Chapter 9
Remaking Eco-civilization by Sustainable Decision-Making

9.1 Eco-citizenship Beyond the Generations

Is there something in humanity's nature that makes us seek out unsafety and risk? Already in the hunter-gatherer society of prehistory, a pattern of communal living for the sake of survival and cooperation to obtain food, clothing, and shelter was universal. Well before recorded history, as humankind progressed from the New Stone Age to the Bronze Age and then the Iron Age, groups of people specialized in making farming tools, weapons, horse tackle, and other forms of metalworking and needed a system of cooperation at the level of the village, community, and state. Meanwhile, from the time of the first agricultural revolution, ruling the waters, for instance by predicting the timing of river floods to assist with seed sowing, tilling, and harvesting, was the basis for the existence of the state.

In Ancient Egypt it was the River Nile, in Mesopotamia the Tigris and the Euphrates, in the Indus Valley the Ganges, and in China the Yellow and Yangtze Rivers, but control of the waters to avoid the natural disasters of flooding and drought was the essence of control of the land. To take control of the waters was to guarantee the harvest of agricultural produce, and the ability to forecast natural disaster was the origin of state power. Conversely, in ancient civilizations, had there been no natural disasters, it is uncertain whether the state could have acquired power. In agricultural societies, to maintain the state monopoly of power, a fiscal basis was established through collection of tributes and taxes. It became so that to rule the waters was to rule the land, and the response to natural disaster undeniably helped promote the birth of the state.

Thanks to the progression of farming tools from wood to stone and the invention of bronze farming tools to replace iron, wheat, maize, and rice yields surged in the 'agricultural revolution' beyond the hunter-gatherer society. From the beginning of historical times—along with the technological innovation of metalworking—stone, papyrus, bamboo, and wooden tablets were used to record taxation (taxes and tributes), and the social division of labor progressed. With the move from bronze

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to iron, the quality of arms and weapons improved and the capacity and opportunities for combat were extended. Meanwhile, ironworking brought the shipbuilding technology that made possible long-distance seafaring and the manufacture of artillery, presaging the advent of 'the age of exploration'. Continuing up to the industrial revolution, the state monopoly of power made use of iron and woodworking technology to plunder overseas wealth. The invention of the internal combustion engine based on steam heat and fossil fuel (coal and petroleum) wrought dramatic change in the subsequent 'industrial revolution'.

Trains and ships driven by the steam engine and other vehicles running on petroleum and internal combustion engines, coinciding with T. Edison's 'electric revolution' and fusing with transportation technology, fed into the 'management revolution' that started with H. Ford and F. W. Taylor. The internal combustion engine and electric lighting and motors enabled the change from home-based workshop manufacture to factory-based mass production, while the securitization of funds through the stock-company system made possible mass production. As a result, the concept of the 'going concern' gave birth to the new social organization of the commercial enterprise. Having brought about this fusion of funds and technology, modern capitalism, building on the foundation of the stock-company system with stock-option exchange securities and supplied through the medium of the financial markets, led the development from the market economy to industrially organized society and onward toward the market society.

As shown in the world scholarly locus (Table 9.1), following the American Civil War and under the influence of F. W. Taylor's 'scientific management', the next trend of human relations involved in Western Electric's Hawthorne experiment (E. Mayo and F. Roethlisberger) focused strongly on the relationship between the commercial enterprise and the worker from the viewpoint of human relations, as part of the 'management revolution'. After the great world depression of 1929, the relation of the organization to the individual was reviewed from the viewpoint of effectiveness and efficiency, crystallizing in the grand theory of the modern organization developed by C.I. Barnard, M.P. Follet, and H.A. Simon.

The industrial revolution was succeeded by the management revolution. Amid the favorable economic climate of the times, mass production revealed a dark side of unsought consequences in the form of mine explosions, factory accidents, and other unnatural disasters, which came to be seen as an issue. In Japan, many workers and local residents became victims of pollution at Chisso Minamata, Sumitomo's Besshi copper mine and the Ashio copper mine. In the initial stage of modern capitalism, there was an endless stream of accidents and disasters, and the combination of Japanese 'industrial revolution' and 'management revolution' not only drove a wider gap between rich and poor through greater labor efficiency, but wealth imbalance also became the cause of labor disputes, demonstrations, and riots. The gap opened up by the technological power and organizational power of capital increased the economic power of the commercial enterprise and the financial power of the state. On the other hand, the social discrimination caused by the expansion of economic inequality also became a breeding ground for unsafety and today continues to feed the global north–south wealth issue.

Table 9.1 World scholarly locus

	Asia/Oceania	Europe/Africa	America	
Sustainalism		T. Piketty (1971–)	J.M. Diamond (1937–)	L.R. Brown (1934–)
Eco-civilization Revolution		G. Chroust (1941–)	H.R. Maturana (1928–)	M.J. Sandel (1953–)
		J. Reason (1938–)	T. Colborn (1927–)	A.B. Lovins (1947–)
Bio-Revolution	S. Yamanaka (1962–)		L.M. Silver (1952–)	E.J. Chaisson (1946–)
Energy Revolution		L. Watson (1939–2008)	E.A. Feigenbaum (1936–)	K.E. Weick (1936–)
	H. Itsuki (1932–)	M. Foucault (1926–1984)	M.L. Olson (1932–1998)	J. Naisbitt (1929–)
ICT Revolution	H. Yukawa (1907–1981)	I. Prigogine (1917–2003)	A. Toffler (1928–)	E.H. Schein (1928–)
		W. H. McNeill (1917–)	J.G. March (1928–)	P. Krugman (1953–)
		A.M. Turing (1912–1954)	D.H. Meadows (1941–2001)	S. Beer (1926–2002)
		J.L. Monod (1910–1976)	T. Kuhn (1922–1996)	G.E. Swanson (1922–1995)
		C. Lévi-Strauss (1908–2009)	H. Kahn (1922–1983)	K.J. Arrow (1921–)
		M. Merleau-Ponty (1908–1961)	R.M. Cyert (1921–1998)	D. Bell (1919–2011)
Scientific Revolution		W. Leontief (1905–1999)	J.G. Miller (1916–2002)	H.A. Simon (1916–2001)
	T. Watsuji (1889–1960)	W.R. Ashby (1903–1972)	C.E. Shannon (1916–2001)	P.A. Samuelson (1915–2009)
	K. Nishida (1870–1945)	L. von Bertalanffy (1901–1972)	M. Friedman (1912–2006)	P.F. Drucker (1909–2005)
		E. Fromm (1900–1980)	J.K. Galbraith (1908–2006)	A.H. Maslow (1908–1970)
		N. Luhmann (1927–1998)	R.L. Carson (1907–1964)	G. Bateson (1904–1980)
Management Revolution		M. Polanyi (1891–1976)	J. von Neumann (1903–1957)	T. Parsons (1902–1979)
		H.W. Heinrich (1886–1962)	S.K. Langer (1895–1985)	A.A. Berle, Jr. (1895–1971)
Social Revolution		J.A. Schumpeter (1883–1950)	C.I. Barnard (1886–1961)	N. Wiener (1894–1964)
		B. Russell (1872–1970)	A. Einstein (1879–1955)	E. Mayo (1880–1949)
		M. Weber (1864–1920)	A.N. Whitehead (1861–1947)	M.P. Follett (1868–1933)
Industrial Revolution			T.A. Edison (1847–1931)	F.W. Taylor (1856–1915)
		K. Marx (1818–1884)		
		G.W.F. Hegel (1770–1831)		
Colonial Period		I. Kant (1724–1804)		
Age of Discovery		I. Newton (1642–1727)		
	M. Miyamoto (1584–1645)	Galileo Galilei (1564–1642)		
	Wang Yangming (1472–1529)	N. Copernicus (1473–1543)		
		Leonardo da Vinci (1452–1519)		
Epoch	Mencius (372BC–289BC)	Aristotle (384BC–322BC)		
		Plato (427BC–347BC)		
		Socrates (469BC–399BC)		
	Confucius (551BC–479BC)	Pythagoras (582BC–496BC)		

