Space and Security

with Scott Madry

- Security of our assets in Space?
- Security from our assets in Space?
- Assured access to Space for all nations?
- Enhanced security of people on Earth by using Space assets and our access to Space?
- Which is it?
- All?

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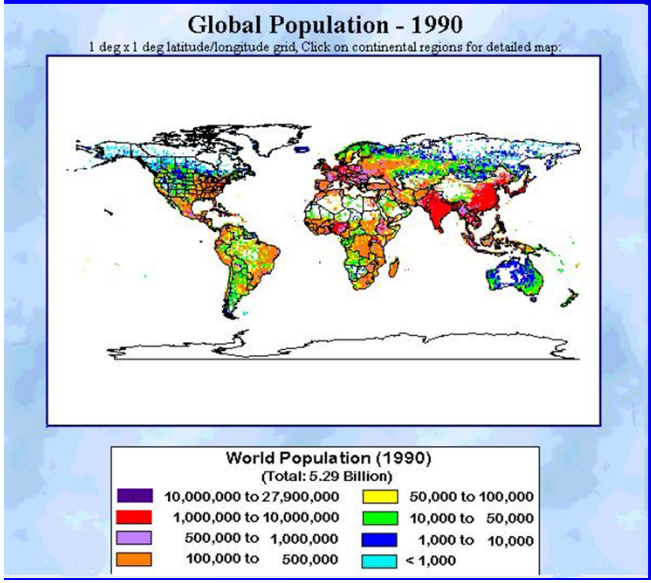
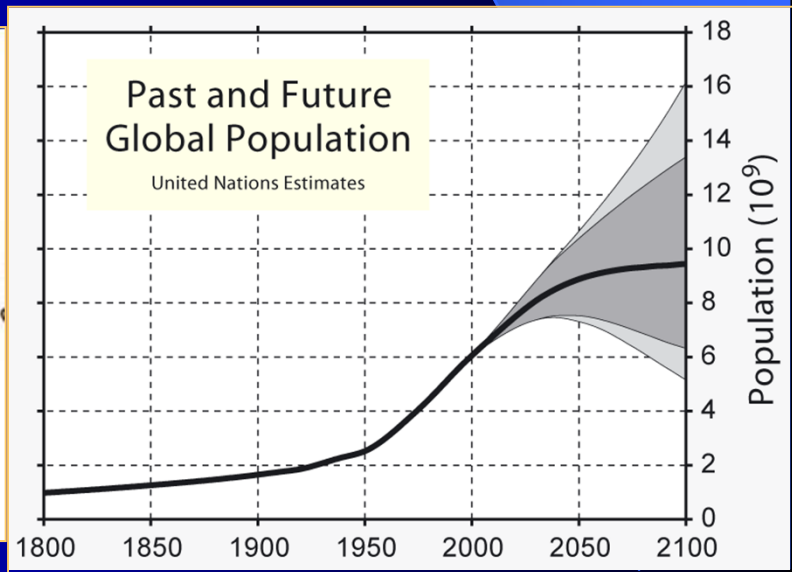
Whose Security?

- Nation states?
- International Aerospace corporations?
- Satellite operators?
- The rich and powerful economic and political interests?
- The people of the Earth?
- Individuals?
- Me?

Space and Whose Security

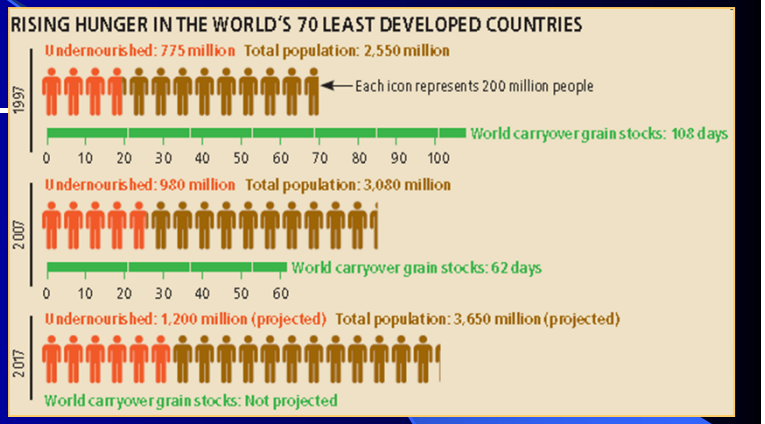
- 9 Billion people on Earth by 2050
  - This equals two additional Chinas
  - All need food and water, homes, jobs
  - How can Spaceship Earth support this?
  - Global political and security instability

