
abstract This article provides an overview of sustainable development from a sociological perspective. It is divided into three parts. Part I presents selected relevant sociological research from before there was ever a concept of 'sustainable development'. The focus here is on work falling under the rubrics of environmental sociology as well as development sociology. Part II briefly discusses the context and process that led to conceptualizing 'sustainable development'. Part III considers the response of several sociology theories to sustainable development issues, with the focus on a selection of four major system theories: world systems theory, neo-Marxist 'treadmill of production' theory, ecological modernization theory and modern systems theory, all of which have addressed development issues and eventually sustainability questions.

keywords development sociology ♦ environment ♦ environmental sociology ♦ industrialization ♦ social structure ♦ sustainable development ♦ system theories

I Background

Sociological legacies

Long before there was a conception of sustainable development, sociologists (as well as other social scientists) were conducting research on development issues (such as modernization, socioeconomic development, distorted development, unequal development, etc.) as well as sustainability issues (pollution, environmental degradation, resource depletion, key resource struggles and politics relating to oil, water, land, etc.).

Selected sociological studies of environment and also development are briefly presented below, each in turn, before we go on to consider the emergence of the concept of sustainable development and some features of sustainable development as a sociological area of theory development and empirical research. In the conclusion, the article suggests that a new societal paradigm relating to sustainable development is emerging – and the study and conceptualization of this paradigm is a major challenge to contemporary sociology.

Environmental research

'Environmental sociology', encompassing a substantial body of research, can be understood as the study

of the interaction between society and the physical environment (Wehling, 2002). Studies include investigations of attitudes towards energy use, pollution and environmental degradation, the extent to which people are ready to try to conserve energy or protect the environment. In addition to attitude studies, considerable research has been conducted on, among other phenomena, actual patterns of household energy use and energy efficiency, innovations in energy technologies, human factors in and response to pollution and environmental degradation, and the politics of environment and energy as well as other resources such as land, water and minerals. Sociologists have especially studied environmental movements and in some instances, their interactions with states (a considerable part this latter research has been institutional as well as historical in character).

Much of the substantial and important work of environmental sociologists emerged initially in the context of mainstream sociology blended in with many other studies up until the 1970s. From the early 1970s, the term 'environmental sociology' came into increasing use. The section 'Energy and Society' (Research Committee 24) was established within the International Sociological Association in 1971, and

some years later (1977) the 'Environment and Technology' section was formed in the American Sociological Association.

Several of the major contributions of environmental sociology include (this listing is not comprehensive in designation of either research areas or the many sociologists who have contributed to important bodies of knowledge in the diverse areas; this highly selected listing is merely intended to suggest the diversity of areas – and some of the intensity – in which sociologists are engaged):

- *Surveys of attitudes and opinions* towards the environment and environmental issues (Dunlap, 1994; Hamilton et al., 2012a, 2012b; McCright and Dunlap, 2011, among others).
- *Lifestyle and consumer behaviour studies* (Boström and Klinton, 2008; Dietz et al., 2003; Spaargaren and Van Vliet, 2000, among others).
- *Environmental movements* (Brulle, 2000; Brulle and Jenkins, 2005; Flam, 1994; Jamison et al., 1990; Pellow and Brulle, 2005; Richardson and Rootes, 1995; Rootes, 1997, among others).
- *Studies of regulation and governance* (Carson et al., 2009; de Man and Burns, 2006; Fonjong, 2008; Kasemir et al., 2003; Lidskog and Sundqvist, 2011; Lindén and Carlsson-Kanyama, 2007; Midttun, 2010; Nikoloyuk et al., 2010; Pellizzoni, 2011).
- *Energy politics and policymaking* (Andersen and Burns, 1992; Baumgartner and Midttun, 1986; Midttun and Finon, 2004; Pachauri et al., 1991; Woodward et al., 1994, among others).
- *Studies of innovation and entrepreneurship relating to alternative energy technologies, energy policies and sustainability issues* (Baumgartner and Burns, 1984; Klemmer et al., 1999; Olsthoorn and Wieczorek, 2006; Woodward et al., 1994, among others).
- *Special sector studies*: climate change (Giddens, 2008; Merlinsky, 2010; Norgaard, 2011; Rosa and Dietz, 1998; Stehr and Von Storch, 2010); biofuels (Bozzini, 2012; Carolan, 2009; Carrosio, 2012; Mol, 2007); fisheries (Burns and Stöhr, 2011a; Finlayson, 1994; Hamilton et al., 2005; Jentoft, 2005); forests (Bunker, 1985; de Man and Burns, 2006; Nikoloyuk et al., 2010; Puy et al., 2008); tourism (Hamilton et al., 2003; Salvatore and Maretti, 2012); transport (Baker, 1994; Wang, 2012; Whitt, 1982; Yago, 1983); air transport (Midttun, 1992); water, sewage (Azpiazu, 2010; Merlinsky, 2011; Tàbara and Ilhan, 2008; Tàbara et al., 2008); environmental education (Schmidt, 2004; Schmidt et al., 2011).
- *Global environmental change studies* (Christen

