Visualising the Environment
& the Politics of Representation

Dr. Joanna Boehnert

Center for Science & Technology Policy Research
Cooperative Institute for Research in Environmental Sciences
University of Colorado, Boulder, USA

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CIRES
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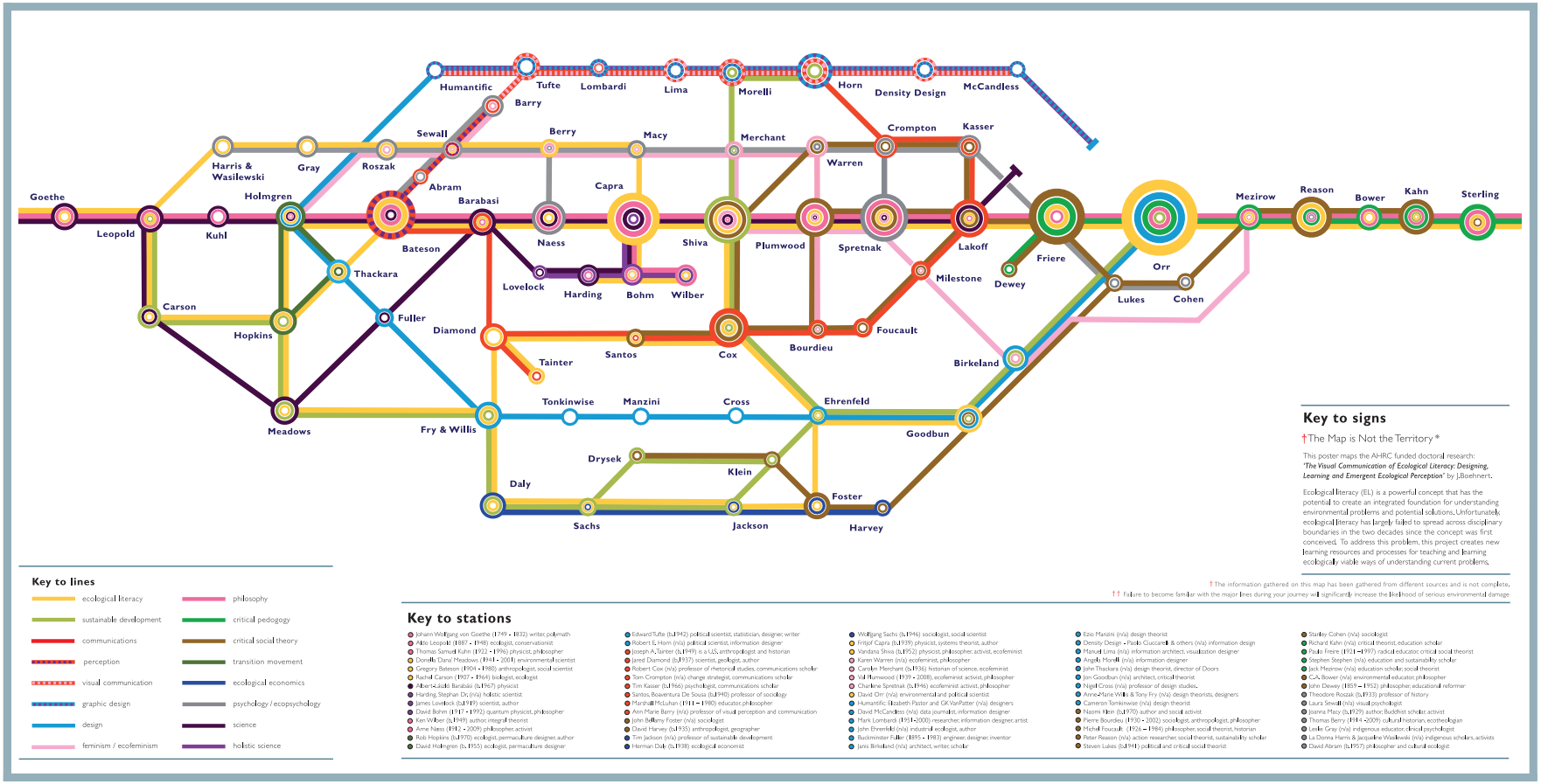
Eco-Literacy Map



Key to lines

- ecological literacy
- sustainable development
- communications
- perception
- visual communication
- graphic design
- design
- feminism / ecofeminism
- philosophy
- critical pedogogy
- critical social theory
- transition movement
- ecological economics
- psychology / ecopsychology
- science
- holistic science

Key to signs

†The Map is Not the Territory *

This poster maps the AHRC funded doctoral research: *'The Visual Communication of Ecological Literacy: Designing, Learning and Emergent Ecological Perception'* by J.Boehnert.

Ecological literacy (EL) is a powerful concept that has the potential to create an integrated foundation for understanding environmental problems and potential solutions. Unfortunately, ecological literacy has largely failed to spread across disciplinary boundaries in the two decades since the concept was first conceived. To address this problem, this project creates new learning resources and processes for teaching and learning ecologically viable ways of understanding current problems.

† The information gathered on this map has been gathered from different sources and is not complete.
†† Failure to become familiar with the major lines during your journey will significantly increase the likelihood of serious environmental damage

Key to stations

- Johann Wolfgang von Goethe (1749 - 1832) writer, polymath
- Aldo Leopold (1887 - 1948) ecologist, conservationist
- Thomas Samuel Kuhn (1922 - 1996) physicist, philosopher
- Donella 'Dana' Meadows (1941 - 2001) environmental scientist
- Gregory Bateson (1904 - 1980) anthropologist, social scientist
- Rachel Carson (1907 - 1964) biologist, ecologist
- Albert-László Barabási (b.1967) physicist
- Harding, Stephan Dr. (n/a) holistic scientist
- James Lovelock (b.1919) scientist, author
- David Bohm (1917 - 1992) quantum physicist, philosopher
- Ken Wilber (b.1949) author, integral theorist
- Arne Naess (1912 - 2009) philosopher, activist
- Rob Hopkins (b.1970) ecologist, permaculture designer, author
- David Holmgren (b.1955) ecologist, permaculture designer
- Edward Tufte (b.1942) political scientist, statistician, designer, writer
- Robert G. Horn (n/a) political scientist, information designer
- Joseph A.Tainter (b.1949) is a U.S. anthropologist and historian
- Jared Diamond (b.1937) scientist, geologist, author
- Robert Cox (n/a) professor of rhetorical studies, communications scholar
- Tom Crompton (n/a) change strategist, communications scholar
- Tim Kasser (b.1966) psychologist, communications scholar
- Santos, Boaventura De Sousa (b.1948) professor of sociology
- Marshall McLuhan (1911 – 1980) educator, philosopher
- Ann Marie Barry (n/a) professor of visual perception and communication
- John Bellamy Foster (n/a) sociologist
- David Harvey (b.1935) anthropologist, geographer
- Tim Jackson (n/a) professor of sustainable development
- Herman Daly (b.1938) ecological economist
- Wolfgang Sachs (b.1946) sociologist, social scientist
- Fritjof Capra (b.1939) physicist, systems theorist, author
- Vandana Shiva (b.1952) physicist, philosopher, activist, ecofeminist
- Karen Warren (n/a) ecofeminist, philosopher
- Carolyn Merchant (b.1936) historian of science, ecofeminist
- Val Plumwood (1939 - 2008), ecofeminist activist, philosopher
- Charlene Spretnak (b.1946) ecofeminist activist, philosopher
- David Orr (n/a) environmental and political scientist
- Humantific Elizabeth Pastor and QK VanPatter (n/a) designers
- David McCandless (n/a) data journalist, information designer
- Mark Lombardi (1951–2000) researcher, information designer, artist
- John Drennikl (n/a) industrial ecologist, author
- Buckminster Fuller (1895 - 1983) engineer, designer, inventor
- Janis Birkeland (n/a) architect, writer, scholar
- Ezio Manzini (n/a) design theorist
- Density Design - Paolo Ciuccarelli & others (n/a) information design
- Manuel Lima (n/a) information architect, visualization designer
- Angela Morelli (n/a) information designer
- John Thackara (n/a) design theorist, director of Doors
- Jon Goodbun (n/a) architect, critical theorist
- Nigel Cross (n/a) professor of design studies.
- Anne-Marie Willis & Tony Fry (n/a) design theorists, designers
- Cameron Tonkinwise (n/a) design theorist
- Naomi Klein (b.1970) author and social activist
- Pierre Bourdieu (1930 – 2002) sociologist, anthropologist, philosopher
- Michel Foucault (1926 – 1984) philosopher, social theorist, historian
- Peter Reason (n/a) action researcher, social theorist, sustainability scholar
- Steven Lukes (b.1941) political and critical social theorist
- Stanley Cohen (n/a) sociologist
- Richard Kahn (n/a) critical theorist, education scholar
- Paulo Freire (1921 –1997) radical educator, critical social theorist
- Stephen Stephen (n/a) education and sustainability scholar
- Jack Mezirow (n/a) education scholar, social theorist
- C.A. Bower (n/a) environmental educator, philosopher
- John Dewey (1859 – 1952) philosopher, educational reformer
- Theodore Roszak (b.1933) professor of history
- Laura Sewall (n/a) visual psychologist
- Joanna Macy (b.1929) author, Buddhist scholar, activist
- Thomas Berry (1914 -2009) cultural historian, ecotheologian
- Leslie Gray (n/a) indigenous education, clinical psychologist
- La Donna Harris & Jacqueline Wasilewski (n/a) indigenous scholars, activists
- David Abram (b.1957) philosopher and cultural ecologist

Version 3.2 - January 2012

Key to Lines: Summary of Disciplinary Lines

Eco-literacy: Ecological literacy (EL) describes a capacity to think in terms of whole systems. Ecological literacy recognizes humankind's embeddedness within the ecological systems and thereby organizes cultural, political, legal and economic systems to prioritise the well-being of the ecological system.

Sustainable Development: Current models of development based on infinite quantitative economic growth within a finite ecological system are entirely unsustainable. Development must reflect growth in nature where physical growth occurs to maturity then levels off towards qualitative growth.

Communications mediate the human-nature relationship and have a vital role to play in responding to environmental problems. Communication is central a civilisation's capacity to avoid collapse. Environmental communication is considered to be a crisis discipline responding the crises in the earth sciences.

Design is uniquely positioned to engage in a process of moving from theory to practice and moving between sectors to facilitate transdisciplinary actions and the design of new ways of living. Design is a problem solving profession with a wide variety of tools and techniques to addresses complex problems.

Graphic Design aims to strategically change human understanding and behavior through the use of visual communication. Graphic design can communicate complex webs of interdependence and help audiences perceive relationships, context, causality and connections in dynamic systems.

Sciences Ecological literacy emerges out the movement away from science characterized by atomism, mechanism, objectivism, anthropocentrism, rationalism and dualism. Post-normal science reflects a shift in epistemological premises following Kuhn's theory of paradigm shifts in science.

Philosophy We have inherited a tradition based on a radical disconnection with the natural world resulting in epistemological error, a crisis of reason and ethical rootlessness. Ecological literacy describes a worldview that supports an ecologically embedded ontology, epistemology, rationality and ethic.

Critical Pedagogy is an educational movement that originated from Paulo Freire's educational practices focused on conscientization or critical consciousness. These teaching practices have been integral to the profound change witnessed in social movements globally, including women's liberation.

Social Theory offers powerful tools of analysis that describe how power functions in society, exposing how and why ecological literacy remains marginal. Symbolic violence describes forms of social control wherein environmental discourses reflect the interests of powerful economics/political interests.

Transition is a social movement and community design practice based on local responses to climate change and peak oil, i.e. depletion of fossil fuel reserves. Transition has its origins in permaculture which developed strategies for the design of systems for local resilience and energy descent.

Ecological Economics is economic theory that recognizes the economic system as embedded within the ecological system and having to function within the carrying capacity of the earth. It describes quantitative growth as no longer delivering prosperity in rich countries. Instead we must aim for qualitative growth.

Ecopsychology address our psychological relationship with the natural world, offering a radical re-visioning of ecological self. While denial is a natural defense mechanism, we can shatter denial using practices from addiction therapy. Ecopsychology is strongly influenced by TEK (traditional ecological knowledge).

Ecofeminism analysis asserts that historically both women and nature have been oppressed by a logic of domination. Feminism is a fundamental building block for a social transformation of enlarging the community of concern to include the wider ecological community as it has emancipative strategies that proven to work.

Holistic Science Holistic science dramatically challenges assumptions and methodological approaches of positivist science. Holistic science unites both quantities and qualities in a paradigm shift in science from physics to the life sciences. Holistic science understands the earth as composed of living systems.

Visual Communication Within the context of an increasingly visual culture, visual communications can facilitate ecological understanding through display of complexity, context, connections and causality. Visuals can nurture qualitative whole systems thinking and even, potentially, an emergent ecological perception.

A map based on the AHRC funded PhD research
The Visual Communication of Ecological Literacy: Designing, Learning and Emergent Ecological Perception
by Jody Joanna Boehnert
School of Architecture and Design
The University of Brighton
Praxis No.12 - Version 3.2 - January 2012

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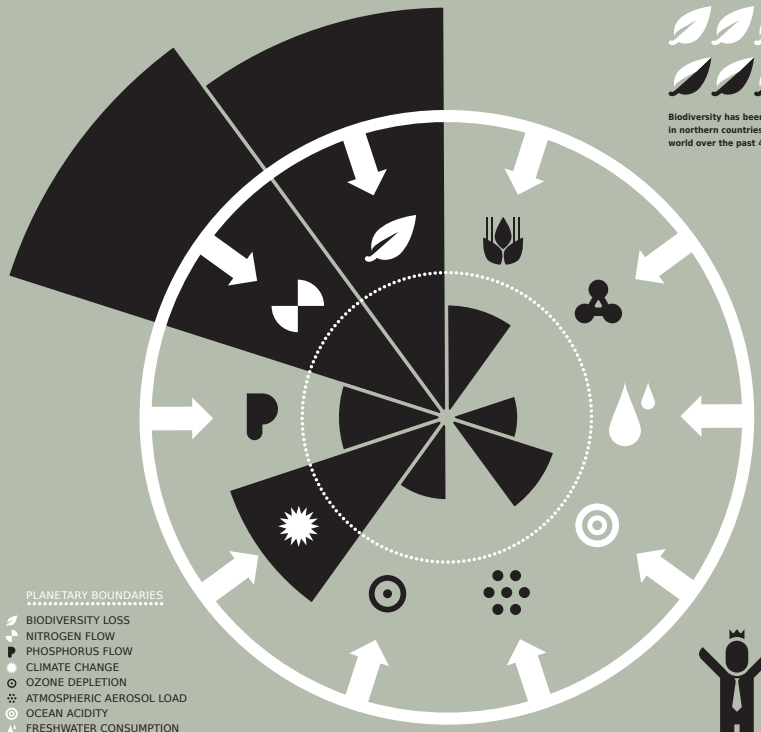
ECOLOGICAL
AUDIT OF DEVELOPMENT

THE BALANCE SHEET FOR GROSS GLOBAL PROSPERITY

The Earth's ability to provide an accommodating environment is undermined by our activities. The Earth is our life-supporting system. Despite this basic fact, measured in biophysical terms, the planet is shrinking due to human interventions. Over the past forty years the Living Planet Index (an indicator of the state of biodiversity) has fallen by 30% in northern countries and fallen by 60% in the tropics. During this time there has been a doubling of demands on natural systems. Assessing the capacity of the ecological system to continue to provide favorable conditions for civilization must be part of an audit of development.



PLANETARY BOUNDARIES

- BIODIVERSITY LOSS
- NITROGEN FLOW
- PHOSPHORUS FLOW
- CLIMATE CHANGE
- OZONE DEPLETION
- ATMOSPHERIC AEROSOL LOAD
- OCEAN ACIDITY
- FRESHWATER CONSUMPTION
- CHEMICAL POLLUTION
- AGRICULTURAL LAND USE

Biodiversity has been fallen by a rate of 30% in northern countries and 60% in the tropical world over the past 40 years.

97-98% of scientists agree climate change is caused by humankind

2/3 ecosystems are exploited beyond their capacity

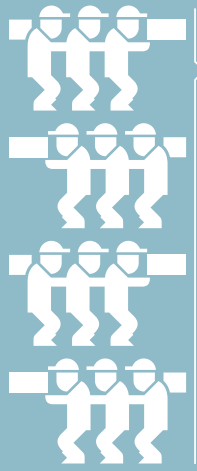
Ecological systems have thresholds that can lead to sudden collapse. Nine planetary boundaries are central to avoid crossing critical tipping points. Three boundaries have already been transgressed: climate change, the rate of biodiversity loss and the global nitrogen cycle. The Anthropocene is a new geological age characterized by dynamics where our industrial patterns are a force dramatically effecting natural, biophysical and geological processes. The Earth is the foundation for substance, but an ecological audit indicates that the model of development is now so dysfunctional that human survival is at stake.

Content, art direction and production: Dr.J.Boehnert, EcoLabs. Graphic design by: Lazaros Kakoulidis and Tzortzis Rallis

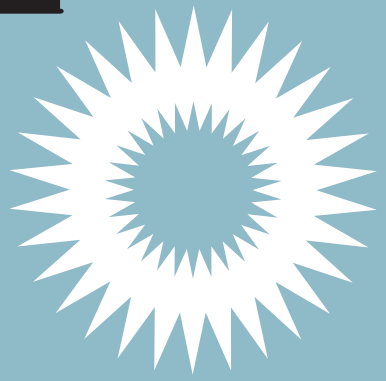
ENERGY
AUDIT OF DEVELOPMENT

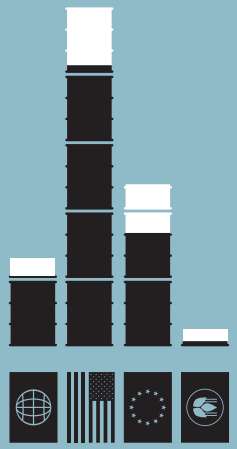
THE BALANCE SHEET FOR GROSS GLOBAL PROSPERITY

Cheap energy made industrial development possible. One barrel of crude oil contains, in energy terms, the equivalent to the heavy manual labour of 12 people working for one year. As easily accessible fossil fuel supplies diminish, the era of cheap energy is ending. One way to understand the consequences of energy scarcity is by measuring EROI, i.e. 'Energy Return On Investment'. In the 1900s EROI was between 100:1 – 50:1. Energy from renewables and unconventional fossil fuels have much lower EROIs; for example the Tar Sands have a EROI of as little as only 3:1. An integrated audit of development that includes energy issues indicates that the current model of development has created dangerous vulnerabilities in its reliance on fossil fuel.

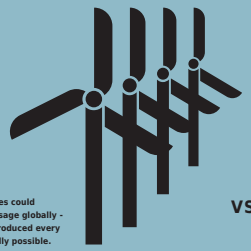


One barrel of crude oil, containing 159 litres, is equivalent to the heavy manual labour of 12 people for one year.





Energy use (kg of oil equivalent per capita)
World = 1851
USA = 7069
EU = 3412
Low income countries = 363
Percentage of total energy consumption that is based on fossil fuels
World = 80%
USA = 83%
EU = 75%
Low income countries = 29%



4 million wind turbines could replace fossil fuels usage globally - 20 million cars are produced every year so it is technically possible.

VS

Energy Return on Energy Investment
EROI in the 1900s = 100:1 - 50:1
EROI in the tarsands = 5:1 - 3:1
EROI estimated to be necessary for 'civilisation' to sustain itself = 5:1

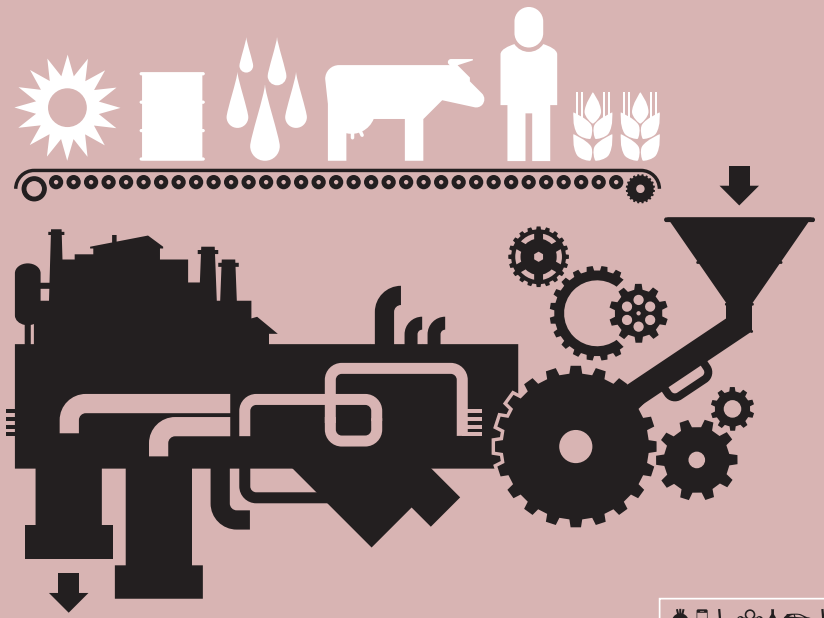
* All expansionary phases of the US economy occurred during times of low energy prices.

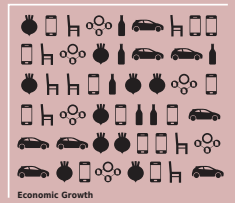
Global fossil fuels subsidies amounted to $523 billion in 2011, up almost 30% on 2010 - this is six times more than subsidies to renewables, and up 30% from 2010.

SOCIAL
AUDIT OF DEVELOPMENT

THE BALANCE SHEET FOR GROSS GLOBAL PROSPERITY

This poster explores the social impact of the current model of development. Humans and the natural world provide essential 'resources' for the purpose of creating products, profits and economic growth. Yet economic growth does not necessarily equal greater well-being. Research as demonstrated that only 1% of growth contributes to rising standards of living. Prosperity is increasingly concentrated and over the past 30 years inequality has risen in over 75% of the countries Global North (OECD countries). Although there is more than enough food to meet everyone's needs, 13% of the global population face hunger. Meanwhile, 30-50% of the food supply is simply wasted. It appears that the current model of development fails to provide prosperity for the majority.

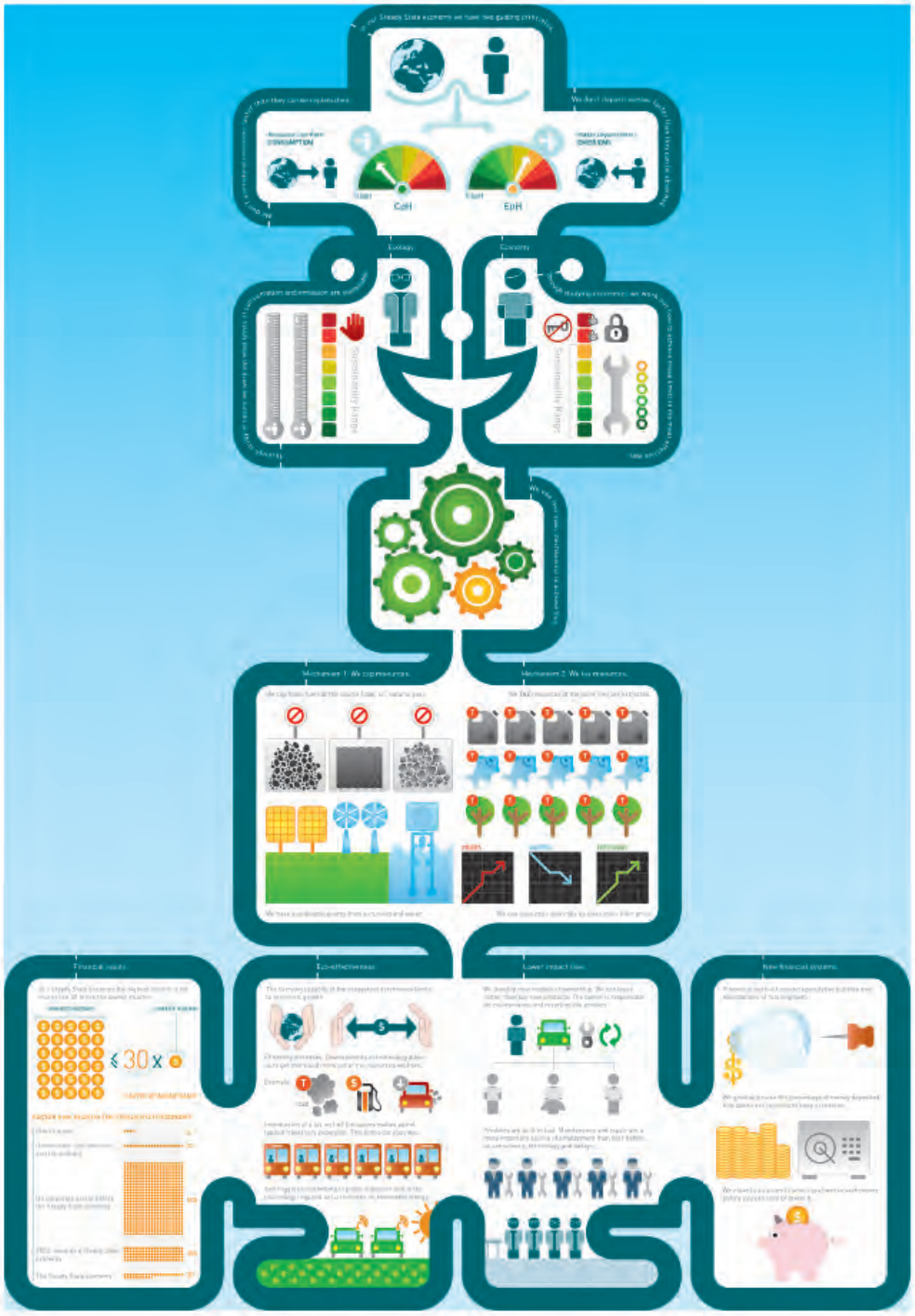




Economic Growth

1% of global food supply would eliminate hunger - yet 30-50% of global food supply is simply wasted.

3/4 countries in the Global North face greater inequality than in 1980.



Art direction and production: Dr.J.Boehnert, EcoLabs. Graphic design by: Angela Morelli

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2. Images & Communication Theory

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1. Introduction: Visualizing the Environment

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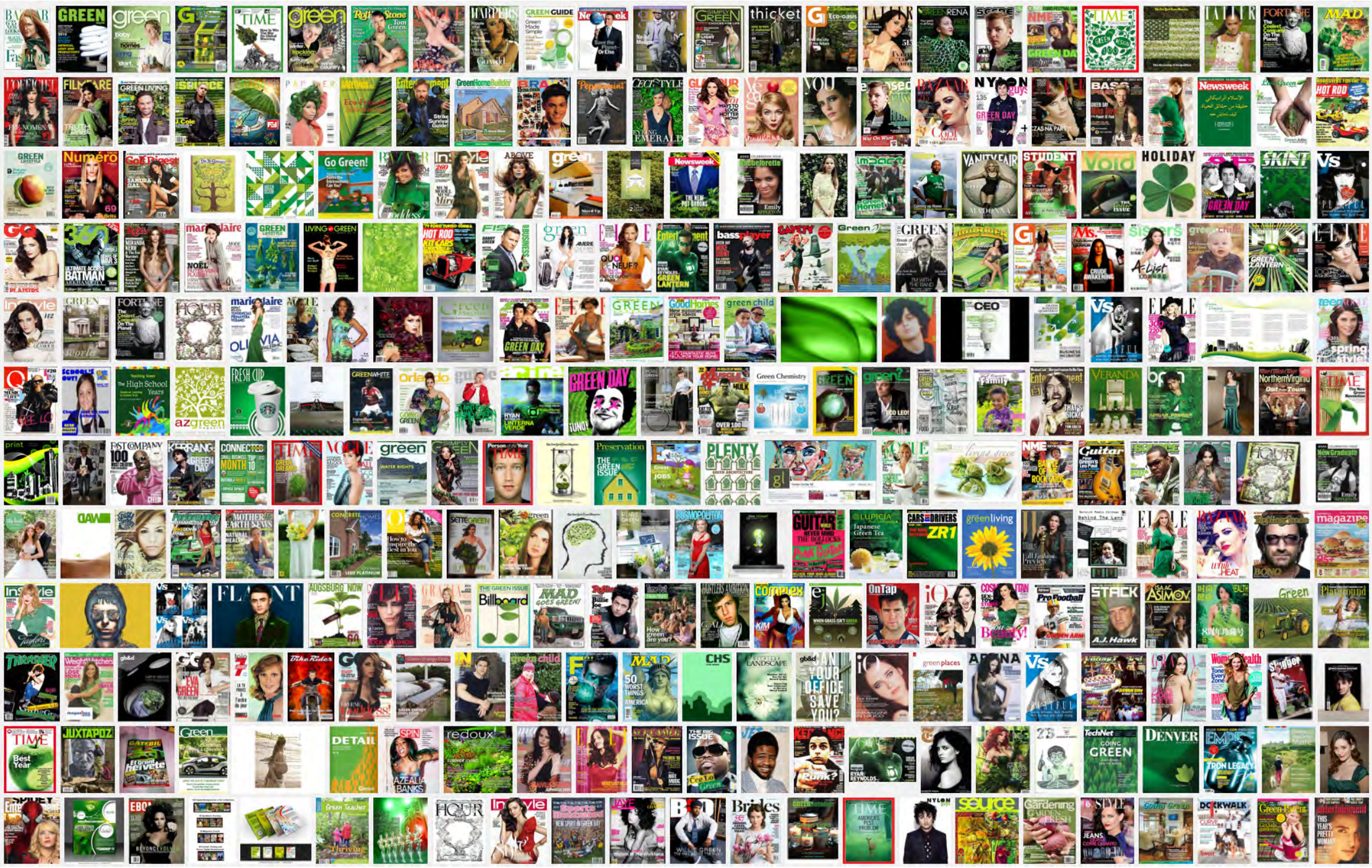

1. Introduction: Visualizing the Environment

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Navajo reservation adjacent to a Phoenix suburb. Photo by Edward Burtynsky.

