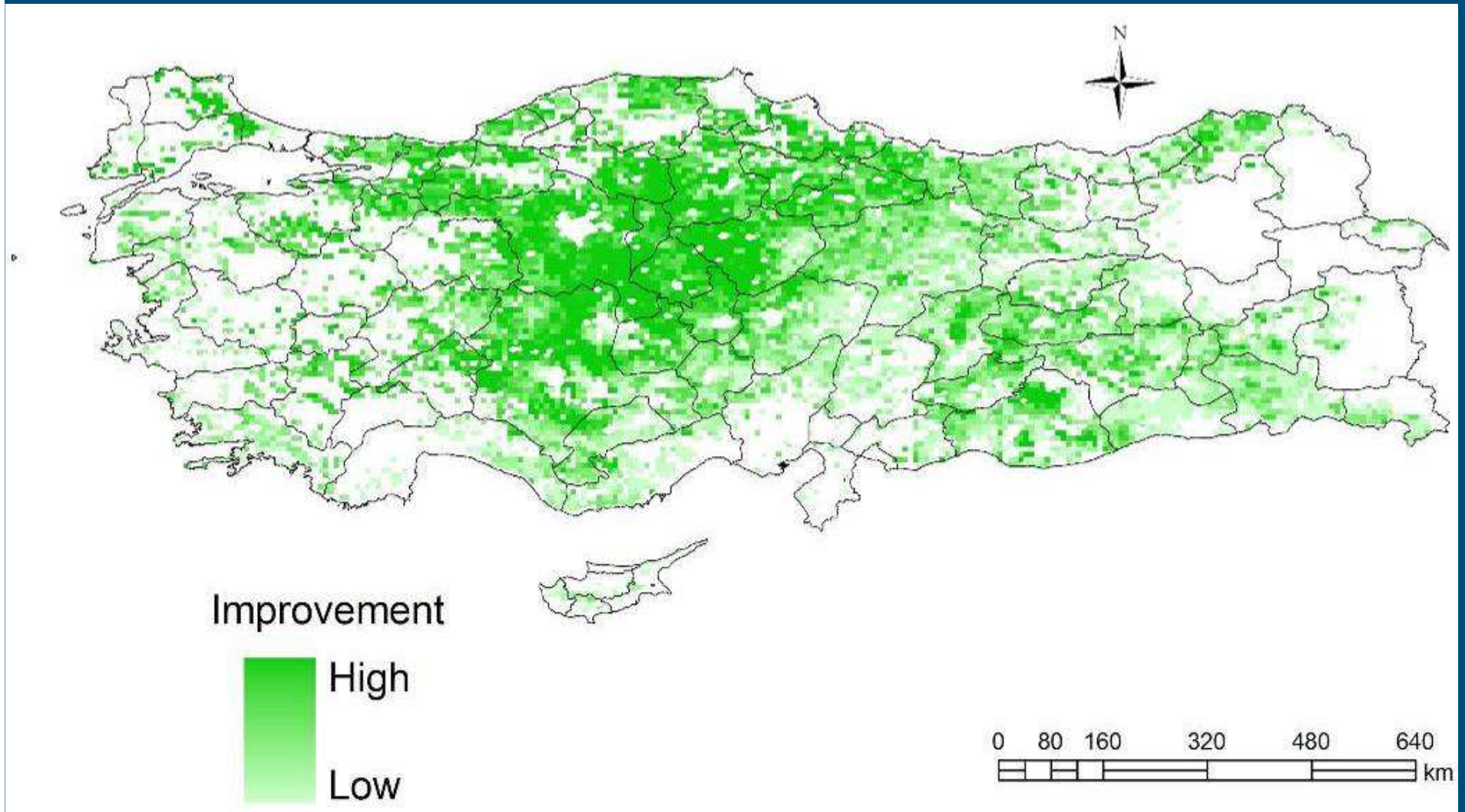


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