et al., 1998; Kaushik and Srivastava, 2003; Pretty et al., 2007; Redclift, 1987; Redclift and Woodgate, 1997; Rosa et al., 2010; Stern et al., 1992; York et al., 2003).

- *Ecofeminism* (Mellor, 1998; Mies and Shiva, 1993; Salleh, 1997, 2009; Shiva, 1992).
- *Social theory, the environment and nature–society relationships* (Benton and Redclift, 1994; Buttel, 2002; Christen et al., 1998; Dickens, 2002; Drummond and Marsden, 1999; Dunlap et al., 2002; Mehta and Ouellet, 1995; Murphy, 1997; Strydom, 2002; Wehling, 2002).

All in all, a substantial number of sociologists – although definitely a minority and to some extent marginal to mainstream sociology – have conducted considerable research on a wide spectrum of environmental questions and issues. A significant part of the research was concerned with humanly caused environmental degradation (fisheries, forests, pollution, etc.). Also, societal damage and loss in the face of environmental degradation have been important, especially its impacts on, among other issues, health, habitat, marginal communities and groups (for instance, women's subsistence livelihood [Mies and Shiva, 1993]). It is an impressive accomplishment and deserves much wider recognition within sociology. (There are a number of anthologies and textbooks covering the general area: Benton and Redclift, 1994; Dunlap et al., 2002; Gross and Heinrichs, 2010; Pretty et al., 2007; Redclift and Woodgate, 1997).

In sum, already starting in the 1960s and 1970s, sociological studies investigated and theorized about environmental issues and the relationship between social and natural systems (Dunlap et al., 2002: 329). Environmental sociology extended its empirical research net (see below), developed a number of particular concepts and models; it criticized mainstream sociology – and sociological theory in particular – for ignoring the biophysical environment and arguing generally that the 'material world' was not sufficiently taken into account in sociology (Buttel, 2002; Catton and Dunlap, 1978; Dunlap and Catton, 1979; Dunlap et al., 2002: 331). Buttel (2002: 39) points out that, indeed, there existed a *classical environmental sociology* (italics in the original): 'Elements of environmental sociology have roots deep in nineteenth-century social thought. Not only did Marx, Durkheim, and Weber incorporate what we might regard as ecological components in their work, they did so from a variety of standpoints. Among the multiple ecologically relevant components of their works are materialist ontologies (in the case of Marx and Engels), biological analogies (Durkheim), use of Darwinian/evolutionary argu-

ments or schemas (Marx, Durkheim, and Weber), the notion of nature-society “metabolism” (Marx), and concrete empirical analyses of natural-resource and “environmental” issues (Marx and Weber)’ (see Dickens, 1997, 2002). At the same time, this emerging subdiscipline was viewed by many if not most sociologists as marginal to mainstream sociology. In the mid-1970s, Catton (1976), Catton and Dunlap (1978), Dunlap and Catton (1979), among others, articulated what they referred to as the ‘new ecological paradigm’, which became an important legacy of environmental sociology (not only in the USA but internationally). Buttel (2002: 38) claims that the core of North American environmental sociology – and, in particular, the new human ecology – emerged in part in opposition to mainstream sociology.