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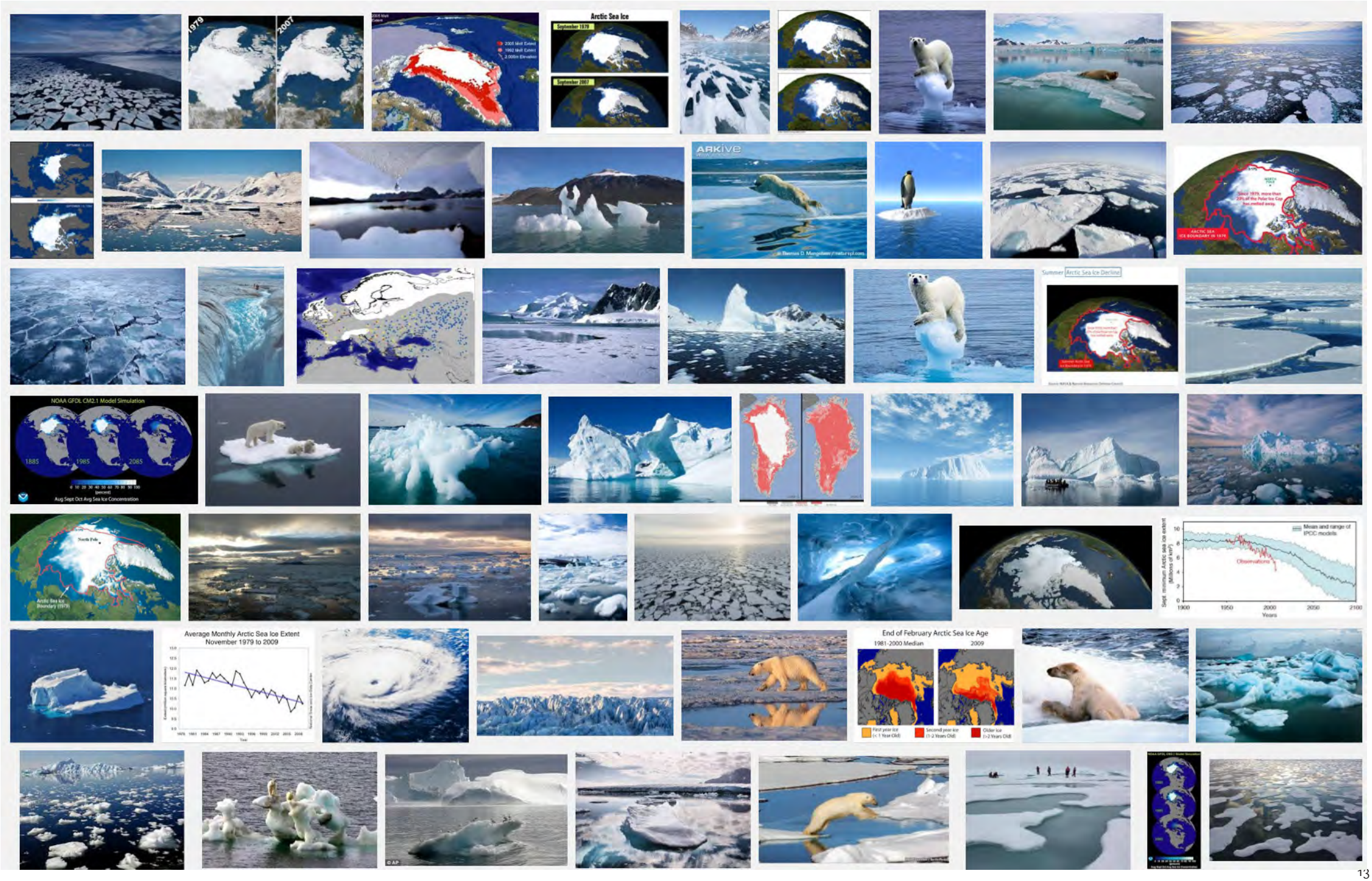

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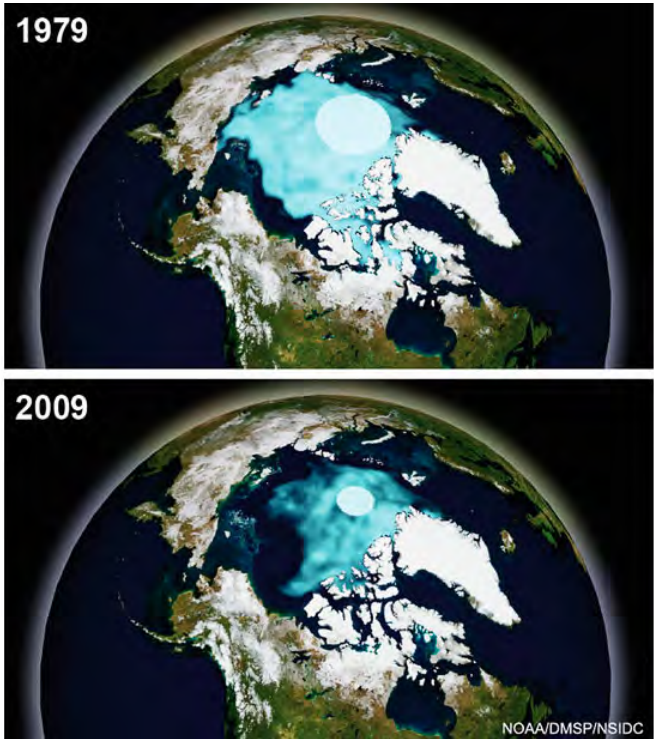
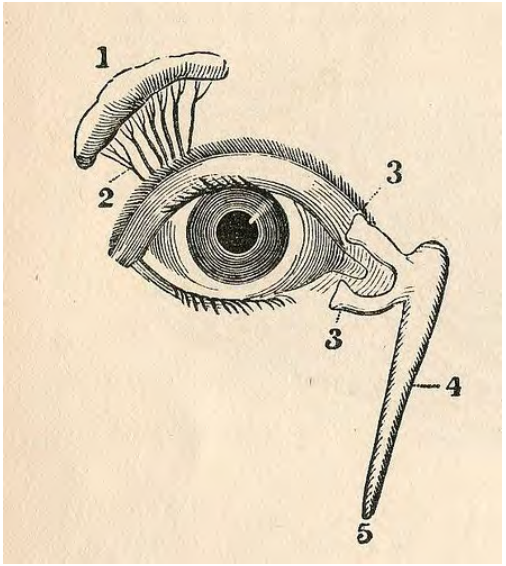


2. Images & Communication Theory

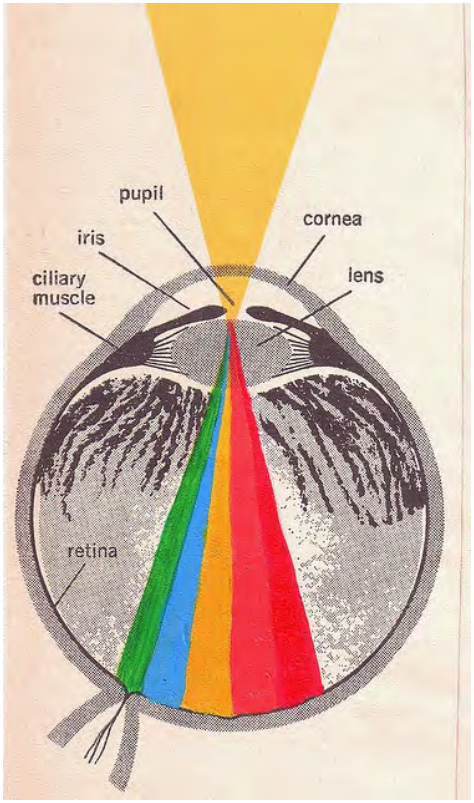
2. Images & Communication Theory

The more visual the input becomes, the more likely it is to be recognized and recalled. One research study found that adding a picture to text improves comprehension and memory by over 50%. Showing a picture before text increases comprehension by over 100% than supplying text alone.*



* Bransford and Johnson 1972 quoted in Chabris and Kosslyn 2005.

2. Images & Communication Theory

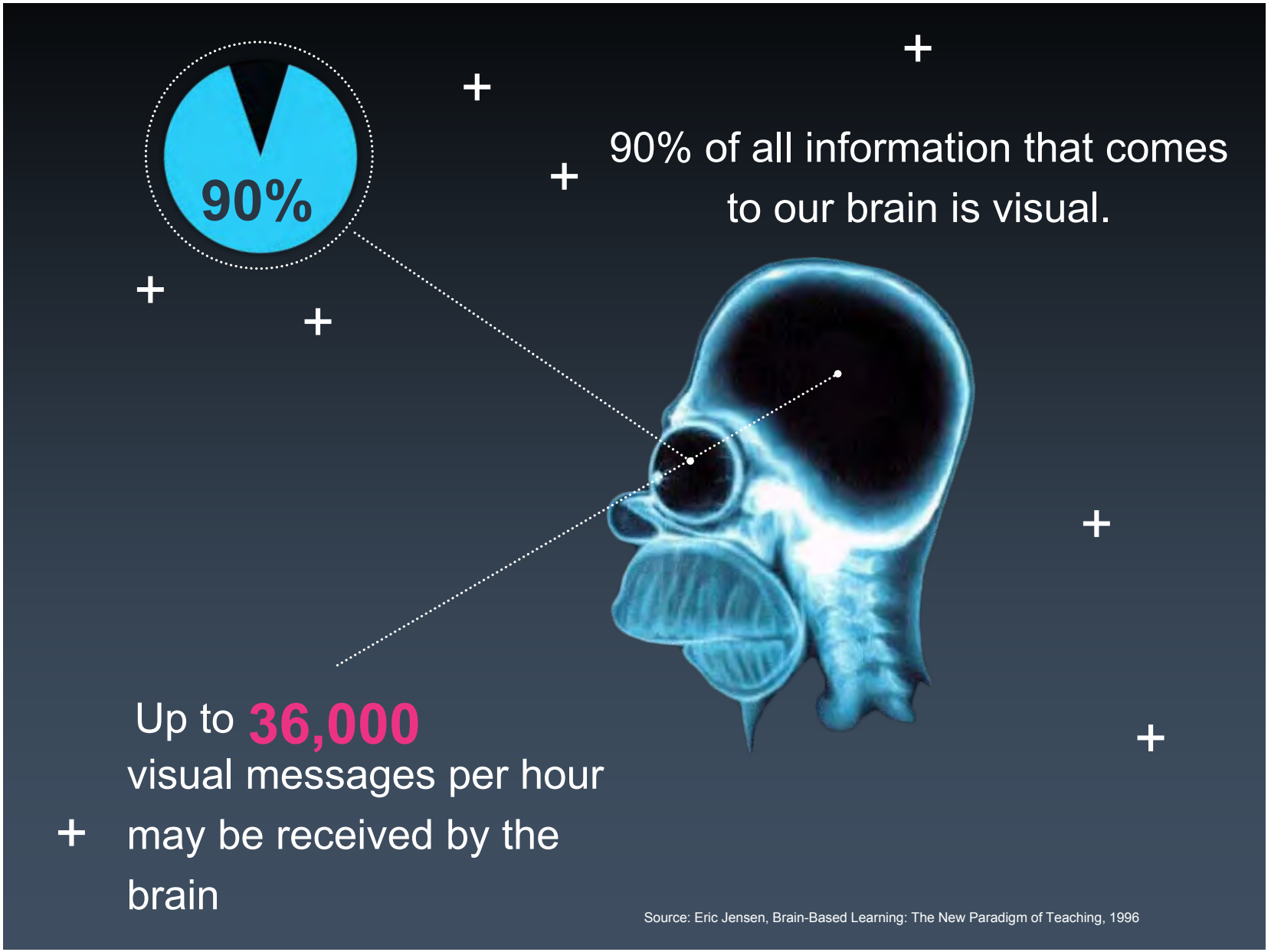


Another study suggests that we typically remember about 10% of the information from an oral presentation when tested 72 hours after exposure. This figure goes up to 65% when a picture is added.*

"the pictorial superiority effect"**

* Medina, J. (2008) *The Brain Rules.* Pear Press. p.234.
**Stenberg, G (2006) Conceptual and pereptual factors in the picture superiority effect European Journal of Cog Psych 18(6): 813 - 847.

2. Images & Communication Theory



2. Images & Communication Theory

Pictures and text follow very different rules

2. Images & Communication Theory

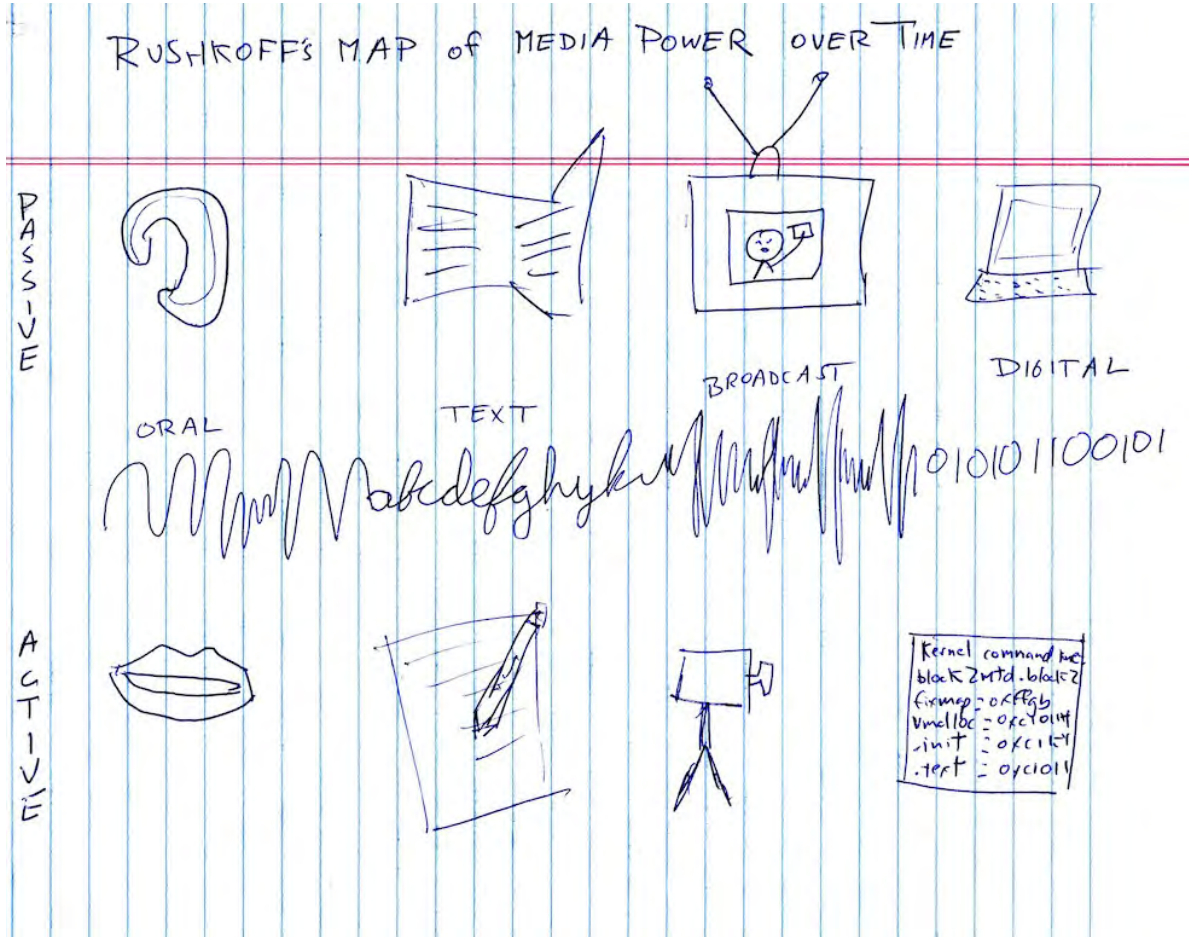
THIS IS A PICTURE OF A BLUE BIRD SITTING IN A TREE.

THE BIRD IS LOOKING TO THE RIGHT.

THE LEAVES OF THE TREE ARE ORANGE, RED, YELLOW AND GREEN.

IT IS AUTUMN.

2. Images & Communication Theory



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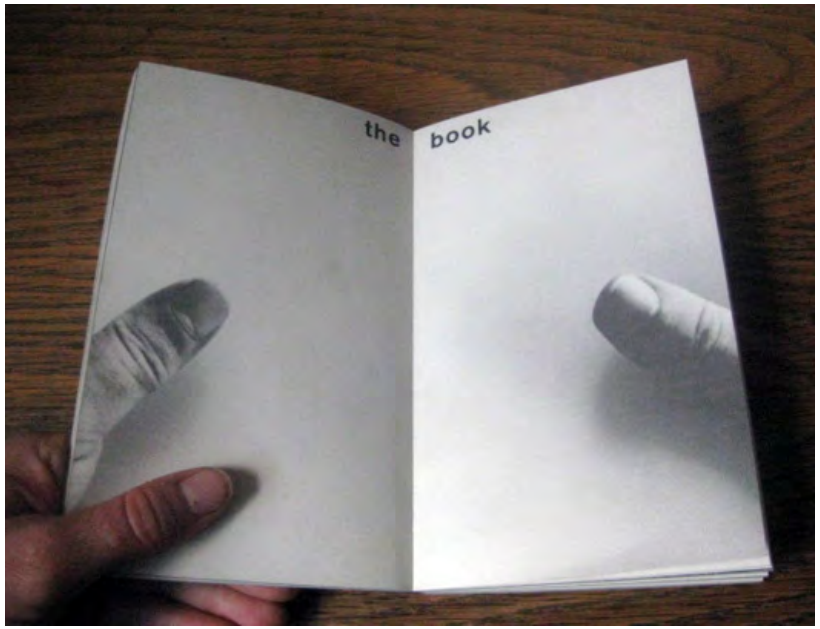


"the effects of technology do not occur at the level of opinions or concepts, but alter sense ratios or patterns of perception steadily and without any resistance"

Marshall McLuhan 1967

Visual culture: **a pictorial turn**

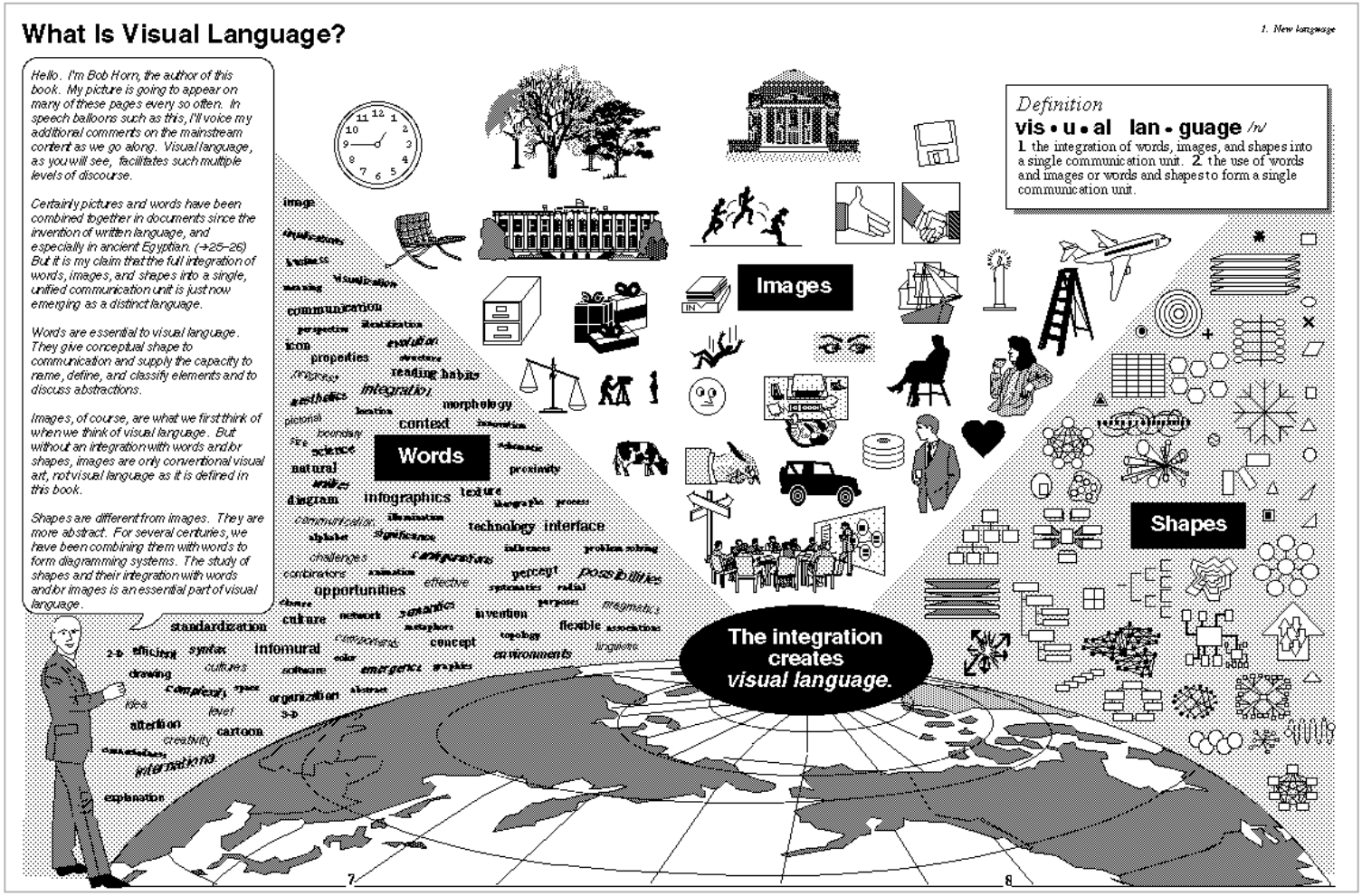
What are the cognitive implications of an increasingly visual culture?

Visual language

‘...has the potential for increasing human “bandwidth” – the capacity to take in, comprehend, and more efficiently synthesize large amounts of new information’

Robert Horn 2001

2. Images & Communication Theory



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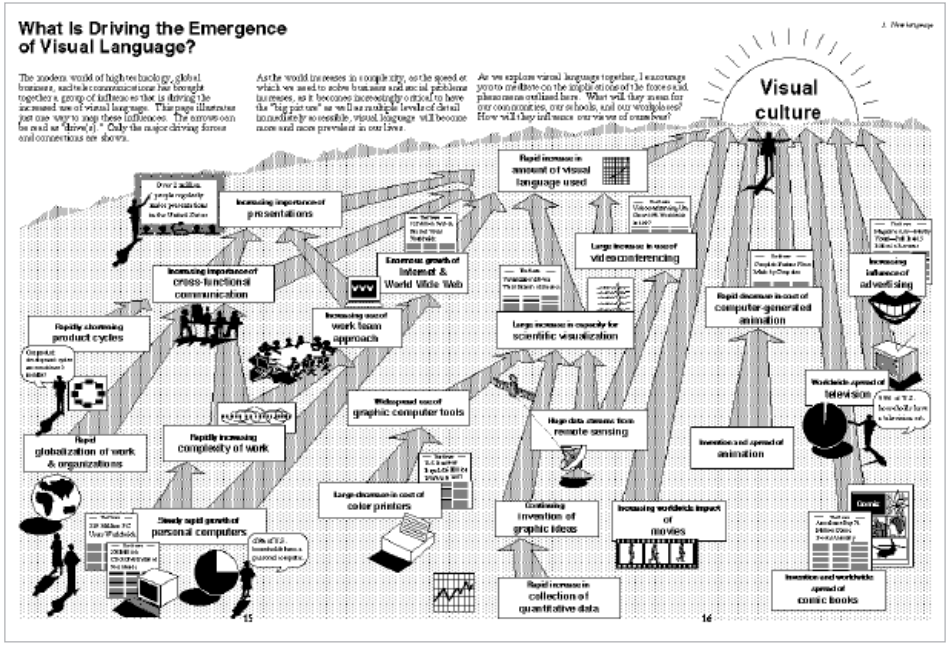
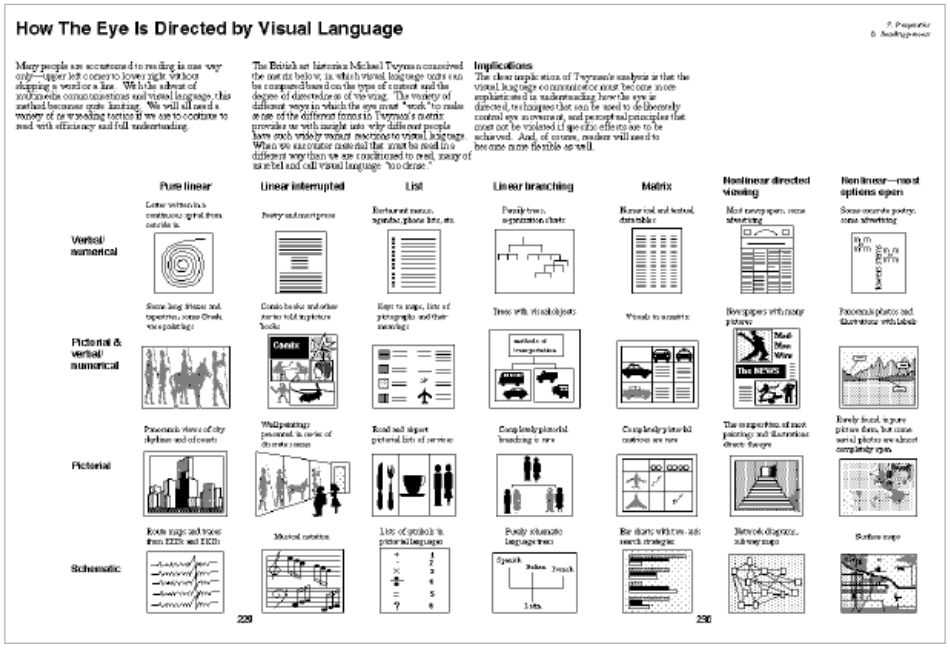




2. Images & Communication Theory

"It has often been said that our environmental crisis is a crisis of perception. We do not readily see the patterns that would reveal our dependence on the natural world, nor are we commonly aware of the systems within which we are deeply embedded. Our attention, entrained on objects and focused on flat screens, is far removed from the dynamic and animated nonhuman world."

Laura Sewall, 2012

Relational Perception

A shift in focus (and thinking)
from **objects** (in isolation) to
processes & relationships.

Visual communications can suppport relational perception by focusing attention on:

- context
- comparison
- connections
- causality
- complexity

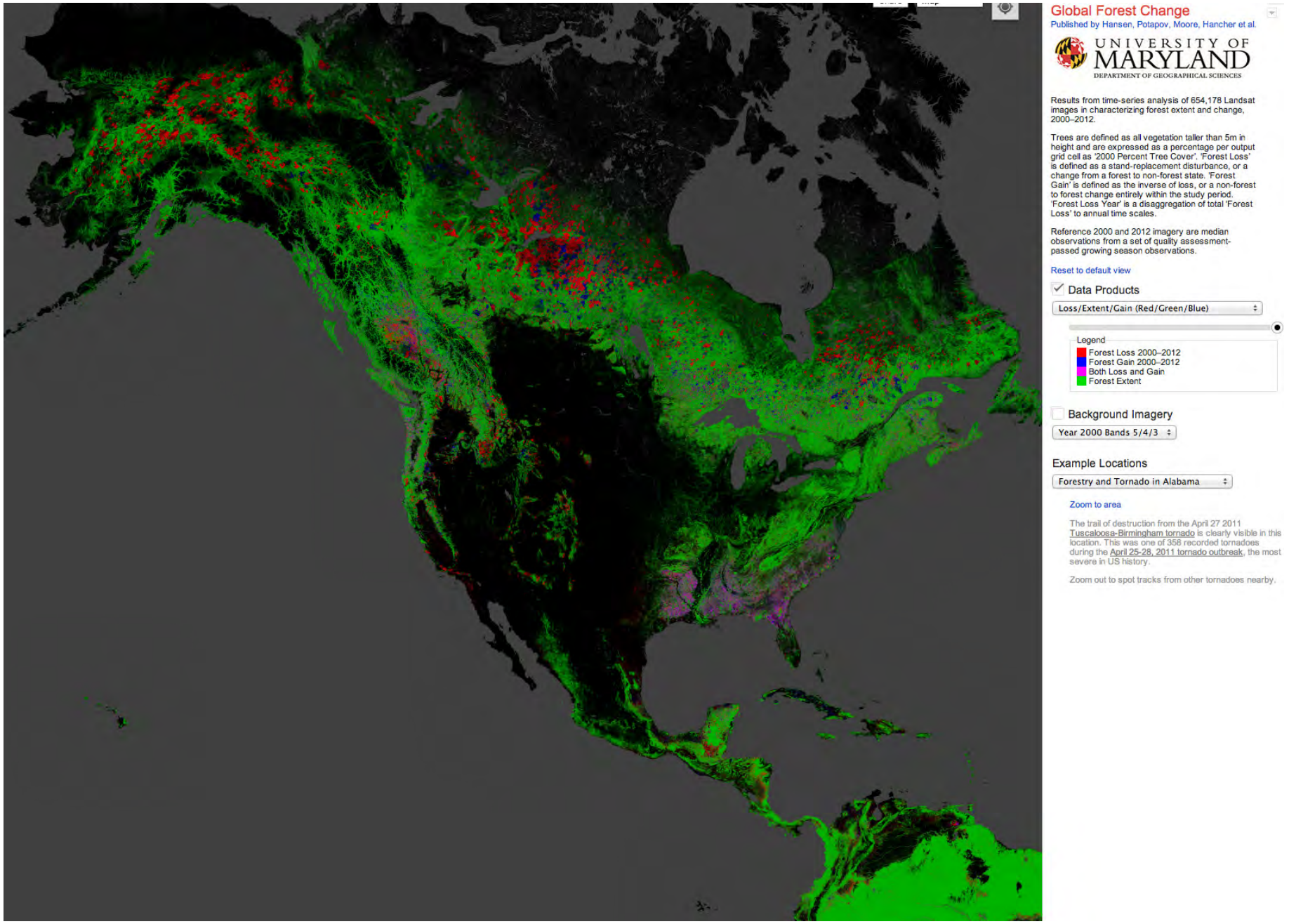
2. Images & Communication Theory

- context (where, what, when?)
- comparison (how much and when?)
- connections (with what or with whom?)
- causality (how, how much and when?)
- complexity (all of the above)

...& at various scales: micro, meso and macro.