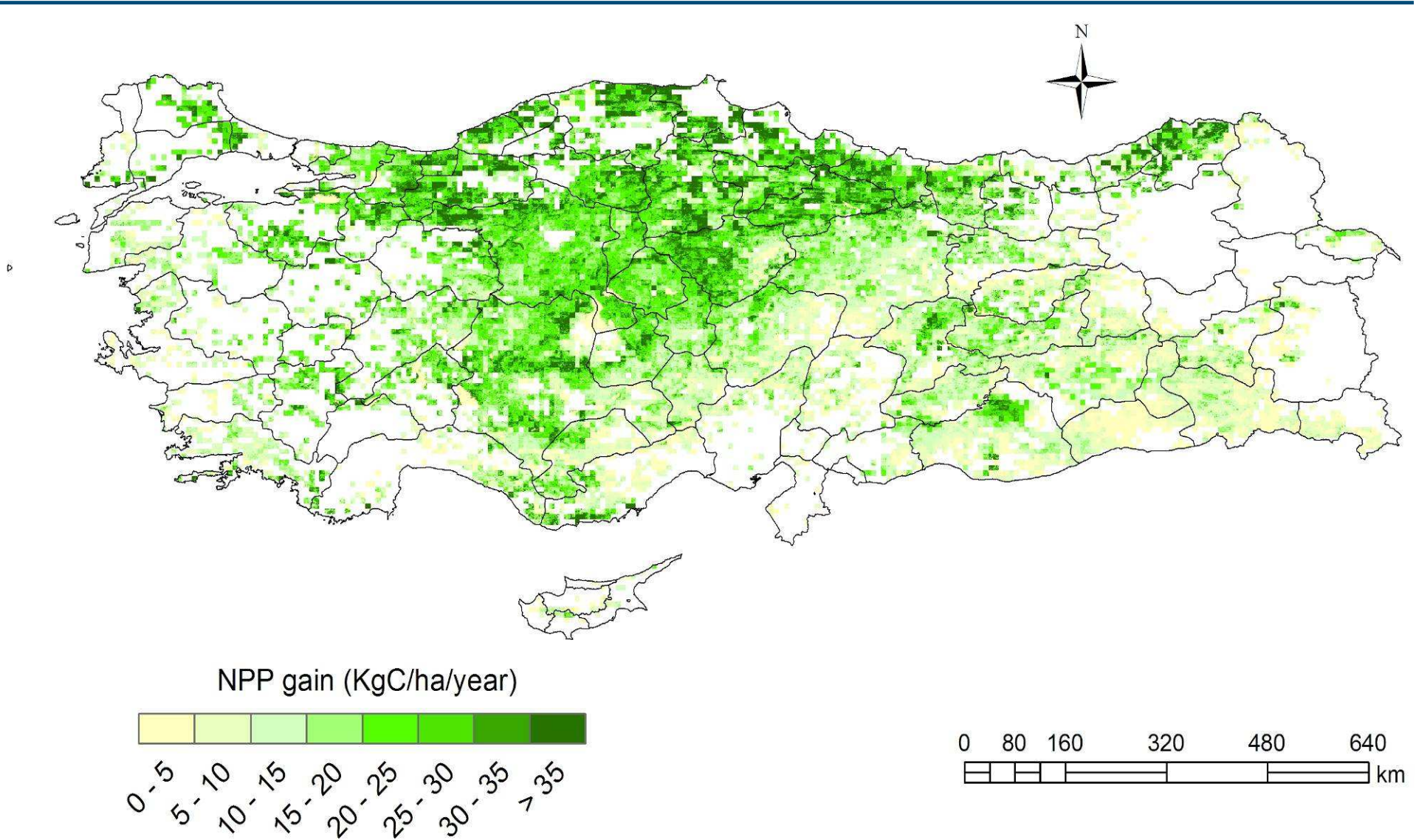
