

Drivers of Global Change

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Contents

1. Global Environmental Crisis.....	3
2. Global Energy Transition.....	4
3. Population/Demographics.....	5
4. Pandemics.....	6
5. Scientific and Technological Hyper-Revolution.....	6
6. Communications Hyper-Revolution.....	7
7. Globalization.....	8
8. War.....	9
9. Short Term Thinking and Lack of Vision.....	10

1. Global Environmental Crisis

a. Global warming

- i. Climate Disequilibrium; disruption of favorable, stable balance in areas selected for habitation and agriculture during previous 10,000 years
- ii. Stronger, Wetter, More Destructive Storms
- iii. Reorganization of Precipitation Patterns
 - (1) Increased overall global precipitation as evaporation from oceans increases, but sharp decreases in some regions
 - (2) Higher percentage falls in Large Storm events (2 inches or more in 24 hrs)
 - (3) Higher percentage of Rain compared to Snow
 - (4) Earlier Spring melting and runoff
 - (5) Faster Evaporation of Soil Moisture
 - (6) More Floods and More Droughts simultaneously
- iv. Water Shortages
 - (1) Contamination of Fresh Water supplies
 - (2) Strip Mining of Deep Aquifers
- v. Melting of Glaciers and Ice Sheets
 - (1) Multi-meter sea-level with displacement of tens of millions
 - (a) Growing risk of 7+ meter rise this century
 - (2) Risk of freshening of North Atlantic slowing Gulf Stream and causing sudden cooling in Northern and Western Europe
- vi. Radical changes to boundaries of ecological niches for animals and plants
 - (1) redistribution of species range and habitat; invasive species; growth and spread of insect populations
 - (a) disease vectors increased (ticks, mosquitoes, etc.)
- vii. Microbial redistribution to higher latitudes and higher altitudes (due to warmer temps, warmer nights, milder winters and fewer days with frost)
- viii. «Runaway» Greenhouse Risk growing

b. Destruction of Ocean Productivity

- i. Strip-mining of Ocean Fisheries
- ii. Acidification of Oceans
- iii. Radical change in salinity distribution; freshening of Arctic and North Atlantic, higher salinity in Tropical Oceans
- iv. Loss of Coral Reefs and dependent species
- v. Impact of shipping on biodiversity (alien species, translocation, antifouling paint, waste dumping etc)

c. Loss of Tropical Forests, and Wetlands and the concentrations of biodiversity located within them

d. Desertification of Drylands

- i. Rate of desertification increasing
- ii. Displacement of populations (i.e., refugees from desertified Chad moved into Darfur)
- iii. Increased dust storms, esp. off Gobi and Sahara

e. Extinction Crisis equal in magnitude to the three previous global extinction events 400 million, 270 million and 65 million years ago

- i. Loss of Biodiversity worldwide; loss of diversity at a genetic level; consequent loss of ecosystem resiliency

f. Loss of Topsoil productivity and consequent impact on agricultural output

g. Degradation and Loss of Vavilovian centers of germplasm and genetic diversity of foodcrops

h. Air pollution in Cities

i. Persistent, long-lived Toxic Waste build-up

2. Global Energy Transition

a. Peak Oil – More Expensive to Replace Reserves

- i. Unstable prices
- ii. OPEC pricing power returns
- iii. Intensified geopolitical competition for access to reserves; geopolitical instability
- iv. More costly to extract oil from existing reserves, talent squeeze
- v. Energy security in the context of carbon constraints

b. Race to develop cost-effective renewable energy sources and «cleaner» versions of all alternatives to oil and coal; increased preference for natural gas

c. Efficiency and Conservation

d. Carbon Capture & Sequestration

e. Carbon Trading Soars as Kyoto goes into effect

f. Global Energy Policy Response

g. Carbon Taxes

h. Pressure for Redesign and Re-architecture of all systems affecting large-scale energy usage

- i. Nuclear renaissance pushed by governments and resisted by utilities**
- j. Pressure for «Clean Coal» – esp. in US & China**
- k. Resource Nationalism on the rise**