Modern capitalism, in concert with the stock-company system, enabled the procurement of funds from the financial market, creating a social structure centered on the market economy. On the other hand, the damage which the money-worshipping market society has inflicted on the individual's sense of values and on social conventions is now coming to light. Amid the current economic materialism, we have lost the spiritual and psychological fulfillment which depended on the safety and security that have been sacrificed. The social functions that support contemporary society—organizational-management functions and public-policy functions—have fostered collusive relationships between political power and the economically wealthy in the market society, and, due to the structural inertia of organizations, they are now drifting in a direction opposite to public welfare. But nowadays, happiness and satisfaction are more sought after than material goods. A light has now been shone into the spiritual darkness resulting from the loss of balance, and a debate has begun from the standpoint of a reaction against materialism.

Following the material wealth brought to the developed countries by the industrial revolution, a return to spiritual wealth has begun. Already, at the time of the 'scientific revolution', there were scholars pointing to the unfeeling nature of the logic of an organized society centered on industry and the economy. In the age of the scientific revolution, these were mainly T. Kuhn in *The Structure of Scientific Revolutions*, J. Monod in *Le Hasard et La Nécessité*, W.R. Ashby in *The Design for a Brain*, and N. Wiener in *Cybernetics*, as well as D. Bohm and G. Bateson, while concern over the effect of science and technology on human society was evident even in A. Einstein's *Theory of Relativity*, B. Russell's *Principles of Mathematics*, and in A. Turing, J. von Neumann, and C. E. Shannon. This recourse to humanity provoked by the scientific revolution can be seen as representing a renaissance focused on the relationships between science, humankind, and society. Even in this scientific revolution, however, human-made disasters and accidents were seen as irregular phenomena and not as the objects of scientific inquiry. Not only unnatural disasters but even natural disasters were insufficiently recorded, so that wide-ranging instances of unsafety have historically been disregarded by people and the state as negative phenomena, allowing the same human-made disasters and accidents to be endemically repeated.

In *Guns, Germs and Steel*, J. Diamond says that humanity stands at a parting of the ways where it must choose either the horse of destruction or the horse of sustainability. Looking back over the history of humankind, we find that China's Spring and Autumn Period, the Mayan civilization, and the ancient Egyptian and Mesopotamian civilizations all used an astronomically calculated calendar to predict floods and droughts and warn farmers of natural disaster, thus laying the foundations of the state.

As capitalism is rumored to be failing, the Christian Protestantism that swept the world in the modern age is today in increasingly serious confrontation with the Islamic extremism. Modern capitalism has been introduced to Russia, China, Vietnam and other socialist and communist countries, expanding by fitting in with collectivism. In the history of management scholarship, the scientific theories of F. W. Taylor, E. Mayo, C. I. Barnard, H. A. Simon, P. F. Drucker and other

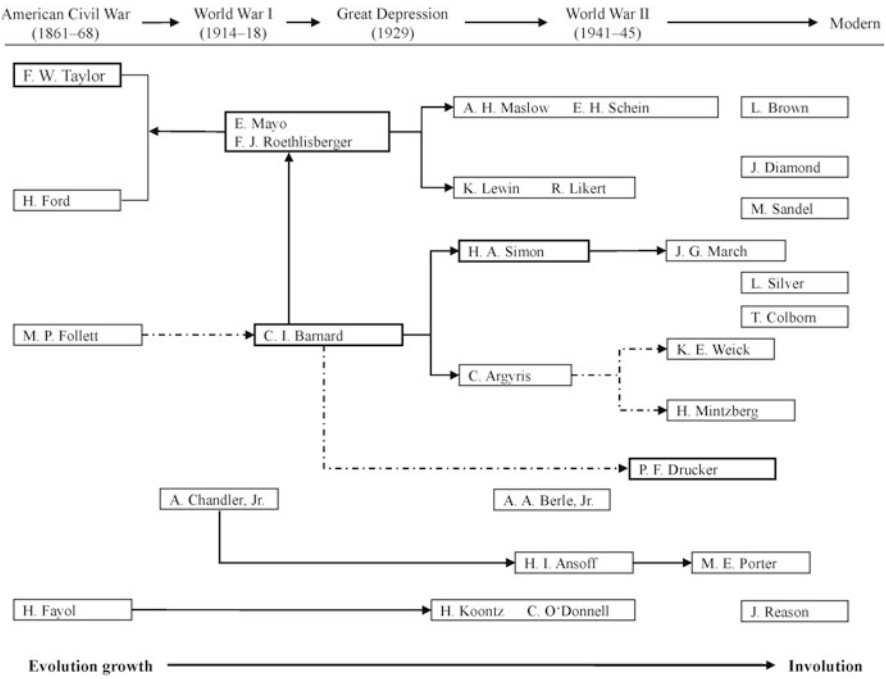
representatives of strategic domains of American management science who contributed to shaping modern capitalism have gradually been pushed aside by the changing times and fallen into disregard. As an alternative new line of thought, L. Brown, and others including J. Diamond, T. Colborn, L. Silver, M. Sandel, and J. Reason have created a new fact-based academic current through empirical research based on presentation of hypotheses that can be understood by people worldwide. Management theories that have contributed to the development of the modern organization have successively shifted their focus from the conventional 'going concern' to the 'public organ' and thence to 'sustainability'. Similarly, in the modern age, led by stakeholders with widely different interests, there has been an evolution from the profit-seeking academic doctrines of the money-worshipping individual organization to a situation where the social functions of 'compliance and governance' have come to be required of organizational management. The academic orientation too, notably in A.A. Berle, has shown a paradigm shift toward pursuit of benefit in terms of social well-being.