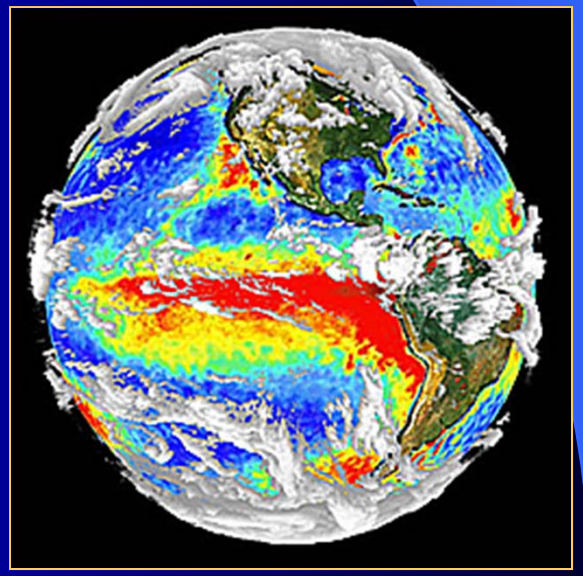




We Face a Possibly Perilous Future

- More disasters, both natural and man-made
- Unknown climate change
- Water resources will become more scare
- Ocean and marine resource crash
- Biodiversity loss
- Agricultural land loss
- Poverty and related diseases
- Lack of energy resources
- All can lead to global political instability and strife





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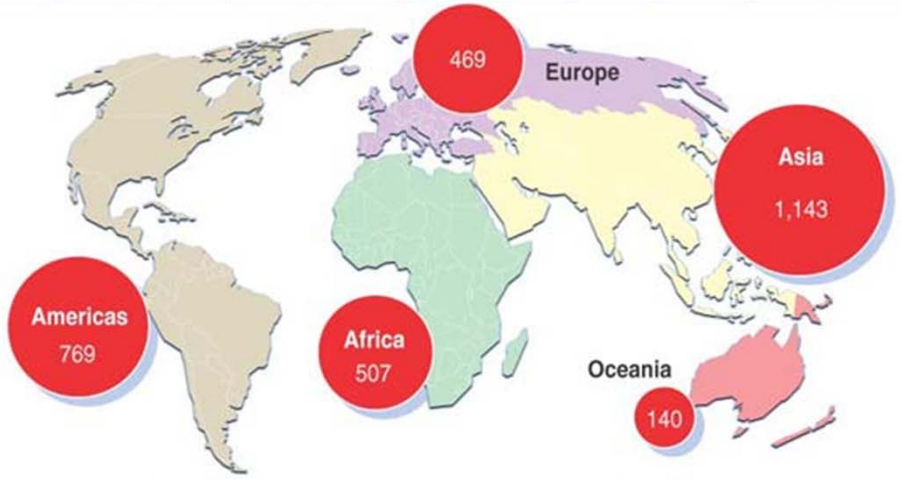
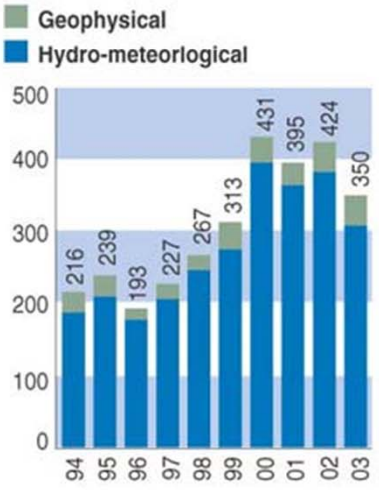
TYPES OF NATURAL DISASTER BY CONTINENT 1994-2003

Geophysical	Africa	Americas	Asia	Europe	Oceania
Earthquakes	11	47	145	45	9
Volcanoes	4	25	12	2	6
Hydro-meteorlogical					
Avalanches/landslides	12	42	105	19	8
Drought/famines	118	46	86	13	10
Extreme temperatures	7	32	45	61	4
Floods	269	256	411	195	29
Forest/scrub fires	13	66	22	46	11
Windstorms	70	277	307	87	61
Other	3	5	10	1	2