3. Population/Demographics

- a. Quadrupling of World's population in last 100 years, from 1.6 to 6.4 Billion; Stabilizing at 9+ Billion within the next 50 years, but momentum still disruptive**
- b. Growing disparity of wealth between developed and developing countries, (and within both developing and developed nations) despite large overall increase in wealth and productivity**
 - i. Global Poverty commands growing attention
 - ii. «Bottom of the Pyramid» markets emerge
- c. Urbanization and proliferation of Mega-cities (15 million+) principally in less developed nations**
 - i. Doubling of urban space worldwide in next 30 years
- d. Migration**
 - i. Explosive growth from Developing Countries is pushed and pulled into the Declining Population Vacuum of the Developed Countries
 - ii. Xenophobia and threat to Democratic Pluralism
- e. Refugee Crises**
 - i. Stateless populations
 - ii. Environmental refugees
 - iii. Cultural and ideological friction
- f. Longer Life-spans and smaller families**
 - i. Graying and Population decline (ex-immigration) in Developed Nations
 - ii. Higher health and pension expenses
- g. Gender Equalization, Earlier Puberty and Marriage Disequilibrium**
 - i. Social and Cultural Transformation
- h. Youth Bulge drives political instability in key areas when employment opportunities lag**
 - i. Saudi demographics & implications for oil prices and political instability in the region

4. Pandemics

a. HIV/AIDS, TB and Malaria

b. Antibiotic-resistant strains of once-controlled diseases re-emerge

- i. Mutated «superbugs»

c. Emergence of «new» diseases

- i. SARS, Avian Flu, etc.

d. Plant and Animal Pandemics

- i. Bee mites, «Sudden Oak Death,» etc.
- ii. Monoculture of crops increases vulnerability

5. Scientific and Technological Hyper-Revolution

a. Genetic Modification of Humans, Animals and Plants

- i. Genetically-based Medicine
- ii. Cloning
- iii. Trait Selection and Augmentation
- iv. Life extension
- v. Blurring of boundaries between species and between Life and Machines

b. Rapid spread of Super-computing

- i. Systems Re-engineering Empowered by Supercomputing
- ii. Information replaces matter as principal source of most economic value

c. Artificial Intelligence

d. Robotics

e. Nanotechnology

f. Molecular Re-engineering and New Materials Science

g. Neuroscience and Behavioral Manipulation

i. Emergence of new, far more precise understandings of «Human Nature»

h. Proliferation of Weapons of Mass Destruction

i. Multiple, successive disruptive new technologies as yet unknown

6. Communications Hyper-Revolution

a. Ubiquitous Broadband Internet

i. Explosion of access to Knowledge

(1) Emergence of Self-organized on-line communities, organizations and centers of economic and political power

ii. Ubiquitous Computing

(1) Explosion of Access to processing power

(2) Low-cost 3rd World terminals

(3) Open source software enabling rapid development of high powered, highly efficient information gathering and processing technology at low cost

iii. New/alternative infrastructures for citizens' communications at a low cost. Increased exploitation of spectrum for ubiquitous terrestrial and satellite wireless

iv. Opening up of pc and mobile communications device infrastructure outside dominance of gate-keeping mega-corporates

v. «X-internet» connecting billions of imbedded sensors and devices

(1) Rapid Growth of Surveillance, Location-tracking and personal transparency/ loss of privacy

b. Television replaces Printed Text as dominant mass medium

i. Satellite TV opens closed cultures

ii. Cable and Satellite proliferate channels

iii. Reading of Newspapers and Magazines Declines Sharply, but not books

(1) Electronic text surges in popularity and Blogs become a major new force in culture and politics; a text Renaissance?

