



OCP Policy Center Conference series

# Climate change and water-foodenergy supply from Africa's drylands : local impacts and teleconnections through global commodity flows

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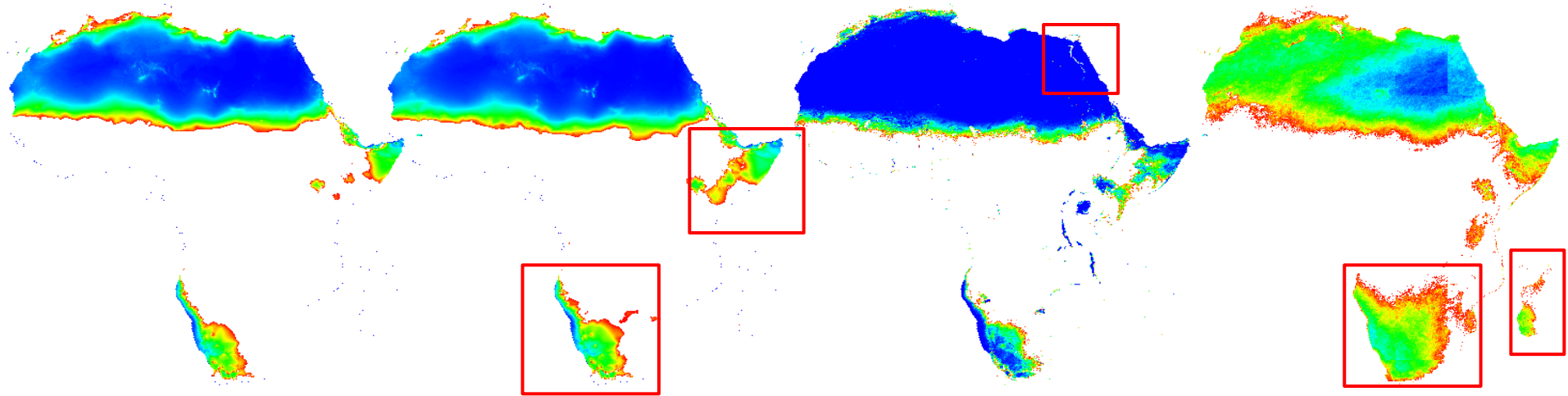
# Definitions of drylands, revisited

(a) Rainfall  $< 300\text{mm/yr}$  [**15M km<sup>2</sup>**],  
red=high, blue=low

(b) Aridity index:  $P/PET < 0.20$  [**16M km<sup>2</sup>**],  
red=less arid,  
blue=more arid

(c) Productivity ( $< 2000\text{ Dg/ha/day}$ ) [**17M km<sup>2</sup>**],  
red=more productive,  
blue=less

(d) Cloud frequency ( $< 0.3$ ) [**17M km<sup>2</sup>**],  
red=higher frequency,  
blue=lower frequency



Different definitions produce different results. Climatically arid regions may not be hydrologically arid.

