The Human Security Index
& National and Global Climate Assessments
How to improve the comparability of County-level Weather-Climate & Societal Indicators?

David Hastings, NOAA National Climatic Data Center: *David.Hastings@noaa.gov*

➔ Background: Weather & Climate & Societal Security

– The issue for this talk:

===>***How to better characterize situations for decisionmakers?***<===

➔ Some sample applications

– Vulnerability to climate change - forecasting adaptation assistance

– USGCRP National Climate Assessment

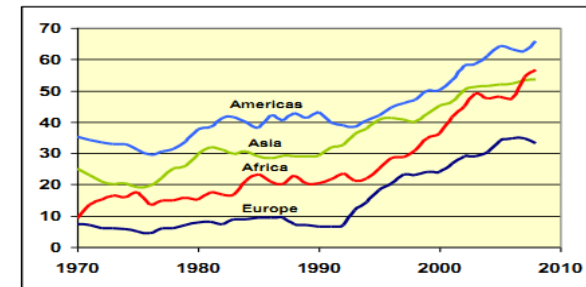– USDA Natural Amenities Scale

– Human Security Index

➔ A challenge/opportunity for the met-climate community?

- Details below

Vulnerability to Climate Change
# Implications for Adaptation Assistance

David Wheeler, Center for Global Development Jan 2011   dwheeler@cgdev.org

* Five-year moving average
Data source: EM-DAT (2010)

-Estimates vulnerability to floods, drought, winds, heat, & wildfires.

-Converted to $$$ needed to adapt to damaging impacts.

-The USA is now dependent on food imports (for our consumption) and food exports (to reduce our longstanding trade deficit).

- Will we be impacted by more (number or severity of) disasters?

- Much of the rest of the world will have food productivity impacted. Will we be impacted by such instability elsewhere? How much $ will they/we need to adapt?

-Uses EM-DAT (Univ. Catholique du Luvain: records human losses from env. Disasters in 232 countries since 1900).
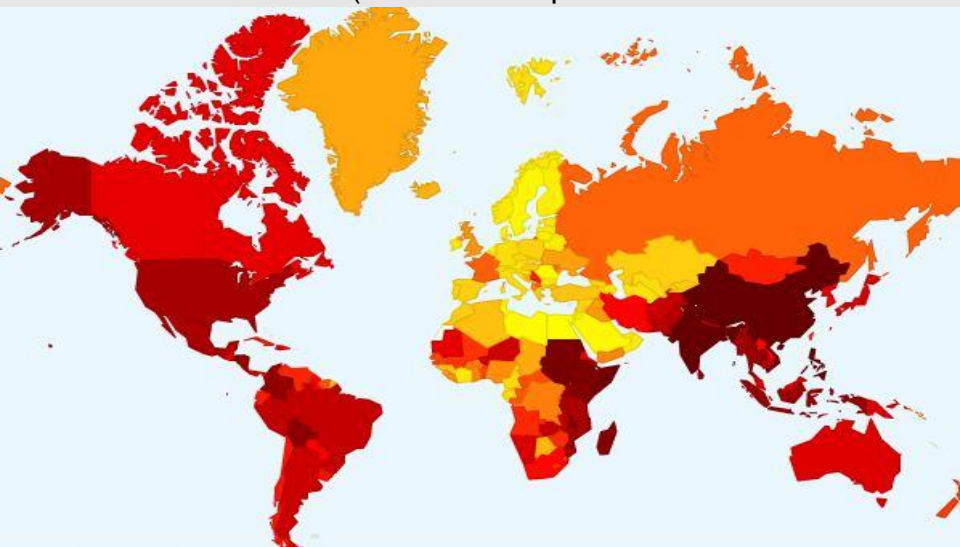
Rank 1 ▮▮▮▮▮▮▮▮ 169 **Extreme Weather Direct Risks:** Physical Climate Impacts
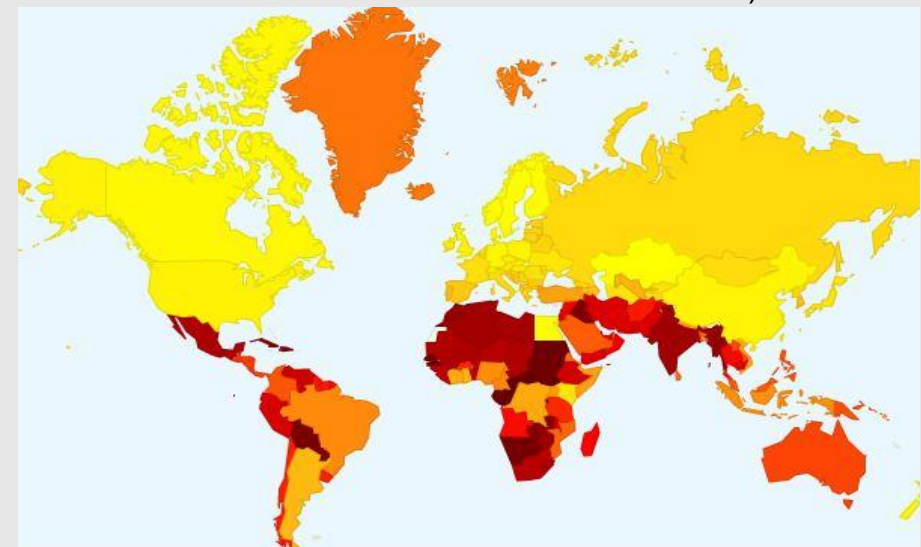
Rank 1 ▮▮▮▮▮▮▮▮ 169 **Agricultural Productivity Loss Direct Risks:** Physical Climate Impacts

National Climate Assessment => for 2013 release?
## Societal Indicators 4/2011 Workshop Draft Report

⚔   "Indicators developed or selected by the NCA should motivate the audience to notice and pay attention, believe the information, and do something about it."

⚔   "Indicators developed or selected by the NCA should reflect both negative and positive aspects of climate (i.e., impacts and opportunities, vulnerabilities and resiliencies)."

⚔   "NCA should engage stakeholders early and often in a 2-way conversation, remembering that not all stakeholders are the same."

⚔   "The indicators developed or selected by the NCA should be evaluated and adaptively managed to allow for changes over time."

⚔   *[Comments above are on societal indicators. Climate and societal indicators need to be synergistic (author's own view).]*

The Natural Amenities Scale
David McGranahan, USDA Economic Research Service, 1999-

⚐ What natural conditions may impact population loss or gain in rural counties?