3. Revealing with Images - CONTEXT

Global forest change

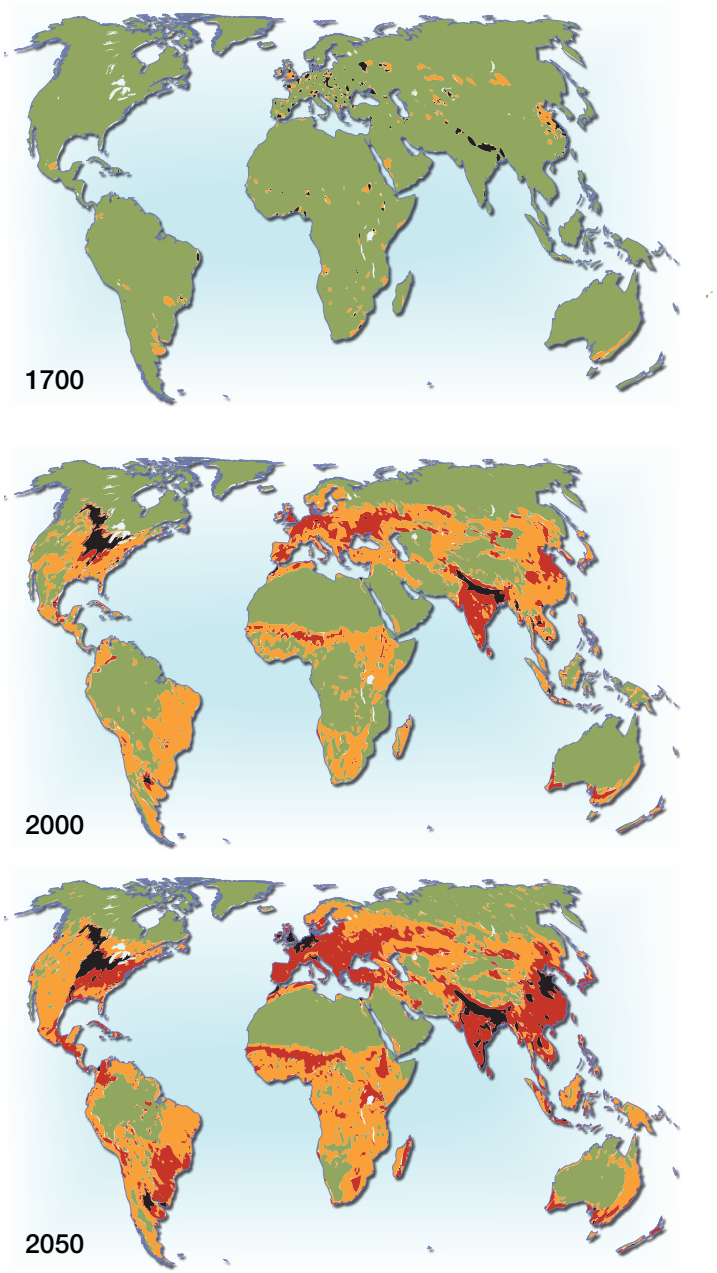


3. Revealing with Images - CONTEXT

The British Isles

3. Revealing with Images - CONTEXT

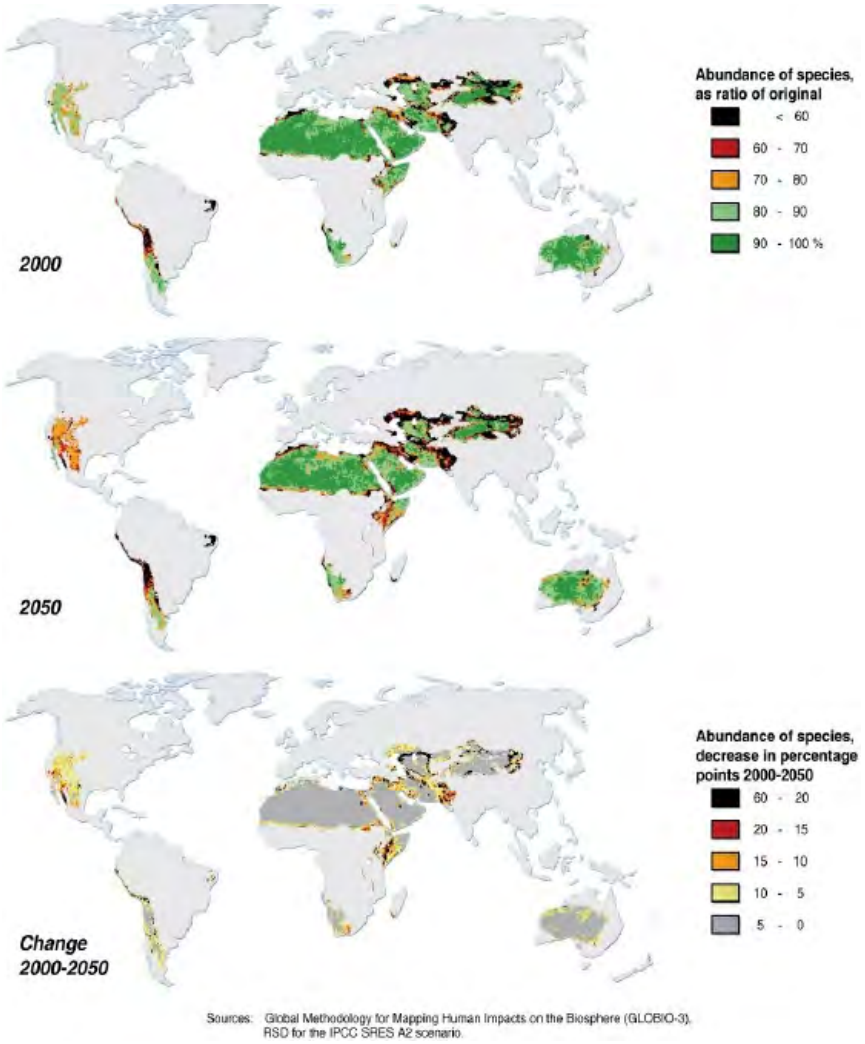
biodiversity loss, as a ratio of species abundance before human impacts



Biodiversity, as ratio of species abundance before human impacts

High impacts	0 - 25
High-medium impacts	25 - 50
Medium-low impacts	50 - 75
Low impacts	75 - 100 %

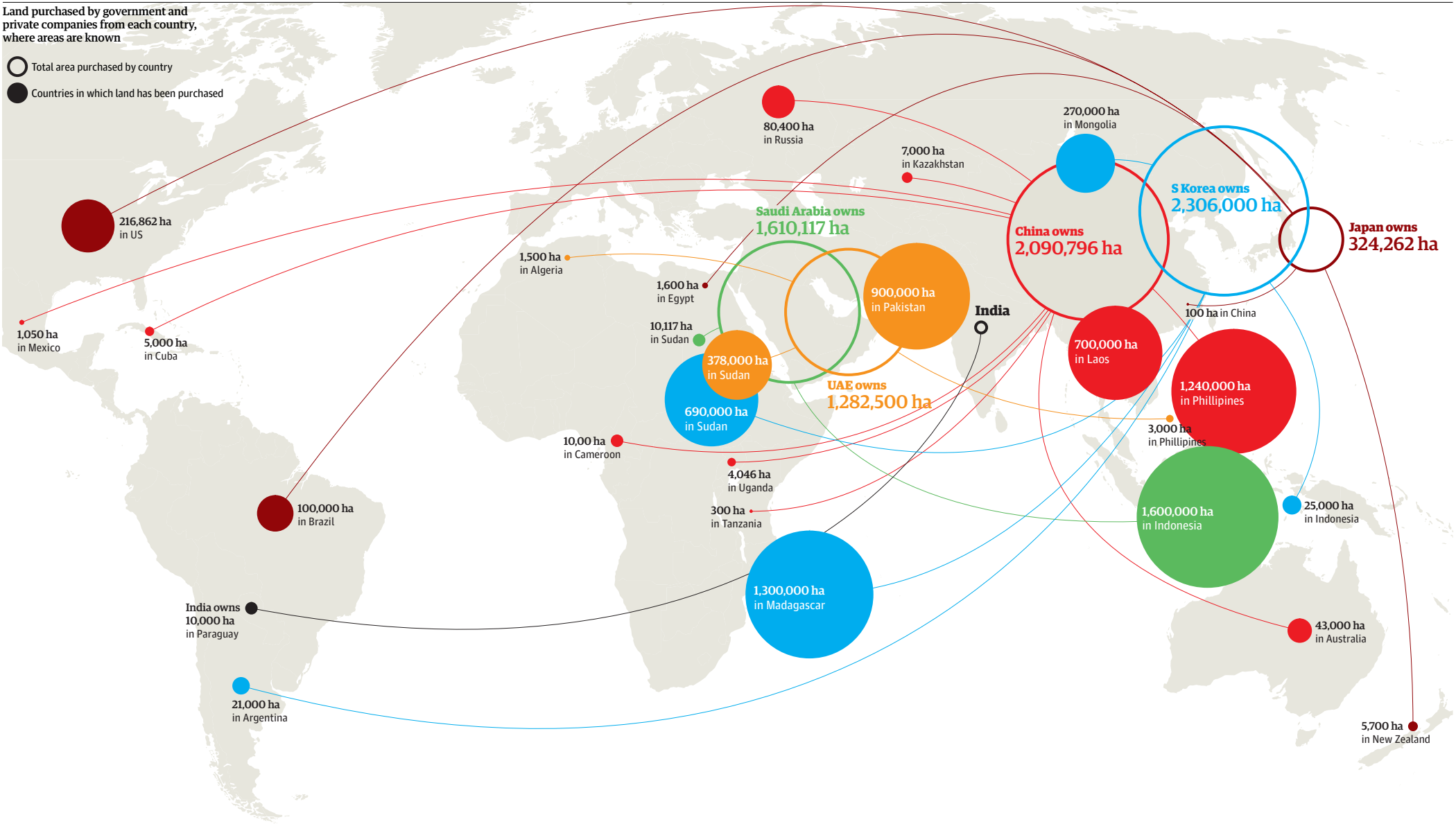
Mean species abundance (%)



Sources: Global Methodology for Mapping Human Impacts on the Biosphere (GLOBIO-3), RSD for the IPCC SRES A2 scenario.

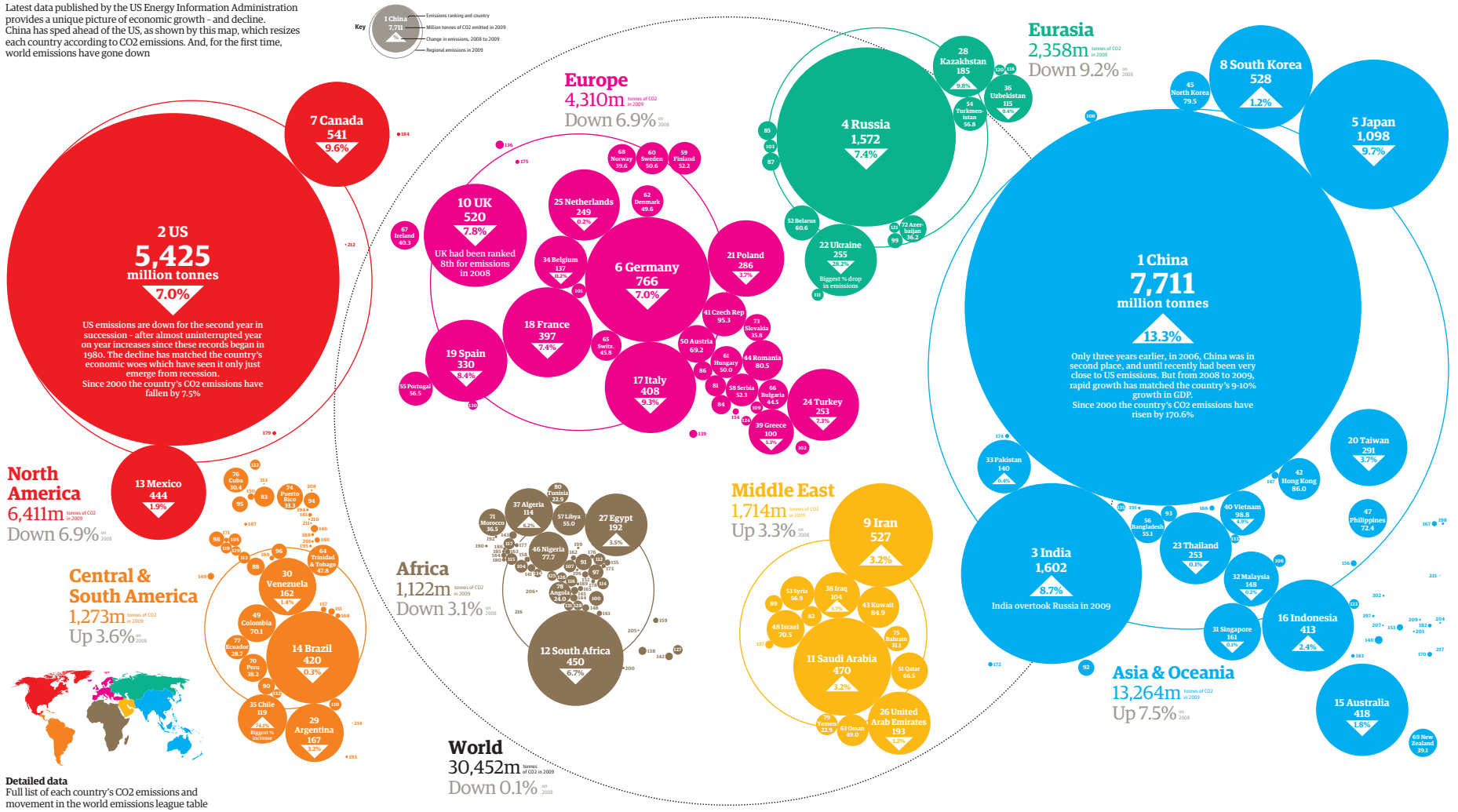
3. Revealing with Images - CONTEXT

World land grabs



An atlas of pollution: the world in carbon dioxide emissions

Latest data published by the US Energy Information Administration provides a unique picture of economic growth - and decline. China has sped ahead of the US, as shown by this map, which resizes each country according to CO2 emissions. And, for the first time, world emissions have gone down



Detailed data
Full list of each country's CO2 emissions and movement in the world emissions league table

Rank/ change on 2008	Country	Million tonnes 2009	Percent change 08–09
= 1	China	7711	13.3
= 2	US	5,425	-7.0
▲3	India	1602	8.7
▼4	Russia	1,572	-7.4
= 5	Japan	1,098	-9.7
= 6	Germany	766	-7.0
= 7	Canada	541	-9.6
▲8	South Korea	528	1.2
▲9	Iran	527	3.2
▼10	UK	520	-7.8
▲11	Saudi Arabia	470	3.2
▼12	South Africa	450	-6.7
= 13	Mexico	444	-1.9
▲14	Brazil	420	-0.3
▲15	Australia	418	-1.8
▲16	Indonesia	413	2.4
▼17	Italy	408	-9.3
▼18	France	397	-7.4
= 19	Spain	330	-8.4
▲20	Taiwan	291	-3.7
▲21	Poland	286	-3.0
▼22	Ukraine	255	-28.2
▲23	Thailand	253	-0.1
▼24	Turkey	253	-7.1
= 25	Netherlands	249	-0.2
= 26	United Arab Emirates	193	-1.2
= 27	Egypt	192	3.5
▲28	Kazakhstan	185	9.8
▼29	Argentina	167	-3.2
= 30	Venezuela	162	-1.4
= 31	Singapore	161	-0.1
▲32	Malaysia	148	-0.2
▲33	Pakistan	140	1.2
▼34	Belgium	137	-11.2
▲35	Chile	119	24.1
▼36	Uzbekistan	115	-9.4
▼37	Algeria	114	6.2
▲38	Iraq	104	-3.7
▼39	Greece	100	-5.3
▼40	Vietnam	98.8	-4.9
= 41	Czech Republic	95.3	-3.8
▲42	Hong Kong	86.0	10.3
▼43	Kuwait	84.9	0.3
▼44	Romania	80.5	-16.6
▲45	North Korea	79.5	14.3
▼46	Nigeria	77.7	-22.4
▼47	Philippines	72.4	-2.9
▲48	Israel	70.5	4.9
▲49	Colombia	70.1	7.9
▼50	Austria	69.2	-2.5
▼51	Belarus	60.6	-6.8
▲52	Syria	56.9	6.1
▼53	Turkmenistan	56.8	-3.2
▲54	Portugal	56.5	1.5
▲55	Bangladesh	55.1	9.4
▼56	Libya	55.0	-3.9
▲57	Serbia	52.3	-3.2
▼58	Finland	52.2	-4.9
▼59	Sweden	50.6	-2.7
▼60	Hungary	50.0	-10.7
▼61	Denmark	49.6	-8.6
▲62	Oman	49.0	9.9
▲63	Trinidad & Tobago	47.8	-4.1
▲64	Switzerland	45.8	1.0
▼65	Bulgaria	44.5	-11.9
▼67	Ireland	40.3	-11.2
▲68	Norway	39.6	-0.3
▲69	New Zealand	39.1	-1.1
▲70	Peru	38.2	4.0
▲71	Morocco	36.5	-2.2
▼72	Azerbaijan	36.2	-8.9
▼73	Slovakia	35.8	-4.5
= 74	Puerto Rico	33.3	-3.2
= 75	Bahrain	31.1	1.6
= 76	Cuba	30.4	4.7
= 77	Ecuador	28.7	1.2
= 78	Angola	24.0	1.8
▲79	Yemen	22.9	13.5
▲80	Tunisia	22.9	5.2
▼81	Croatia	21.5	-4.7
▲82	Jordan	20.0	2.4
▲83	Dominican Republic	19.9	2.1
▼84	Bosnia and Herzegovina	18.3	-15.9
▼85	Estonia	17.5	-11.8
▲86	Slovenia	17.4	-0.3
▼87	Lithuania	15.8	-12.8
= 88	Panama	15.5	1.7
= 89	Lebanon	14.5	-3.6
= 90	Bolivia	13.9	-2.7
▲91	Sudan	13.0	7.0
▼92	Sri Lanka	12.8	1.7
▼93	Burma	12.5	-9.5
▼94	US Virgin Islands	12.5	-3.5
▼95	Jamaica	12.1	-4.6
= 96	Netherlands Antilles	11.6	-4.1
▲97	Kenya	11.5	2.4
= 98	Guatemala	11.3	1.4
▲99	Armenia	11.2	1.5
▲100	Zimbabwe	10.6	18.6
▼101	Luxembourg	10.6	-11.2
= 102	Cyprus	9.4	-1.5
▲103	Latvia	8.5	8.1
▲104	Ghana	8.1	9.6
= 105	Honduras	7.9	-2.4
▼106	Brunei	7.6	-27.1
▼107	Cameroon	7.5	-1.9
= 108	Mongolia	7.4	-3.8
▼109	Macedonia	7.3	-20.1
▼110	Uruguay	7.2	-10.2
▼111	Moldova	7.1	-41.1
▲112	Ethiopia	6.9	7.1
▼113	Costa Rica	6.8	-4.4
▲114	Tanzania	6.7	7.1
▼115	IvoryCoast	6.6	2.2
▲116	Congo	6.3	3.8
= 117	Senegal	6.2	1.8
▼118	Tajikistan	6.1	-10.4
= 119	El Salvador	5.9	0.0
▼120	Kyrgyzstan	5.7	-0.4
= 121	Georgia	5.3	-4.9
= 122	Bahamas	5.2	3.1
▲123	Papua New Guinea	4.8	6.2
▲124	Albania	4.6	3.1
▼125	Equatorial Guinea	4.6	-2.1
▼126	Gabon	4.6	-3.2
▼127	Mauritius	4.6	-4.0
▲128	Botswana	4.5	7.7
▼129	Nicaragua	4.5	-2.9
▼130	Gibraltar	4.4	-3.8
▲131	Namibia	4.1	3.7
▼132	Paraguay	4.0	3.7
▼133	Cambodia	3.9	-4.1
▲134	Benin	3.5	4.3
▲135	Nepal	3.4	3.8
▼136	Iceland	3.4	-2.1
▲137	Palestine	3.2	4.3
▲138	Madagascar	3.1	13.4
▼139	Malta	3.1	-2.0
▼140	New Caledonia	3.0	0.0
▲141	Togo	2.8	5.6
▼142	Reunion	2.8	0.0
▲143	Mauritania	2.7	5.3
▲144	Zambia	2.7	18.8
▼145	Congo, Dem Rep	2.7	-2.6
▼146	Martinique	2.6	6.3
▼147	Macau	2.4	1.3
▲148	Mozambique	2.3	4.6
▼149	Guadeloupe	2.2	-4.1
▲150	Haiti	2.1	2.9
▼151	Suriname	2.0	4.0
▼152	Uganda	1.9	-3.0
▼153	Fiji	1.9	-6.2
= 154	Montenegro	1.9	4.3
▼155	Djibouti	1.8	3.4
▼156	Guam	1.7	-3.5
= 157	Guyana	1.5	0.0
▲158	Burkina Faso	1.4	3.1
= 159	Seychelles	1.4	6.1
▼160	Barbados	1.4	-4.0
▲161	Swaziland	1.4	17.0
▼162	Niger	1.3	3.5
▼163	Guinea	1.3	-1.2
▲164	Sierra Leone	1.3	5.9
▼165	Malawi	1.3	4.6
= 166	Laos	1.2	1.1
▼167	Wake Island	1.2	-4.1
= 168	French Guiana	1.1	6.1
= 169	Aruba	1.1	4.2
▲170	French Polynesia	1.1	7.7
▼171	Belize	0.94	-5.8
▼172	Maldives	0.92	3.4
= 173	Somalia	0.90	3.4
▼174	Afghanistan	0.83	-2.9
= 175	Faroe Islands	0.80	6.4
▲176	Eritrea	0.77	6.4
▲177	Mali	0.74	6.4
▼178	Rwanda	0.74	0.0
= 179	Bermuda	0.71	4.2
= 180	Liberia	0.69	2.2
= 181	Antigua and Barbuda	0.69	4.4
= 182	American Samoa	0.67	2.2
▲183	East Timor	0.61	4.7
▼184	Greenland	0.61	-4.8
▲185	Guinea-Bissau	0.46	0.0
▲186	Gambia	0.44	15.4
▼187	Cayman Islands	0.43	-11.8
▼188	Saint Lucia	0.41	0.0
▲189	Burundi	0.37	4.0
▲190	Cape Verde	0.34	4.5
▼191	Bhutan	0.33	-11.1
▲192	Western Sahara	0.32	0.0
▲193	Antarctica	0.31	17.6
▲194	Saint Kitts and Nevis	0.30	11.1
= 195	Grenada	0.30	4.8
▼196	Central African Republic	0.29	-13.0
▲197	Solomon Islands	0.29	2.5.0
▼198	US Pacific Islands	0.29	0.0
▼199	Chad	0.29	11.1
▼200	Lesotho	0.27	5.9
= 201	Saint Vincent/Grenadines	0.27	17.6
▲202	Nauru	0.20	0.0
▼203	Tonga	0.15	-23.1
▲204	Cook Islands	0.15	66.7
▲205	Comoros	0.15	25.0
▼206	Sao Tome and Principe	0.15	11.1
▲207	Vanuatu	0.15	25.0
▲208	British Virgin Islands	0.15	25.0
▼209	Samoa	0.15	-16.7
= 210	Montserrat	0.15	58.7
▼211	Dominica	0.14	11.1
▼212	Saint Pierre and Miquelon	0.11	16.7
= 213	Turks and Caicos Islands	0.08	0.0
= 214	Falkland Islands	0.05	0.0
= 215	Kiribati	0.04	0.0
= 216	Saint Helena	0.01	11.2
= 217	Niue	0.01	2.9

Table shows total carbon dioxide emissions from the consumption of energy

GRAPHIC: MARK McCORMICK, PAUL SCRUTON. SOURCE: EIA

3. Revealing with Images - COMPARISONS

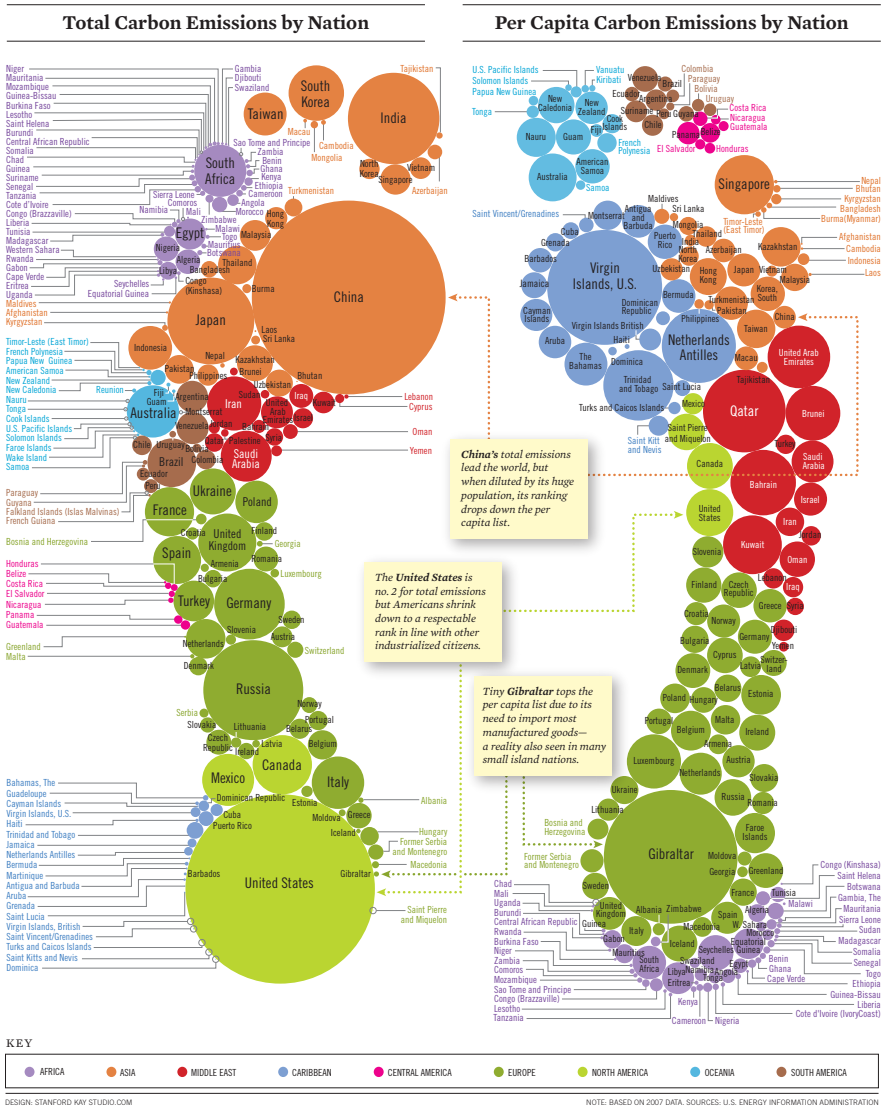
carbon emissions per nation

Miller-McCune

Tracking Carbon Emissions

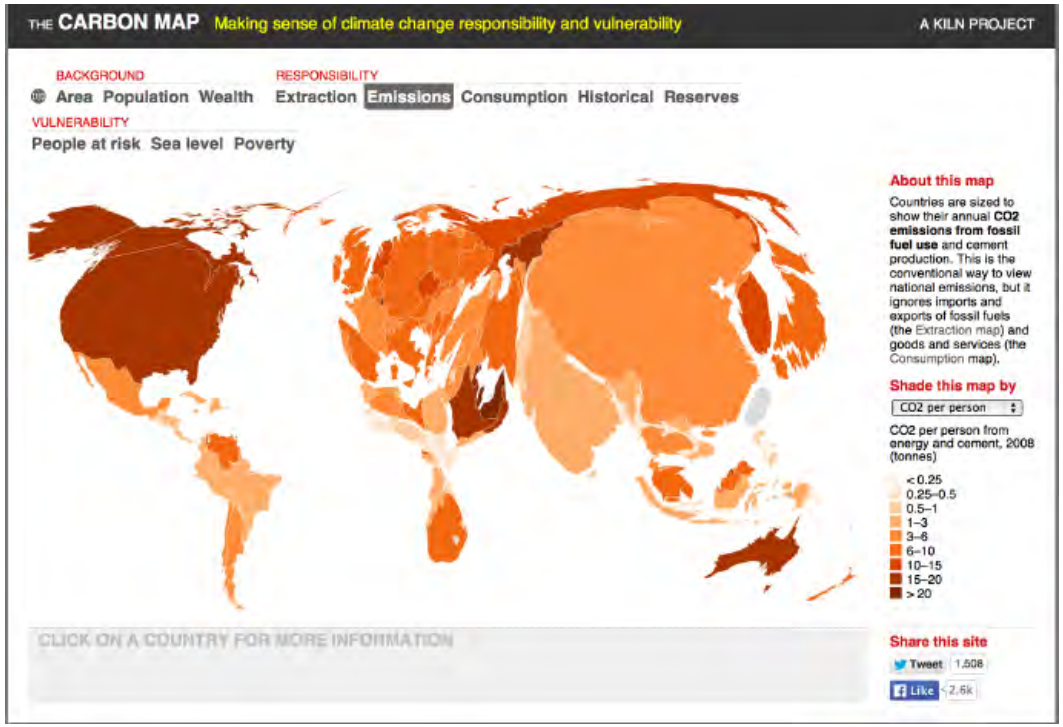
A footprint comparison of total carbon dioxide emissions by nation and per capita shows there's plenty of room for smaller countries to reduce their carbon footprints.