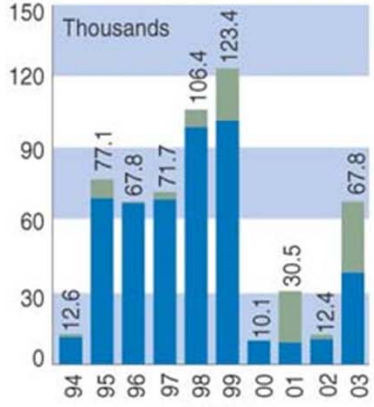
TOTAL NATURAL DISASTERS BY CONTINENT 1994-2003



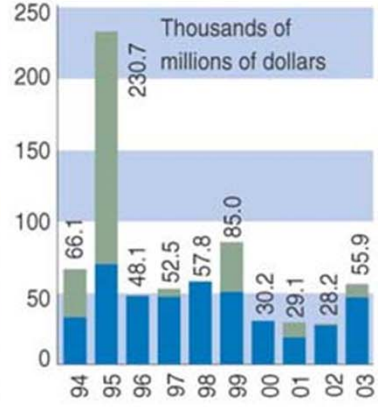
NUMBER OF NATURAL DISASTERS



NUMBER OF DEATHS IN NATURAL DISASTERS



COST OF NATURAL DISASTERS Estimated



Source: International Red Cross / Red Crescent

REUTERS

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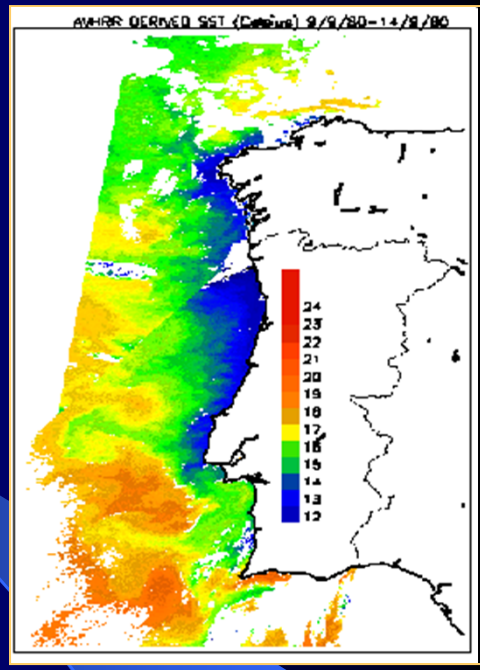
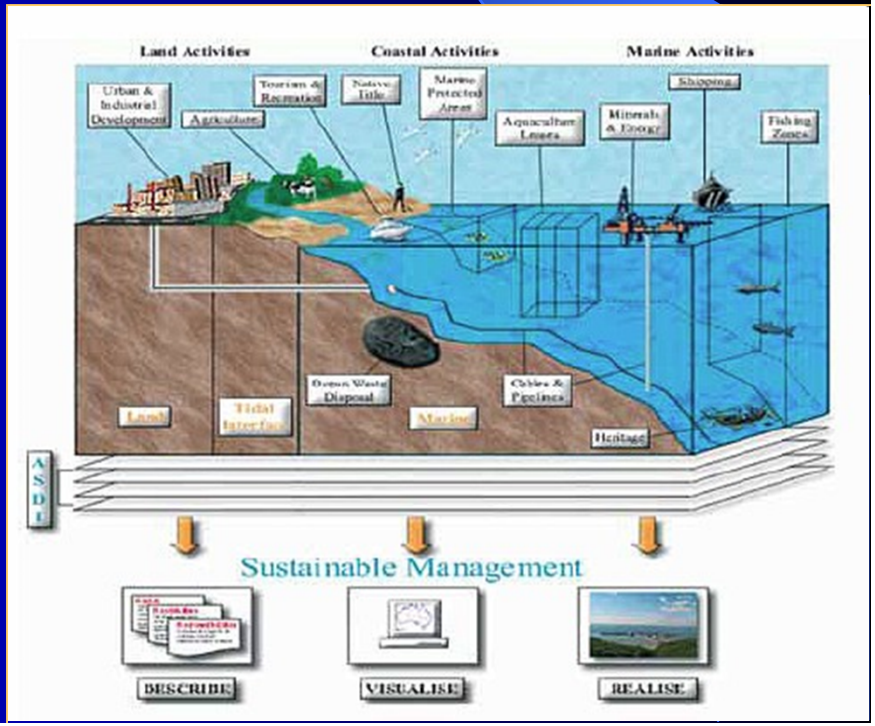
Changing Global Priorities