Development research

Development research emerged as a major sociological undertaking after the Second World War (there were parallel developments in the other social sciences); ‘development’ referred to a multidimensional transformation of society – although there are many different conceptions in the details). It was more than a field of study, it was an aspiration, an ideology (or several) (Bernstein, 1971: 142). The research was particularly oriented to ‘less developed’ or ‘non-industrialized’ societies that were undergoing (or could be expected to undergo) a transition to industrialization (the transitions usually occurred under some form of capitalism but communist countries also launched massive industrialization and modernization programmes). A major part of the early efforts had a particular theoretical perspective, namely ‘modernization theory’ (Bernstein, 1971; Eisenstadt, 1966; Huntington, 1968; Inkeles, 1974; Lerner, 1958; Moore and Cook, 1967, among many others) and referred to the emergence of modes of social life, organization and economy which appeared in Europe from the seventeenth century onwards and which came to have worldwide influence (Giddens, 1990). In other words, modernization referred to development or change towards ‘modern’ economic, political and social systems such as those that characterized the USA and Western Europe (see also Apter, 1965; Halpern, 1966; Levy, 1966; Nisbet, 1969; Rogers, 1962). The approach postulated more or less linear movement from ‘traditional societies’ to ‘modern societies’ (the latter bearing considerable similarity to the USA): the emergence of ‘rational’ thinking and calculation, professionalization, monetization, market economy, urbanization, representative democracy, advanced educational systems, the spread of mass communication systems and literacy, extensive research systems,

modern family structure, and much more. ‘Successful’ development (economic, political and cultural) was expected over time for all nations, and, consequently, a global convergence was predicted: faster or slower as the case may be. In a word, it was a theory not only of societal development but social transformation (Halpern, 1966).

In response to the take-off of modernization theory in the 1960s and 1970s (see references above) there emerged widespread critique as well as a number of counter-approaches to the analysis of society and its development (and underdevelopment): among others, dependency theory (Amin, 1976; Cardoso and Faletto, 1979; Frank, 1967), neo-Marxist theory (Benton, 1989; Dickens, 1997; Schnaiberg, 1980, among others), world systems theory (Hopkins and Wallerstein, 1982; Wallerstein, 1974, 2004) and modern systems theory (Baumgartner et al., 1986; Buckley, 1967; Burns and Flam, 1987; Burns et al., 1985; see also Archer, 1995).

Criticism of modernization theory focused on its simple dichotomization of traditional/modern, the transparent western ethnocentrism and strong assumptions of reductionism (individuals and personality structures as key explanatory variables). The critical perspectives highlighted the importance of class and international power relationships, unequal exchange (developed countries gaining at the expense of less developed countries) and ‘underdevelopment’ as a source of constraint as well as other perverse developments and distortions appearing in weaker, peripheral parts of ‘the Third World’. The opposition became a counterpoint to the optimism and apparent ‘value neutrality’ of ‘modernization theory’, emphasizing rather class exploitation, the perverse ‘development of underdevelopment’, ‘blocked development, divergence in development patterns and global inequality generally.

By the end of 1970s, modernization theory had faded (only to return a decade later as ecological modernization theory emphasizing ecological considerations, societal learning and institutional and cultural analysis, see below). World systems theory, neo-Marxist and modern systems theory presented and elaborated their considerations of societal development (the following discussion is drawn from Burns, 2006). World systems theory, in particular, evolved into a major sociological research programme on development, which continues to be active and flourishing and which has in the last decade also embraced environmental issues (see below) (Bergesen, 1983; Chase-Dunn, 1997; Chase-Dunn and Grimes, 1995; Chase-Dunn and Hall, 1976; Hopkins and Wallerstein, 1982; Wallerstein, 1974, 2004).