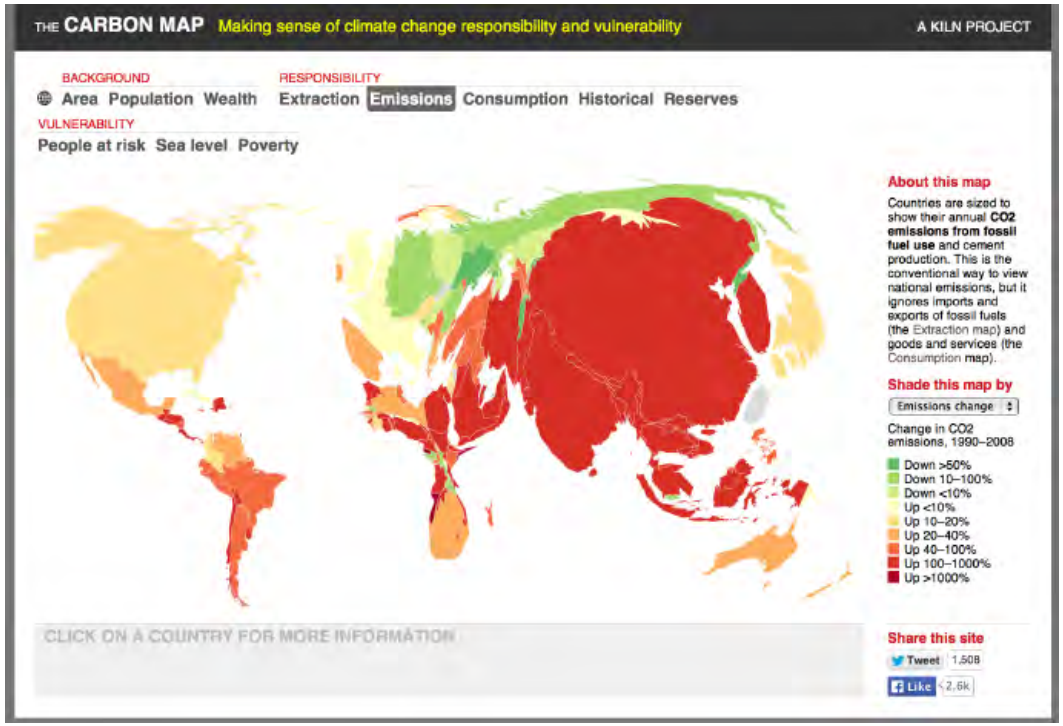
By Stanford Kay



3. Revealing with Images - COMPARISONS

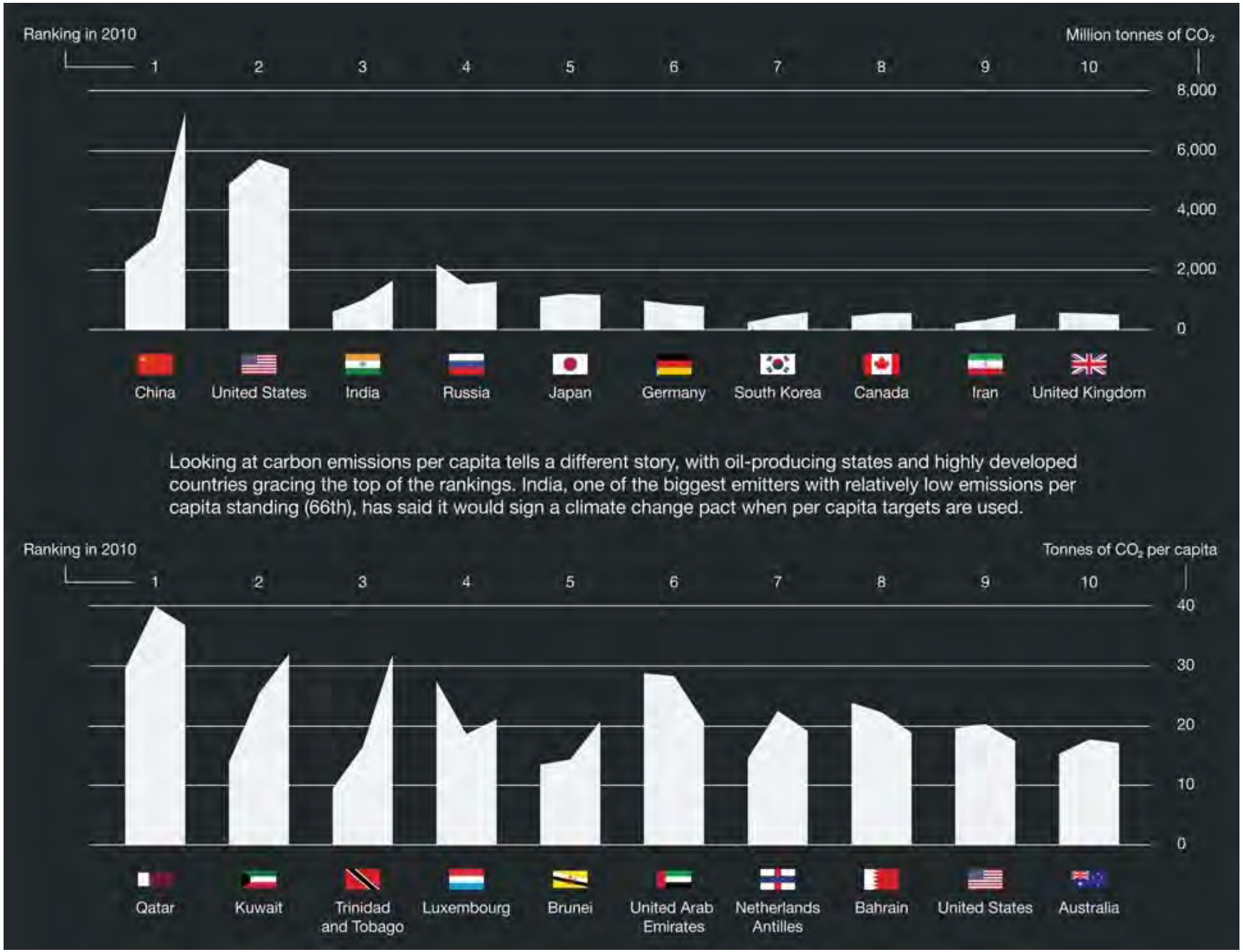
carbon emissions per nation - Co2 per person + emission change





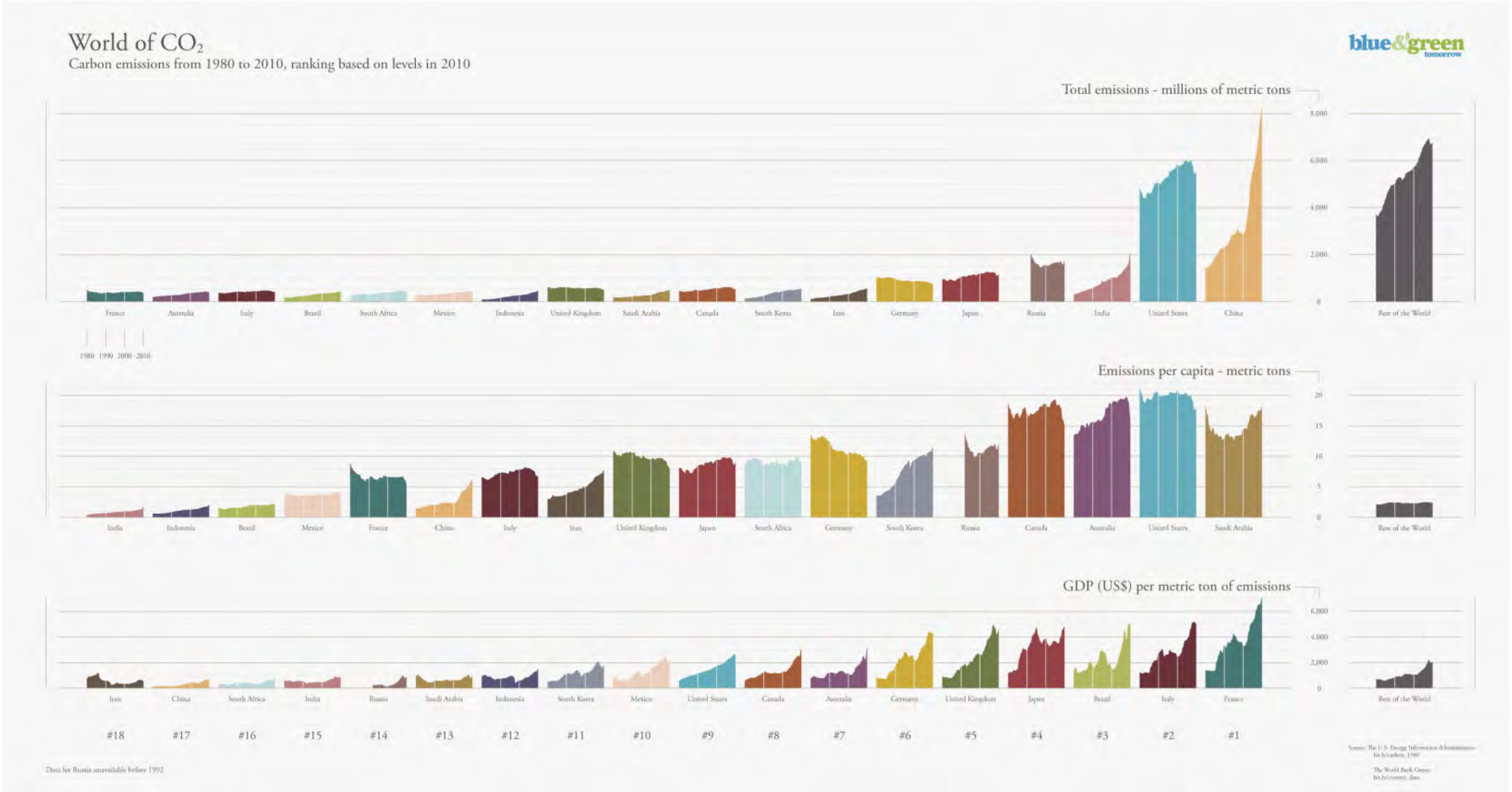
3. Revealing with Images - COMPARISONS

carbon emissions per nation



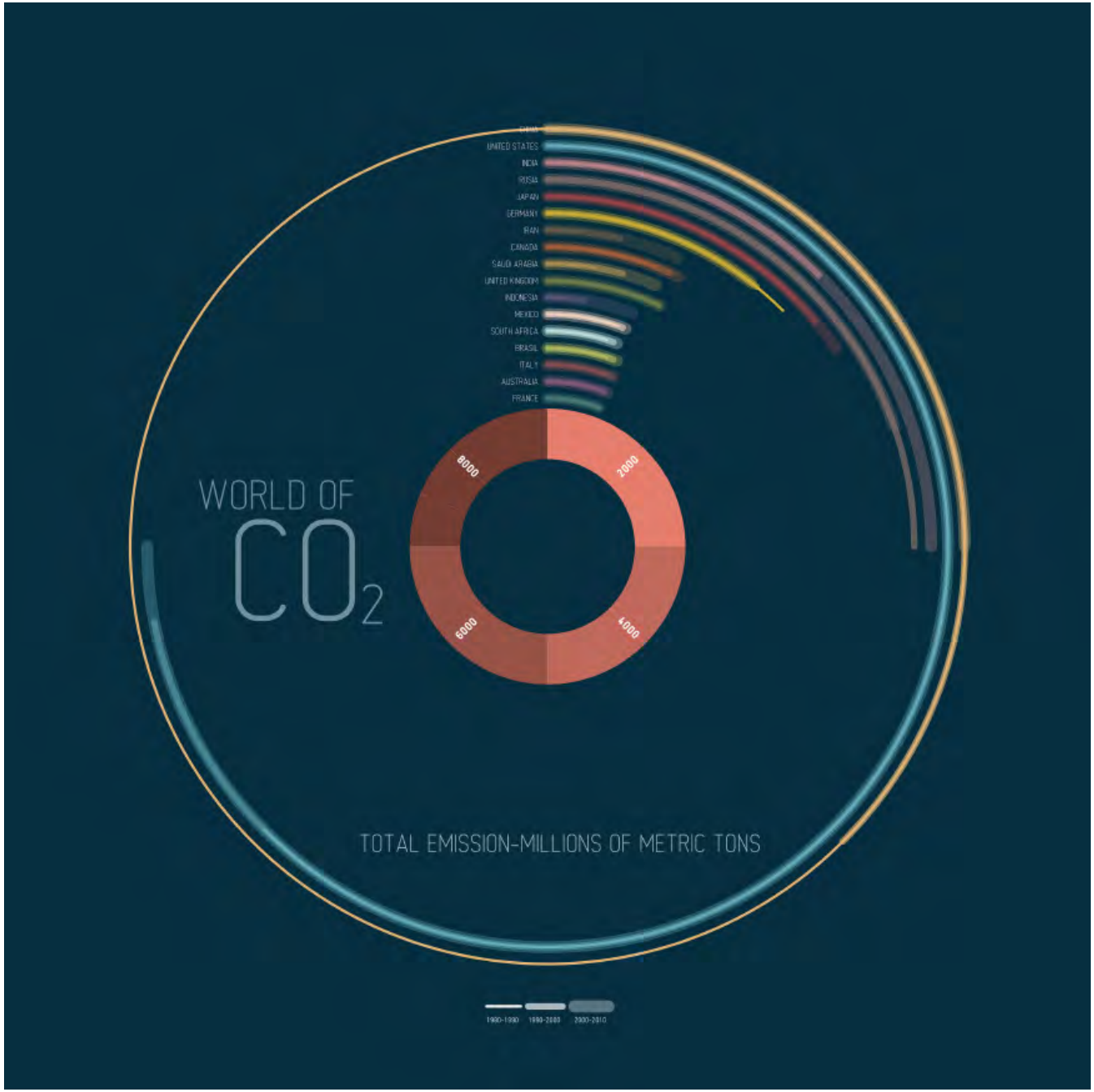
3. Revealing with Images - COMPARISONS

carbon emissions per nation



3. Revealing with Images - **COMPARISONS**

carbon emissions per nation



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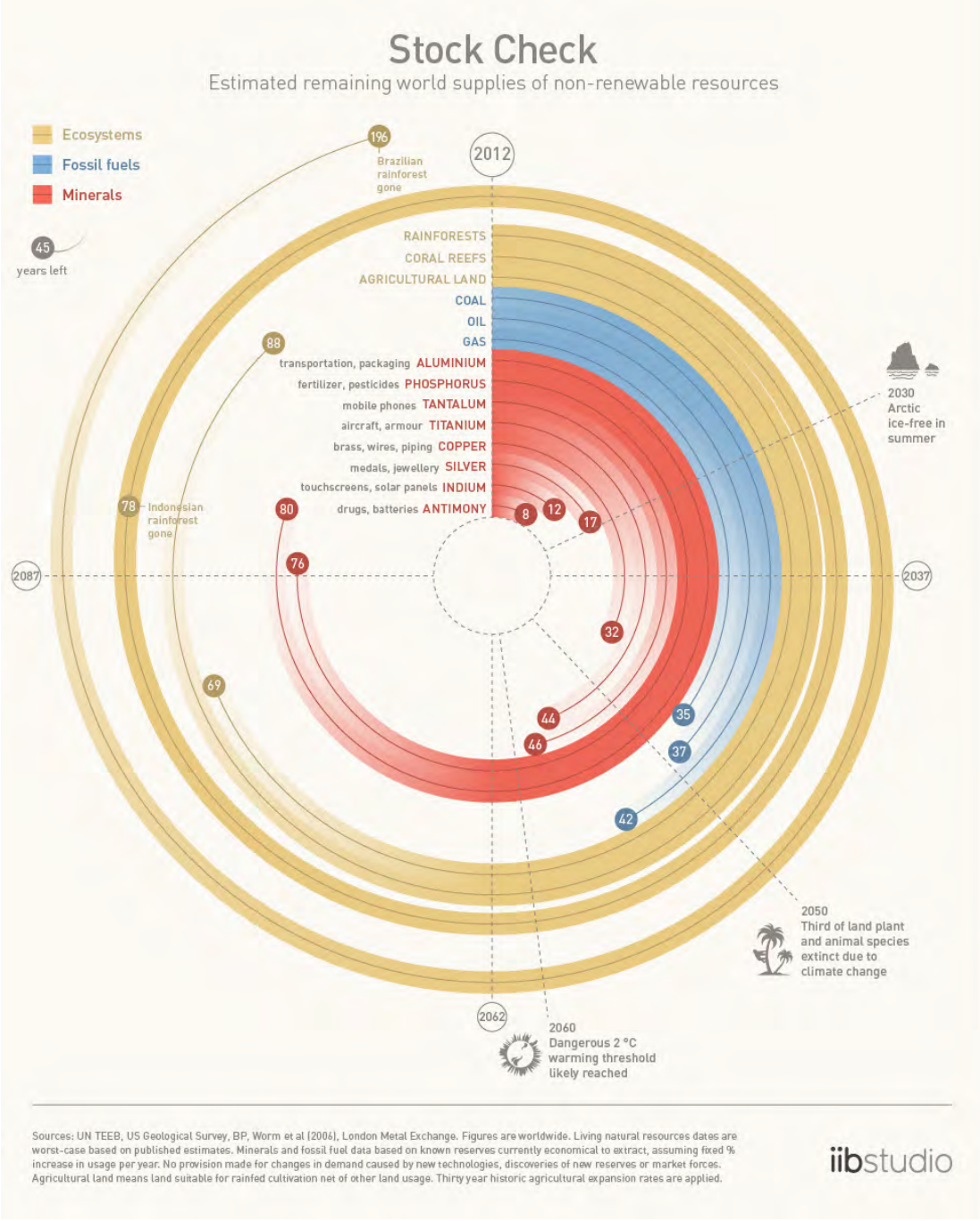
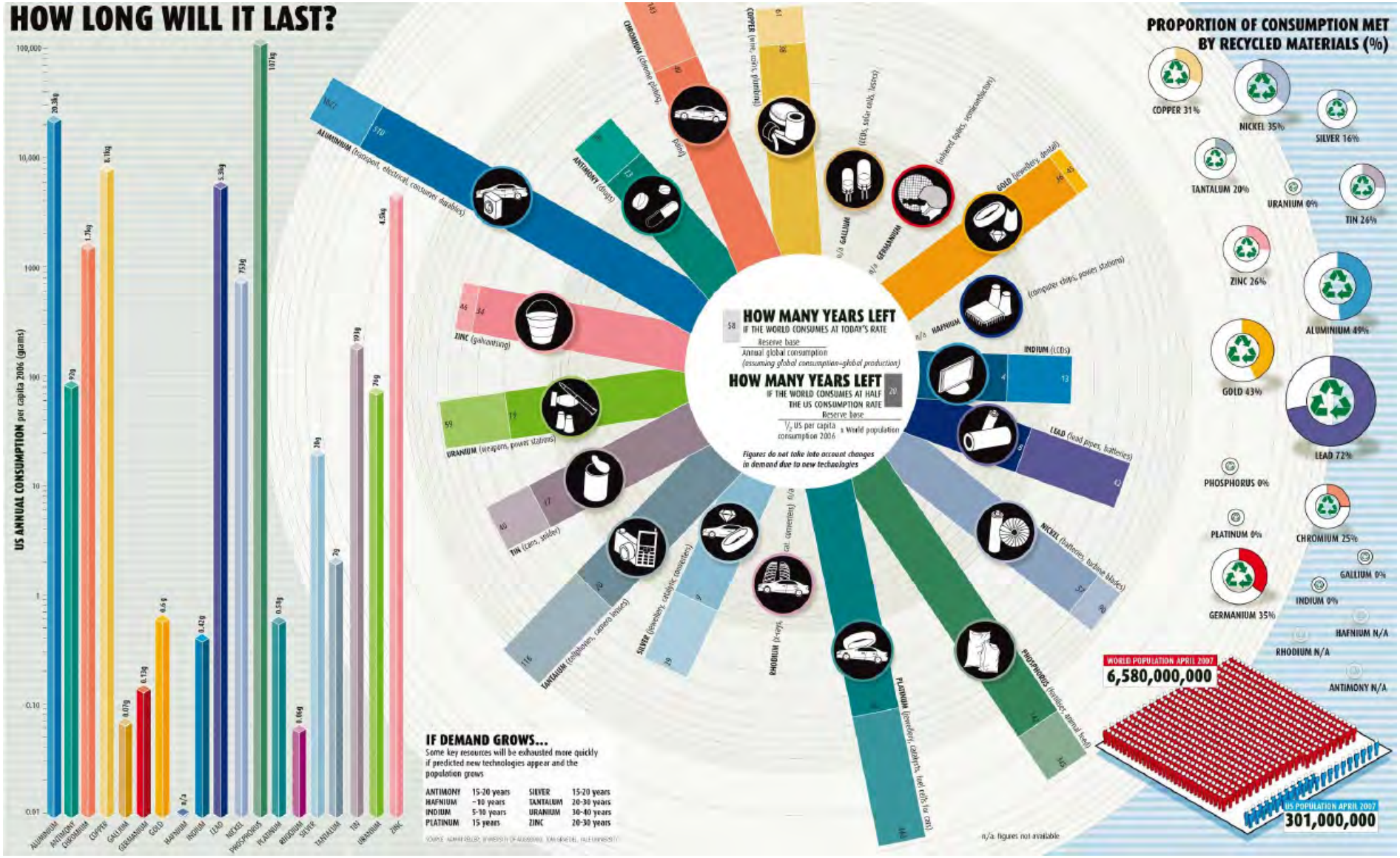
estimated remaining non-renewable resources



3. Revealing with Images - COMPARISONS

estimated remaining non-renewable resources



3. Revealing with Images - COMPARISONS

ecological footprint per nation

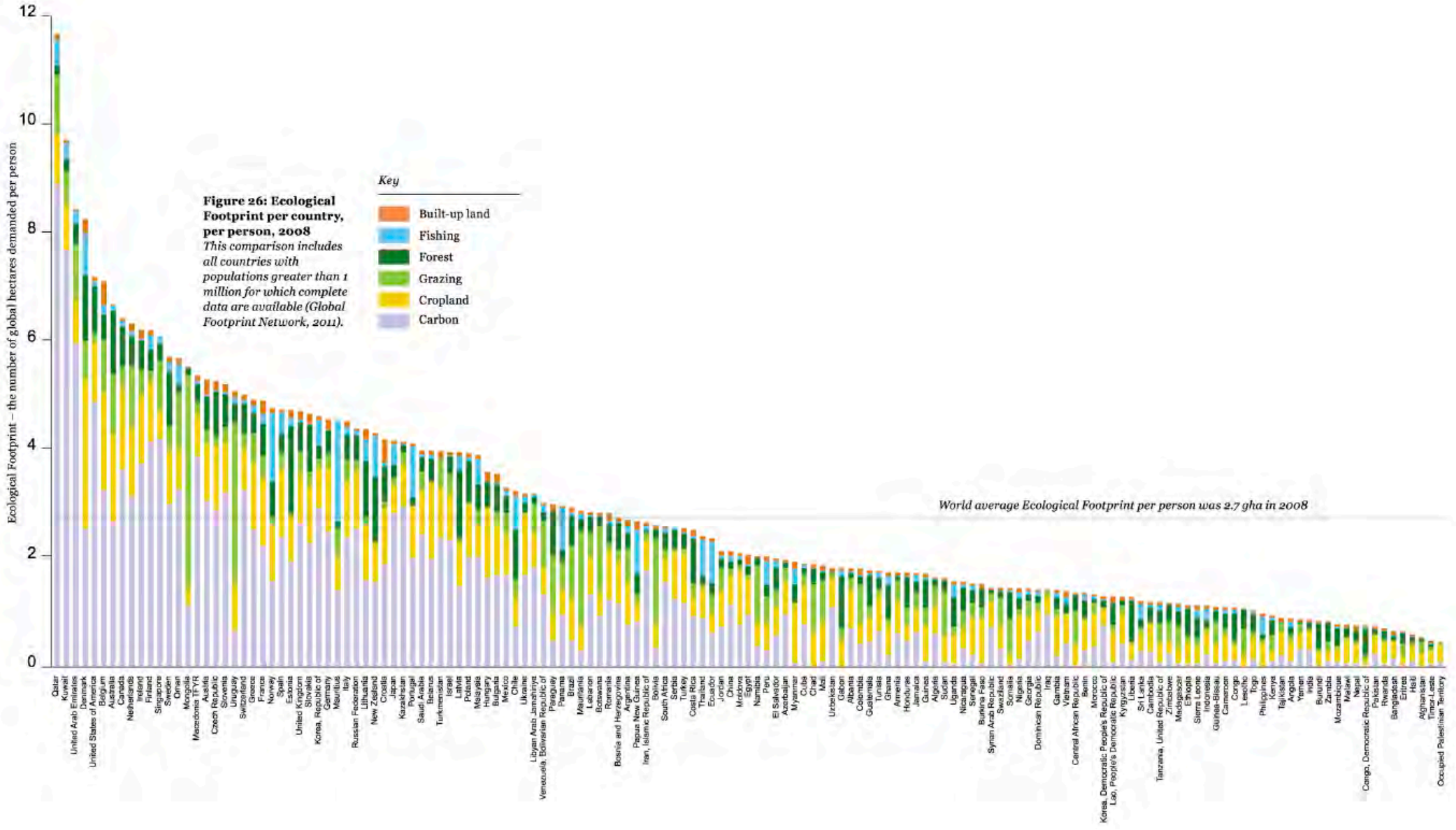
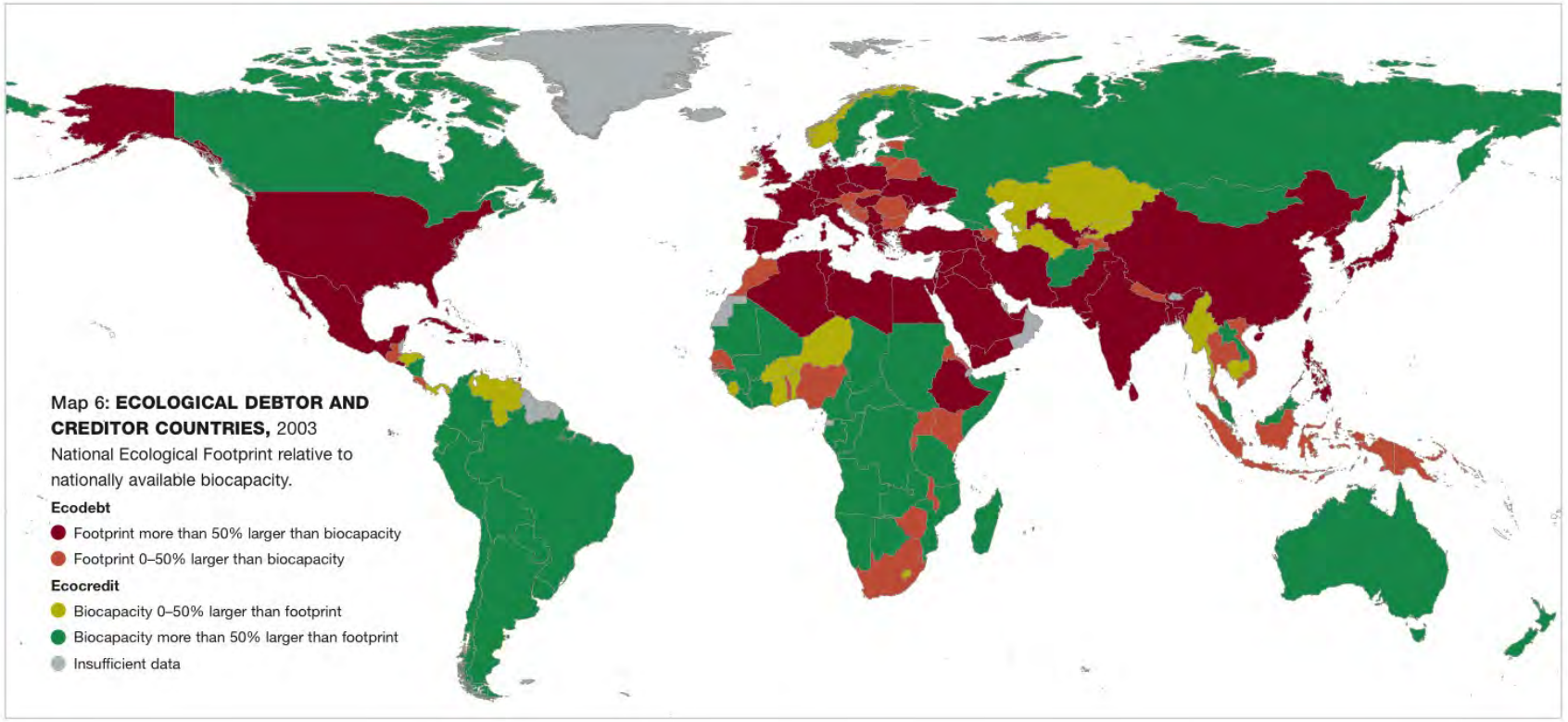


Figure 26: Ecological Footprint per country, per person, 2008
This comparison includes all countries with populations greater than 1 million for which complete data are available (Global Footprint Network, 2011).