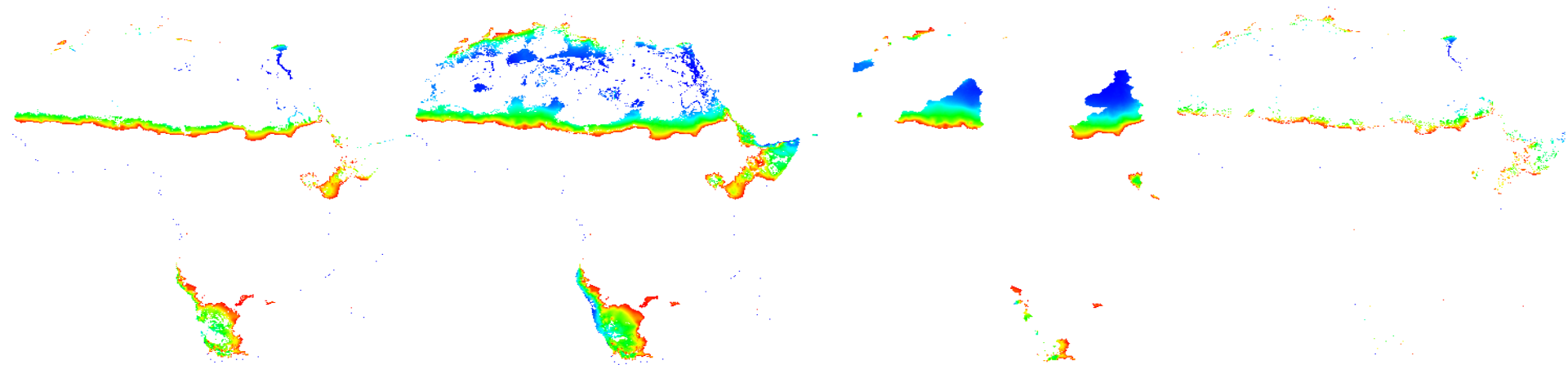
# Water-Food-Energy Nexus in Arid Africa

Arid **croplands** [110M people, **2.7M km<sup>2</sup>**], red=less arid, blue=more arid

(b) Arid **rangelands** [118.5M people, **6.9M km<sup>2</sup>**], red=less arid, blue=more arid

(c) Arid **watersheds of dams** [**2.9M km<sup>2</sup>**], red=less arid, blue=more arid

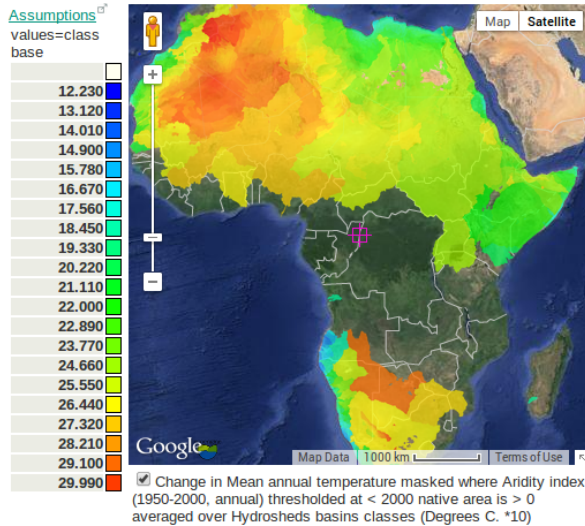
(d) Arid **populations >10 p/km<sup>2</sup>** [142M people **0.92M km<sup>2</sup>**], red=less arid, blue=more arid



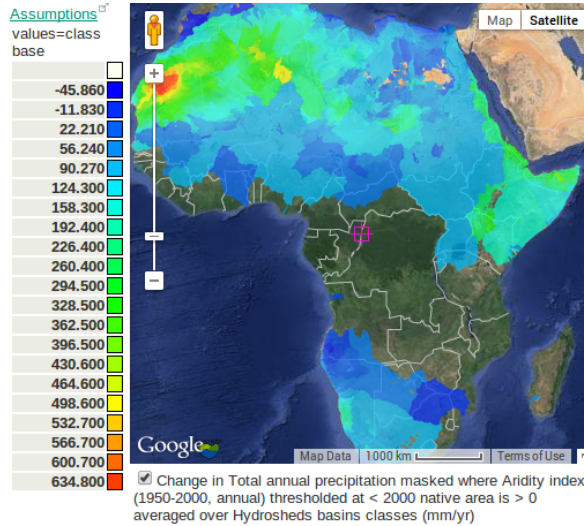
Very little nexus activity except water capture in hyper-arid areas. Significant activity in climatically arid but hydrologically humid areas (eg Nile). >100M people dependent on nexus in African drylands