⚐ Scaled Jan & July mean temp; Jan sunshine; July humidity; terrain and surface water. Climate data are for 1941-1970 (Area Resource File).

⚐ An experiment: adjust the weighting after additional thinking:

- Original NaturalAmenityScale: the lower the humidity, the better. Warmer Jan. temps., & lower July-Jan temp differences are considered better.

- Revised NAS: humidity ~40% is best. Drier & more humid less desirable. July avg. temps ~12C good for tourism?, perhaps not so good for residents?

- Map on the left = original USDA scaling. Map on the right = after rescaling.

⚐ What other county climate indicators should be used to characterize well-being? How to scale them? Who will make & review them?
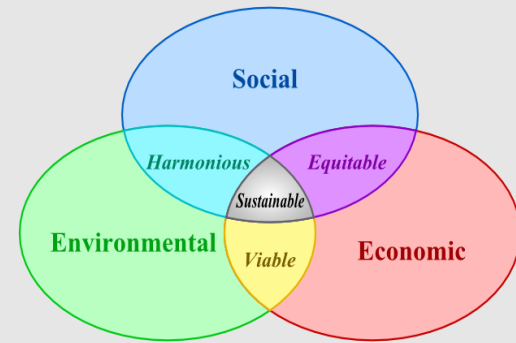

Natural Amenities Scale: Orig.
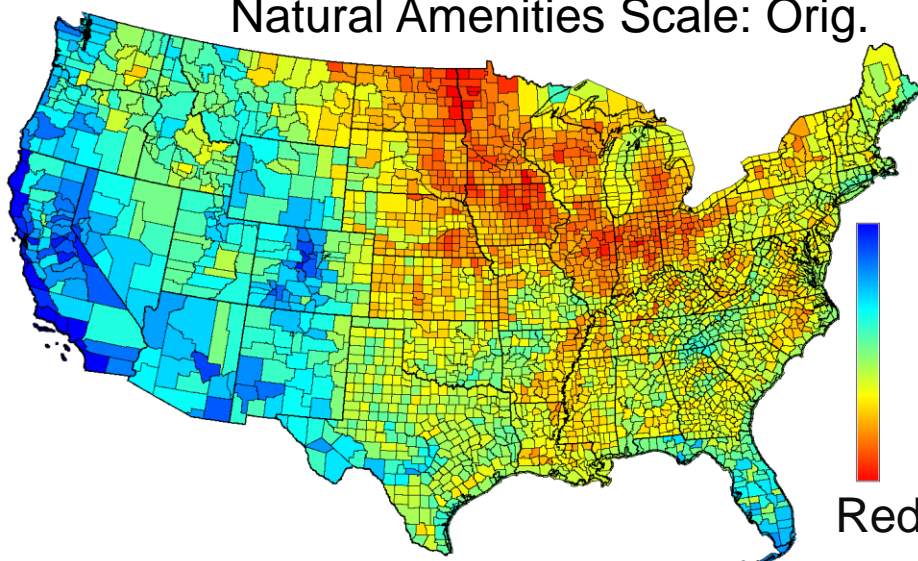

Natural Amenities Scale: Rescaled
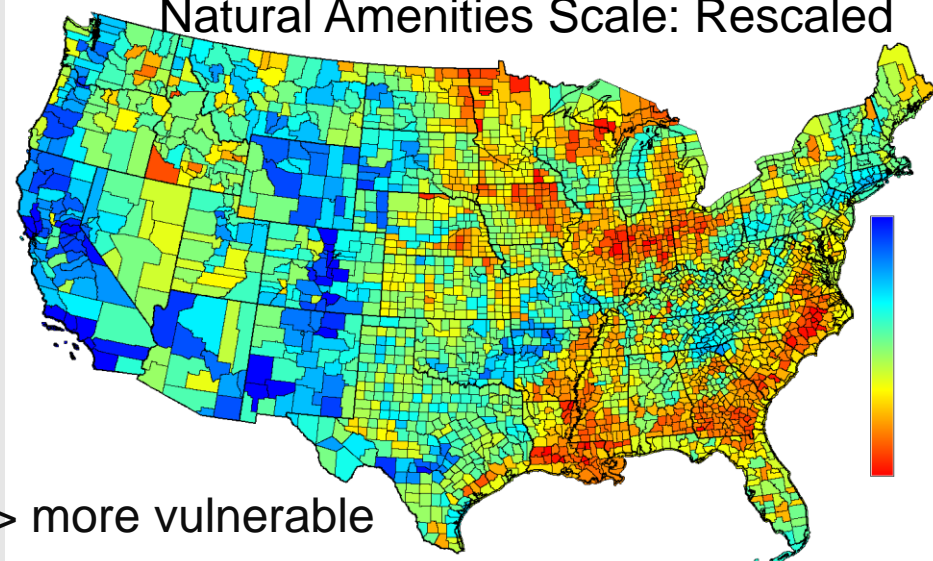
Red => more vulnerable