- Coastal zones will become more important
  - More than half the world's population lives within 60 km of the shoreline, and this could rise to 3/4 by the year 2020
  - More than 90% of natural disaster-related deaths occur in developing countries
  - 25% of Earth's biological productivity and an estimated 80-90% of global commercial fish catch is concentrated in coastal zones
  - Worldwide agricultural costs of El Niño US$450-$550M/year



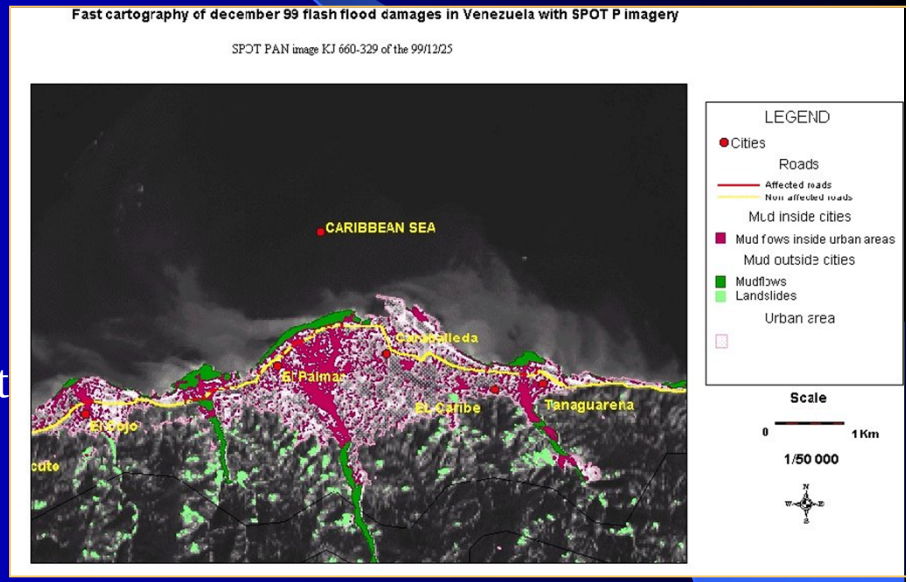


International Charter on Space and Disasters 1999

- To coordinate satellite data providers response to major disasters
- ESA, Argentina, Britain, Canada, China, Frnace, India, Japan and the United States
- Has been activated 175 times
- Timely delivery is still a problem, as is smaller disasters and limited budget
- http://www.disasterscharter.org/