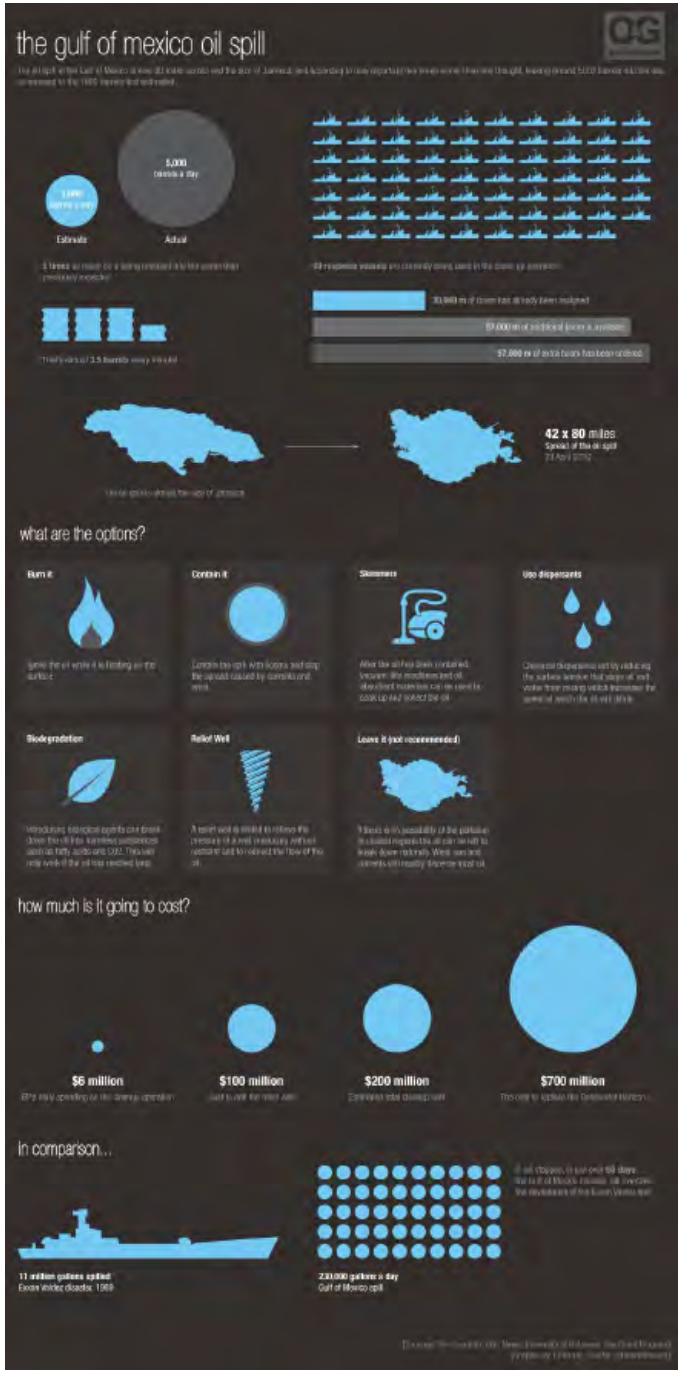
3. Revealing with Images - COMPARISONS

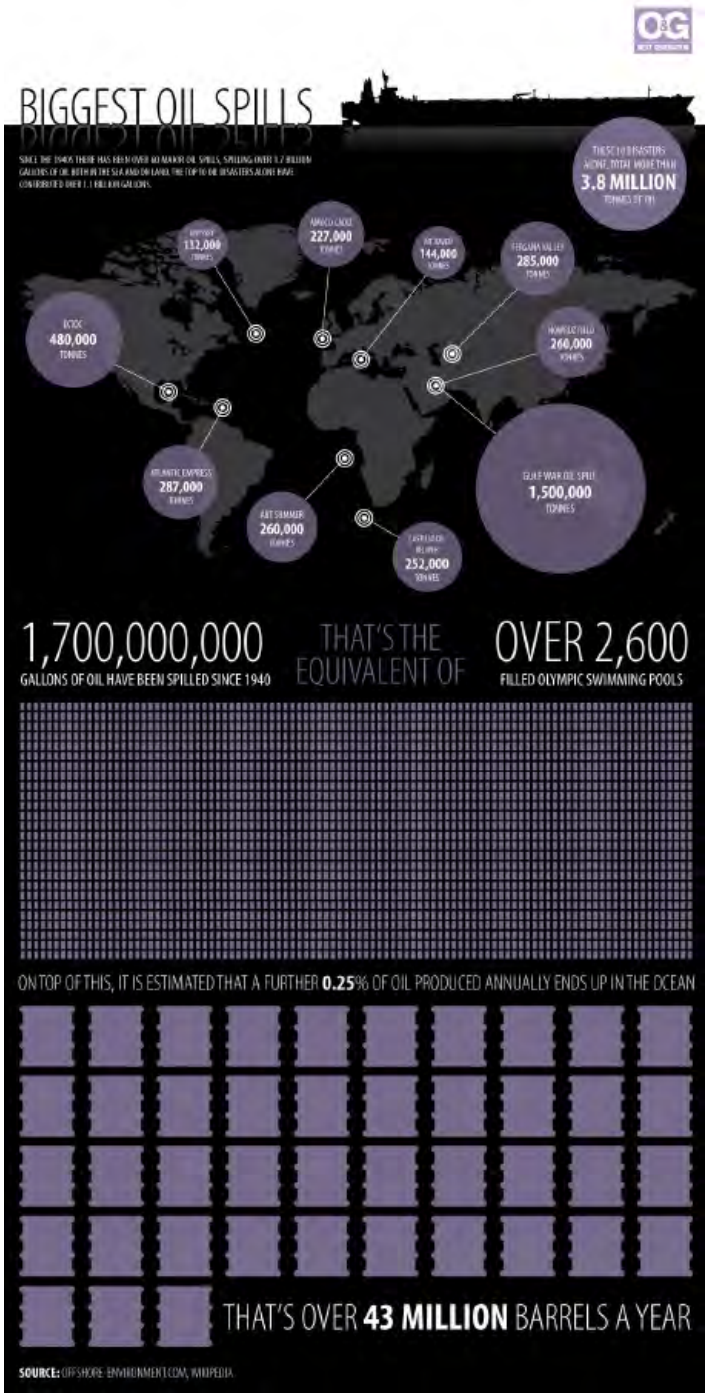
ecological footprint relative to biocapacity



3. Revealing with Images - COMPARISONS

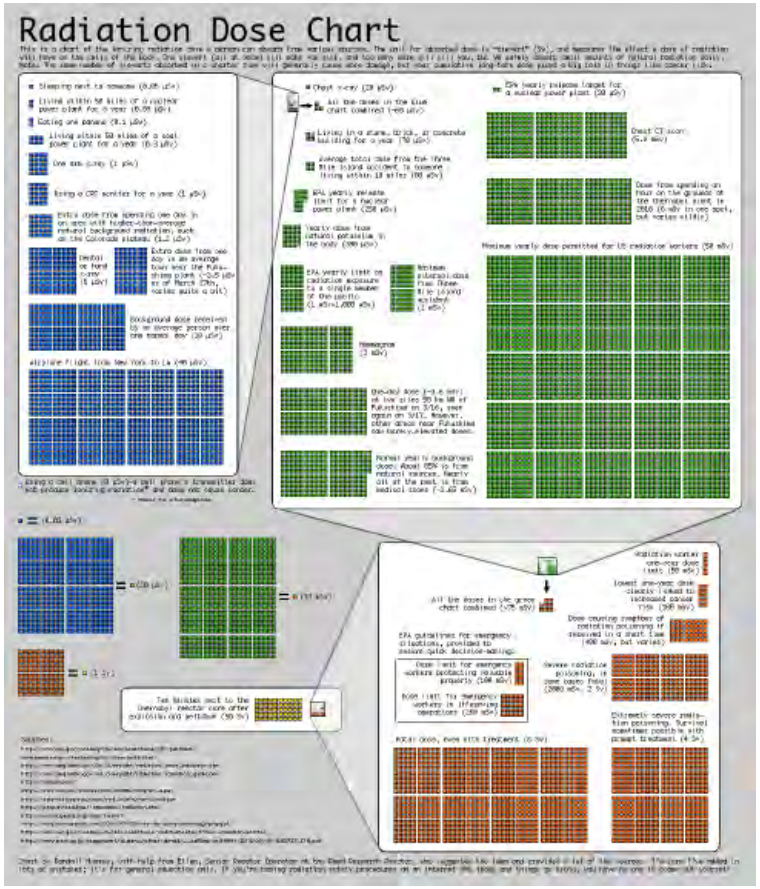
scale - large (oil spills)





3. Revealing with Images - COMPARISONS

scale - small (radiation doses)



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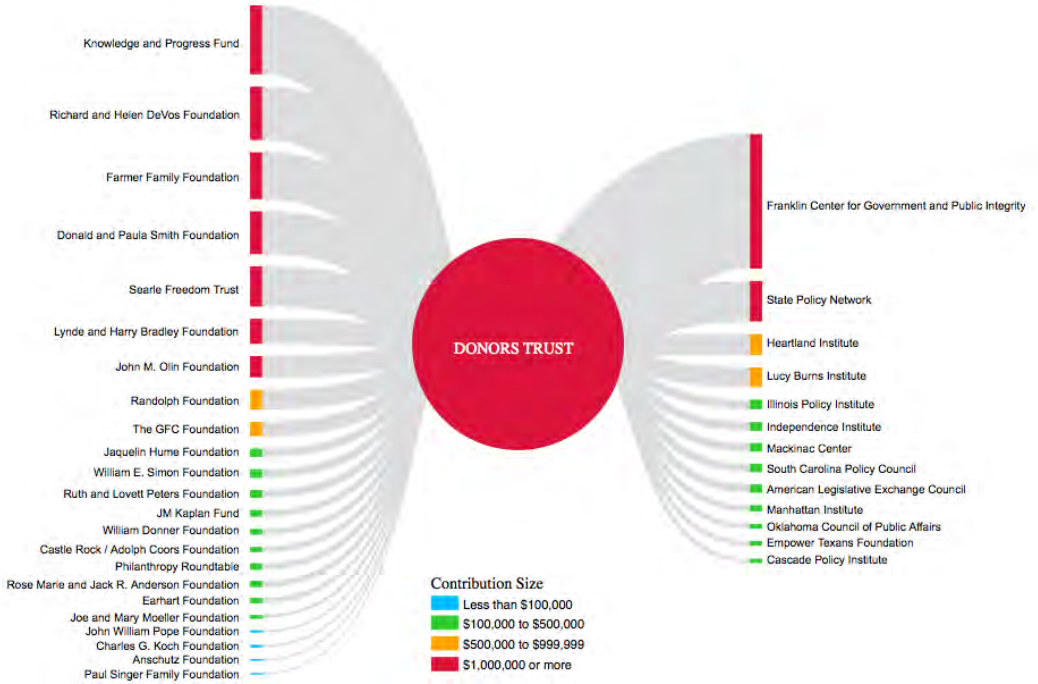
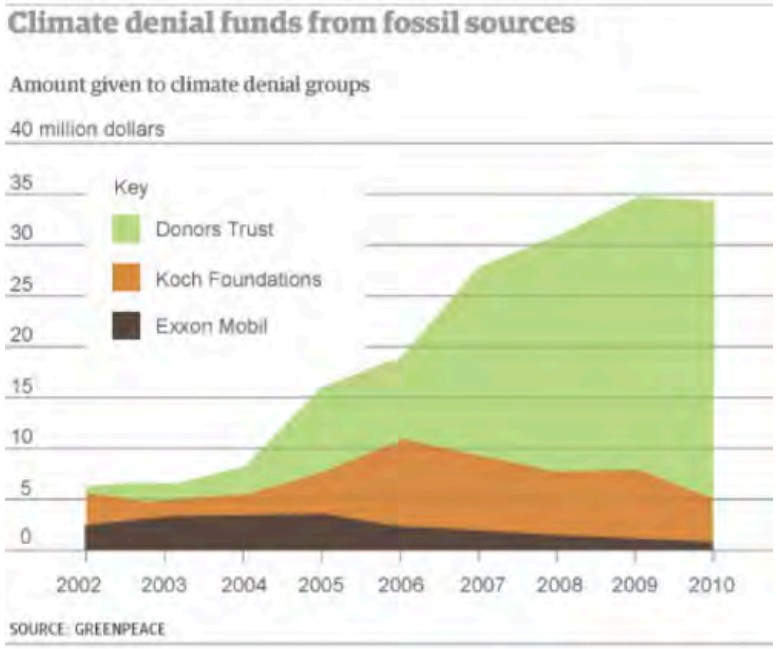
networks in the climate denial industry





The Center for Public Integrity. Following the Donors Trust money trail. 2013.

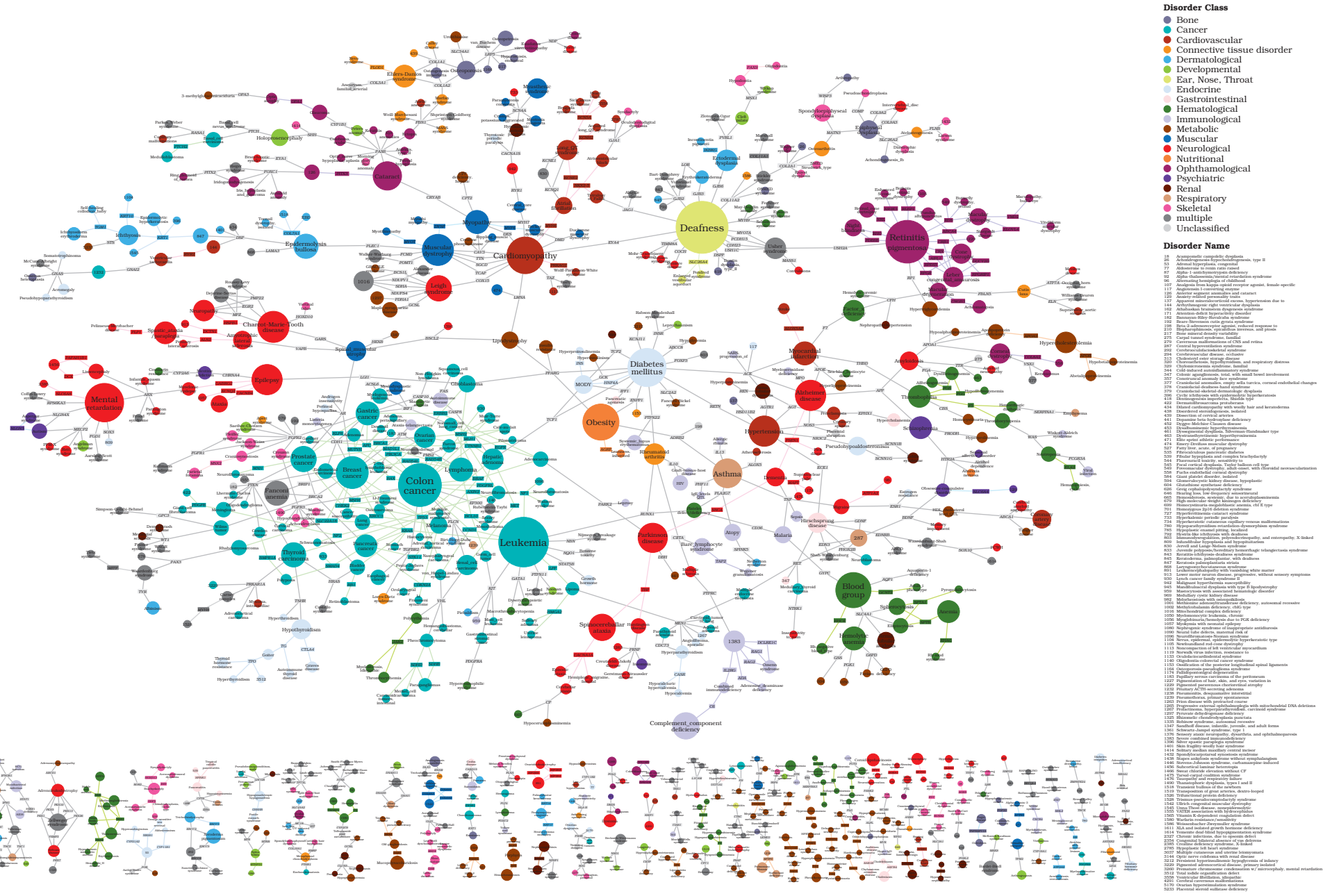
3. Revealing with Images - CONNECTIONS

network visualization

Human Disease Network

Supporting Information Figure S9

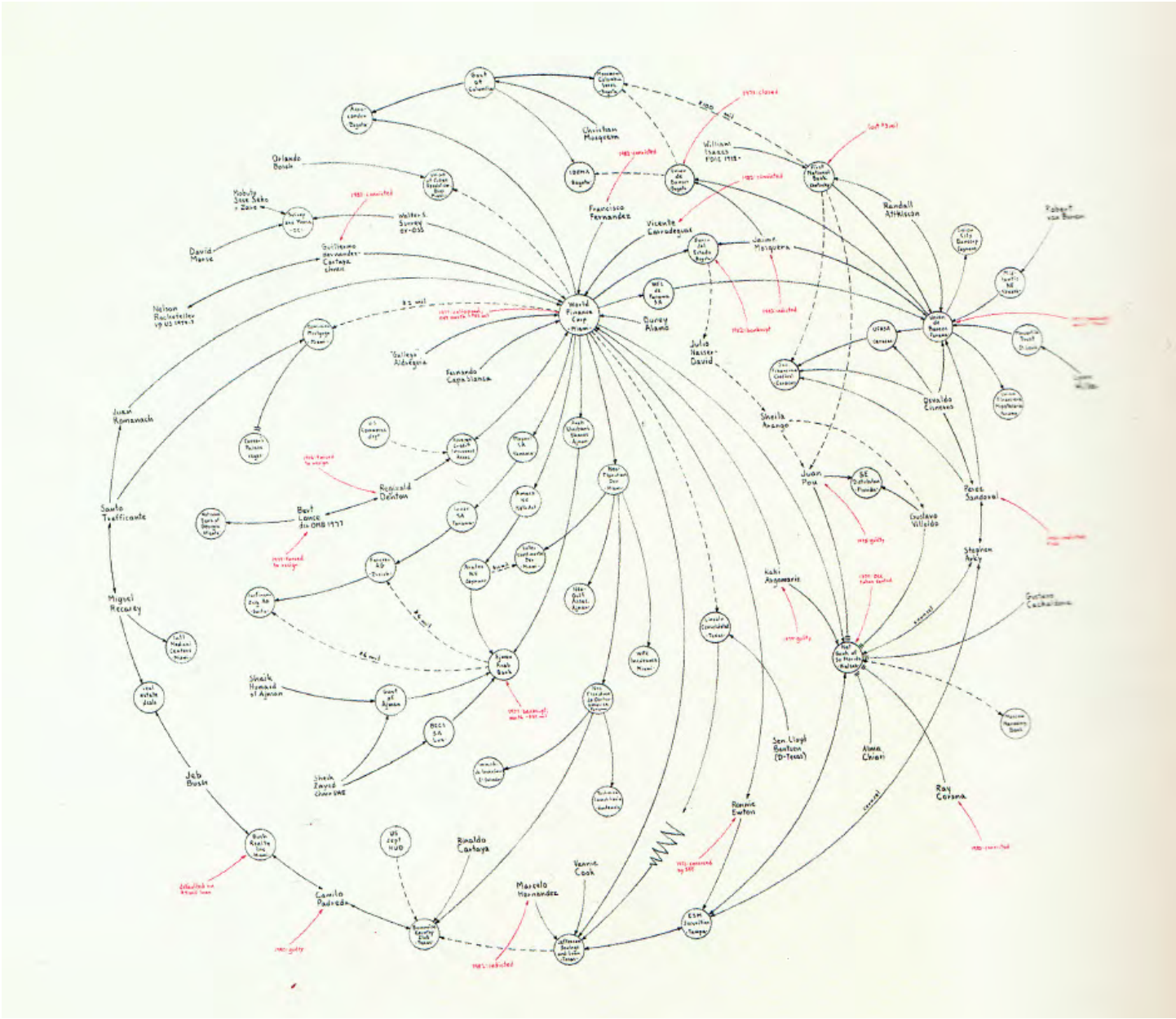
Kwang-Il Goh, Michael E. Cusick, David Valle, Barton Childs, Marc Vidal, Albert-László Barabási



Supporting Information Figure S9 | Bipartite-graph representation of the diseasome. A disorder (circle) and a gene (rectangle) are connected if the gene is implicated in the disorder. The size of the circle represents the number of distinct genes associated with the disorder. Isolated disorders (disorders having no links to other disorders) are not shown. Also, only genes connecting disorders are shown.