Human Security Index

- Global HSI released 2008; v2 in 2010.
  - USA ranks #11 of 232 in GDP per capita.
  - USA ranks #147 of 232 in human security => vulnerable
- HSI USA in prototype. Many upbeat and downbeat situations.
- Compare the HSI to "quality of life" or "well-being" indices.
  - Typical "quality of life indexes" tend to focus on the middle class & above
  - This focuses on all people (e.g. ~twice as many people).
  - The HSI looks at economic, environmental, and social aspects.
- Applications include
  - Supporting tools for strategy, development, and decision-support.
  - Can we design better services when we can see who's (not) doing well?
  - Can crisis response be in better context? Can we avoid future "Katrinas"?
  - The next National Climate Assessment is sensitized to the potential links between climate and well-being/vulnerability.
    - How to craft better climate indicators, to better perceive societal impacts?
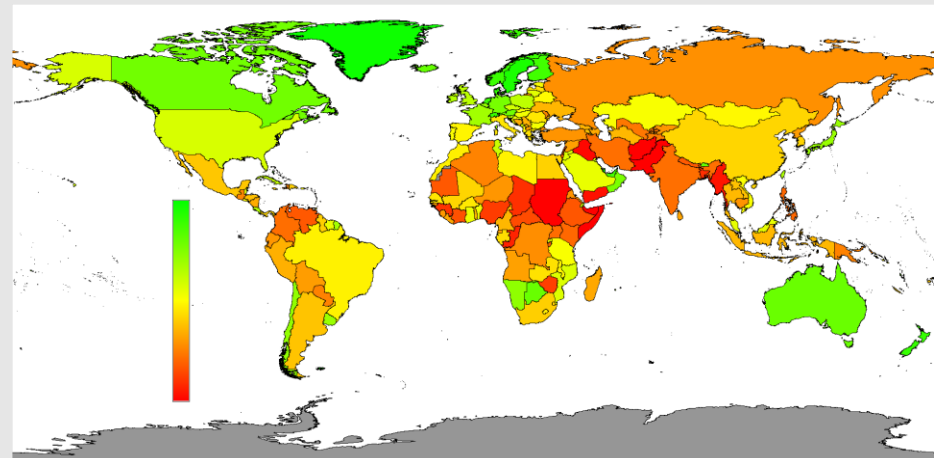   - How to craft better societal indicators, for comparing with climate, etc.?
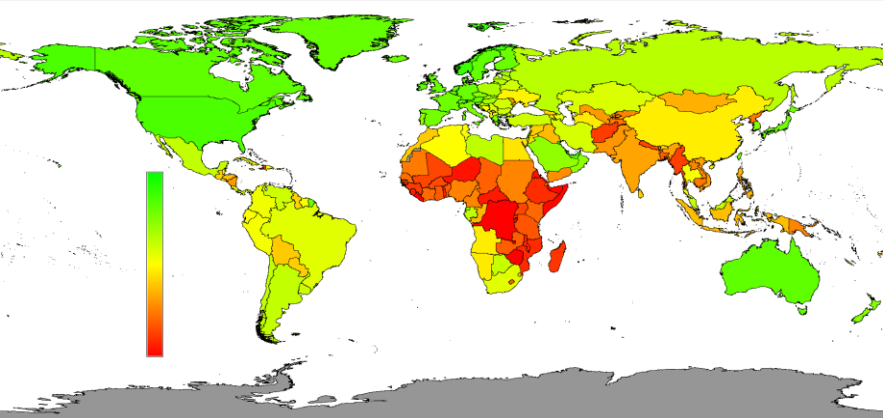
Economic Fabric
<= Income (GDP per capita at PPP)
[sources: IMF, World Bank, CIA, UNDP]
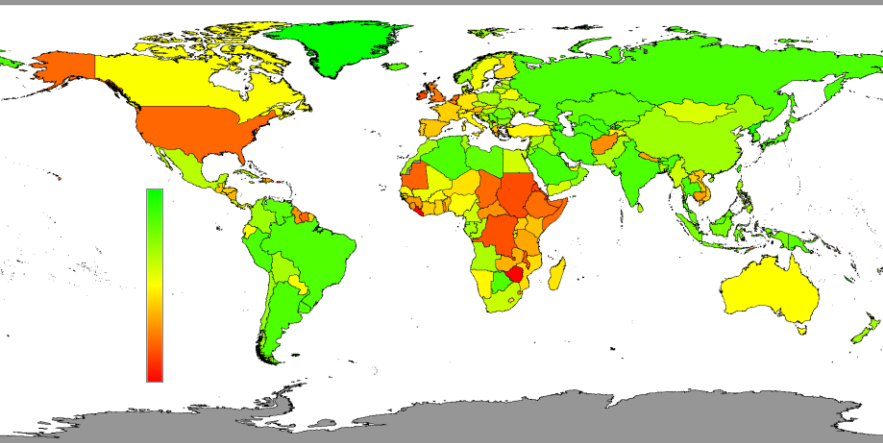
<= Economic/Financial Governance (trade balance, etc.) [sources: World Bank, etc.]
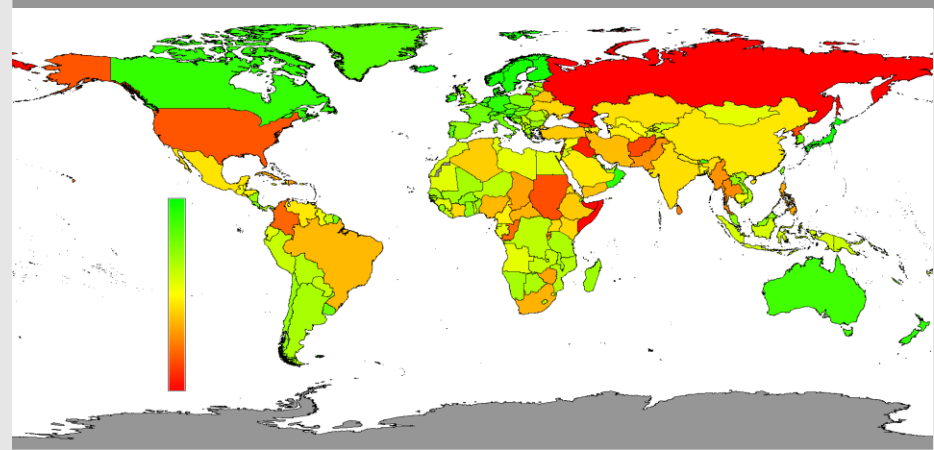
Social Fabric
Governance (stability, corruption) [sources
World Bank, World Economic Forum]

=>

Peacefulness at home and abroad (Global
Peace Index, World Prison Brief, Political Terror
Scale)   [sources: VisionOfHumanity, Kings
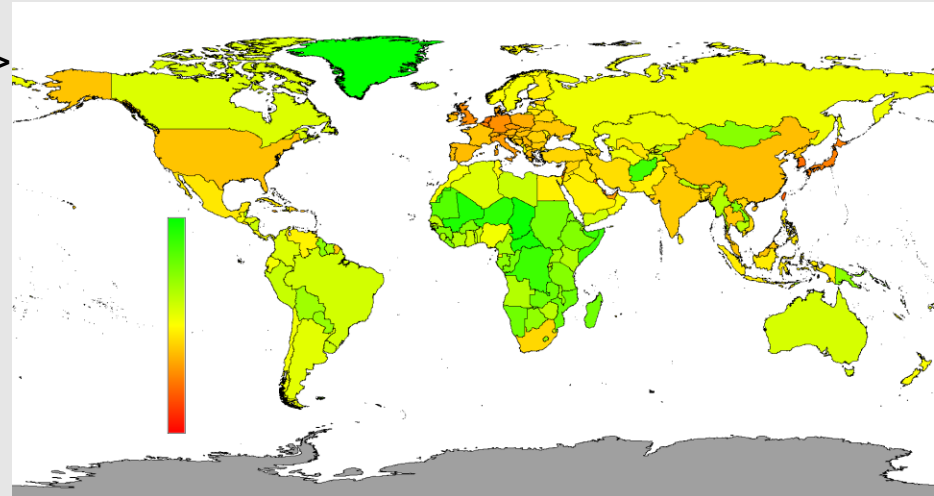College London, UNC-Asheville]