World systems theory shared the Marxian historical perspective paying close attention to economics but shifted the focus from a single state to a global world economic system linked by trade. More attention was paid to market and trade expansion than to modes of production, the latter much emphasized by conventional Marxists. It focused on imperialism and dependency among nations and considered 'development' in a global and comparative perspective.

In the world systems theory perspective, competing states (and their economic agents) are linked together in a global system which is structured as core (rich, developed and powerful) and periphery (poor, underdeveloped and relatively weak). Centre-periphery is, in a word, relational. The former dominates the latter, yet the functioning of each part is interdependent in the global system. Major wealth and other gains accrue to the core, which is characterized by high profitability, high wage levels, multiple benefits and high-skill developments producing diverse and advanced goods and services. Profitability in the core, it is argued, is achieved without the brutal exploitation of labour. On the other hand, peripheral areas are systematically 'underdeveloped' and are characterized by low profitability, low wages and the production of less advanced goods and services; labour tends to be highly exploited. Contrary to the view of many Marxists, it is the periphery (not the developed centre) that is the locus of great exploitation (and increasing environmental degradation, as suggested below).

By conceptualizing positions of societies in a matrix of global trade and diplomacy, world systems theory contributed to breaking out of the framework utilized by most sociologists, modernization theorists as well as Marxists, that is, the investigation of the development of individual societies in isolation from one another (Chirot and Hall, 1982: 102). World systems theory also articulated a variety of systemic concepts and analyses, such as structures of domination, centre-periphery relationships, semi-peripheral regions (halfway between centre and periphery in terms of economic structure and power), unequal exchange and accumulation and anti-global system movements (Wallerstein, 2004). While world systems theory has played an important role in development sociology, it neglected until recently the biophysical environment (a failing it has acknowledged). Increasingly, it gives attention to global environmental issues (see below).

The historical approach of Marx conceived of all societies as evolving in a series of stages. Each stage was characterized by a particular structure, a certain mode of production as well as other structures, for

instance, the 'superstructure' of politics and culture derived from and dependent on the substructure of production. Human beings generate these structures through their own actions, but not always under the conditions of their own choosing or in the ways they intend. Marxist theory identified and explained why certain modes of production, that is, particular social structures, give advantages to one group or class rather than another. The relative power of social classes is determined by the particular mode of production, the ownership of productive property and the authority system required by a given technology (Stinchcombe, 1968). Classes have not only different interests (ideology and modes of mental production) but also different capabilities and means of political mobilization and influence.

According to Marx, because of contradictions between structures, the capitalist system has been historically characterized by economic crises, conflicts and tendencies for continuous transformation not only of its economic relations but also other social relationships. Advances in technology and knowledge and increasing size of production units contribute to changes in the mode of production and redistribute power among classes over time. Those agents or classes of agents with growing power under emerging conditions increase their influence over institutional and cultural conditions.

Actor system dialectics (ASD) developed by Buckley, Burns and their associates dealt with some of the same issues as world systems theory and Marxist theories. In investigating and analysing societal dynamics and development (and underdevelopment), ASD stressed the role of human agency, institutional, cultural and power factors, interactions (conflict, exchange and struggle), as well as innovation and sociopolitical mobilization and transformation. Active agents with their distinctive characteristics, motivations and powers interact with one another and contribute to establishing and transforming structures such as institutions, sociotechnical systems and physical and ecological structures but always within the existing constraints and opportunities and not in precisely the ways the change agents intend. Complex, dynamic social systems are described and analysed in terms of the interplay between stabilizing mechanisms (morphostasis) and destabilizing mechanisms (morphogenesis) (Archer, 1995; Buckley, 1967; Burns et al., 1985). The structural and cultural properties of society are not only carried by but transmitted and reformed through individual and collective actions and interactions. ASD has been especially used to identify and analyse mechanisms of innovation and the development and transformation of technologies, infrastructures and social and ecological structures

(Baumgartner and Burns, 1984; Burns and Hall, 2012; Carson et al., 2009; Woodward et al., 1994).