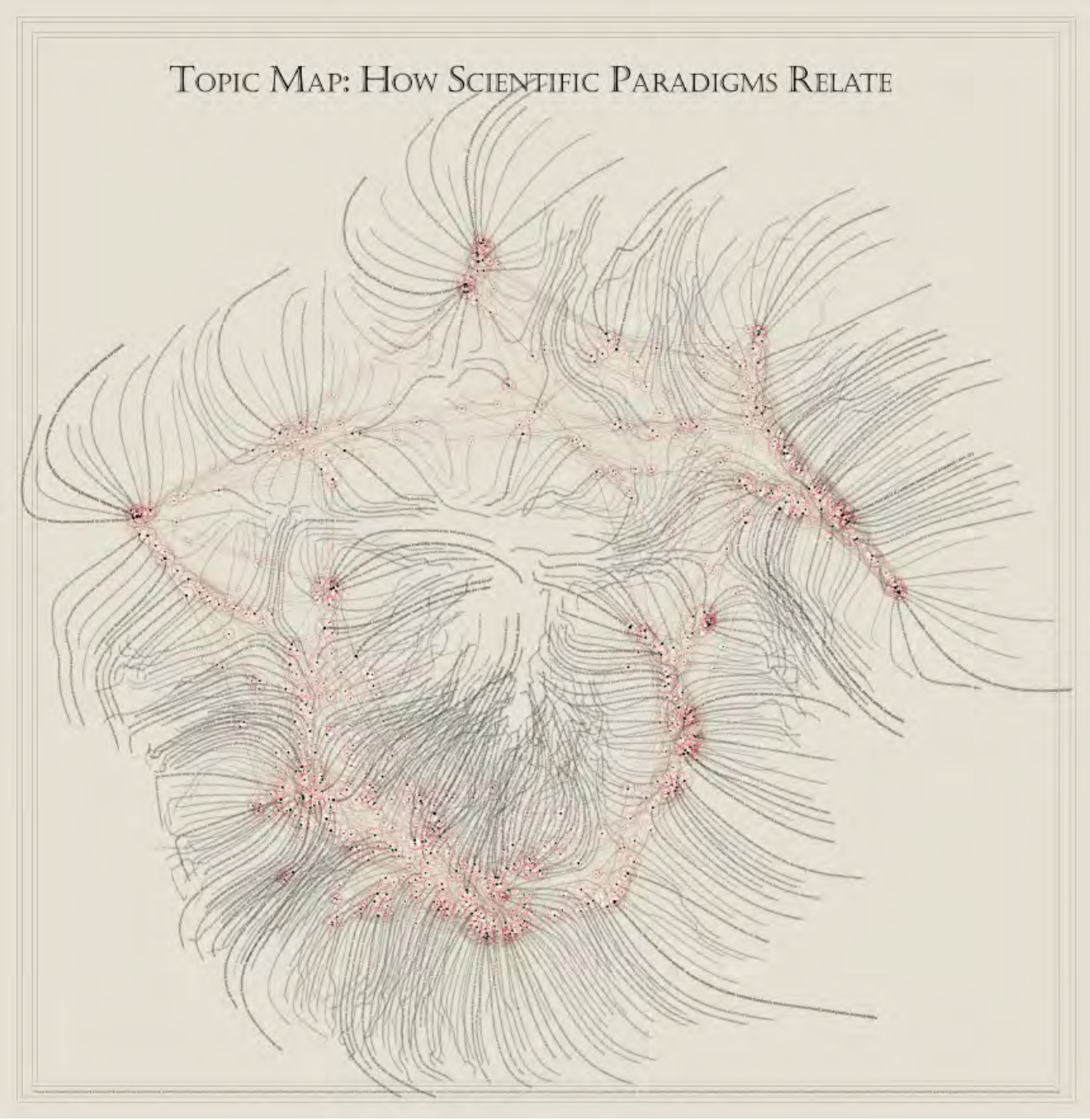
3. Revealing with Images - CONNECTIONS

early network visualization - Mark Lombardi



3. Revealing with Images - CONNECTIONS

Map of Science



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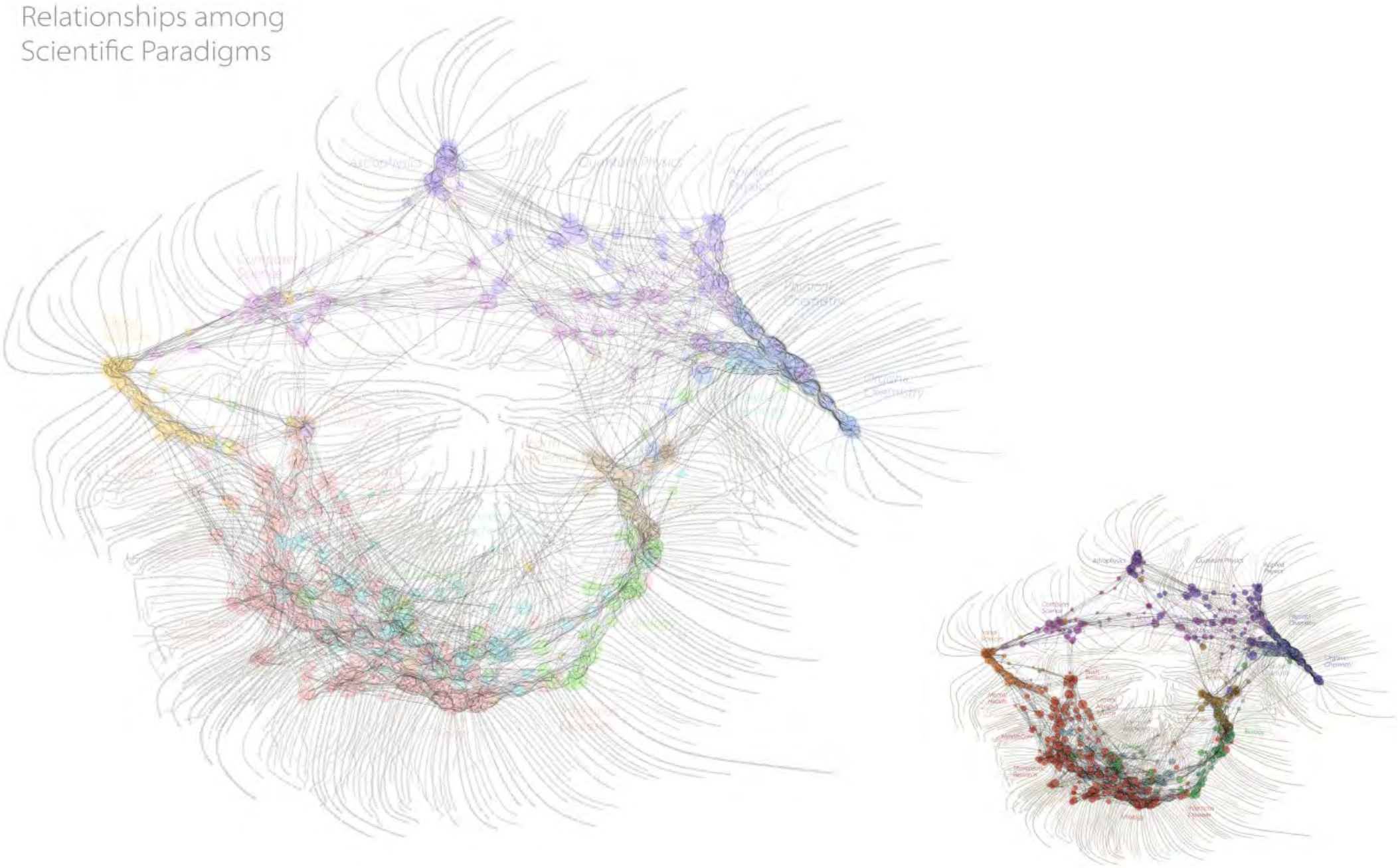
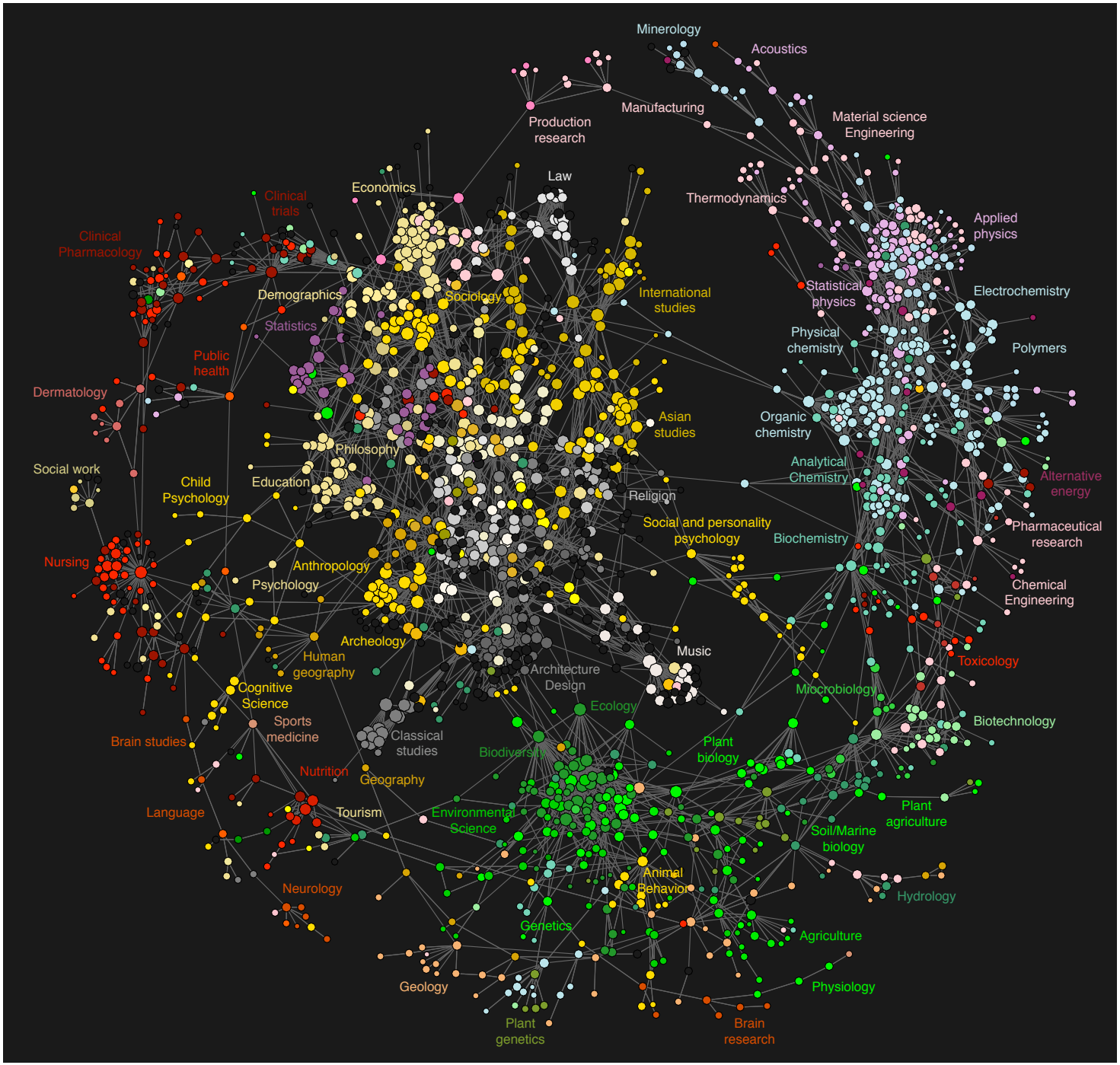
Map of Science



3. Revealing with Images - CONNECTIONS

Map of Science

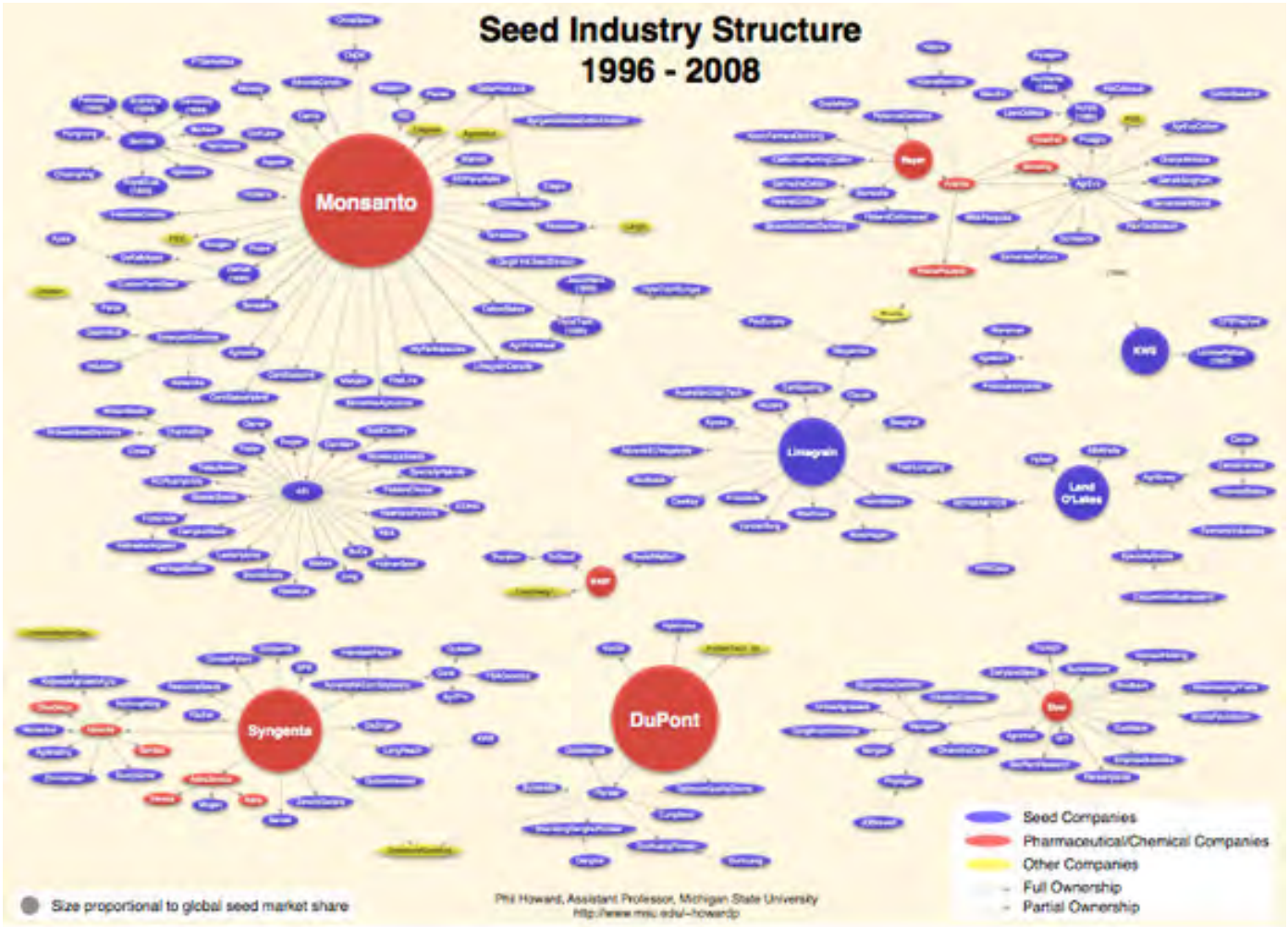


3. Revealing with Images - CONNECTIONS

networks in the food system

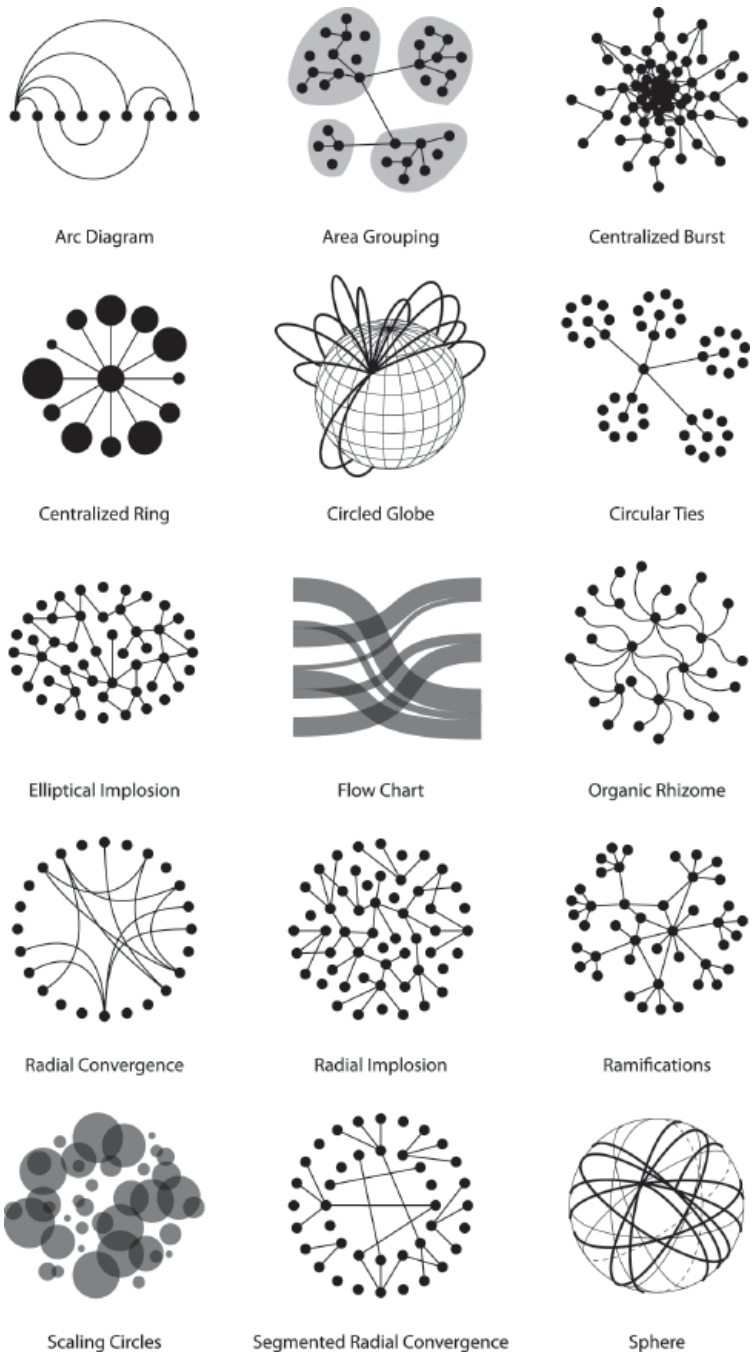
3. Revealing with Images - CAUSALITY

networks in the seed system



3. Revealing with Images - CONNECTIONS

network typology - Manual Lima



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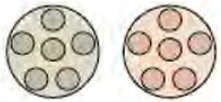
network typology - Pew Research Center

NETWORK TYPE		GROUPS	EXAMPLES
Divided 1	 **POLARIZED CROWDS** This type illustrates different groups of Twitter users who discuss polarizing topics. They often rely on different sources of information and commonly do not interact with groups that disagree with them.	**2 large**	Politics or divisive topics that display separate "echo chamber" structures
Unified 2	**TIGHT CROWDS** This type captures close communities, such as conferences, professional topics and hobby groups, where participants strongly connect to one another for information, ideas and opinions.	**2-6 medium**	Hobbies, professional topics, conferences. No outsiders, all participants are members
Fragmented 3	**BRAND CLUSTERS** This type is formed around products and celebrities. These popular topics attract large fragmented Twitter populations, generating mass interest, but little connectivity.	**Many small**	Brands, public events, popular subjects
Clustered 4	**COMMUNITY CLUSTERS** These groups are created around global news events and popular topics. Communities form around multiple news sources. These community clusters are mostly disconnected from one another.	**Many small and medium**	Global news events
In-Hub & Spoke 5	**BROADCAST NETWORK** This type is often triggered by news media outlets and pundits who have loyal followers who retweet them. These communities are often star-shaped, as little interaction exists among members of the audience.	**1 large, some secondary**	News pundits and media outlets, famous individuals
Out-Hub & Spoke 6	**SUPPORT NETWORK** This type is created when companies, government agencies or organizations respond to complaints and customer requests. The company, or hub, account replies to many disconnected users, creating outward spokes.	**1 large, some secondary**	Companies and services with customer support

PEW RESEARCH CENTER in association with Social Media Research Foundation

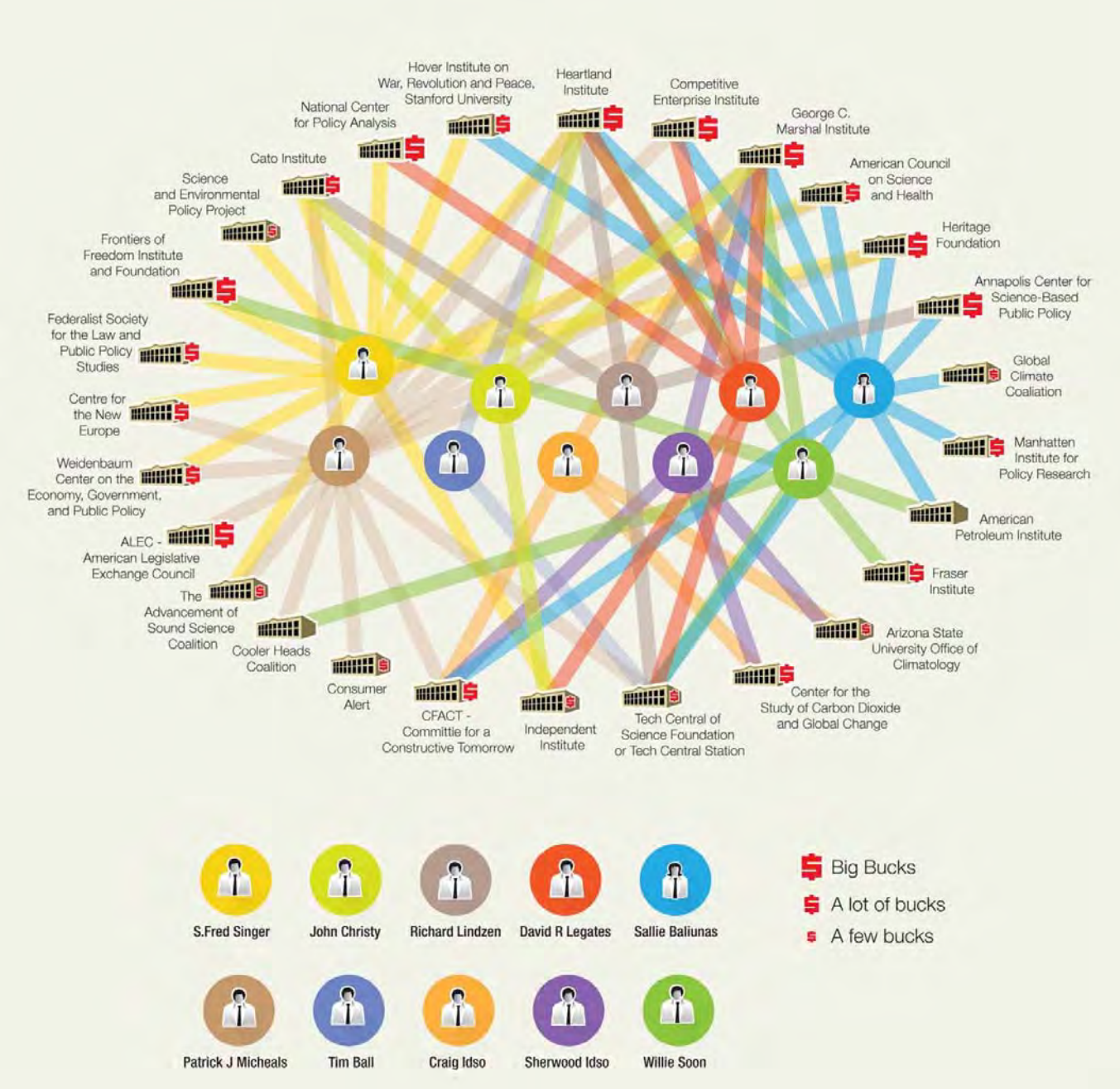
3. Revealing with Images - CONNECTIONS

climate discourse visualization using Twitter hashtags

EMAPS (Electronic Maps to Assist Public Science). Created as part of the 7th annual DMI Summer School 24th June to 5th July 2013. Twitter hashtag clusters around the hashtag global warming/climate change. Depicted as network graph. DMI Twitter Capture and Analysis Tool (TCAT).

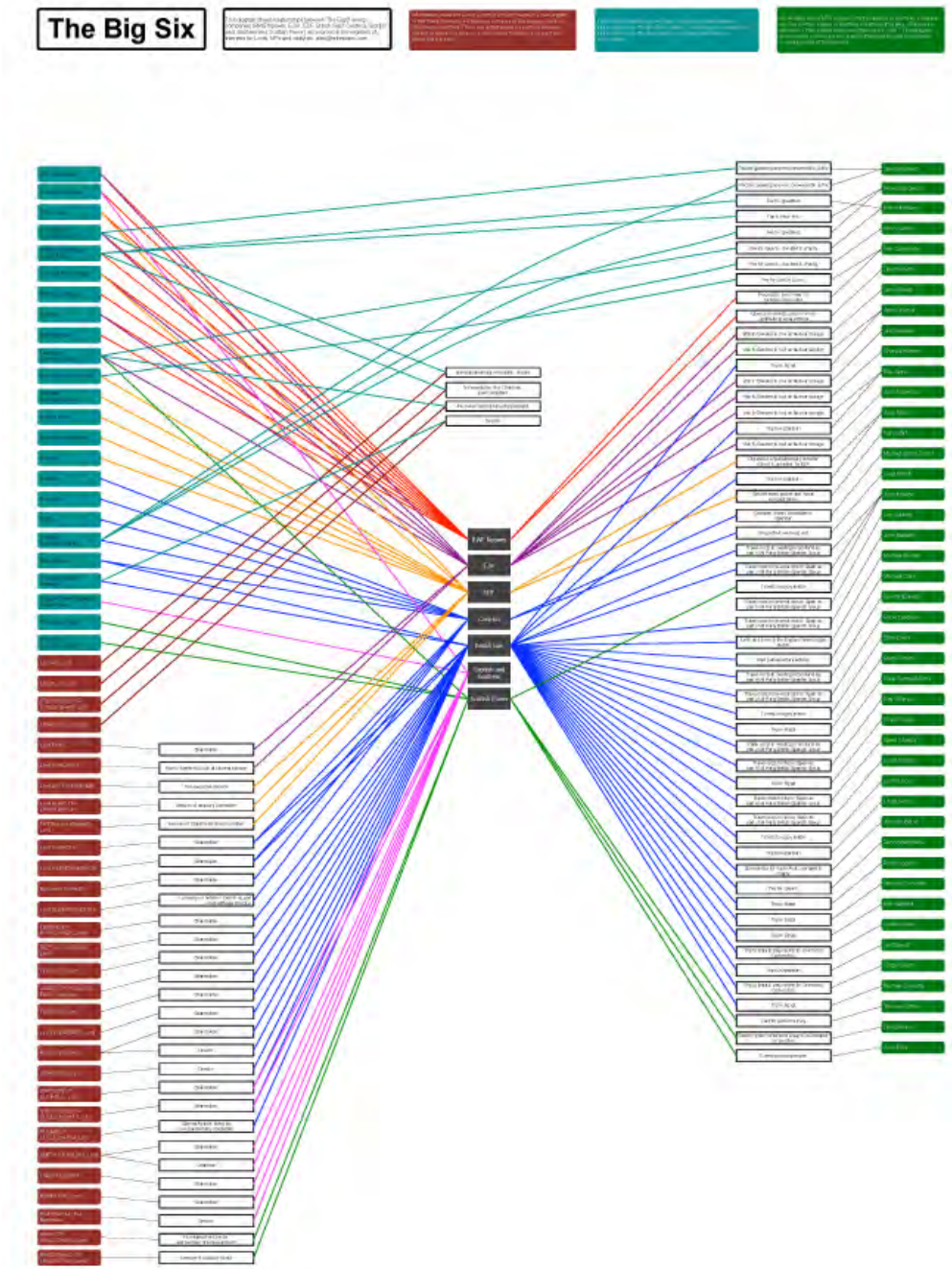
3. Revealing with Images - CONNECTIONS

Exxon Secrets network visualization - by Greenpeace



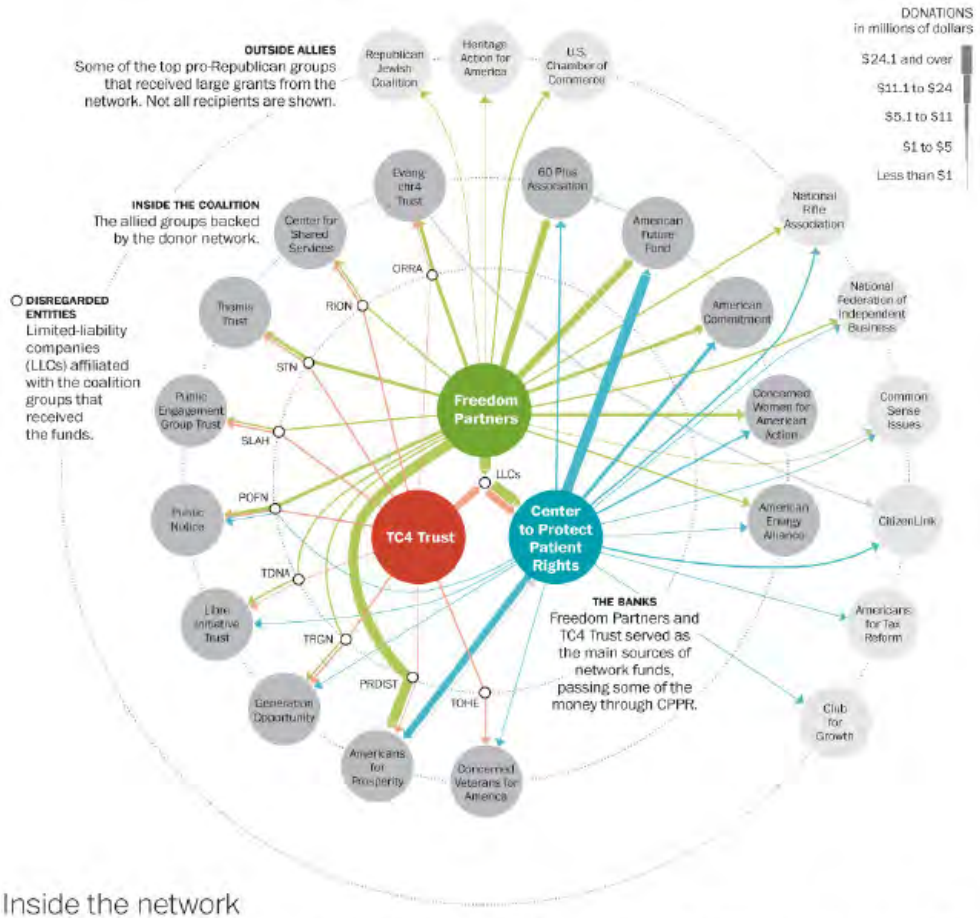
3. Revealing with Images - CONNECTIONS

The Big Six - UK Energy companies, lobbyists and MPs



3. Revealing with Images - CONNECTIONS

Koch network visualization + flow diagram- by OpenSecrets.org, Center for Responsive Politics

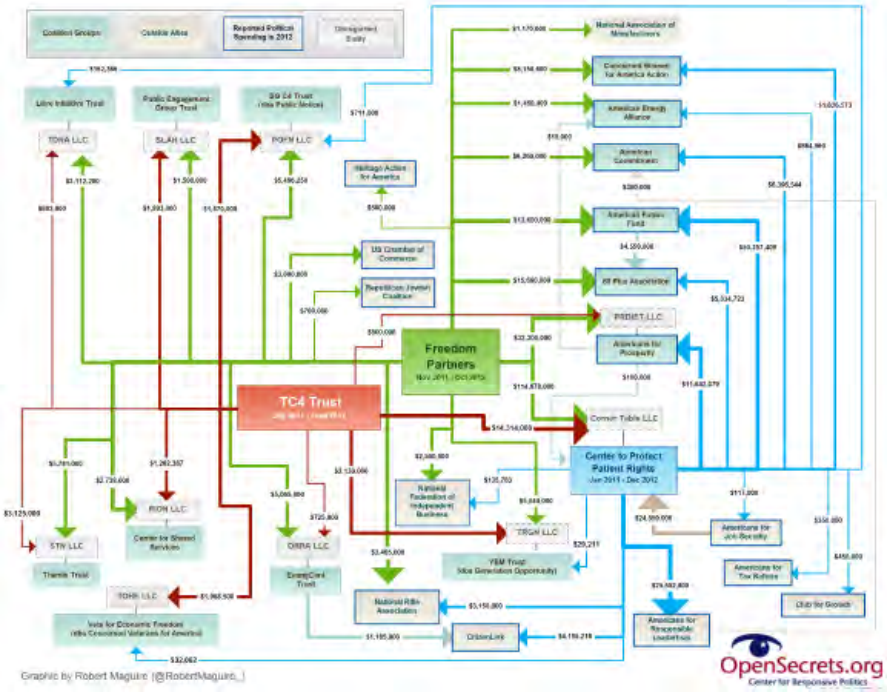


Inside the network

TC4 TRUST, a now-defunct Alexandria-based group, sent its funds to LLCs affiliated with the nonprofit groups in the network.

FREEDOM PARTNERS, an Arlington County-based group whose board includes current and former Koch Industries officials, now plays a role similar to that of TC4 Trust, funding many of the same groups.

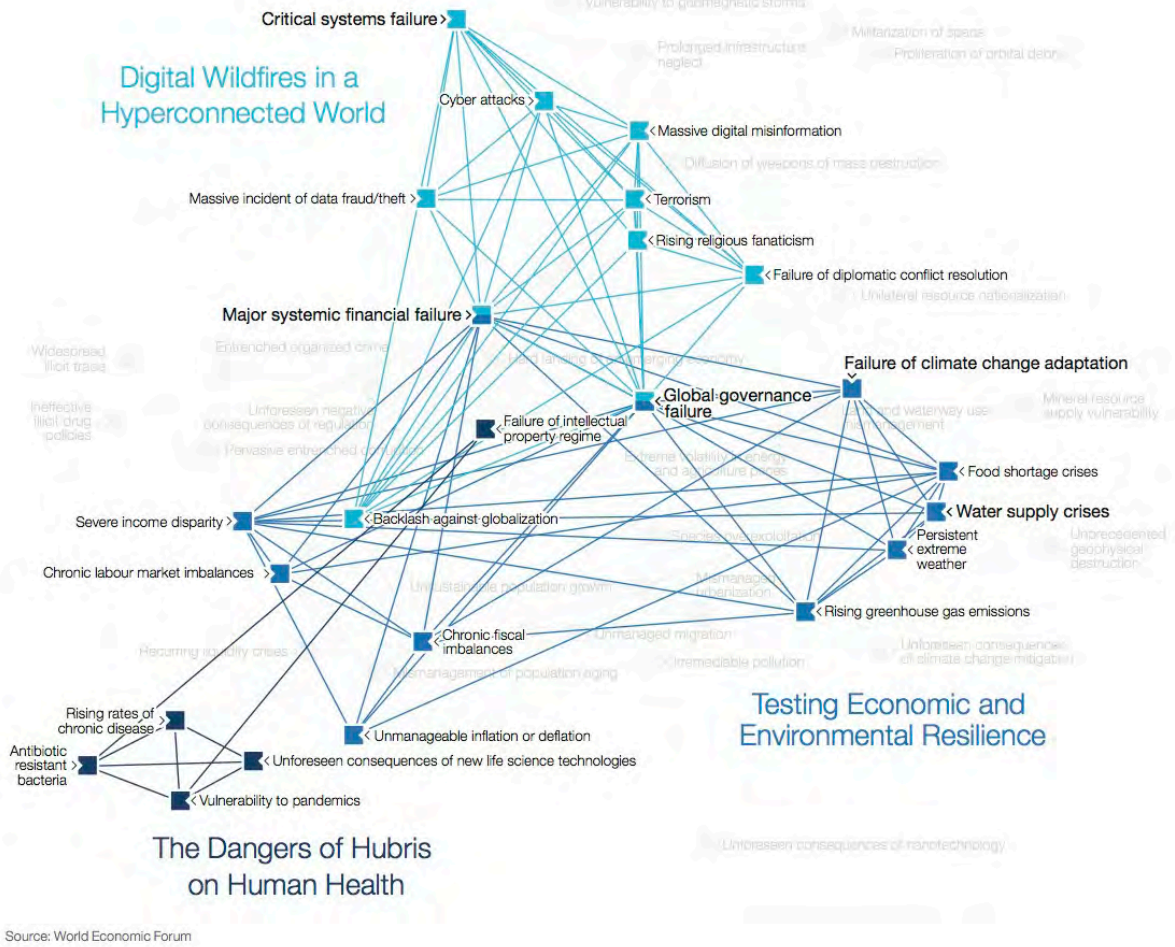
CENTER TO PROTECT PATIENT RIGHTS served as an intermediary group, passing along millions from TC4 Trust and Freedom Partners to nonprofit groups in the network.