=>

Environmental Fabric

<= Environmental Vulnerability Index – _vulnerability to environmental disasters_ (SOPAC-UNEP)
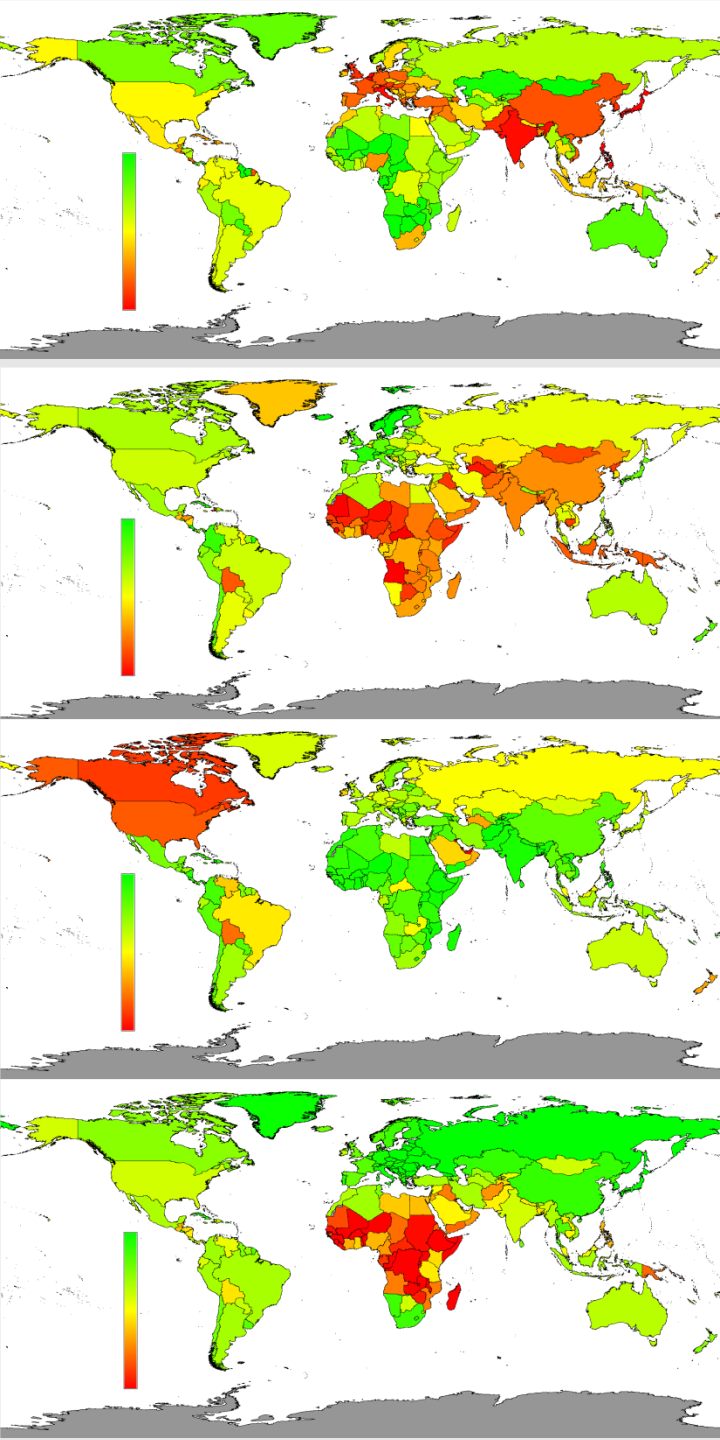
<= Environmental Performance Index – _delivery of environmental health & other outcomes_ (Yale-CIESIN)

<= Greenhouse Gas Emissions Per Capita (WRI – IPCC)
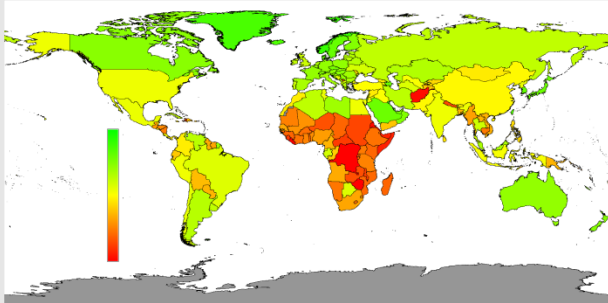
CO_2/area=>
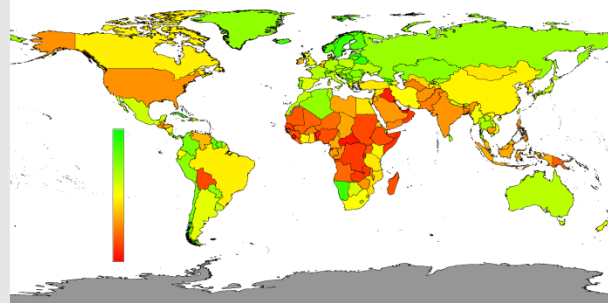
<= Population change rate (Census & UN Pop Div)

Global Human Security Index Version 2

Economic Fabric Index

Environmental Fabric Index

Social Fabric Index

Human Security Index

More resilient

USA=middle

More resilient

More vulnerable

More resilient?