In conventional economic and management research, the mainstream approach has been directed at securing individual and national wealth based on growth theory, but in the modern age, managerial strategies in the global market have begun to take account of impacts on the social environment and the ecosphere. Among the particular examples referred to here are the alarm sounded by L. Brown over the global environment, J. Diamond's civilizational collapse, T. Colborn's environmental hormones (brain contamination through accumulation of chemical substances), the dangers posed from bio-business to moral hazard as described by L. Silver, and M. Sandel's concern over the moral limits (moral dilemmas) accompanying the shift from a market economy to a market society. These are all part of an ongoing paradigm shift from growth theory to an emphasis on survival. As once foreseen by C. I. Barnard in his reference to 'unsought consequences' and P. F. Drucker in his 'unexpected results', the sum total of organizational activity based on human cooperation is now being examined in terms of the actual benefit for human society which results from it (Table 9.2).

The ideas and insights of these earlier scientists are carried on through the ISSS in works such as G. Chroust's 'human-made disaster', L. Troncale's 'systems pathology', and J. Kineman's 'crisis sciences', as well as J. Reason's 'organizational accident' and S. Bennett's 'disaster management', which show a move toward interdisciplinary research oriented to the resolution of problems associated with modern 'unsafety phenomena'. These are logical progressions of the thought of Barnard and Drucker in the historical development of management science and indeed belong to a trend toward global environment-oriented eco-management centered on a shift from growth to 'sustainability'. In recent years, crisis management and sustainability has been identified as a focus issue within IFSAM, a conspicuous strand of which is the academic current toward human resource management (HRM) and crisis/risk management from the perspective of global resources for the sake of social and eco-survival as advocated by M. Morley and others, the new trend of management scholars.

In the Fukushima nuclear disaster (Chap. 2), the response by the Japanese government and the power company revealed an approach led not by the principle

Table 9.2 Genealogy of management theories



Note: Drawing based on 'Scholarly history of management' by H. Koontz, C. O'Donnell, and H. Weihrich

of protecting the public, but instead by the priority given to self-protection by government officials and the management teams of the commercial enterprises. It is undeniable that, where its interests coincided with those of the power company, the government, rather than protecting the public from radioactive contamination, sacrificed the public by working to save face and maintain the power structure. Contemporary society is thus upside down. The original irrational decision to locate a nuclear power station in an earthquake-prone area, where it was allowed to age for more than 40 years, was compounded by the obstinate cover-up of successive operational failures and accidents and the falsification of records, which have since been revealed and called into question. It cannot be ruled out that the egregious irrationality and obstinacy surrounding the Fukushima nuclear disaster will be found to have damaged the mental health of the children of the next generation. As for the next generation, who will live in this country in the hope of social justice—what should they believe? In a 2014 survey, the residents of the earthquake zones were found to suffer five times the normal rate of depressive symptoms, indicating a spreading spiritual darkness.

In Germany and Italy, in the wake of the Fukushima nuclear disaster, policy decisions have already been taken to move toward denuclearization, with the decommissioning of nuclear reactors in the near future. In Japan itself, however,

nuclear power issues have been shielded within an archaic social structure which upholds the interests of the nuclear industry and its regulatory structure and the associated approval and licensing system and protects them within a Galapagos-like cultural ethos. In public opinion research, 70–80 % of the Japanese public supported the denuclearization of energy. However, the underlying approaches of "Japanese spirit with Western learning", which divides science and technology from spiritual culture, may have obscured the nuclear power issue. The social functions of 'organizational management'—on one hand, that is the strategic decision-making designed to control the technology and resources of the private sector, and on the other hand 'public policy' systems to supervise private sectors—are in a process of divergence from the will of the public, like that of the JR West Accident (Chap. 4). The politicians who are in charge of public policy and the National Diet members who represent influential lobbies come to curry favor with voters only at election time. The very next day, they fall back in step with the operators of the commercial enterprises that assist with their election funds, representing only the interests of the financial world, and committing a considerable amount of misappropriation. Some commentators claim that even the media are in the pocket of vested interests. Surely I am not the only one who feels that Japan, the country which experienced the Fukushima catastrophe, is now in urgent need of 'citizenship power'?

Who could have imagined that the chlorofluorocarbon gas used in refrigerator coolant would open a hole in the ozone layer of the global stratosphere, allowing cosmic radiation to reach the earth's surface and presenting the threat of skin cancer and other issues, especially in the southern hemisphere? No one foresaw this decisive damage to the global ecosphere (Gaia). It is the same story with environmental hormones (Chap. 3) that accumulate and cause damage to children's brains, and with the socio-biological hazard (Chap. 5) of the viruses encouraged by global warming that are extending their range toward the north and south poles. Nor was it foreseen that humans would be infected with measles, tuberculosis, and smallpox from cattle, whooping cough from pigs, influenza and malaria from poultry, or any of the other infectious diseases passed on from livestock. Global warming (Chap. 6) itself is the accumulation since the industrial revolution of CO_2, smoke and soot, and PM2.5 from fossil fuels coal and petroleum, which, according to WHO survey results, is related to the high dioxin levels detected in breast milk in Europe. Moreover, the cumulative effects of CO_2-based atmosphere global warming, and hydrosphere ocean warming by thermal effluent from the cooling process of the world's 441 nuclear reactors, which cause the melting of the frozen soil of Greenland, Siberia, the Arctic, and Antarctic, and the release of the methane hydrate fixed in the continental shelf seabed, produce at least 20 times the greenhouse-gas effect of CO_2, further exacerbating global warming. This development could combine with food crises in the wake of crop failures due to climate change and abnormal weather patterns, which would be further worsened by the population explosion (Richard Muller, Berkeley Earth Surface Temperature Project).