3. Revealing with Images - CAUSALITY

Global risksm, WEF

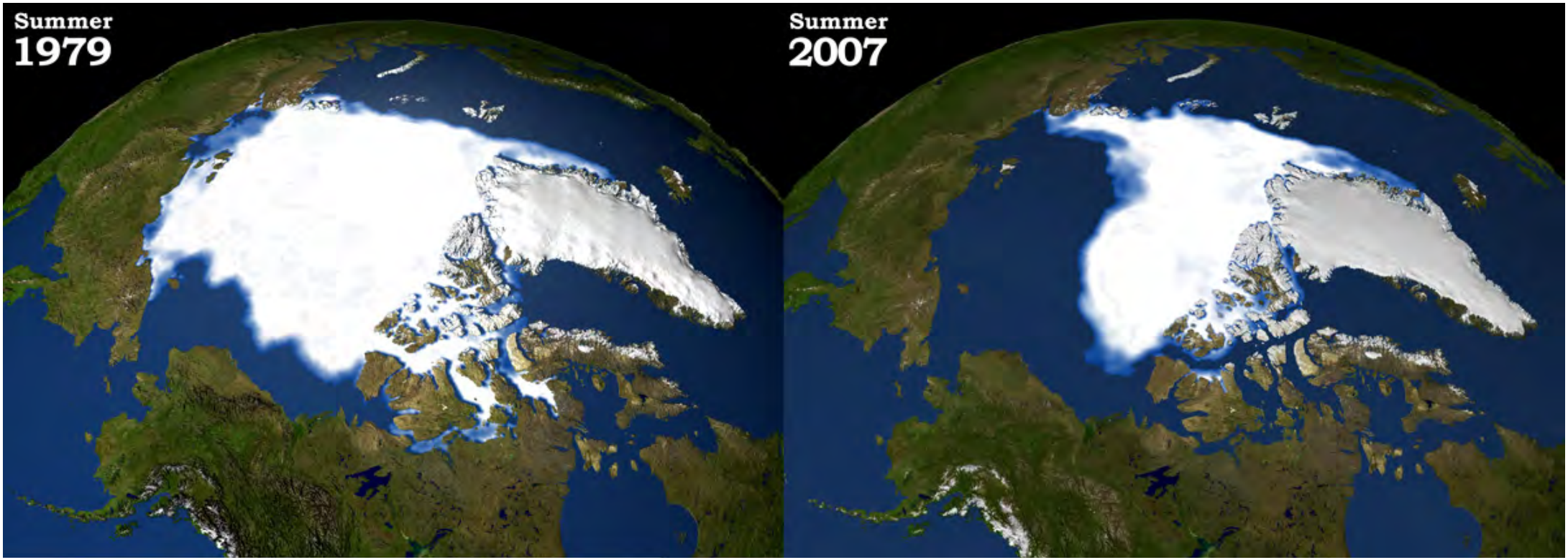
Figure 3: Global Risks Map 2013[ii]



Source: World Economic Forum

3. Revealing with Images - CAUSALITY

Artic ice caps



3. Revealing with Images - CAUSALITY

Artic ice caps

National Snow and Ice Data Center, 2007

2010 - 2030

2040 - 2060

2070 - 2090

Arctic Climate Impact Assessment, 2004

3. Revealing with Images - CAUSALITY

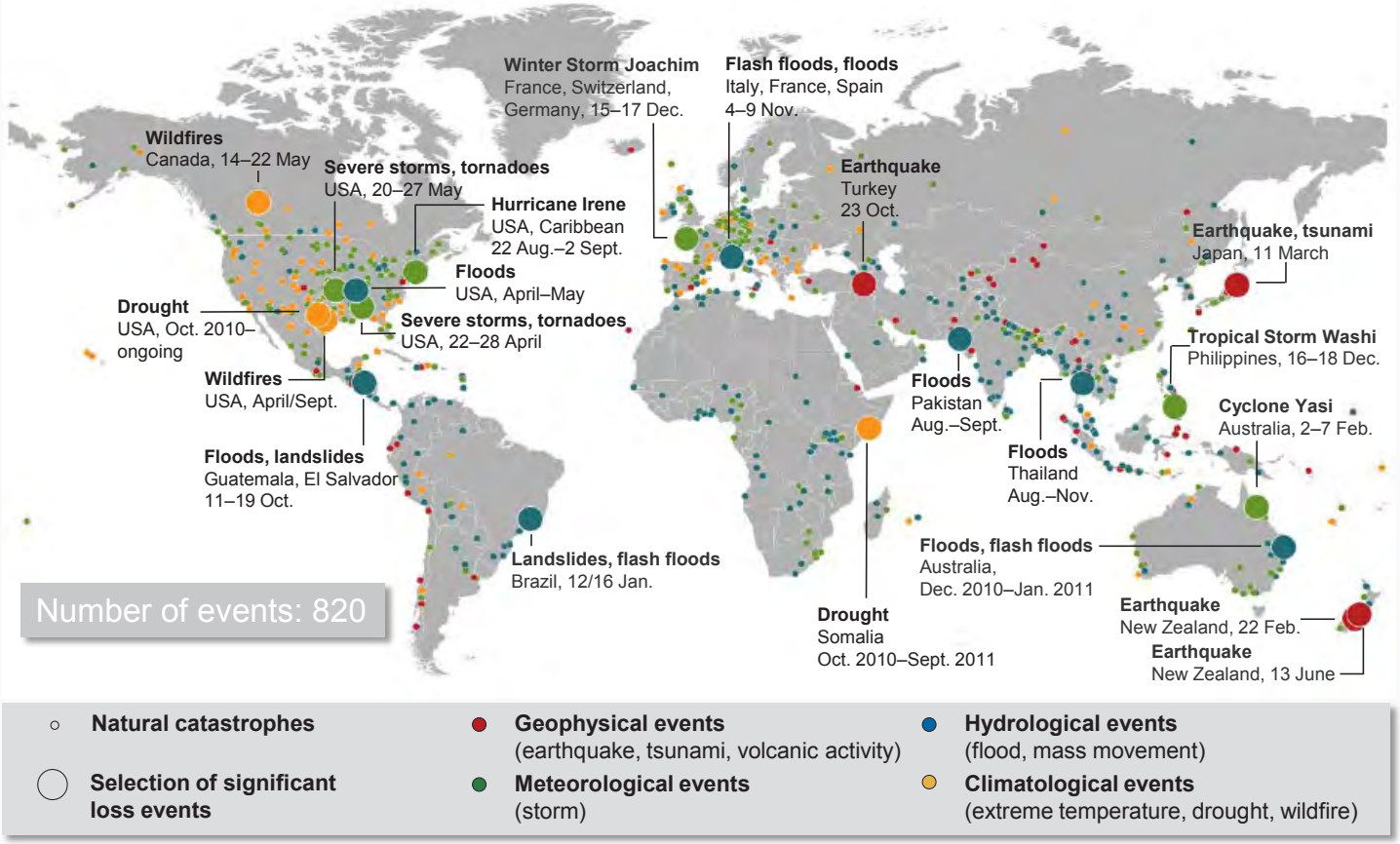
Natural catastrophes 2011

NatCatSERVICE

Natural Catastrophes 2011

World map

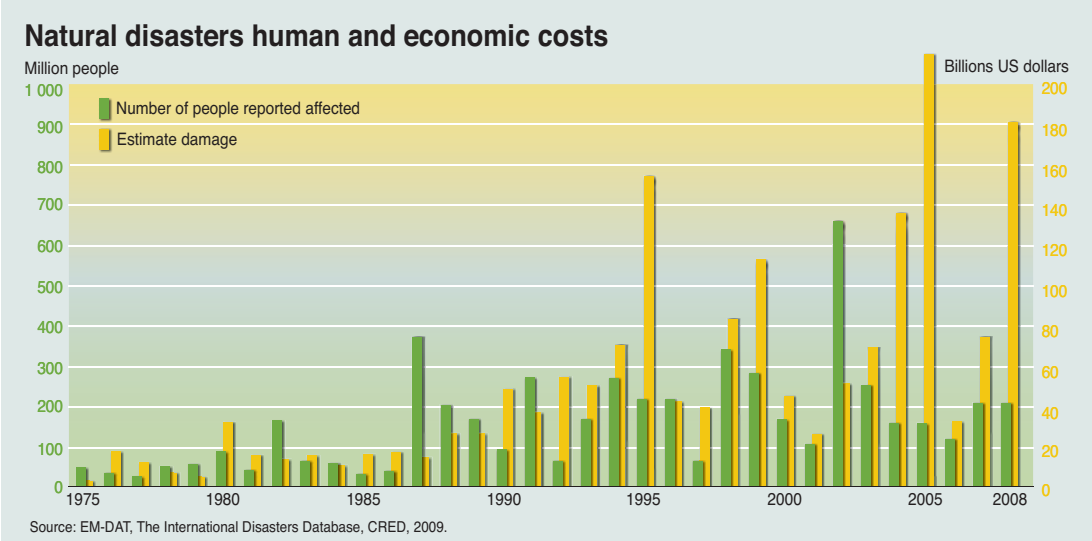
Munich RE

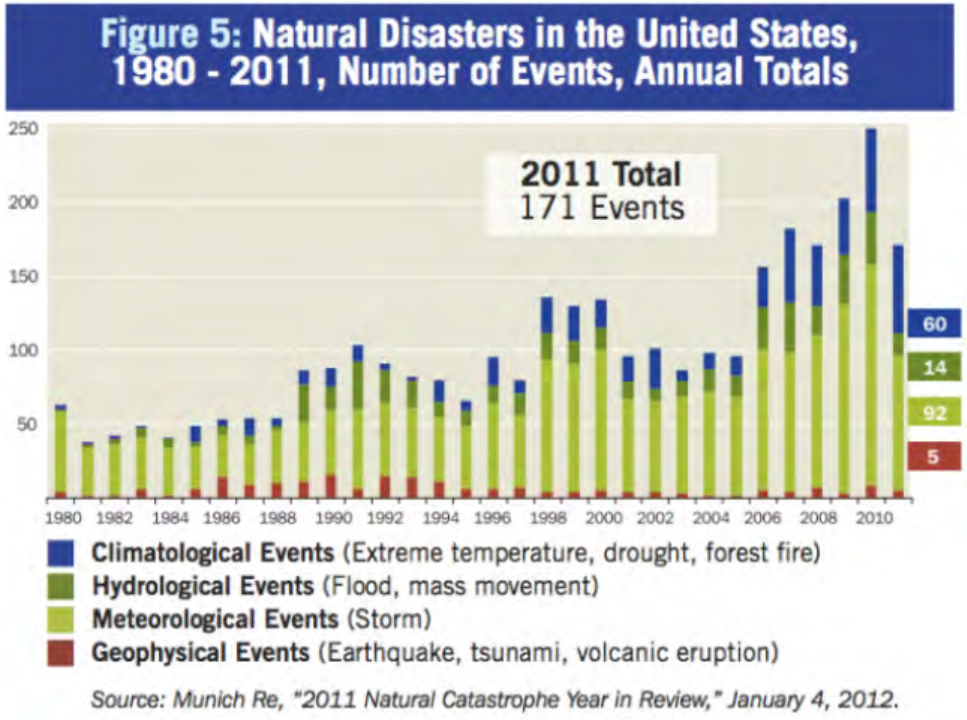


© 2012Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE

3. Revealing with Images - CAUSALITY

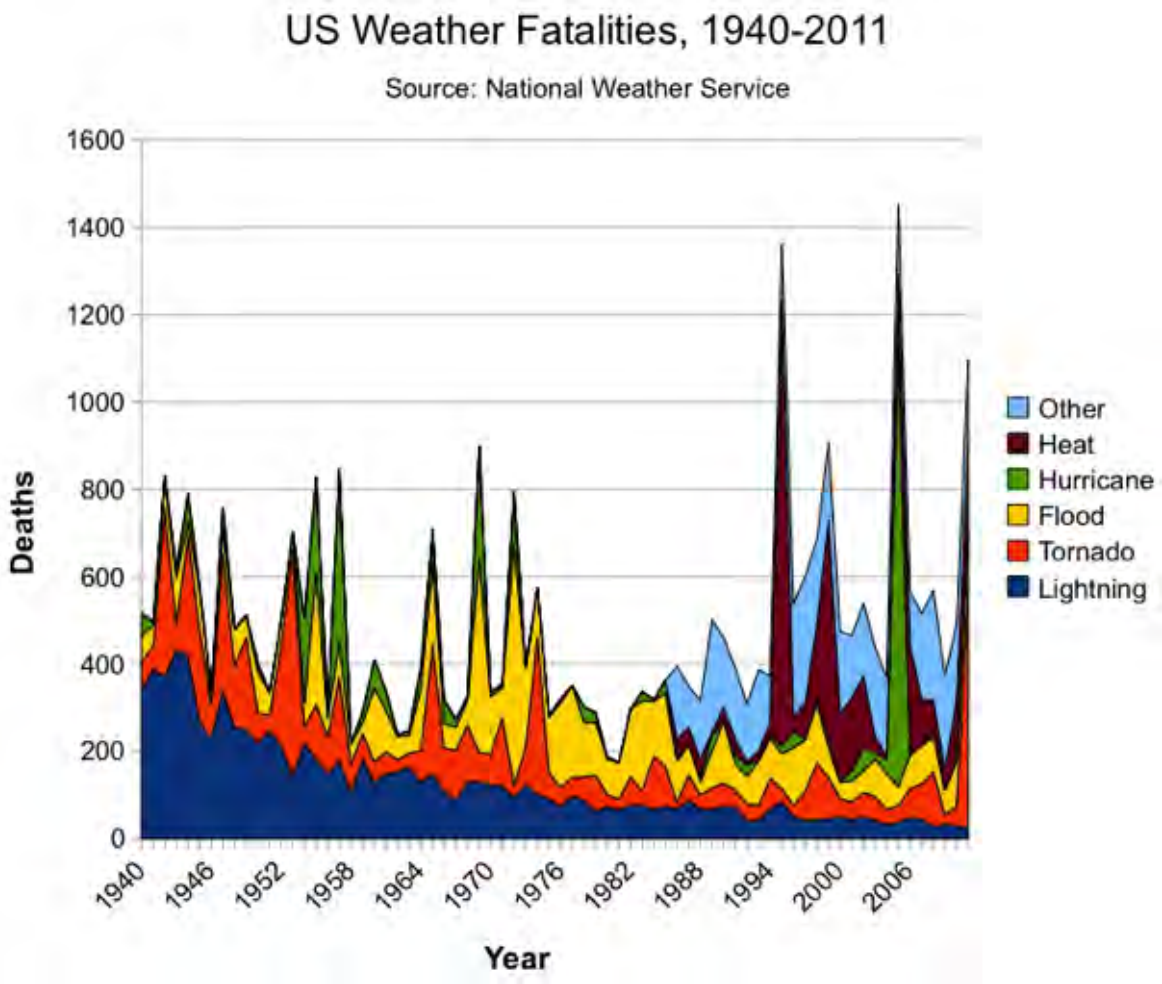
human and economic cost of disasters + natural disasters in the USA