More resilient
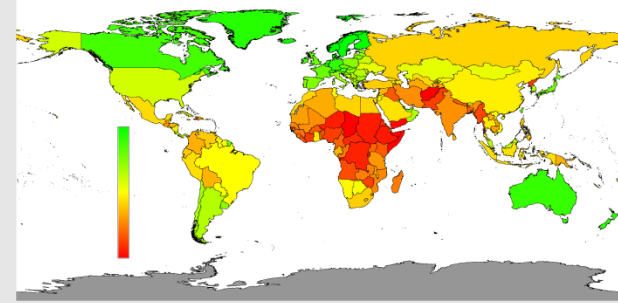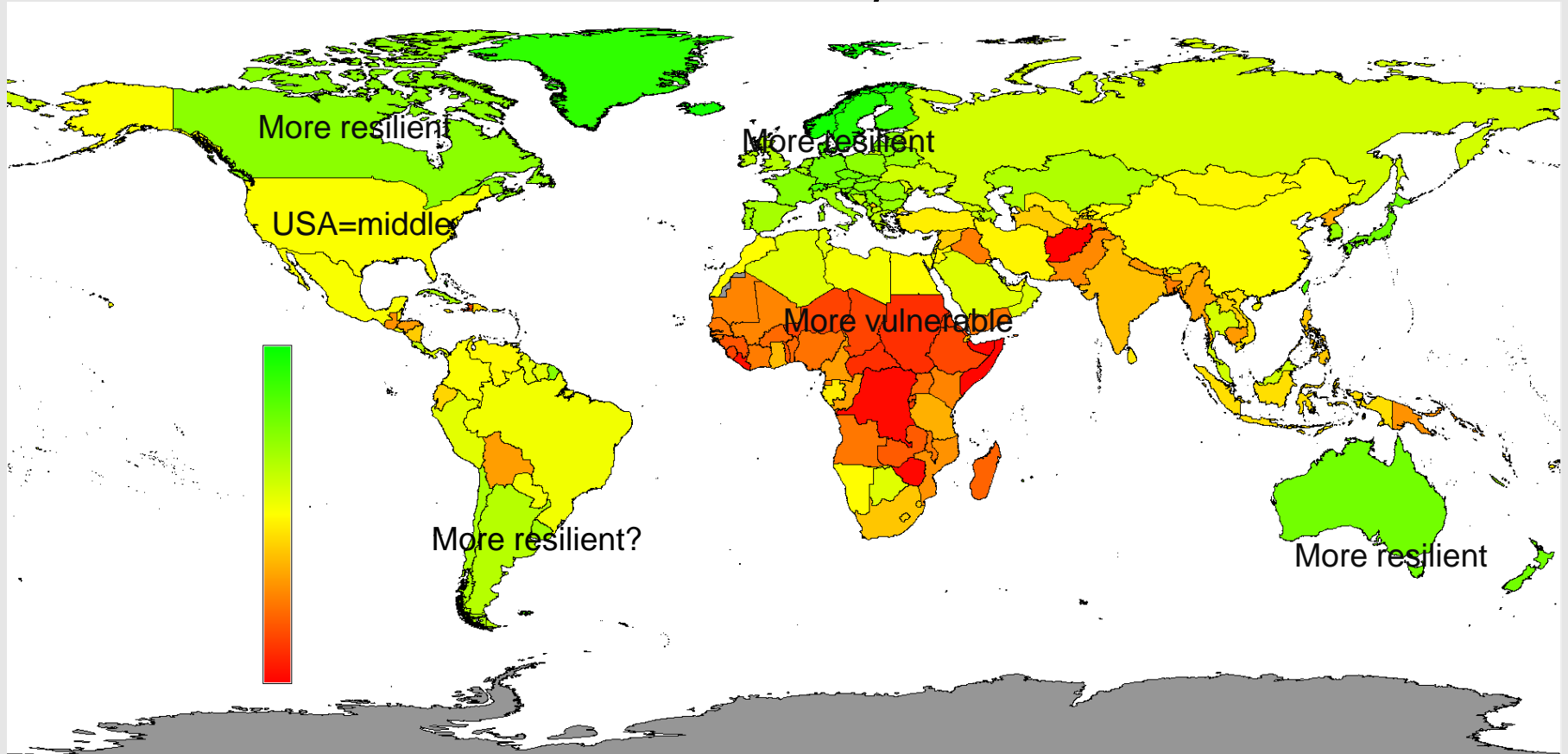
| Human Security Index USA Version 0.1: ~35 input data sets			
Input fields	**{source}**	**Components**	**Index**
Poverty	{Census SAIPE 2008}		
Unemployment (~U3)	{BLS LAU 2010}		
Median Household Income, C.O.L[1]. adjusted {Census ACS 2008} C.O.L derived from HUD rent values and CityData C.O.L postings		**Economic Fabric Index**	
Inequality (Gini Coefficient)	{Burkey NCAT.edu after Census}		
% of population on "food stamps"	{USDA – New York Times}		
Particulate days > EPA threshold	{HHS}		
Ozone days > EPA threshold	{HHS}		
CO_2 emissions	{VULCAN project Purdue.edu}	**Environmental Fabric Index**	
Natural Amenity Index	{modified from USDA ERS}		
Population change 2000-2009	{derived from Census data}		
High School diploma %	{Census}		
Some college incl. Associates Degree %	{Census}		
Undergrad degree+ %	{Census}	*Education subcomponent* **Social Fabric Index**	
Adult Literacy (below BPLS)	{DoEd NCES}		
% 5+ y.o. less than good English	{Census 2000}		
M&F Life Expectancy at Birth	{Murray et al HHS mortality data}		
Lesser of F or M LE change 1999-1983	{Ezzati et al PLoS Medicine}		
YPLL premature death rate	{HHS}		
% obesity	{HHS}		
Motor vehicle mortality rate	{HHS}	*Health subcomponent* **Social Fabric Index**	
Chlamydia rate	{HHS}		
Adult uninsured	{Census SAHIE}		
Adult insured (<200% of poverty level)	{Census SAHIE}		
Healthy food access index	{HHS}		
Violent crimes per 10000 population	{Census}		
Property crimes per 10000 population	{Census}	*Crime & Punishment subcomponent* **Social Fabric Index**	
Incarceration	{BJS & Census}		
Child poverty rate	{USDA ERS}		
Mentally unhealthy days	{HHS}		
Teen birth rate	{HHS}		
Mortgage foreclosure rate	{HUD}		
Housing vacancy rate (excl. vacation/seasonal vacancies)	{Census}	*"Social Stress" subcomponent* **Social Fabric Index**	
"Inadequate social support" %	{HHS}		
Grandparent performing parental role %	{Census 2000}		
"Creative Class" %	{USDA ERS}		
Commute Index (%DriveAlone*CommuteTime)	{derived fr Census}		