(2) Advertising shifts from Paper Publications to Internet Search

iv. Social and Political Disequilibrium accompanies transition from Print to Television

(1) Disintermediation of Elites

(2) Cultural Disequilibrium and Loss of Traditional Patterns

(a) Values Disequilibrium and Perceived Loss of Meaning

- (3) Constriction and Degradation of the «Public Forum»
 - (a) Decline of Participatory Dialogue
 - (i) Low entry barriers for Print replaced by High entry barriers for mass distribution of video
 - (ii) Until Internet is robust enough for real-time, mass distribution of fullmotion video
 - (ii) Consolidation of Ownership and Control
 - (b) Weakening of Enlightenment-based governance
 - (i) Rule of Reason loses ground to Raw Power
 - (ii) Enhanced Vulnerability to Ultra-nationalism, Tribalism and Totalizing Ideologies
 - (c) Rise of Propaganda and Information Strategies
 - (i) Citizen resistance; collaborative filtering and reputation-based peer rating of information sources

7. Globalization

a. IT-empowered redistribution of work and investment

- i. Hemorrhaging of highly paid skilled jobs in wealthier nations
- ii. Surplus of all manufactured goods at lower prices
- iii. Rapid but highly uneven growth in emerging markets
- iv. Threat to Free-Trade Consensus

b. Rise of China and India

- i. Redistribution of Asian Power Relationships
- ii. Enhanced Competition for Global Resources
- iii. Crack-down on corruption

c. Simultaneous Emergence of Supra-National Entities (EU, NAFTA, WTO, UN –chartered organizations, etc.); and

d. Sub-National Entities (Flanders and Wallonia, Catalonia, Quebec, Nunavut, Kurdistan, Aceh, etc.)

- i. European Throes of Integration, Expansion and Governance
 - (1) Monetary union without fiscal coordination creates transition crisis
 - (2) National identities strengthened by xenophobic reaction to immigration flood, esp. Muslims (with Turkey's application pending)
 - (3) Lower wages in expansion countries seen as economic threat
- ii. Re-emergence of separate identities within Post-colonial Nations created after World War I and World War II
- iii. Strengthening of National Autonomy in former Soviet Republics

- iv. Re-organization of Latin American nations as IT-empowered Indigenous majorities find their voice and political influence; and as poor lose patience with Inequality of Income and Lifestyle
- v. African Crises (civil wars, hyper-corruption, rapid industrialization and social chaos, HIV/Aids, Famine, Drought, etc) command global attention and focus
- vi. Emergence of unstable «Post-national entities»

e. Rise of Fundamentalism as Disruptive Force and as Organizing Principle

- i. Islamic Fundamentalism
 - (1) Threat to secular regimes
 - (2) Threat of «Clash» with the West
 - (3) Threat of support for Terrorism
 - (4) Sunni v. Shia conflict
- ii. Christian Fundamentalism
- iii. Hindu Fundamentalism
- iv. «Market Fundamentalism»

f. Spread of democracy

g. Dearth of effective global governance

8. War

a. Threat of Nuclear Exchange still exists

b. Intractable Civil Wars Persist

- i. Congo/Kinshasa, Sudan, Colombia, Sri Lanka, etc.

c. Proliferation of WMD

d. Terrorism

- i. «Dirty Nukes»
- ii. Stolen or Black market nukes
- iii. Bio-weapons
- iv. Surface to air missiles
- v. Cheap, laser-guided smart weapons
- vi. Cyber-terrorism

e. Over-reaction to Terrorism

f. Empires of the mind/spirit

9. Short Term Thinking and Lack of Vision

a. Systemic Failure to focus on future consequences of present decisions and policies

- i. «Operating the Planet like a business in Liquidation»
- ii. The «Tragedy of the Global Commons»

b. Unsustainable Borrowing, Consumption and Waste Generation

- i. Twin Deficits
- ii. Asian Creditors of US (particularly China) play larger role
- iii. Risk of sudden Exchange rate consequences

c. Short-term investment horizons create unsustainable pattern

- i. 100% annual portfolio turnover in average Mutual Fund
- ii. More Mutual Funds than stocks
- iii. Entire Market is «Short» on «Long»
- iv. Failure to invest in the future

d. Incomplete measurement of Value; inaccurate perception of risks and opportunities

e. Misalignment of incentives for investors and managers

f. Reform is Brewing

- i. Stakeholder capitalism, accountability & transparency on the rise
- ii. Commons-based Peer Production may emerge as a driver of economic change
- iii. Bottom of the Pyramid investing emerges alongside sustainable & responsible investing
- iv. Growing understanding of systemic risk of sustainability
- v. Internalizing of externalities by business & investment