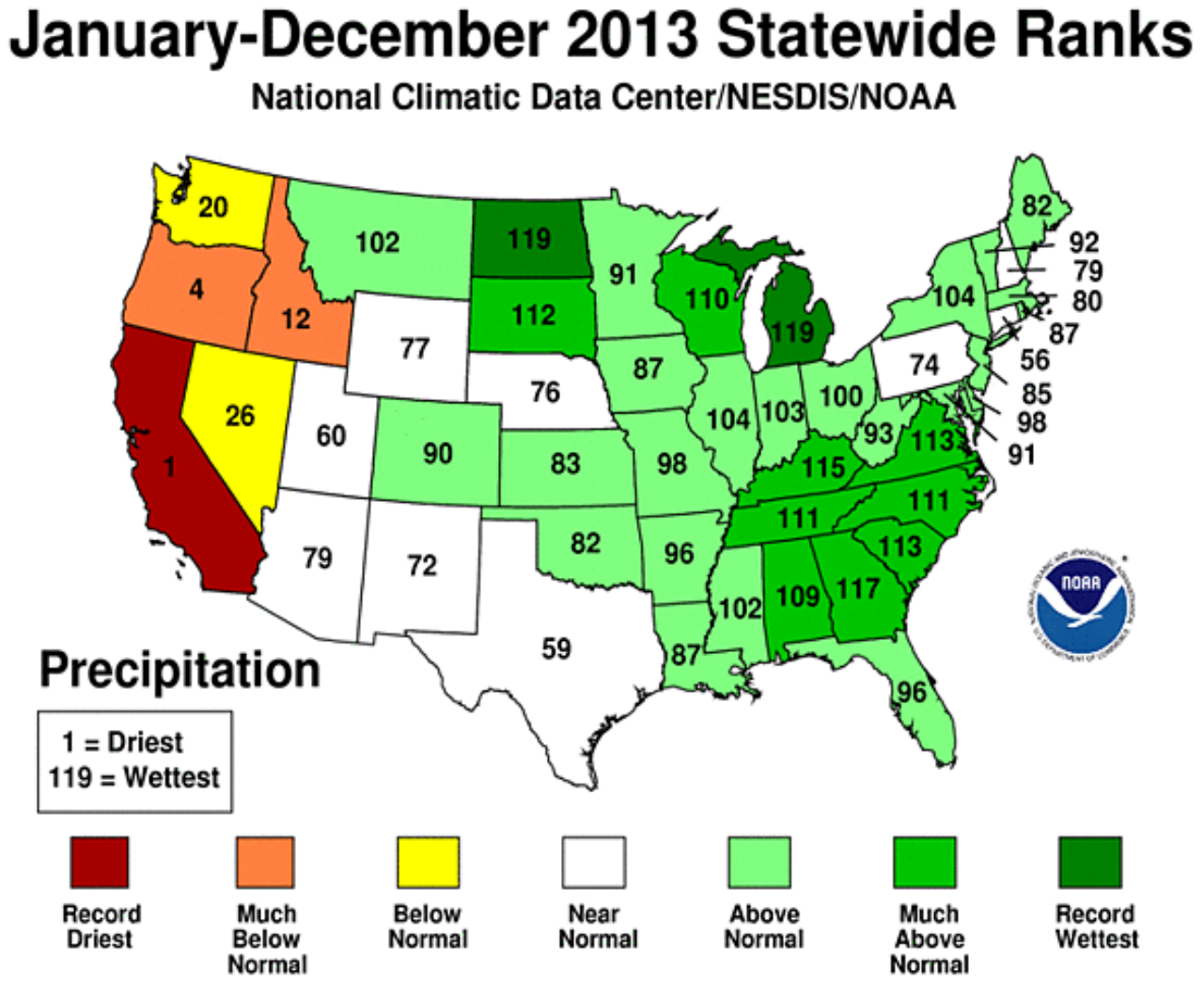
3. Revealing with Images - CAUSALITY

US weather fatalities, National Weather Service



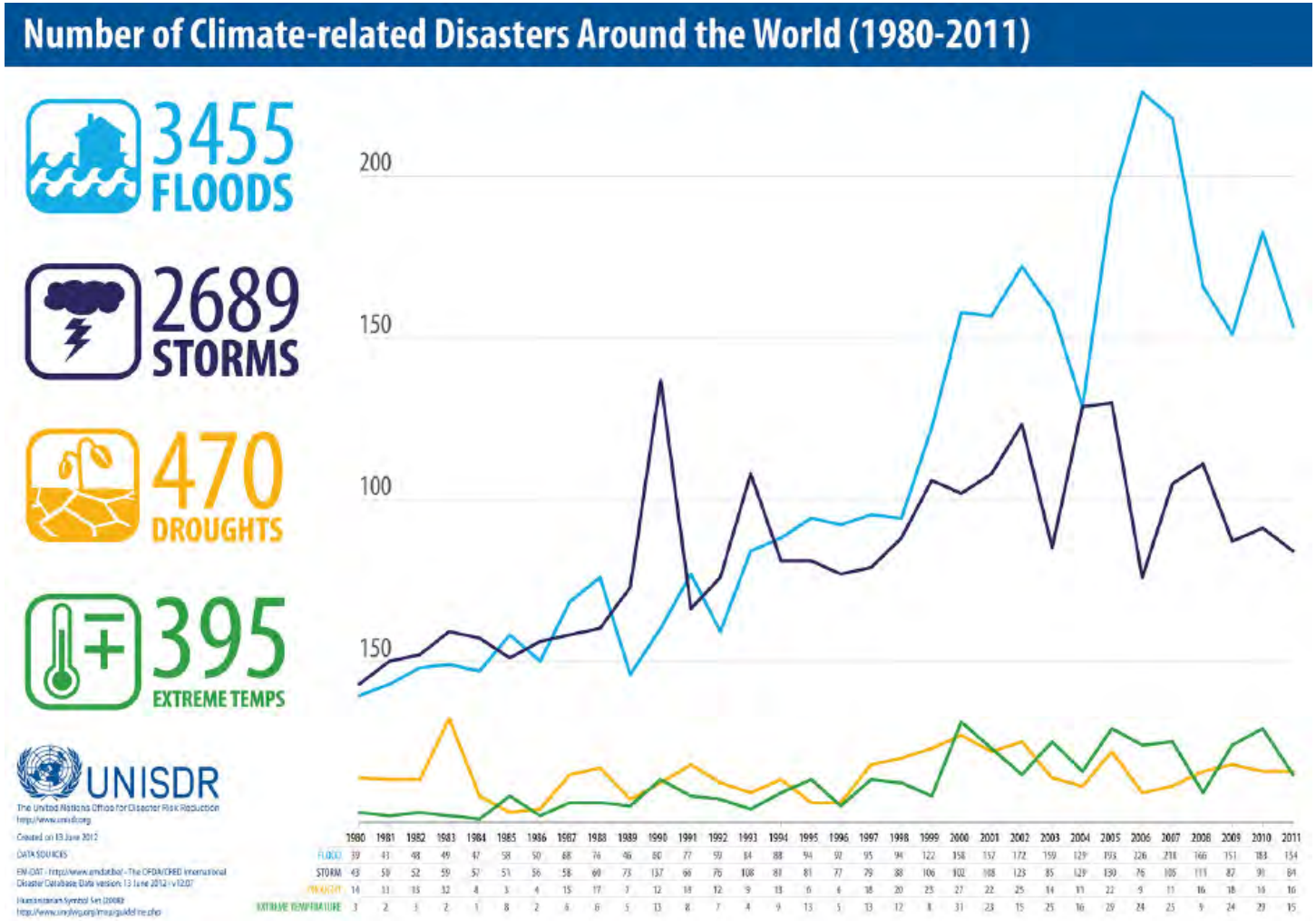
3. Revealing with Images - CAUSALITY

precipitation



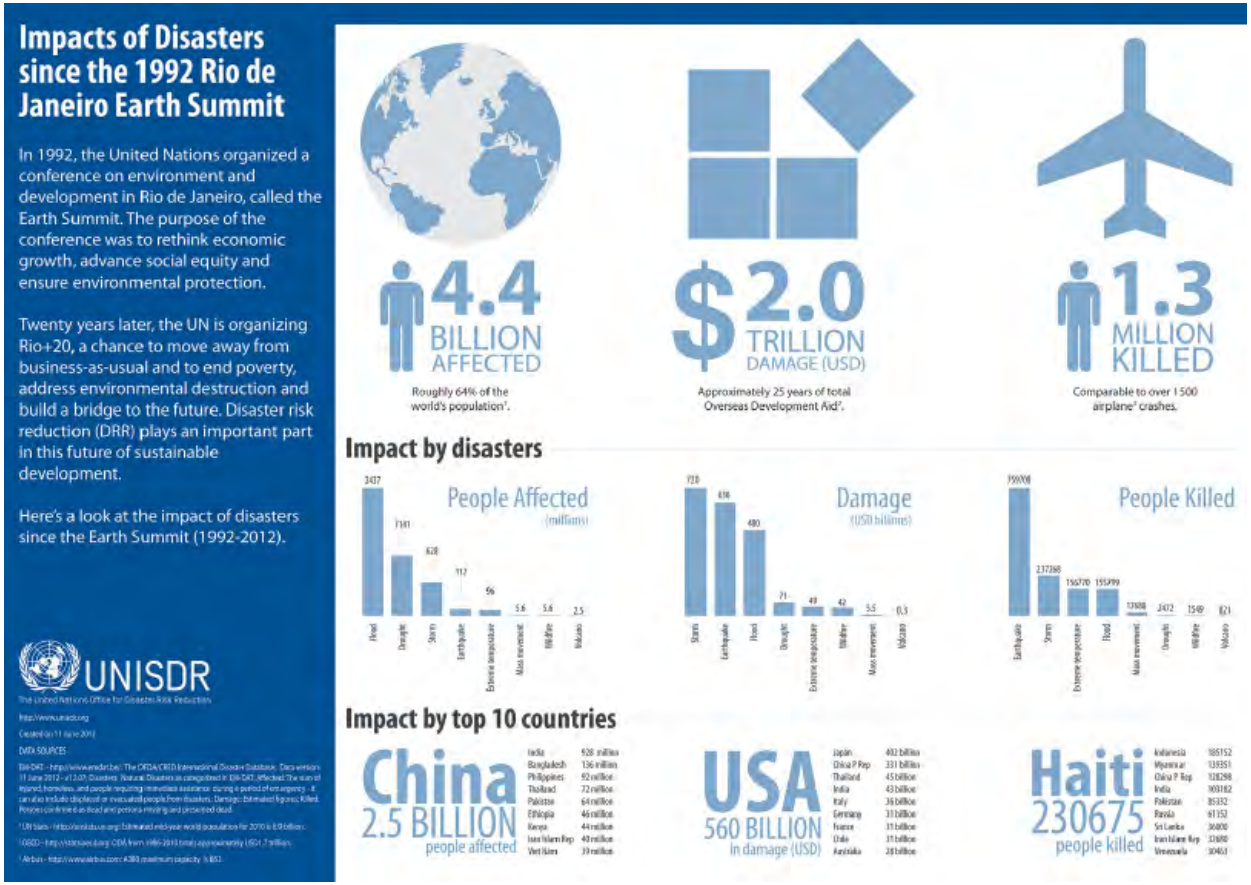
3. Revealing with Images - CAUSALITY

number of disasters, UNISDR



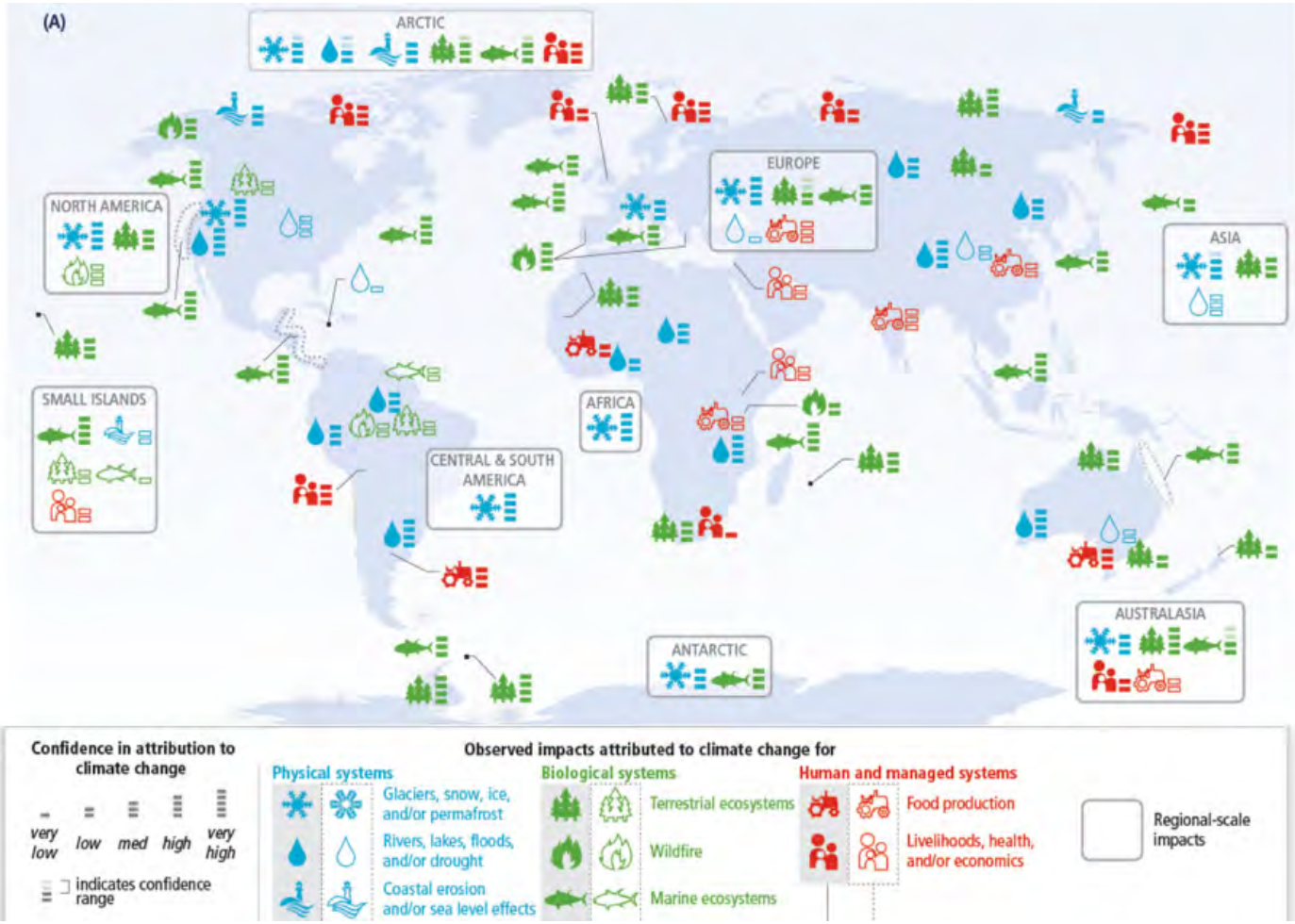
3. Revealing with Images - CAUSALITY

impact of disasters, UNISDR



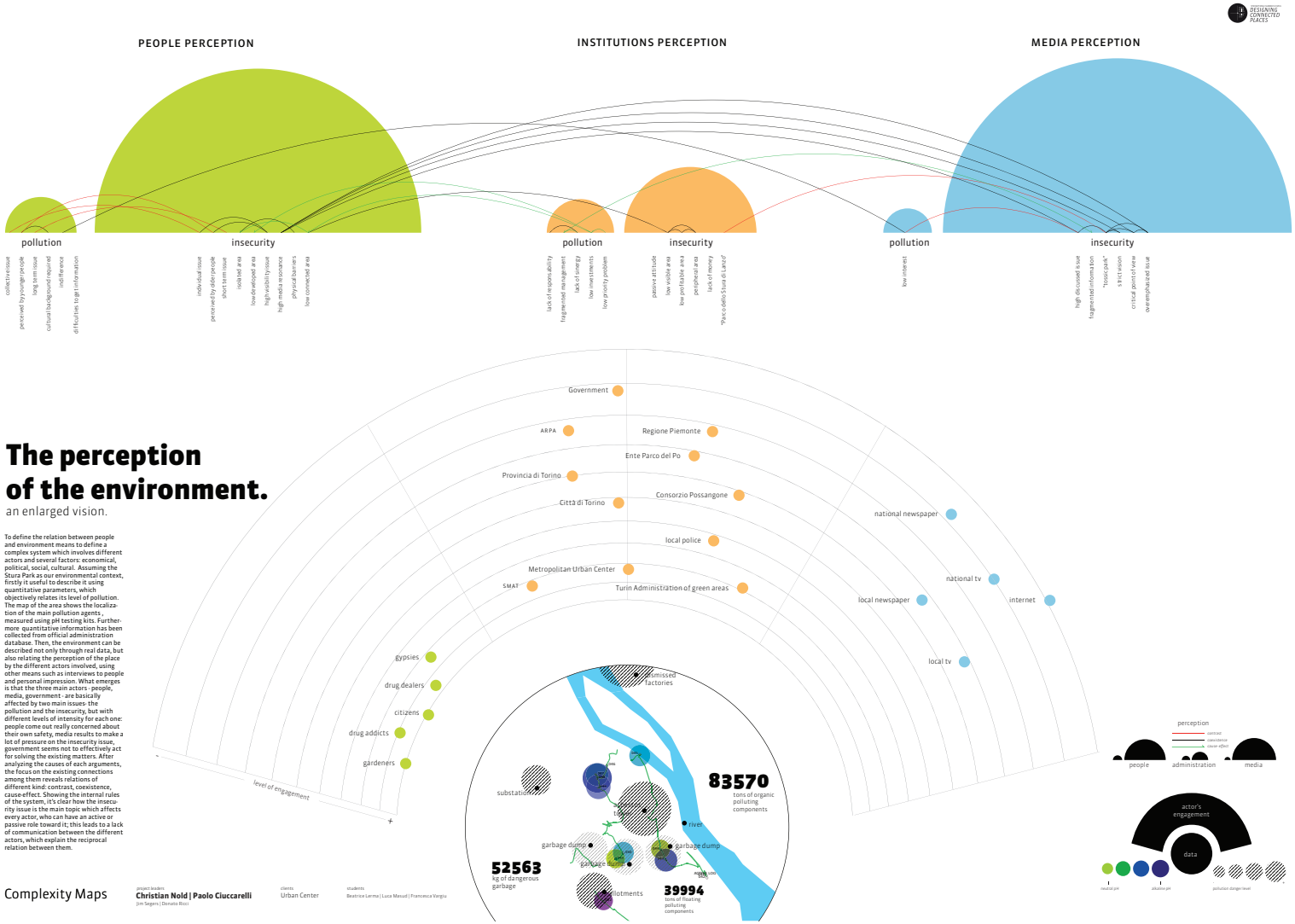
3. Revealing with Images - COMPLEXITY

Mapping impacts, IPCC 2014



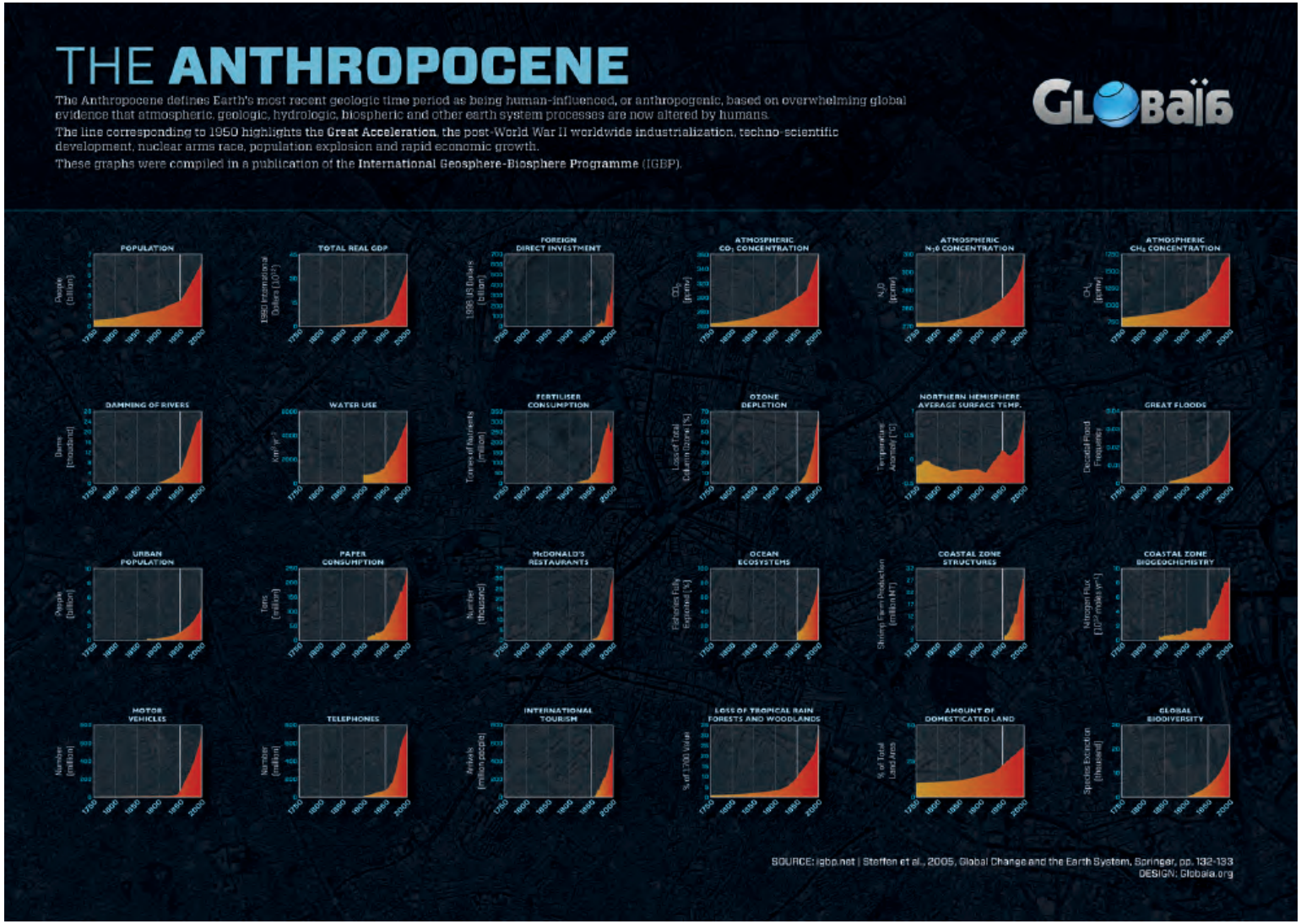
3. Revealing with Images - COMPLEXITY

The perception of the Environment by Christian Nold and Paolo Ciuccarelli



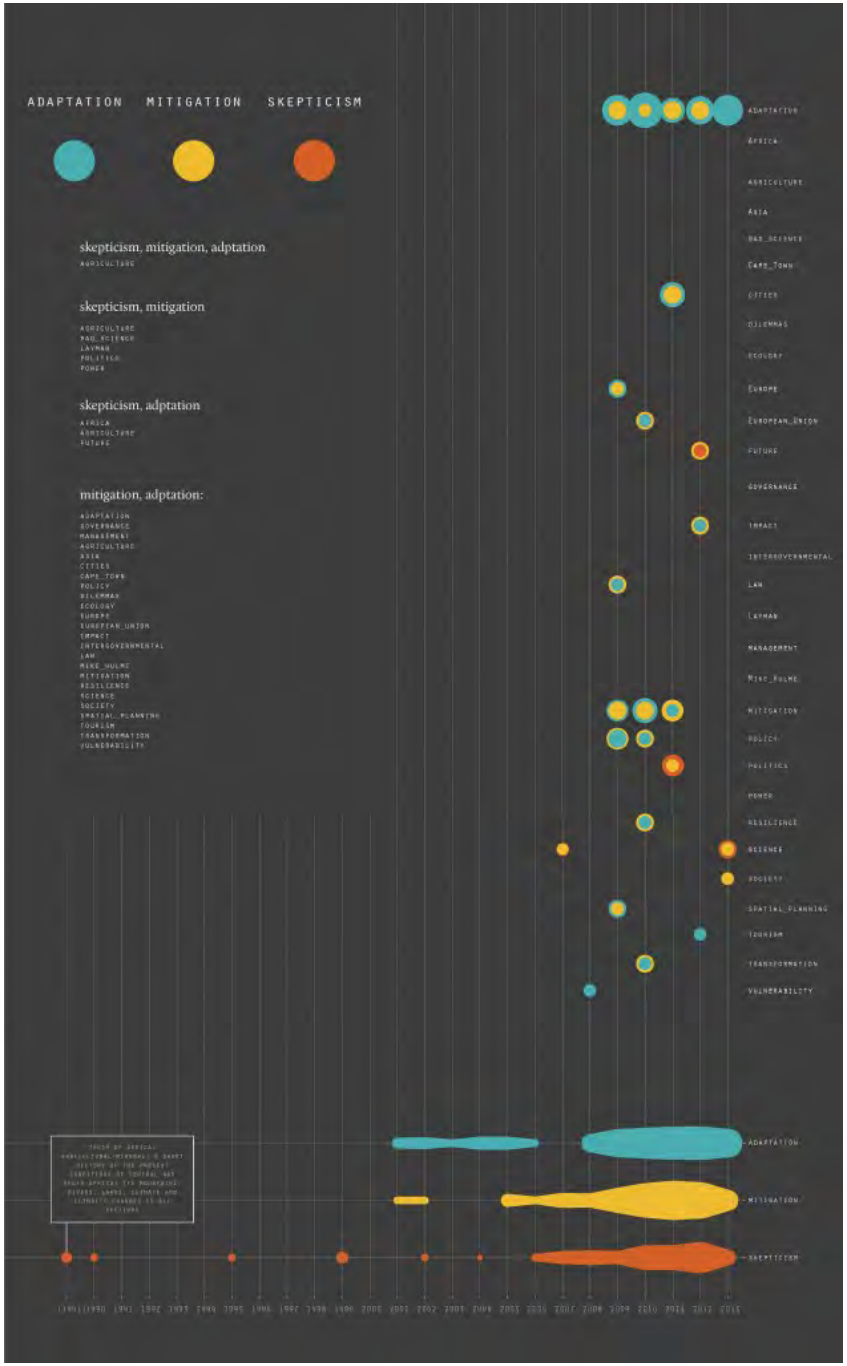
3. Revealing with Images - COMPLEXITY

the "great acceleration" - post-ww2 industrialization



3. Revealing with Images - COMPLEXITY

Climate change discourses - Bubble matrix visualization using keywords from book titles



Emaps Group. Climate change formats and keyword uptake. Depicted as bubble matrix. The visualization includes on the right side the keywords captured from book titles, and below the year that corresponds to each of the books from which the keywords were captured. Queries performed on 30 June 2013

4. Concealing with Images – Fox News

Another Misleading Fox News Graphic: Temperature Edition

BLOG ››› March 25, 2013 5:33 PM EDT ››› JILL FITZSIMMONS

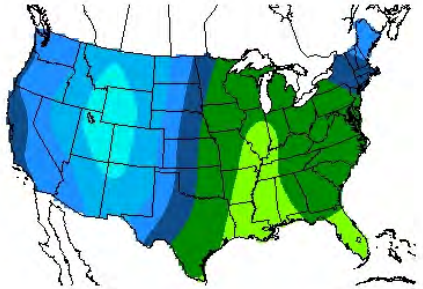
Like 390 Tweet 135 +1 114 102

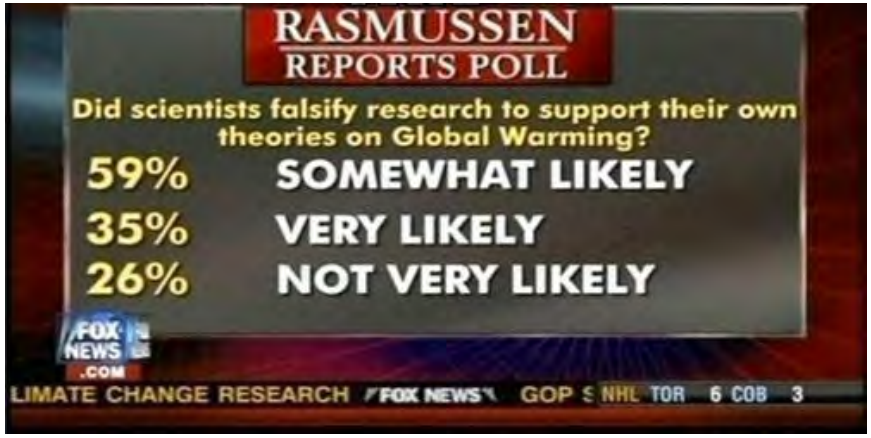
Fox News is suggesting that scientists were "wrong" about global warming by using misleading graphics to obscure the long-term global temperature rise.

On his Fox News show, Neil Cavuto suggested that the recent cold weather invalidates concerns about global warming, asking weather forecaster and climate misinformer **Joe Bastardi**, "How did we get this so wrong?" Cavuto aired a graphic which at first glance appears to show that temperatures are dramatically cooler now than they were last March. But the graphic compares apples to oranges: the map on the left shows whether temperatures were **above or below average** for the month of March, while the map on the right shows **absolute minimum** temperatures for last Wednesday, March 20.

If the temperature scale for the map on the right were applied to the map on the left, it would mean that temperatures were over 100 degrees Fahrenheit in the upper Midwest in March 2012.

A more honest comparison would look at the **same day** in March 2012, showing a far less stark contrast:





4. Concealing with Images – Climate denial

4. Concealing with Images – Environmental crisis as spectacle

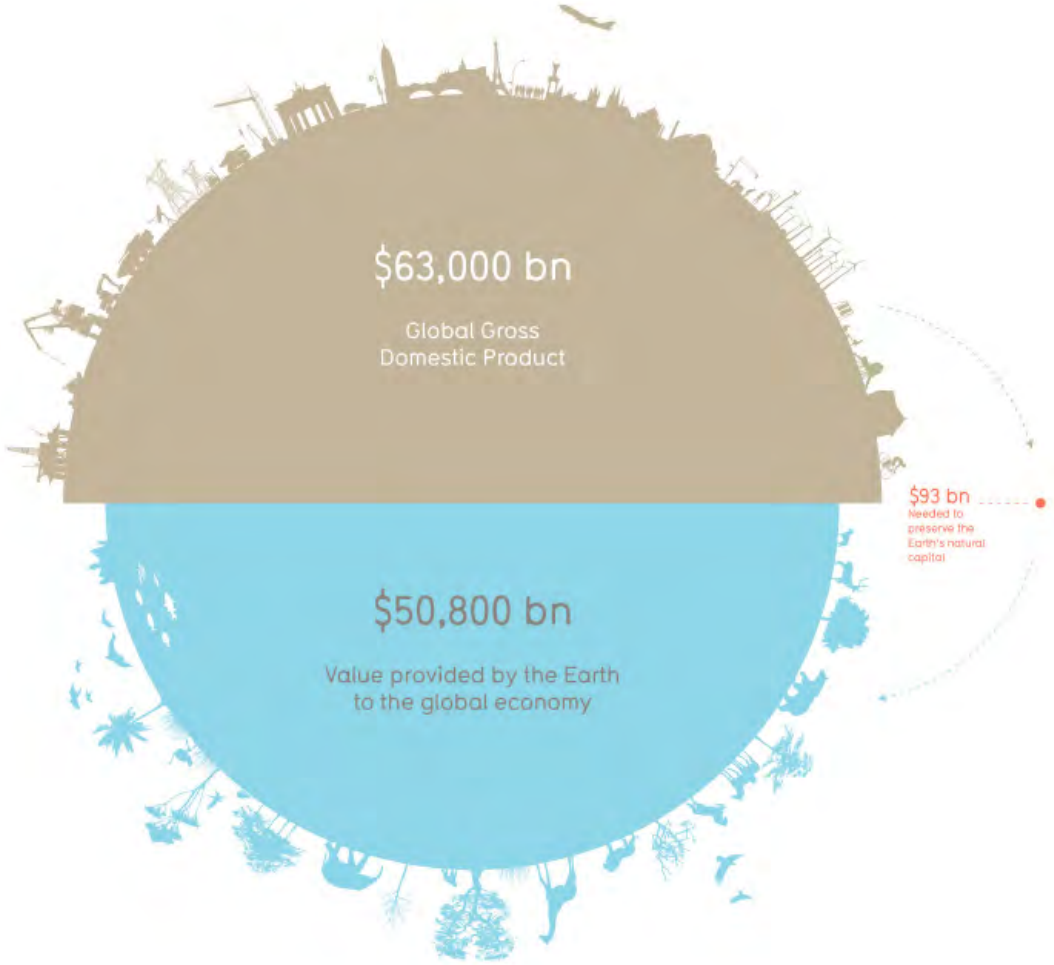
Vogue Italia response to Deepwater Horizon

4. Concealing with Images - The Green Economy

World Forum on Natural Capital

4. Concealing with Images - The Green Economy

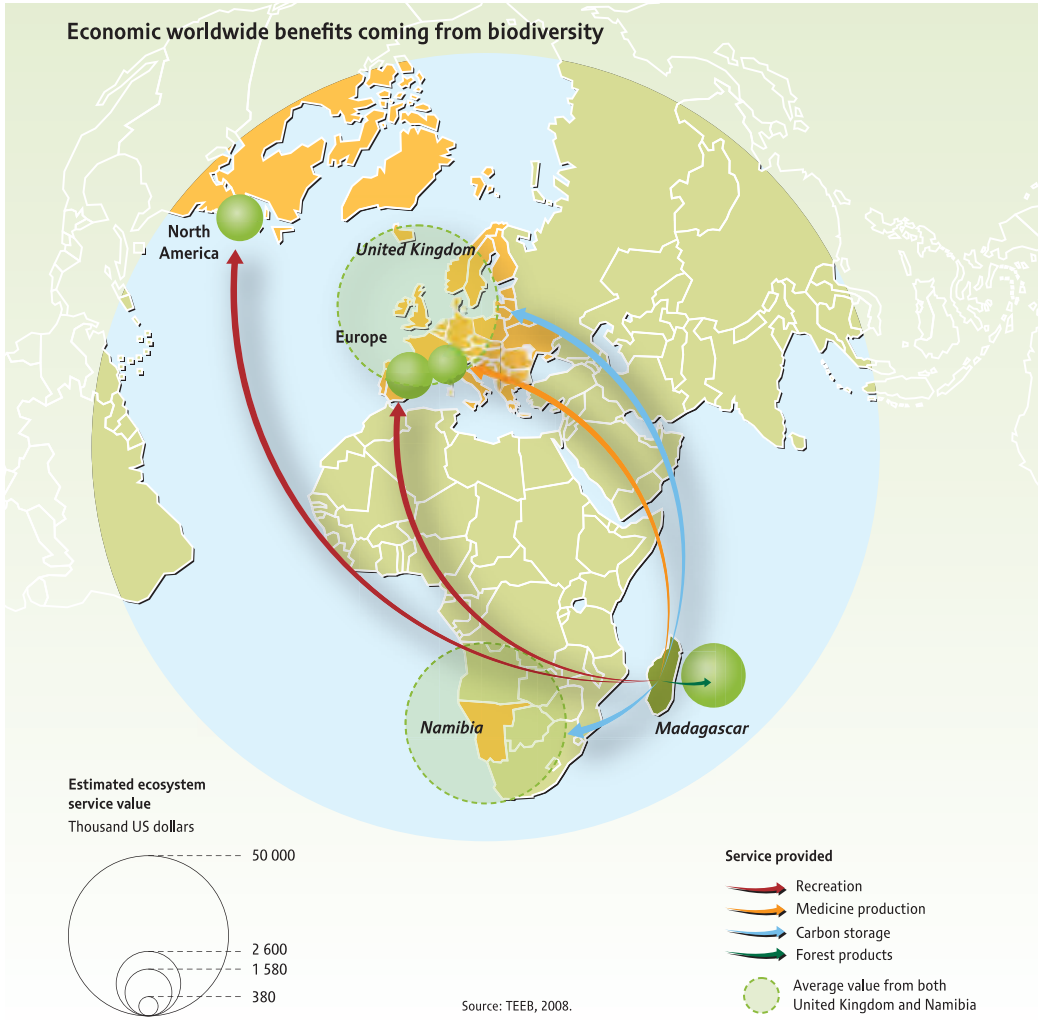
Costing the Earth [Information is Beautiful Studio] (2011)



4. Concealing with Images - The Green Economy

Costing the Earth Revised (2013)

4. Concealing with Images - The Green Economy



4. Concealing with Images - The Green Economy

In the future, the food chain and the supply chain will merge.

In tomorrow's global economy, every resource will be counted. HSBC is one of the world's leading supply chain organisations. We help companies keep tabs on stock across six continents – and five oceans. The future starts today.

There's more on world trade
at www.hsbc.com/inthefuture

HSBC

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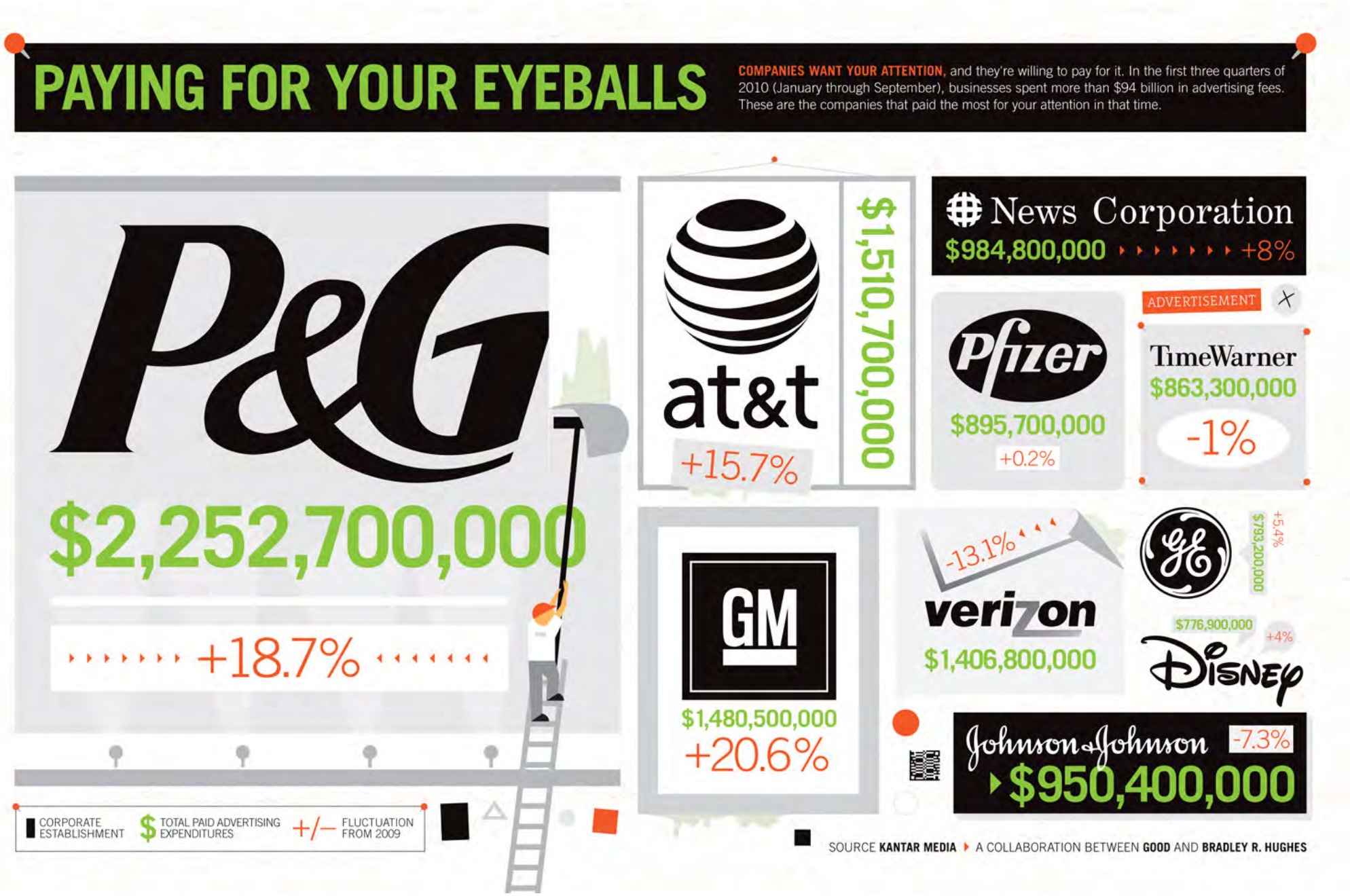
PAYING FOR YOUR EYEBALLS
COMPANIES WANT YOUR ATTENTION, and they're willing to pay for it. In the first three quarters of 2010 (January through September), businesses spent more than $94 billion in advertising fees. These are the companies that paid the most for your attention in that time.
P&G
$2,252,700,000
+18.7%
at&t
+15.7%
$1,510,700,000
News Corporation
$984,800,000
+8%
Pfizer
$895,700,000
+0.2%
ADVERTISEMENT
TimeWarner
$863,300,000
-1%
GM
$1,480,500,000
+20.6%
-13.1%
verizon
$1,406,800,000
GE
$793,200,000
+5.4%
$776,900,000
+4%
Disney
Johnson & Johnson
-7.3%
$950,400,000
CORPORATE ESTABLISHMENT
TOTAL PAID ADVERTISING EXPENDITURES
+/— FLUCTUATION FROM 2009
SOURCE KANTAR MEDIA A COLLABORATION BETWEEN GOOD AND BRADLEY R. HUGHES

5. Conclusion: A Role for Design

Mapping the design for a circular economy, The Four Design Models - by The Great Recovery at the RSA

Dr. Joanna Boehnert

Joanna.Boehnert@colorado.edu

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