Human Security Index
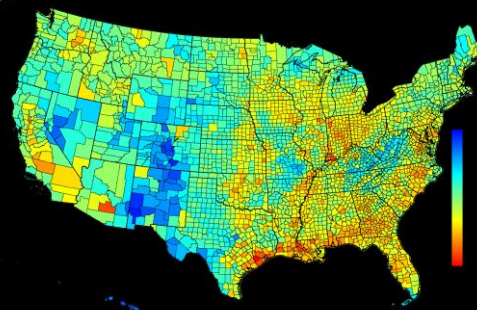
HSI_USA

Prototype

>30

inputs

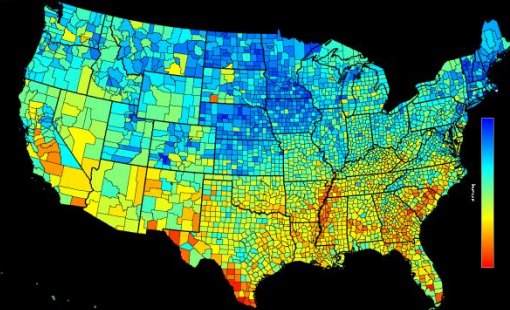# (Draft) Human Security Index USA Version 0.3
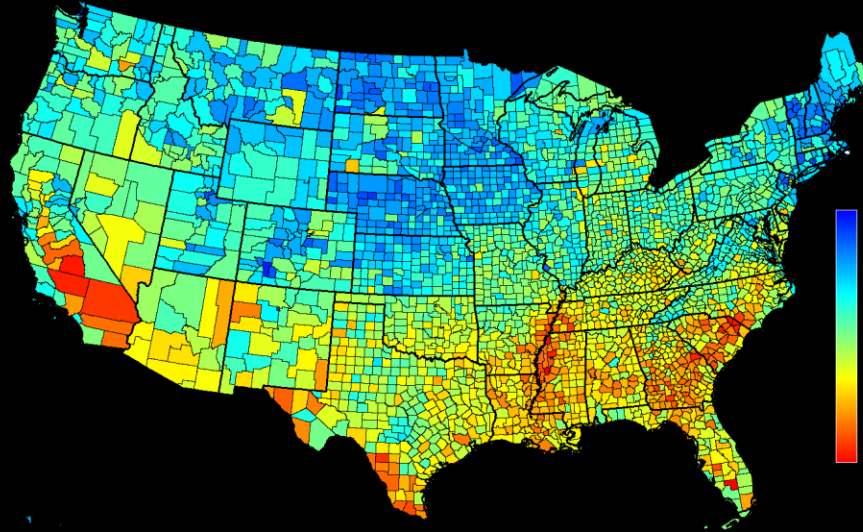

Economic Fabric Index
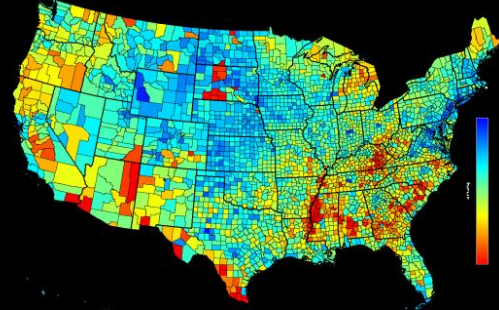
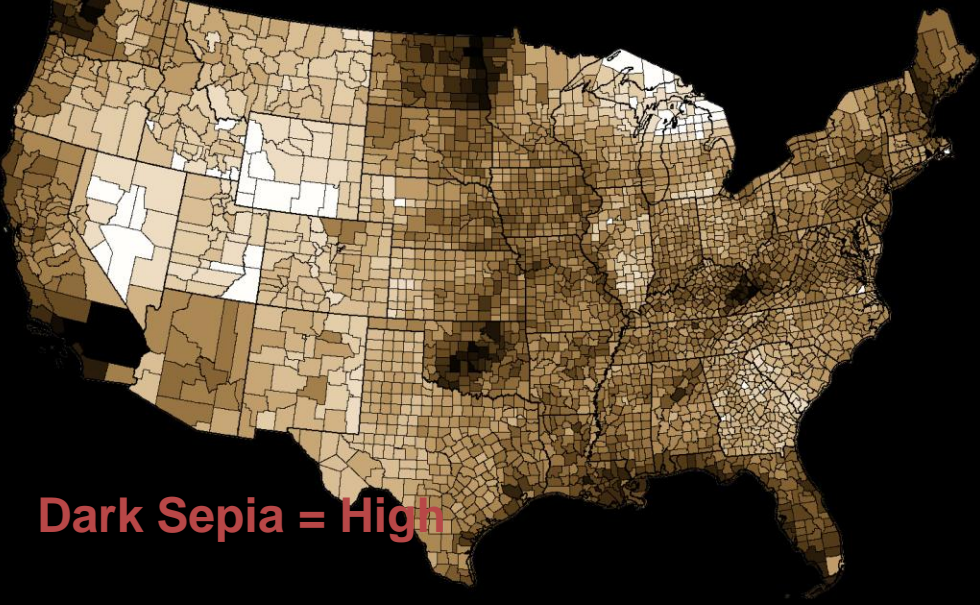Environmental Fabric Index

Social Fabric Index
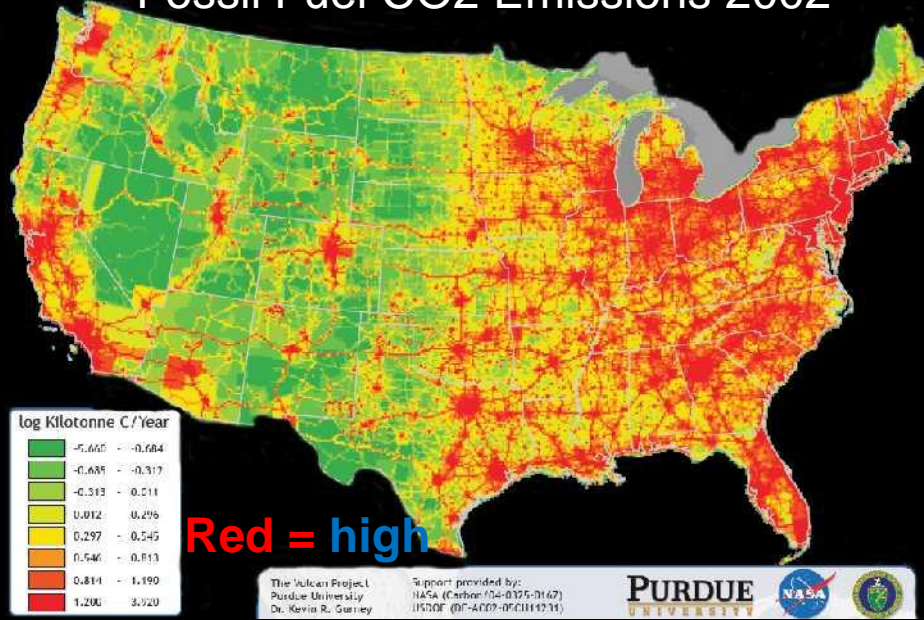
Composite Human Security Index