Originally, the role of the state was to protect its populations by preventing disaster- and accident-related risk and crisis, ensure fiscal capacity through taxes collected, and work to prevent disaster in the public interest. The state itself did not engage in direct creation of wealth and services and did not produce commercial

and industrial profit. If, as in the Fukushima nuclear disaster, risk and crisis are hidden from the public, the loss of the state's power base naturally follows, which should have been clear from the fall of the Berlin Wall. A similar trajectory was reflected in the following Japanese general election with the huge defeat of the Democratic Party of Japan and the recovery of the Liberal Democratic Party. Under the state apparatus of modern capitalism, a collusive structure is appearing between the two great social functions of public policy to formulate political strategy and business administration to operate commercial enterprises. These social roles are normally in opposition and mutually restraining, but in the modern situation where the social function of disaster prevention for public protection is weakened, how can this embrace be unraveled? For the business administration and public policy on which we depend in the modern age to operate as social functions, it is surely essential to return to the starting point and rediscover 'citizen power'. Many international intellectuals concerned with the public interest, notably L. R. Brown and J. M. Diamond, have made clear statements on their hopes for the potential of 'eco-citizenship'.

The so-called revolution in information and communications technology (ICT), which fuses the digital processing and telecommunication that are features of the Internet society, has created electronic space and encouraged creativity, but on the other hand has also given rise to 'cyber terror' and other threats to information resources and privacy. There are companies who make a business of the commodification of privacy: that is, they entice readers to consent to online terms and conditions intentionally made difficult to read, then have them press a 'like button' on Facebook to automatically broadcast their date of birth complete with photograph to an indefinitely large audience. Still other companies such as Google have the aim of 'capitalizing knowledge': there are Wikipedia and so on, who digitalize the data of physical libraries and apply charges to what were charge-free information-search sites. Digitalization in the Internet society produces globalization and impacts the world economy, politics, and public order. At the same time, whether for good or for ill, conflict and terrorism are increasingly internationalized. The issues of nuclear disaster and energy which were presented to the world by Fukushima have revealed the possibility of the globalization even of human-made disasters.

Turning our attention to the energy resources of the current age, conflict over such resources, which has been the cause of world war and conflict in the past, appears to be being mitigated by the renewable energy revolution. Renewable energy sources such as solar and wind power, geothermal energy, biomass, hydrogen fuel and sources as diverse as oil sand, shale gas, methane hydrate, and artificial photosynthesis are being explored. In some cases, for instance, in the US city of Portland and at Feldheim in Germany, an eco-energy shift is being attempted. Meanwhile, in a separate trend arising in the developed countries with their aging populations, regenerative medicine (ES, iPS, and STAP phenomena), genetic diagnosis, and other developments signal the start of a 'bio-revolution' affecting health and longevity issues. As pointed out by L. Silber, the organ business, Nobel Prize winner sperm banks, surrogate motherhood and other 'bio-businesses' are

emerging. In tandem, there are voices raising concerns over the ethics of bio-engineering.

Based on the logic of capital, the bio-revolution occurring simultaneously with the 'energy revolution' contains implicit issues of bioethics and social convention. For humankind, the 'holy trinity' of the energy, bio-, and ICT information revolutions was originally supposed to serve the public interest, but despite the expectation of a benefit from their progression, the resulting gap between communities and individuals introduces a latent inequality. The current world population is exploding toward a figure of ten billion (2050) estimated by the United Nations. Food crises, water shortages, and conflict over energy resources and other issues are spreading across the globe, and the water, air, food, and energy that humanity needs to live are being stretched beyond their limits. The depletion of all resources on a scale never yet experienced in human history, with a few exceptions such as the Easter Island and Mayan civilizations, is exceeding what we envisaged. But this unsafety has been forgotten in the generational transition as we have sought escape by turning away from the alarming phenomena of crisis and risk, which means that they may well return like a boomerang in the form of a fresh major misfortune.

Going forward, the trend toward 'energy revolution' and 'bio-revolution' arising from the 'ICT revolution' will bring not only economic profit and social surplus but also a wealth gap and simultaneously not only the globalization of the effluent and exhaust gases emitted by big capital's mega-factories and the associated by-products and goods and services, but also the globalization of disasters and accidents. P. F. Drucker's 'unexpected result' presents a besetting problem, especially for CO_2-emitting countries such as China and the United States. The logic of capital under modern capitalism has spread worldwide across national boundaries, but people are beginning to realize that, however hard they pursue profit, it does not make them particularly happy. Through a system focused on commercial profit in line with the logic of capital, the multinational and world enterprises supported by big capital have brought about a conversion of the market economy into a market and world society, which has awakened in people an 'awareness of sustainism' in preference to capitalism. The basic principle of organizational management must become to maintain the character of the enterprise as a going concern and a public organ, and to realize sustainability. In today's world, compliance, governance, and human resource management designed to serve social well-being are essential. In public-policy formulation too, the systems for medical treatment, welfare, health, pensions, and nursing care, which are a common difficulty faced by developed countries, have become dysfunctional, and their maintenance has become challenging in countries that continue to operate a national deficit. What will we reap in the near future from the holy trinity of ICT revolution, energy revolution, and bio-revolution?

As foreseen by L. Silver, the incongruence of the effects of bio-revolution exemplified in bio-business and by T. Colborn and brain damage from environmental hormones illustrates the undeniable possibility that human-made disasters may mutate by accumulation into natural disasters. We can probably infer that going forward the world will continue to be oppressed by the collusive relationship between private administration and public policy, that the gaps between north and

south and east and west will grow, and that instability will increase progressively. The imbalance arising from the inequality of wealth and material possessions is the very source of unsafety, and cannot be remedied under present conditions. To arrest this development, we can look to citizen power in opposition to the public policy and business management of the current age, which foreshadows a new global revolution in favor of an eco-civilization.

There are societies where those who advocate education for girls are shot, like the schoolgirl Malala in Pakistan, and there are children who take up a gun after losing their families to war and conflict or terror. Meanwhile, there are children receiving education in economically rich societies and leading quite different lives. True to the warning that all empires must come to an end, this kind of imbalance will before long come back to haunt the developed countries. Unsafety arising from imbalance brings human-made disasters and combines with natural disaster to precipitate catastrophes. These can visit the people of both developing and developed countries, who share the same planet, and to whom the saying "there but for good fortune may go you or I" applies universally. From Europe's floods and America's snow blizzards to Africa's drought and Asia's extreme heat, "what happened next door yesterday" will be visited on us today under an altered guise. Like natural disaster, human-made disasters happen to everyone. History teaches that things happening in distant locations will sooner or later have repercussions at home. Sources of great suffering must therefore not be treated as other people's problems but must be prevented by humans working together at the global level. To prevent the great misery of civilizational collapse, we must take our chance on a 'global eco-civilization' based on eco-citizenship in opposition to business management and public policy, by shifting from 'capitalism to sustainism'. Since we cannot ask this of the people of the future, nor space aliens of course, we, as members of Gaia, must in the end overcome these issues ourselves.