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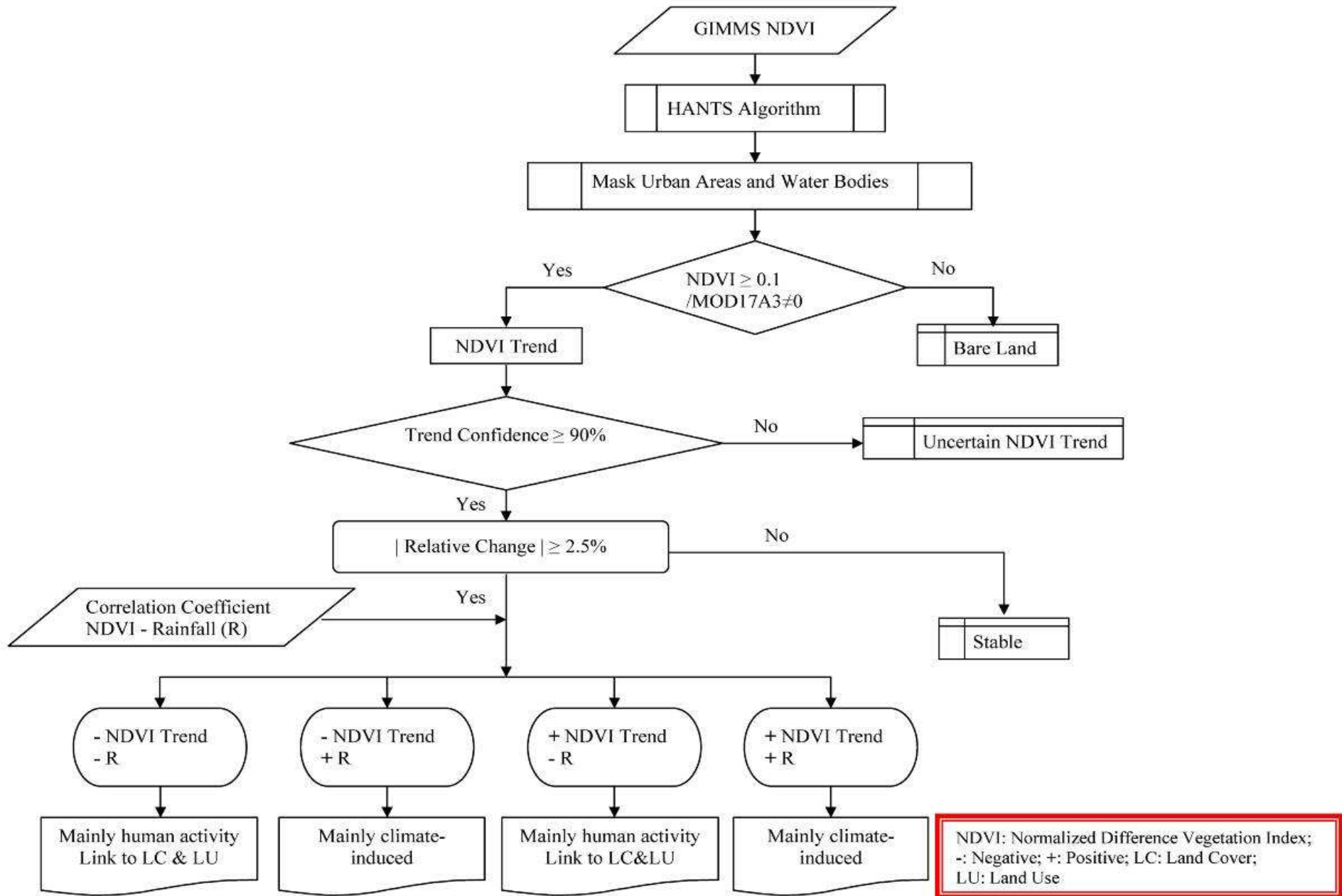