Sample "community-level" indicators on Human **Environmental** Security

Presidential Disaster Declarations 1965-2011

Dark Sepia = High

Fossil Fuel CO2 Emissions 2002

log Kilotonne C/Year

-5.660 - -0.684
-0.685 - -0.317
-0.313 - 0.011
0.012 - 0.296
0.297 - 0.545
0.546 - 0.813
0.814 - 1.190
1.200 - 3.020

Red = high

The Vulcan Project
Purdue University
Dr. Kevin R. Gurney

Support provided by:
NASA (Carbon/04-0325-0167)
USDOE (DE-AC02-05CH11231)

PURDUE UNIVERSITY NASA

USDA Desertification Risk
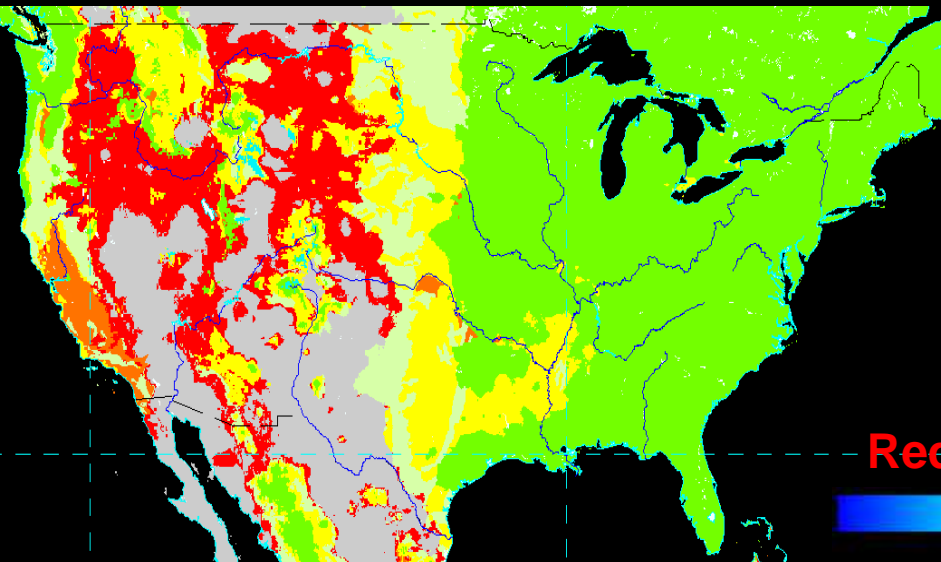
Prototype Disaster Vulnerability Index

Red = high

A quick review: where are we in this talk?

➔ Background: Weather & Climate & Societal Security?
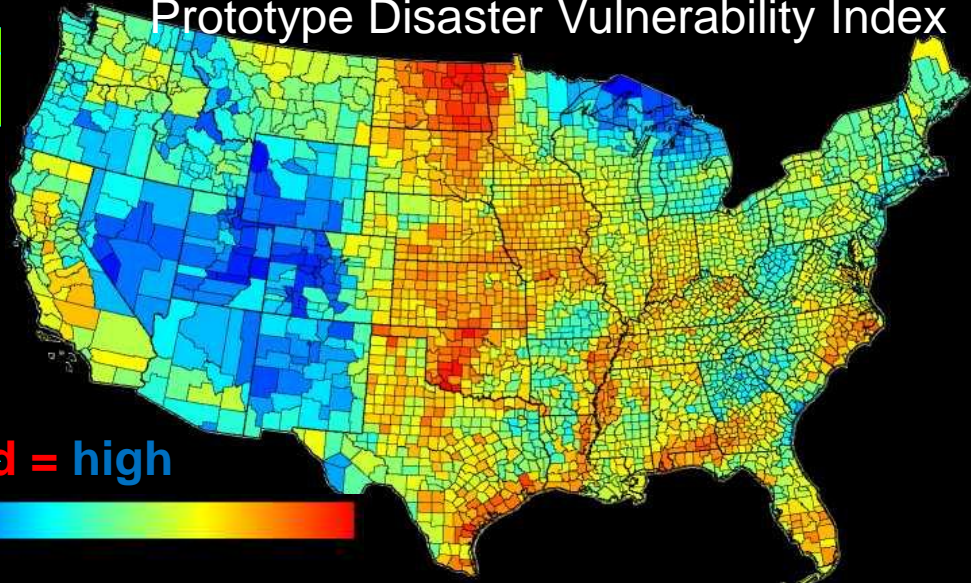
Reviewed

➔ Sample applications

Reviewed..

Next & last for this talk:

➔ A challenge/opportunity for the met-climate community?

*Are current met & climate stats too instrument & phenomenon-oriented? What about mapping stats to counties or census tracts (so decision-makers can be better guided to act)?*

What can improve National Climate Assessments, etc.?

What stats best influence current and future quality of life?