The scope of systems sciences based on interdisciplinary translational research focuses on unsafety as it transmutes from the physical and the biological to civilizational collapse.

9.2 Translational Research for Climate Crisis

Human history is the history of disaster and is intimately entwined with the history of the earth and the history of the universe. As is clear from the chronological events, the period of global warming within the hyper-timescale of the Earth has seen frequent human-made disasters such as wars and conflicts. At other times, the solar cycle or dust and ash clouds from meteor strikes or volcanic eruptions have blocked the sun's rays and triggered cooling, leading to sustained crop failures and nomadic migrations caused by loss of pasturage, for instance the southward migration of the Germanic tribes and the westward movement of the Huns. The result has been hunger and famine leading to uprisings and coups d'état. Events in the history of the earth and human history thus have a strong degree of interconnection, such that natural disaster may lead to unnatural disaster (Table 9.3).

Table 9.3 Translational review between earth and human history

BC5500–AD1300

Year	History of the Earth	warm/cold	History of Humankind
5500BC	Sahara desertification		
5000BC			Yellow River civilization
3500BC			Mesopotamian civilization
3000BC			Egyptian civilization
2600BC			Indus Valley civilization
2300BC	Global cooling (–2100BC)		Fall of Egypt's Old Kingdom
1800BC			Decline of Indus Valley civilization
1760BC			Code of Hammurabi
1750BC	Veniaminof volcano		
1627BC	Santorini eruption		
1600BC			Establishment of Shang dynasty
1500BC	Global cooling (–1000BC), great worldwide drought		
1200BC			Olmec civilization
1159BC	Mount Hekla eruption		
770BC			Spring and Autumn Period/Warring States Period (–221BC)
627BC			Assyrian Empire
428BC			Buddhism
331BC			Eastern expedition of Alexander the Great
221BC			Unification of China under Qin state
264BC			Punic Wars
217BC	Vesuvius eruption		
27BC			Establishment of Roman empire
30			Christianity
220			Three Kingdoms Period (–280)
250			Maya civilization
300			Northern tribes invade northern China
			Spread of Hinduism (–400)
365	Earthquake on Crete		
370			Western migration of Huns
375			Great southern migration of Germanic tribes
476			Fall of Western Roman Empire
526	Earthquake at Antioch, Turkey		
610			Islam
750			Establishment of Abbasid Caliphate
962			Establishment of Holy Roman Empire
1096			First Crusade
1206			Establishment of Mongol Empire
1257	Samalas eruption		
1299			Establishment of Ottoman empire
			Flourishing of Aztec and Inca empires

■ global warming ■ global cooling

(continued)

Table 9.3 (continued)

1301–1800

Year	History of the Earth	warm/cold	History of Humankind
1315–17	Great famine in Europe		
1334–37	Famine in China		
1337			Hundred Years War between England and France
1346–50	Plague outbreak in Europe (Black Death)		World population near 370 million
1452	Kuwae eruption		
1509	Istanbul earthquake		
1517			Reformation
1521			Fall of Aztec Empire
1533			Fall of Inca Empire
1556	Huaxian earthquake		
1571			Battle of Lepanto
1581			Netherlands independence
1586	Mount Kelud eruption		
1600	Huaynaputina eruption		
1641	Mount Parker eruption		
1642			English Civil War
1644			Demise of Ming dynasty, China united under Qing dynasty
1668	Anatolian earthquake		
1669	Mount Etna eruption		
1672	Mount Merapi eruption		
1688			Second Hundred Years War between France and England
1707	Hōei earthquake, Mount Fuji eruption		
1711	Mount Awu eruption		
1737	Kolkata earthquake and cyclone		
1746	Lima earthquake and tidal wave		
1755	Lisbon earthquake		
1757			Battle of Plassey
1770	Bengal famine		
1775			American War of Independence
1776			American Declaration of Independence
1780	Lesser Antilles Hurricane		
1783	Mount Laki eruption		
1789			French Revolution
1792	Mount Unzen eruption		

■ global warming ■ global cooling

(continued)

Table 9.3 (continued)

1801–1930

Year	History of the Earth	warm/cold	History of Humankind
1804			Haitian Revolution
1815	Mount Tambora eruption		
1819			Britain acquires Singapore
1831			First Turco-Egyptian War (–33)
1839			Ottoman Empire begins *Tanzimat*
1840			Opium War (–42)
1845	Famine in Europe		
1846			Mexican-American War (–46)
1849			British conquest of India
1851			Taiping Rebellion (–64)
1853			Crimean War (–56)
1854	Ansei earthquakes		
1856	Mount Awu eruption		Arrow War (–60)
1857			Indian Rebellion (–59)
1861			American Civil War (–65)
1868	Chile earthquake and tidal wave		
1869			Completion of Suez Canal
1877			Russo-Turkish War (–78)
1877	Drought in China (–78)		Establishment of British Indian Empire
1879	Drought and famine in India (–89)		
1883	Krakatoa eruption and tidal wave		
1887	Yellow River floods		
1891	Nōbi earthquake		
1894			Sino-Japanese War (–95)
1896	Sanriku earthquake		
1898			Spanish-American War
1899			Boer War (–1902)
1900	Drought and famine in India		
1902	Mount Pelée eruption		
1904			Russo-Japanese War (–05)
1908	Messina earthquake		Young Turk Revolution
1911			Xinhai Revolution
1914			**First World War (–18)**
1917			Russian Revolution
1919			Treaty of Versailles
1922	Chile earthquake and tidal wave		
1923	Great Kantō Earthquake		
1929			Great Depression

■ global warming ■ global cooling

(continued)

Table 9.3 (continued)