# Climate change in Africa's drylands

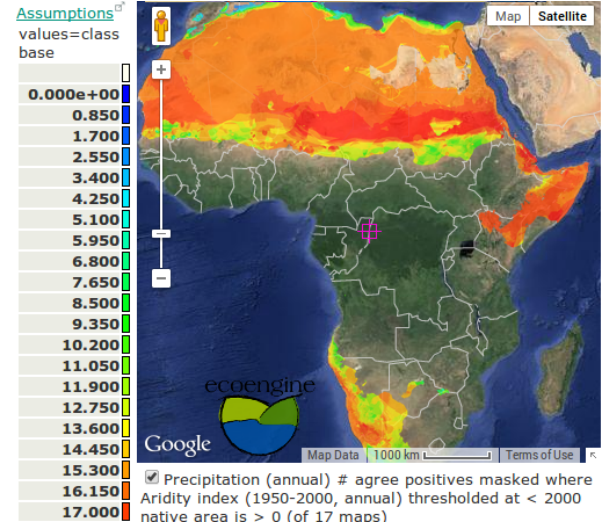
(a) Change in mean annual temperature, by basin



(b) Change in annual total precipitation, by basin



(c) Drylands: # GCMs (17) agreeing wetting A2a. All agree warming, everywhere.



Five GCM ensemble mean. Warming greatest in 'North Interior' and 'South Interior' basins. Significant increases in rainfall throughout but especially 'North Interior' and 'North-east Coast'. Only +62 mm/yr required to offset extra evaporative load of warming.

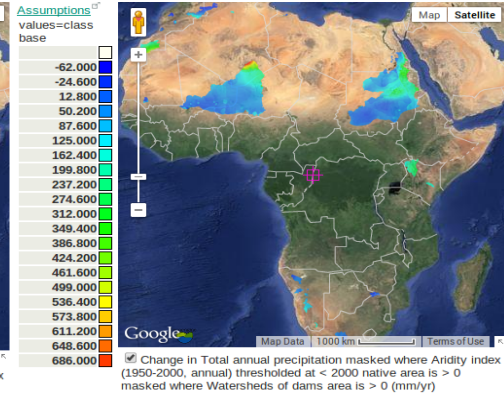
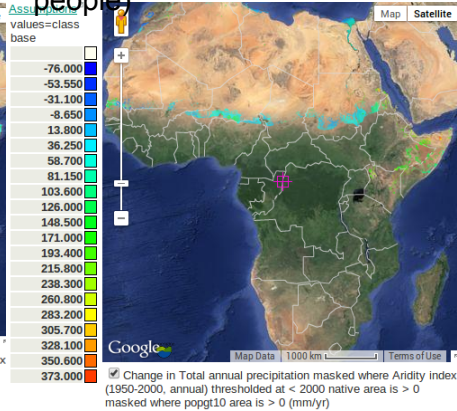
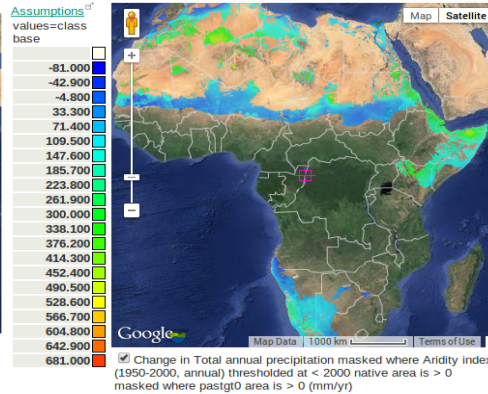
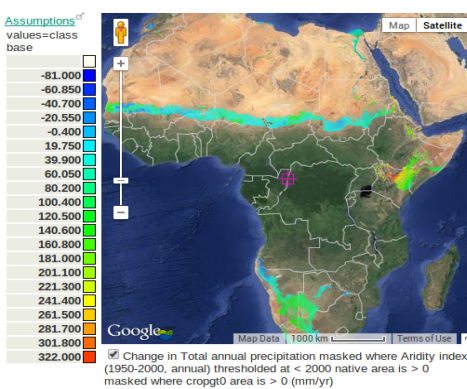
# Projected rainfall change in Africa's drylands

agriculture (mean change: +59mm/yr +ve: 90%; -ve: 9%)

rangelands (mean change: +100 mm/yr +ve: 95%; -ve: 5%)

populated areas (mean change: +67 mm/yr +ve: 91%, 110M people; -ve: 9%, 17 M people)

watersheds of dams (mean change: +81 mm/yr +ve: 95%; -ve: 5%)