# Turkey: positive trend in NDVI 1981-2006, climate-adjusted



# Turkey: positive trend in biomass productivity 1981-2006, climate-adjusted

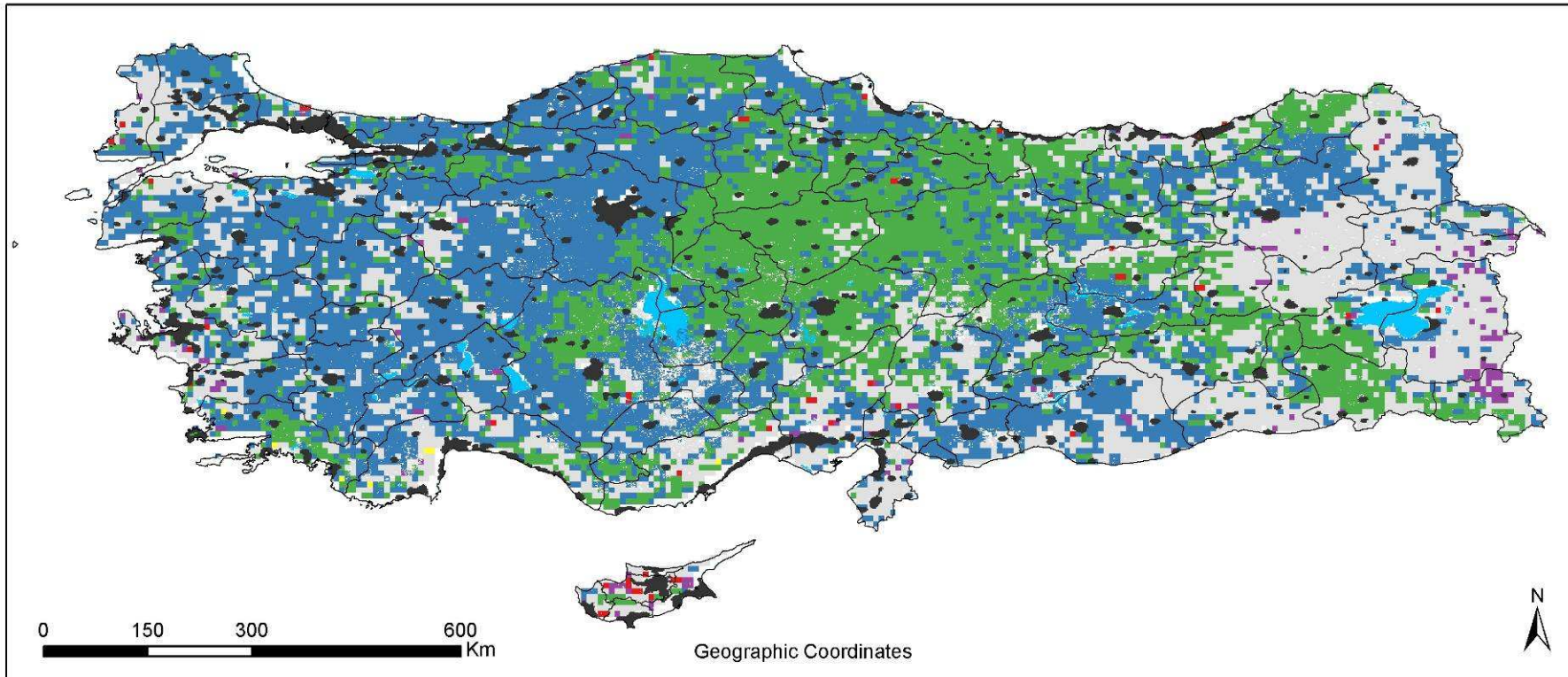




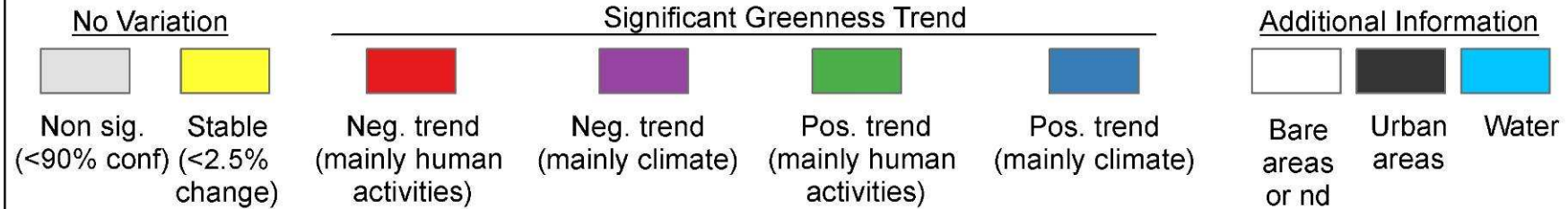




# Greenness Evolution in Turkey by Sum NDVI (1981-2006)



## Greenness Evolution by Sum NDVI (1981-2006)



Source: GLADIS 2010. version 0.5



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# Thank you!



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