1931–2014

Year	History of the Earth	warm/cold	History of Humankind
1932	Caucasus region drought and famine (–34)		
1933	Sanriku earthquake and tidal wave		
1937			Sino-Japanese War (–45)
1939			**Second World War (–45)**
1944	Tōnankai earthquake and tidal wave		
1946	Aleutian Islands earthquake		
1947			Independence of India and Pakistan
1950			Korean War, World population over 2.5 billion
1955			Warsaw Pact agreement
1955			Asian-African conference
1960	Great Chilean earthquake		Independence of African nations
1960			Vietnam War (–75)
1962			Cuba crisis
1964	Alaska earthquake		
1970	Peru earthquake		
1973			First oil shock
1979			Iranian Revolution, Second oil shock
			Soviet invasion of Afghanistan (–89)
			Three Mile Island nuclear power disaster
1980			Iran-Iraq War (–88)
1982	El Chichón eruption		
1986			Chernobyl nuclear power disaster
1989			Tiananmen Square incident
1991	Mount Unzen eruption, Mount Pinatubo eruption		Gulf War, dissolution of Soviet Union
1995	Great Hanshin earthquake		Population explosion
2001	Global warming		America 9/11 terror attacks, Terrorism
2003			Afghan War and Iraq War
2004	Sumatra earthquake		Global Terrorism
2005	Hurricane Katrina		JR Fukuchiyama Line Derailment Accident
2008	Sichuan earthquake		Bankruptcy of Lehman Brothers, Financial crisis
2010	Chile earthquake and tidal wave		Arab Spring
	Eruptions of Eyjafjallajökull		Conflicts Expantion of North Africa
2011	Great East Japan Earthquake		Fukushima nuclear power accident
2012	Abnormal weather		Syrian Civil War
2013	Super Typhoon Haiyan, Chelyabinsk meteor		World population over 7.2 billion
2014	Mt. Ontake eruption		Ukrainian revolution
2015	Floods and drought in the world		Paris terror attacks, EU refugee flow
			Climate change, food and water crisis
2050			World population over 10 billion (estimate by UN)

■ global warming ■ global cooling

Note: Based on Super Time Scale of the Earth by Japan Society of Geology and a World History by W. H. McNeill.

In the environment, not only the water sphere (seas, rivers, lakes, and water vapor) but also the atmosphere, the land, and the earth's crust are fundamentally linked in a state of continuous circulation. Additionally, cosmic radiation from the galaxy and from supernova explosions in outer space, solar activity cycles, and meteor strikes create clouds in the earth's atmosphere that cause climate change (*see also,* connecting Chap. 1 Table 1.1, above). These changes in the history of space have not only had a determining influence on global cooling and global warming but were also connected with the cyclical mass extinctions in geological time, for instance that of the giant insects (50–100 times larger than now) and the large reptilians (5–10 times bigger). The relationship between the history of space and the history of the earth has been decisive in human history, from the Ice Age, through prehistory and the age of civilization to the modern age. In this context, the unnatural disasters which we encounter in our normal life spans are events of a single moment's duration. For people living today, disasters may bring great misery and appear fateful, but in the light of human wisdom we should attempt to see them in proportion. Just as natural disaster may underlie human-made disaster, equally the reverse effect may apply. It is the aim of this book to point out that the totality of the activities of human civilization can in this way trigger human-made disaster that leads on to natural disaster.

Recent years have seen global warming and abnormal weather patterns. Hurricanes, great tornadoes, and extreme cold have struck America while Europe has been hit by low pressure systems causing violent storms and major flooding alongside avalanches and heat waves. In addition to major earthquakes in Haiti, New Zealand, Sumatra, Turkey, Japan, and China, earthquakes have also been recorded in France, while volcanic eruptions have occurred in Iceland and Japan, great floods in Thailand and Bangladesh, and a super-typhoon in the Philippines. Drought and water shortage plague Africa, while acid rain in South America and Europe brings deforestation and desertification. On top of these comes the accelerating depletion of water resources worldwide, leading to the spread of hunger and famine. The list is endless. As well as such natural disasters, global warming has encouraged the poleward expansion of infectious and endemic diseases, while the movement of people promotes the worldwide expansion of infectious tropical diseases such as Ebola hemorrhagic fever, West Nile fever, Dengue fever, SARS, and MERS. Meanwhile, the wealth gap between the northern and southern hemispheres and religious tensions between Christianity and Islam have opened up multiple sources of terrorism and ethnic conflict. Past human history actually indicates a pattern of globalized human-made disaster through war and conflict in periods of warming. In periods of global cooling, such as those caused by meteor strike, volcanic eruption, or supernova explosion, after which the globe becomes a 'snowball', life activity has been suppressed, and new environments have appeared to which selectively adapted living species have evolved. There are also phenomena running counter to this natural process.

The great calamities that the author has experienced, the Great East Japan Earthquake and the Great Hanshin Earthquake, the eruption of Mount Ontake, the Fukushima Nuclear Power Station disaster and the JR West rail accident, show a

connecting cyclicality and commonality. Of course, natural disasters and unnatural disasters are phenomena which differ in essence and in logical character, but in terms of experience and statistics, the two types of disaster frequently coincide and can be seen in the chronological table to exhibit connectedness and cyclicality. Cooling cycles reflect cosmic phenomena, while periods of global warming see an activation of water and carbon-based life forms and intensified competition for the earth's limited resources, affecting the giant insects and the giant reptiles, and equally the human race. In the case of the human race, the result of the intensified competition is globalized war and conflict, coups d'état, and terrorism. Table 9.3 shown, crop failures in cool periods led to the large migration of Germanic tribes and the great movement of the Huns, which was a chain reaction to poor harvests among nomadic tribes. Such territorial struggles over food resources, or over energy resources such as coal or petroleum, could pave the way to another world war. Both world wars were expected at the time to be short-lived conflicts, but, as is now known, events took an unexpected turn and an unforeseen situation developed.

Human-made disaster arises from and simultaneously with the risk of natural disaster in a scenario termed 'crisis synchronicity'. The accumulation of human-made disasters may lead to natural disaster and catastrophe in the near future, for instance through the polar ozone hole caused by the accumulation of CFC gas from refrigerators and hairspray. As history indicates, disaster involves both natural and human elements in a mutual chain reaction with the synchronicity phenomenon. The result has been a repeated cycle of destruction and creation which is counter-intuitive and defies human understanding. Interestingly as seen in Table 9.3, the global religions of Christianity, Islam, and Buddhism came into being at the beginning of a period of global warming, and this transition from a cool to a warm period with plentiful food supply and a growing population coincided with the outbreak of multiple conflicts. The conclusions might be that in cool periods the human race is preoccupied with securing food and is disinclined to engage in fighting amid the glacial conditions, and that large migrations take place in glacial periods with long-lasting food shortage. Taking a super-historical view, it would seem that the rise of religions and the outbreak of wars start in eras of global warming, while racial migration, internal conflicts, and state collapse from poor harvests occur in eras of global cooling. For reference see Table 9.3 Translational review between earth and human history.