- *Means, or observed=>likely extremes?*
- *Which parameters => to county or more local levels?*

Example #1: How to characterize
hurricane impact on human security / well-being
(for county-federal decisionmakers)?
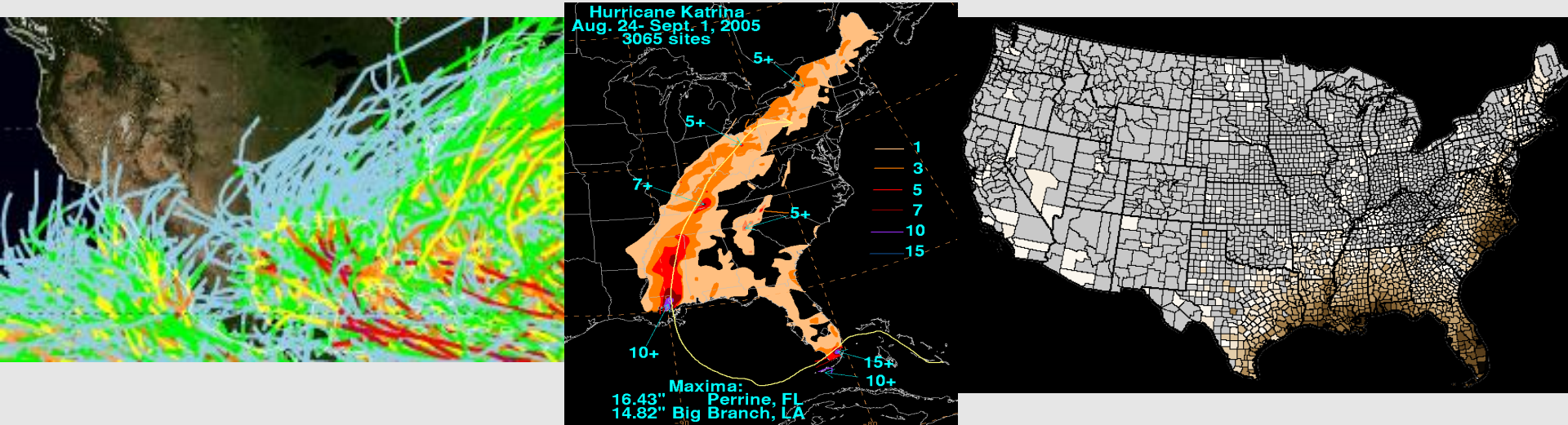
IBTrACS by county?   Precip to county?   USDA&FEMA impact?

By IBTrACS occurrences by county adjusted for Saffir-Simpson?

By summed precipitation (all mappable events) by county?

By events triggering FEMA or USDA assistance/indemnities?

Other?   (My provisional votes are underlined. What are yours?)

Example #2: How to characterize ***tornado*** impact on human security / well-being (for county-federal decisionmakers)?
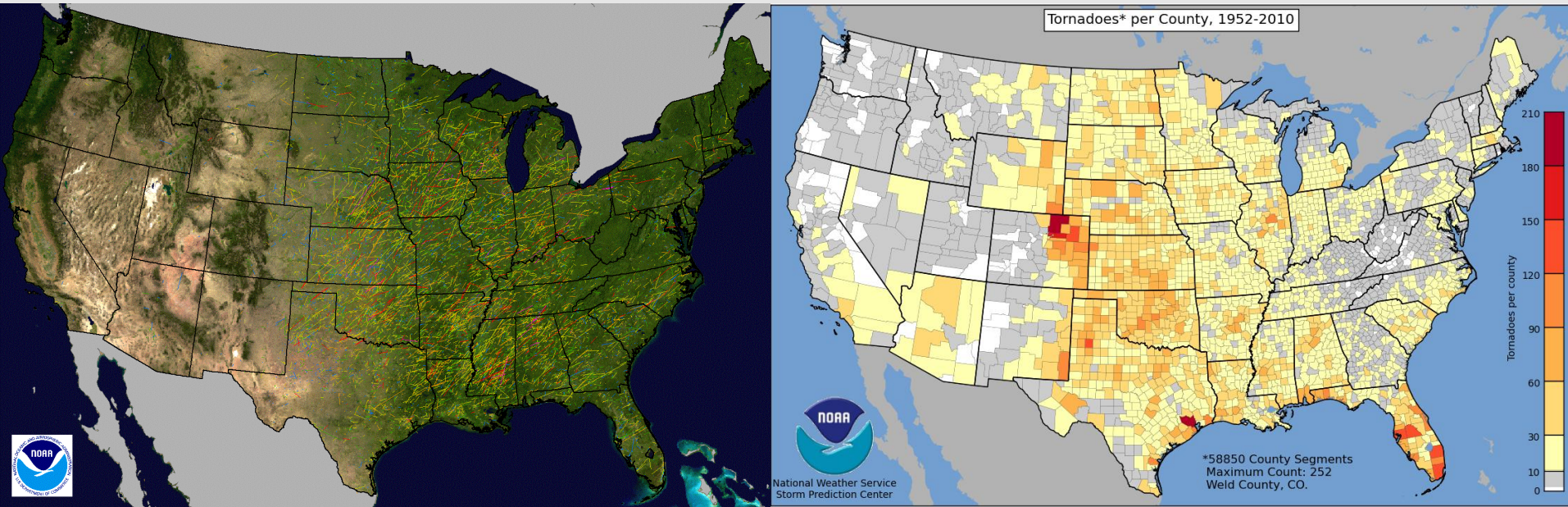
By tracks?   By occurrences by county?

By occurrences by county adjusted for EF strength?

By events triggering FEMA or USDA assistance/indemnities?

Other?   (My provisional votes are underlined. What are yours?)

What met-climate parameters to have?

- Max annual heating & cooling degree days?

- Max winds (derived from historical maxima for all comparable neighboring areas)?

- Max precipitation (from historical maxima for comparable neighboring areas)?

- Drought, water availability, land degradation & desertification?

- USDA (ag), FEMA (other) disaster damage?

- Solar & wind generation potential?

- What else? Interp. for community well-being vs. vulnerability?

  All of the above by decade & ENSO cycle? Past + forecast?

  All of the above adapted to the county level?

  Many of the above have been partially sketched as rasters (sometimes sampled to make contour maps) in the National Climate Atlas, for/by NREL (solar&wind), or in models.

  Extension to counties, past + forecast decades + ENSO cycle are challenges & opportunities?.

Conclusions

- How to improve the "on-target" perceptiveness of weather, climatic, and other environmental indicators – to visualize potential societal impacts?

- As societal data compilations improve, to the county or finer detail, how to do similarly with weather, climatic, and other environmental indicators?

- Needs include
    - National Climate Assessments.
    - Improved national to local (and corporate) planning.
    - Strengthening well-being. Mitigating vulnerabilities.

- There are few current "on-target" county level indicators.
    - *Hopefully, you will see opportunities in this arena.*
    - *Thank you!*   *david.hastings @noaa.gov*   *<= the author*
    - *Thank you!*   *stephen.a.delgreco @noaa.gov*   *<= myself*