Imagery used in several disasters

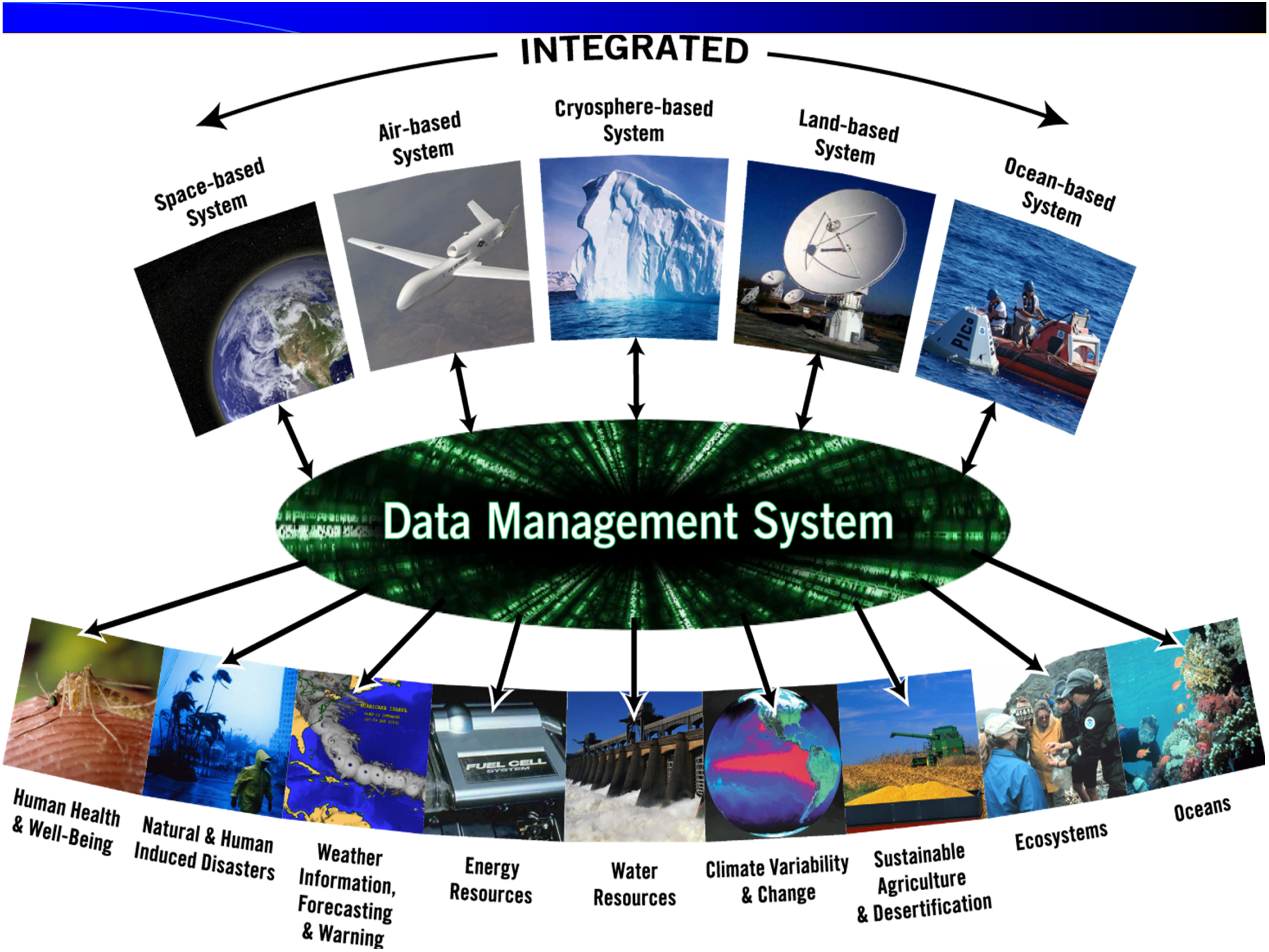
- Nevado Sabancaya volcano eruption, Peru (1988)
- Landslides in Colombia (1989)
- Mount Pinatubo volcano eruption, Philippines (1991)
- Aigion earthquake, Greece, (1995)
- Nyiragongo volcano eruption, Zaire (1994)
- Soufrière volcano eruption in Montserrat Island (1996-1998)
- Tsunami on north coast of Papua New-Guinea (August 1998)
- Izmit earthquake, Turkey (1999)
- Floods in SE of France (Nov. 1999)
- Hurricane and floods in Mozambique (February 2000)