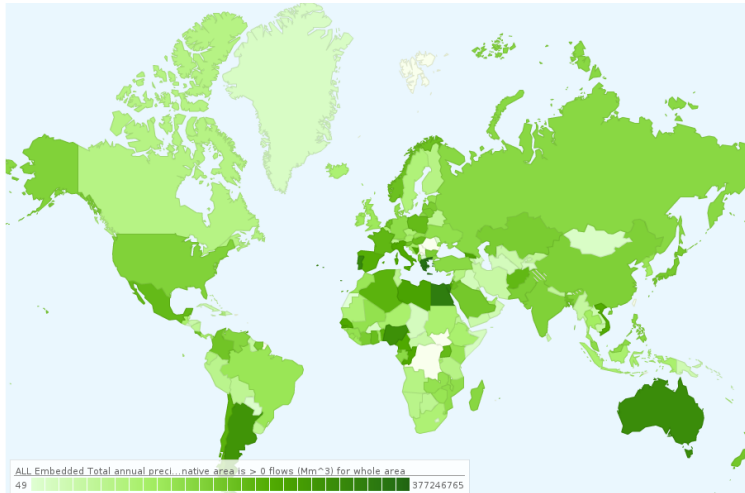


Drylands get wetter. 90% of dryland croplands, 95% of drylands rangelands, 901% of dryland populated areas, 81% of dryland dam watersheds are projected to have at least enough rainfall to offset greater ET under warming.

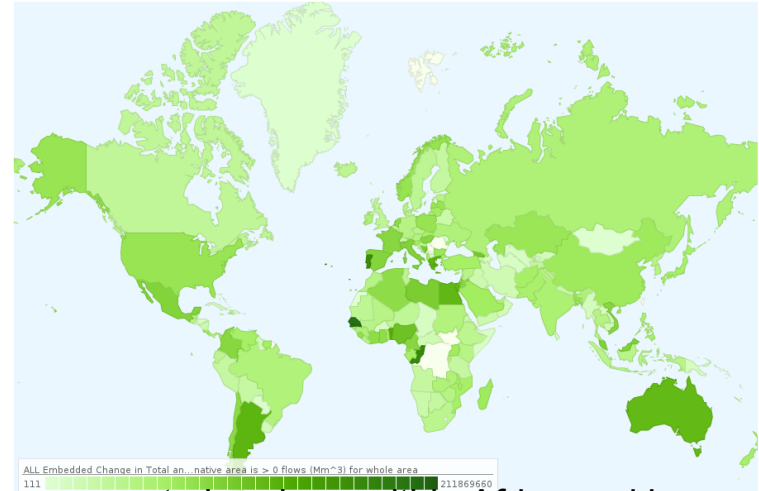


# The beneficiaries of rainfall in Africa's drylands, now and in 2050

Baseline supporting rainfall flows from dryland Africa for all commodities [total: 24,646,290,049 Mm<sup>3</sup> for 2007-2011]



Change in supporting rainfall flows from dryland Africa for all commodities [total: +9,876,102,110 Mm<sup>3</sup>, +40%]



Rainfall in dryland Africa supports significant food-water-energy export elsewhere within Africa and beyond. Climate change in Africa's drylands could (with the right investment) expand this export potential by 40%. This could make Africa a bright-spot for global food security, **but do we really know what the future climate holds (rainfall, CO<sub>2</sub> fert., land degradation) ?** Contradicts the massive over-reporting of pessimistic impacts of climate change.