If the present global warming is to be understood as a human-made disaster, then attention needs to be given not only to the incubating effect of CO_2 but also to the world's 441 nuclear power plants with an average capacity of 100 Mwe, each of which discharges water heated by 7 °C (70–100 ton/sec) for a period of approximately 40 years, leading to the phenomenon of ocean warming. It cannot be ruled out that the human race is thereby raising the risk of disaster. Changes in the global environment in the form of the warming-related climate crisis and abnormal weather patterns influence the cycles of convection and circulation in the atmosphere and the water sphere, inducing phenomena such as super-typhoons, heat waves, and extreme cold. These may also prevent heat release and circulation to adjust to global thermal differences and restore energy equilibrium, affecting even

the activity of the earth's surface and the earth's crust (plate movement due to mantle convection). It is still unclear whether the great changes in the climate of today are dependent on cyclical solar activity or perhaps due to a change in the gravitational balance following the solar system planetary alignment of 2012. Nevertheless, the totality of human activity cannot be excluded as at least a factor in triggering disaster events. Human history demonstrates that disasters are not transitory events but have the ability to become chronic in character. In the face of the threat to the continued existence of the human race, I therefore felt the need to sound the alarm from the disaster-prone country of Japan, where we have frequent experience of earthquakes, tidal waves, volcanoes, typhoons, torrential rains, floods, landslides, and other natural disasters. In attempting this book, intended as a warning message to readers transcending location and generation, I wished to point to the potential for such natural disasters to join forces with human-made disaster and cause global devastation.

Atmospheric global warming and hydrospheric ocean warming (the boiling globe phenomenon) are explained by crisis sciences based on interdisciplinary within *transdisciplinary paradigms*.

9.3 Crisis Sciences as Transdisciplinary Paradigms

The aim of this book is to make a contribution to humanity by alerting the world to the gradually 'spreading unsafety' that faces us in the near future by presenting examples such as the Fukushima nuclear power disaster (radioactive contamination), environmental hormones (chemical substance contamination), the continuing series of railway accidents, viral infection pandemics, and the nuclear-heated ocean warming which is a factor in global warming. The idea is, firstly, to consider the natural disasters and unnatural disasters likely to confront us in the future by reviewing world history; secondly, to prevent the major misfortune of catastrophes combining natural with human-made disaster; and thirdly, for the next generations to explore the potential for realizing sustainability through 'citizen power for eco-civilization' as a preventive social function to counter the collusive relationship of business administration and public policy under modern capitalism.

This book consists of three parts encompassing a total of nine Chapters. Part I, Disaster Chain, begins with Chap. 1, Carbonized Terra, which traces the history of the earth and humankind to establish an understanding of the contemporary problem of unsafety; Chap. 2, The Fukushima Nuclear Catastrophe, serves as an example of the interconnectedness of natural disaster and human-made disaster; Chap. 3, Environmental Hormones, investigates the damage caused by the accumulation of chemical substances. Part II, Organizational Accidents, opens with Chap. 4, The JR West Accident, which focuses on a 2005 railway accident to present an example combining human error with system error; Chap. 5, Sociobiological Hazard, points to the northward and southward spread of contagious disease pandemics; Chap. 6, Boiling Globe, raises the issue of ocean warming

caused by thermal effluents from the cooling process of the world's 441 nuclear reactors and presents a case study of the criticality accident at JCO's Tōkai nuclear-fuel plant. Part III, Science of Crises, begins with Chap. 7, Escape from Disaster, which applies the academic theories of pioneering scientists to explain the mechanism whereby a zone of indifference intervenes in the cognitive human process around disaster and accident, causing us to seek mental escape from risk and crisis; Chap. 8, Crisis Sciences for Sustainability: Limits of Management and Policy, warns of the collusive relationship between public policy and private management which threatens public safety and advocates the potential of an eco-civilization based on citizen power as a corrective social function; Chap. 9, Remaking Eco-civilization, traces humankind's journey to present a historical review of the contemporary unsafety which is the book's main theme and place it in context. To sum up, the book reexamines the danger of the risk latent in a market society leading to a collusive relationship between the normally opposing functions of organizational management and public policy, which may then become the source of crisis with 'moral destruction', and explores the possibility of the citizenship paradigm shift from capitalism to sustainism.

The book seeks to investigate examples of the organizational disasters and accidents which are a negative aspect of human cooperation in contemporary society and to think about how social systems can be designed to avoid their recurrence in the future. The world is full of needless disasters and accidents and instances of unsafety that should have been prevented, which more and more frequently plunge victims' families and loved ones into the greatest sorrow. Perhaps the time has come for those of us with the will to prevent the looming crisis of the near future to fight to assert citizen power over the state and companies and organizations. Today, the power residing in the state and organizational authority acts with increasing oppressiveness against the individual. A reaction based on eco-citizenship is the only social function able to prevent the unsafety that tends to be masked by organizational authority and state power. The intention of this book is to highlight the inescapable need for 'sustainability within eco-civilization' as a lesson proceeding from the combined disaster of the Great East Japan Earthquake (natural disaster) and the Fukushima nuclear accident (human-made disaster).

When one investigates and thinks about the issues facing contemporary society, one notices that they consist of the mixed blessings of the organized society created by modern rationalism. Part of the cause of this is that the methods of contemporary science are biased toward making microscopic distinctions relating to partial phenomena and analyzing related functions and structures from the limited approach of all normative individual sciences. While this method does have the ability to provide partial explanations for limited phenomena, it is not suited to elucidating overall phenomena. This is the problem of the 'subdivided sciences' to which G. Bateson refers. It is true that contemporary rationality has brought about economic development and a society of plenty through the pursuit of material wealth, but the negative side of the balance cannot be ignored. One example is global environmental pollution, as seen, for instance in the issue of environmental hormones, whose effects will impact not only contemporary society but also

successive future generations. Meanwhile, the disasters and accidents that have occurred frequently in recent years have pointed up the limitations of the contemporary social system based on the logic of growth.

Another reason is that the design approach to knowledge and technology in contemporary society is the 'logic of the strong' centered on growth and development, which has marginalized and excluded the grieving and complaining weak. The negative aspects of human cooperation resulting from this are too numerous to recount, but include an increase in global environmental problems and unnatural disasters. Going forward, toward the realization of a sustainable society, the need has surely arisen to explore a preventive science that focuses on issues of safety. In modern capitalism, structures of collusion between business administration and politicians have also had a range of damaging effects. This collusion between business management and public policy, which should normally be opposing forces, leaves no option as a preventive function other than citizenship. The accelerating drive toward the 'market society and worship of money' under the capitalist system is bringing us to the 'limits of morality'. Preventive social functions would be similar to the parasympathetic nerves that control sympathetic nerves in living organisms, and we have now entered an age where they need to be engineered into social organizations.