http://earth.esa.int/applications/dm/GSP/venezuel.htm

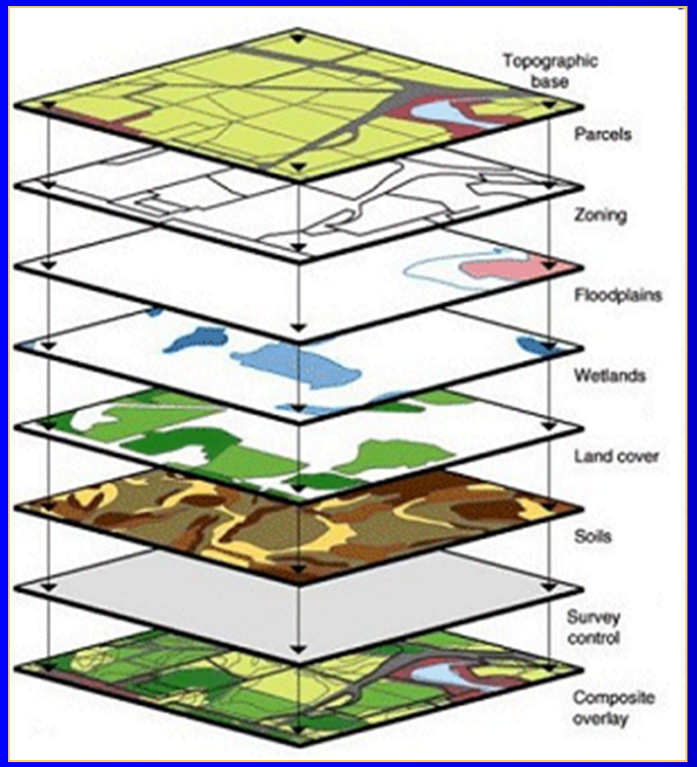
Reactive

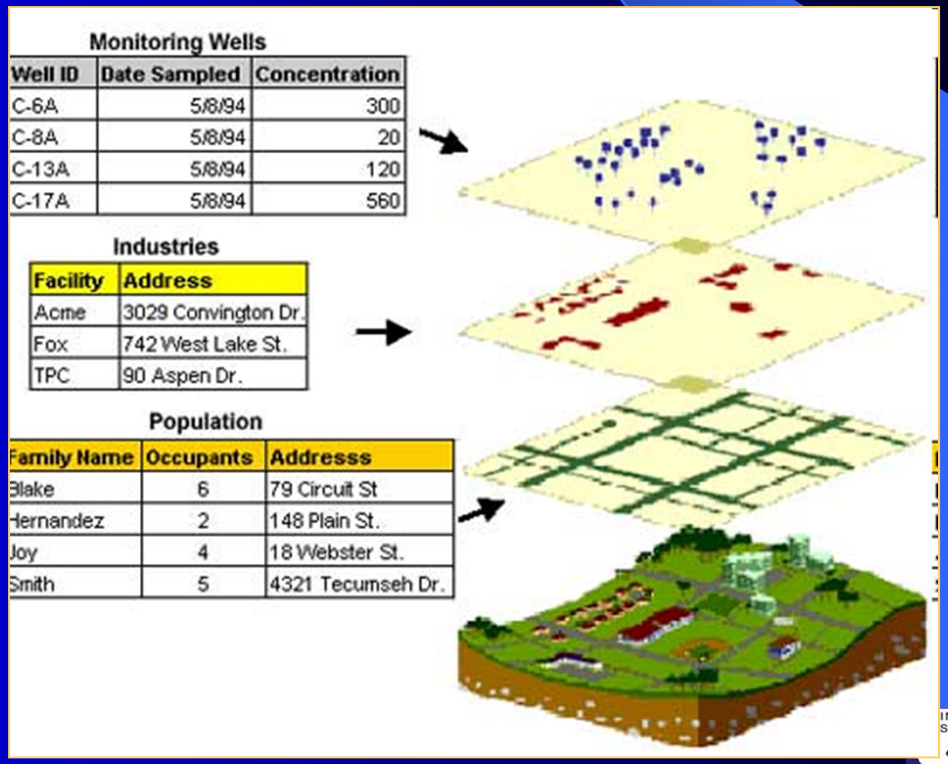
- We are reacting to specific, individual events
- Not addressing the root causes of the global issues that we face.


INTEGRATED
Space-based System
Air-based System
Cryosphere-based System
Land-based System
Ocean-based System
Data Management System
FUEL CELL
Human Health & Well-Being
Natural & Human Induced Disasters
Weather Information, Forecasting & Warning
Energy Resources
Water Resources
Climate Variability & Change
Sustainable Agriculture & Desertification
Ecosystems
Oceans

Geographic Information Systems

- GIS allows integration of remote sensing data and extraction of useful information





Monitoring Wells

Well ID	Date Sampled	Concentration
C-6A	5/8/94	300
C-8A	5/8/94	20
C-13A	5/8/94	120
C-17A	5/8/94	560

Industries

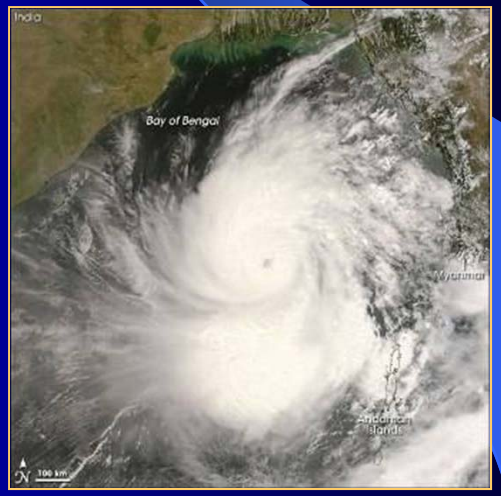
Facility	Address
Acme	3029 Convington Dr.
Fox	742 West Lake St.
TPC	90 Aspen Dr.

Population

Family Name	Occupants	Addresss
Blake	6	79 Circuit St
Hernandez	2	148 Plain St.
Joy	4	18 Webster St.
Smith	5	4321 Tecumseh Dr.