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Thank you

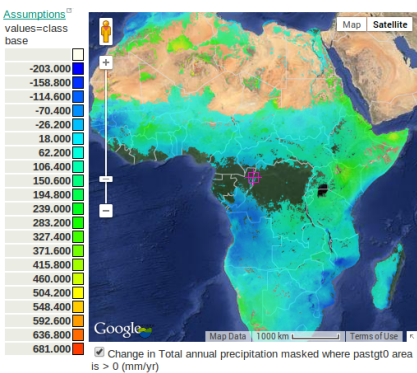
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[www.policysupport.org/waterworld](http://www.policysupport.org/waterworld)

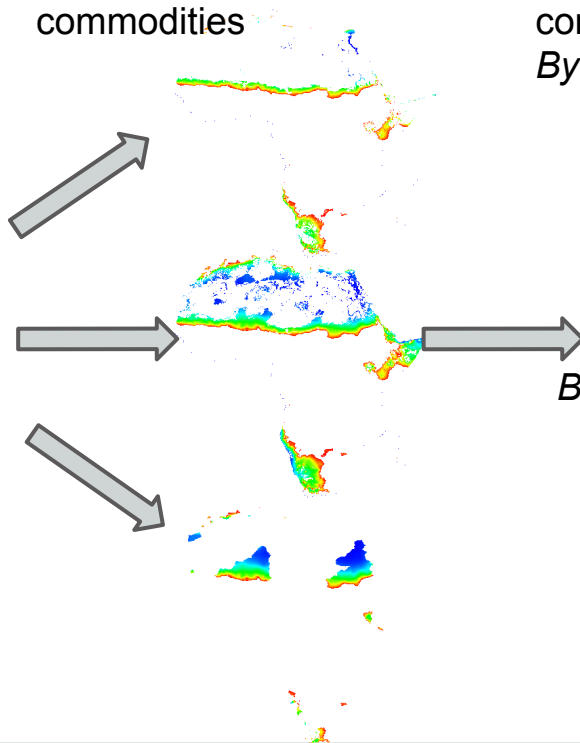
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# [Method]

Rainfall and rainfall change to 2050s



Land uses associated with commodities



Country level exports of commodities.  
*By commodity:*

	2007 to 2011	Map all	Map +ve	Map -ve
Food products n.e.c.	1,300,000,000	Map Food products n.e.c. <sup>17</sup>	Map Food products n.e.c. <sup>17</sup>	no records
Dairy products	1,100,000,000	Map Dairy products. <sup>17</sup>	Map Dairy products. <sup>17</sup>	no records
Animal products n.e.c.	1,100,000,000	Map Animal products n.e.c. <sup>17</sup>	Map Animal products n.e.c. <sup>17</sup>	no records
Meat products n.e.c.	1,100,000,000	Map Meat products n.e.c. <sup>17</sup>	Map Meat products n.e.c. <sup>17</sup>	no records
Bovine cattle, sheep and goats, horses	920,000,000	Map Bovine cattle, sheep and goats, horses. <sup>17</sup>	Map Bovine cattle, sheep and goats, horses. <sup>17</sup>	no records
Bovine meat prods	910,000,000	Map Bovine meat prods. <sup>17</sup>	Map Bovine meat prods. <sup>17</sup>	no records

*By beneficiary:*

	2007 to 2011
Greece	380,000,000
Egypt, Arab Rep.	350,000,000
Portugal	330,000,000
Australia	320,000,000
Nigeria	310,000,000
Argentina	300,000,000
Libya	270,000,000
Georgia	260,000,000
Bosnia and Herzegovina	260,000,000
Senegal	260,000,000
Congo, Rep.	250,000,000
Italy	250,000,000
Cameroon	250,000,000
Israel	250,000,000
Vietnam	250,000,000
Spain	240,000,000
Trinidad and Tobago	240,000,000
Benin	240,000,000
Seychelles	240,000,000
Chile	240,000,000
Algeria	230,000,000
France	230,000,000
Algerian	220,000,000
Uganda	220,000,000

Supporting rainfall 'flows'