The significance of the environmental management and disaster management (S. Bennett) of recent years is that it marks the advent of an age where, as it were, the sympathetic nerve for growth has been replaced by a parasympathetic nerve for prevention. The various social systems and control technologies which have developed in the organized society of today have expanded their applications rapidly in line with systems of information and communications technology, but have not contributed greatly to the prevention of unsafety at the global level. In historical terms also, individual scientific disciplines limited to specific situations are waning in their power to prevent the major misfortunes of human-made and natural disaster. As an individual citizen of Japan, the country where the Fukushima nuclear disaster occurred, I have a message to communicate to the world. That is, that the chain of unsought consequences that are the cumulative result of human negative cooperation can combine with natural disaster and lead to irrecoverable catastrophe. My reaction to global warming and other global environmental issues is to launch a global debate from Japan on the combination of human-made and natural disasters that result from accumulated negative cooperation and on the prevention of catastrophe for 'eco-civilization'.

Until now human science has been focused on matters of benefit to humankind and has been a study exclusively of fortunate circumstances, but we are now in an age where we need to include misfortune as a subject of scientific study. This should be clear from the examples given in Chaps. 2, 3, 4, 5, and 6 of this book. We need to think not of immediate gain or loss but of the moral aspect. A favorite book of businesspeople around the world is the *Book of Five Rings* by Musashi Miyamoto (a legendary swordsman of the 16th and 17th centuries). In his theory of the rings of elements, he advises humanity to "think lightly of oneself and deeply of the world" and "not envy another's good or evil." For the future of humanity, it can be

concluded that the truth lies in the reality of misfortunes represented by disasters and accidents, namely, *unsafety*.

For the sake of the sustainability of the next generation, crisis sciences are rethinking the existing processes of decision-making at the individual, organizational, and social level.

This book examines accidents and disasters in the modern era, clarifies the mechanisms involved using real-life examples from Japan, and asks the question of how we can check the underlying pathology and threat of systemic breakdown. In recent years, disasters causing enormous misery have occurred across the globe at a frequent rate, while human-made organizational accidents have also inexorably grown in scale, presenting an urgent issue in all nations for individuals, organizations, regions, and the state. The objective of this publication is to explore potential management approaches (parasympathetic systems) and policies to limit the globally expanding problem of human-made disasters, drawing retrospectively on real-life examples from the Japan of recent years.

The role of the book is to contribute to the resolution of a range of emerging problems, from the aging of vital infrastructures for the supply of water, gas, and electricity to the breakdown of healthcare, pensions, and other social systems. One factor in the Fukushima nuclear catastrophe, which followed in the wake of the earthquake and tsunami disaster that struck eastern Japan in 2011, was the latent deterioration and aging of systems at all levels from the physical to the social, leading through 'chain reaction to unsought consequences' that no one foresaw, as explained in *The Functions of the Executive* (C. I. Barnard 1938). Here, the aging of the nuclear reactor system, the breakdown of safety management, and inappropriate instructions from the regulatory authorities combined to create a 'threefold disaster', in which technological, organizational, and governmental dysfunction has been diagnosed as reflecting a systems pathology infecting all levels.

Previous studies in the field of organizational accidents and human-made disasters have followed a well-known academic trajectory marked by works such as *Our Stolen Future* (T. Colborn 1996), *Remaking Eden* (L. Silver 1997), *Managing the Risks of Organizational Accidents* (J. Reason 1997), *World on the Edge* (L.R. Brown 2011), and *Collapse: How Societies Choose to Fail or Succeed* (J. Diamond 2011). Nevertheless, the academic discipline has yet to establish a sufficient identity. The historical development of scientific study in the fields of crisis management, risk cognition, safety policy, and reliability has been limited to specific disaster regions and countries. Since no widely shared history of disaster has been elaborated, this area can be viewed as a new global science or revolution.

As in America, Western Europe and Japan, trends in the BRICs nations (China, India, Brazil, and Russia) and other emerging economies suggest the risk of a global disaster escalating in the manner of a domino effect, as seen when inadequate safety management leads to the release of radioactive contamination, environmental hormones, or biohazards. Whether physical or social, whether process or reality (A. N. Whitehead), and whether micro or macro in scale, disasters share a common essence, which means that there is social value in establishing 'factual premises', as proposed by *Administrative Behavior* (H. A. Simon), on the basis of these frequent

phenomena. These 'factual and valuable premises' will be significant as 'scientific paradigms' as in *The Structure of Scientific Revolutions* (T. Kuhn) and can be seen as occupying a perspective that integrates theoretical, empirical, and pragmatic science. Indeed, this book's approach can be considered as an interdisciplinary science based on this integration of normative methods.

In its structure, this book distinguishes between physical disasters (typhoons, earthquakes, tsunamis, floods), chemical disasters (environmental hormones, polychlorinated biphenyls, dioxins, PM2.5), and biological disasters (biohazards, virus pandemics, bio-manipulation), and is based on an interdisciplinary approach to preventing disaster through examination of the process of mutual repercussion that is at the genesis of disaster. In view of current needs, with the number of people and regions affected by disaster rapidly increasing, the growth of research in this area can be seen as science fulfilling its social mission in response to a tacit societal desire for a future where safety is guaranteed. The book's aim is thus not merely to launch a critique of business and government, but rather to contribute to achieving a sustainable society in the near future.

9.4 Afterword

The inspiration for this research arose from a number of unsettling personal encounters with unsafety. Tracing them back in reverse order, I was affected by the EU refugee crisis and global terrorism; in December 2015, in the German town of Fussen, I was forced by the hotel manager to leave my hotel in the early morning without breakfast because of a misunderstanding and felt unsafe due to the tense situation in the town caused by the EU refugee crisis; the Fukushima Nuclear Disaster and the Great East Japan Earthquake of 2011; the Thai coup d'état of 2007 (during transit at Bangkok airport on my way to a volunteering event at Mt. Everest); an Alaskan wild grizzly scare in a 300 km-long canoe trip on the Yukon River in 2007; the JR Fukuchiyama Line derailment accident of 2005 (to which a student from one of my classes fell victim); an extreme cold snap in a mountaineering trip to the Matterhorn in August 2003, on the contrary an extreme heat wave on Gran Paradiso and rock fall caused by glacier melt at Mont Blanc in 2003; the SARS pandemic that swept across Asia in 2003 (during which I was delayed by a major disinfection carried out at Kansai airport while on my overseas research posting to Prof. M. von Zedtwitz at the IMD (Institute for Management Development) in Lausanne; the coup d'état by Peru's Fujimori government in 1999 (during which I experienced an enforced stay at Machu Picchu by the rebel troops); and the Kobe earthquake of early morning in 1995. Unfortunately, it was thus the unsafety that I experienced personally that proved sufficient motivation for the publication of this book.