What percentage of National Governmental and Space Agency funds are directed towards these issues?

- Information Technology, Satellite Telecom, Imagery, Navigation and GIS are Integral and Fundamental To Global Security
- ISS costs ~$100 Bil?



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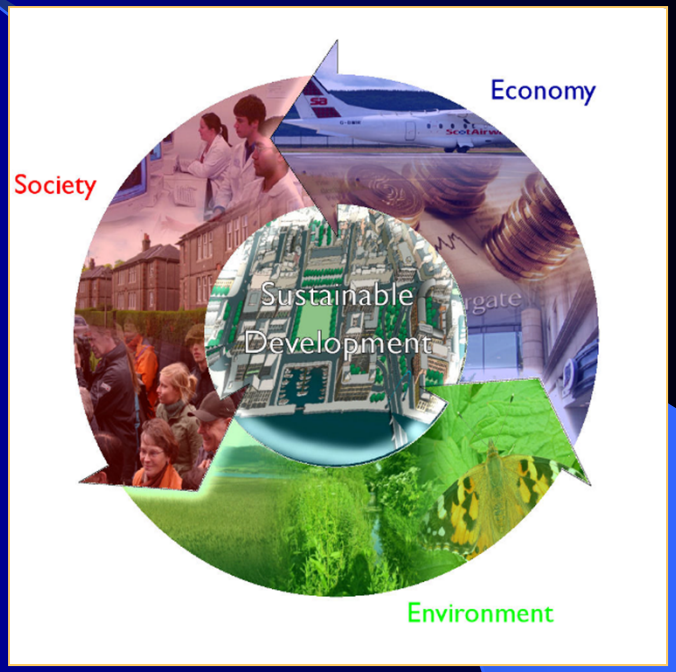
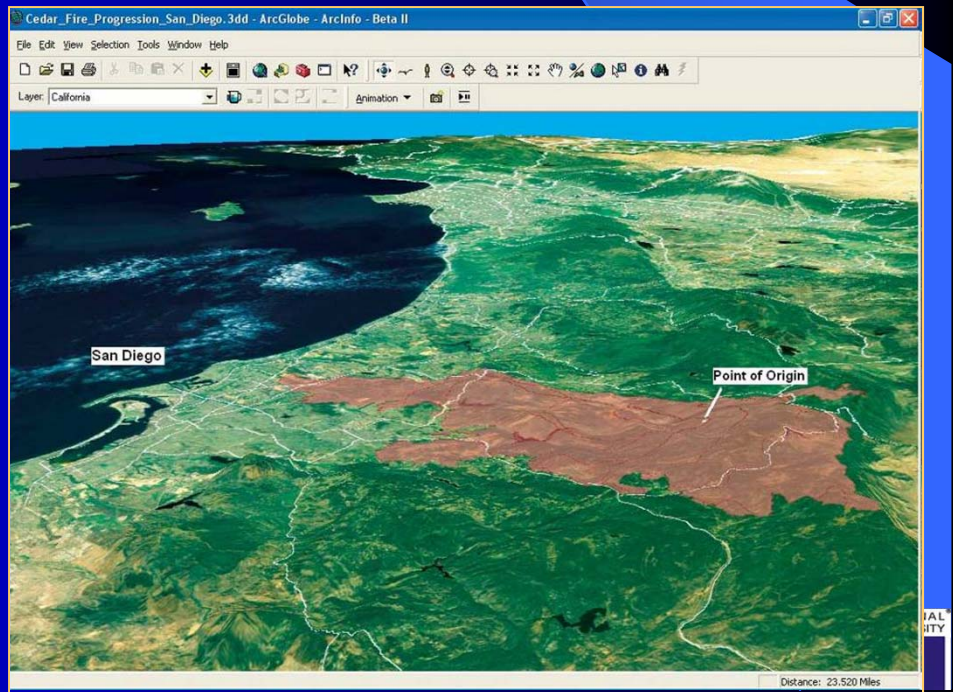
Conclusion

- We need a broad definition of Space and Security
- In the end, if we cannot provide a sustainable future for the inhabitants of Spaceship Earth, we will not have the peace, money, or political will to pursue our exploration of space.
- Which moral imperative is more important: exploring space or addressing global hunger and poverty? Can we do both?
- Is that Space and Security?



The hardest part is making the world's leaders understand….



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