In general, agents through their interactions generate structural reproduction, elaboration and transformation. They play constructive as well as destructive and transformative roles in the context of complex sociocultural systems. In such terms, agents and the institutional and stratification structures in which they are embedded contribute to creating and recreating themselves in an ongoing developmental process.

From the ASD perspective, structures such as institutions and cultural formations as well as ecological conditions are temporally prior, relatively autonomous and possessing causal powers, constraining and enabling people's social actions and interactions with their constructive and destructive potentials for transformation (see also Archer, 1995).

II The concept of sustainable development emerges

There is a substantial scientific consensus that the major global environmental threats are the consequences of human factors – cultural forms, institutional arrangements, social practices and behaviour: overconsumption of precious resources (such as water, forests, fossil fuels), overexploitation of nature's 'capital' and destruction of ecosystem services, unsustainable land practices, the unabated release of toxic chemicals and emissions driving climate disruption, among others. The result is the disruption of carbon, ocean, climate, biotic and other biogeochemical cycles and the loss of biodiversity, deforestation, environmental degradation – overexploitation of nature's 'capital' and 'services' (Rosa et al., 2010; Strydom, 2002). A biosphere catastrophe (beyond one or more of several tipping points – see earlier) threatens to wreck the economy and society as we know them.

A short look backward – to the decades just before the current millennium – reveals the remarkable acceleration in the pace, scale and spread of human impacts on the global environment (Rosa et al., 2010). Looking forward, greenhouse gases now in the atmosphere will remain there for a millennium; will increase by releases to which we are already committed, and will almost certainly contribute to weather extremes, flooding and drought, which will seriously affect agriculture and the life conditions of people living on islands and along coastal regions. This, plus the spread of tropical diseases, increased vulnerability to vast epidemics, sea level rise and more severe storms, will reduce (are already reducing) the welfare of many human communities and

populations. A biosphere catastrophe (beyond one or more of several tipping points) threatens to wreck the economy and society as we know them. Arguably, the Greenhouse effect is already transforming global and local weather patterns, floods of a magnitude that might once have happened every 100 years become frequent events, as do powerful hurricanes, continental forest fires and other disasters; all of these draw down the reserves of insurance companies and the emergency funds of even the most prosperous states. The poor ones suffer their fates or receive some relief through international aid.

Despite widely held scientific views about the potential of a biosphere catastrophe, policy decisions needed to deal with these threats have been disappointing – thus far arguably not up to the level necessitated by the challenge. Meanwhile, the accumulation of greenhouse gases (GHGs) continues unabated (and humanity still lacks a clear agreement or strategy for enforceable reductions), species extinction rates accelerate to thousands of times 'background' extinction rates, and more and more toxic compounds accumulate globally.

Figures 1 and 2 show the exponential growth since the 1750s of several of the major 'drivers' of environmental change and destruction (the systems producing increasing built environments, cars, fossil fuel consumption, electronic goods, tourism, water consumption, garbage, etc.) and some of the physical impacts (also, exponential growth curves): gas emissions, collapse of fisheries, tropical deforestation, biodiversity loss and much more.

Modernization – whichever its current forms and however it is brought about – appears to make human life increasingly unsustainable on this planet. One of the issues – and challenges raised by contemporary research – concerns what possible forms of modernization are sustainable and how they might be accomplished (see later discussion).

Global environmental change touches upon every facet of human existence – health, diet, leisure, quality of life, everyday practices; production, consumption, education, research, politics, and societal values. A 'transformation' of ways of thinking, judging, and acting, etc. needs to take place – and there are many developments in this direction, but it is not clear or certain that these changes will take place in a number of the most critical areas quickly enough (see Concluding remarks).

Sustainability: Emergence of a public normative concept

The literature on the concepts 'sustainability' and 'sustainable development' is vast. These influential concepts emerged out of political and administrative processes, not scientific ones. Like the concept of

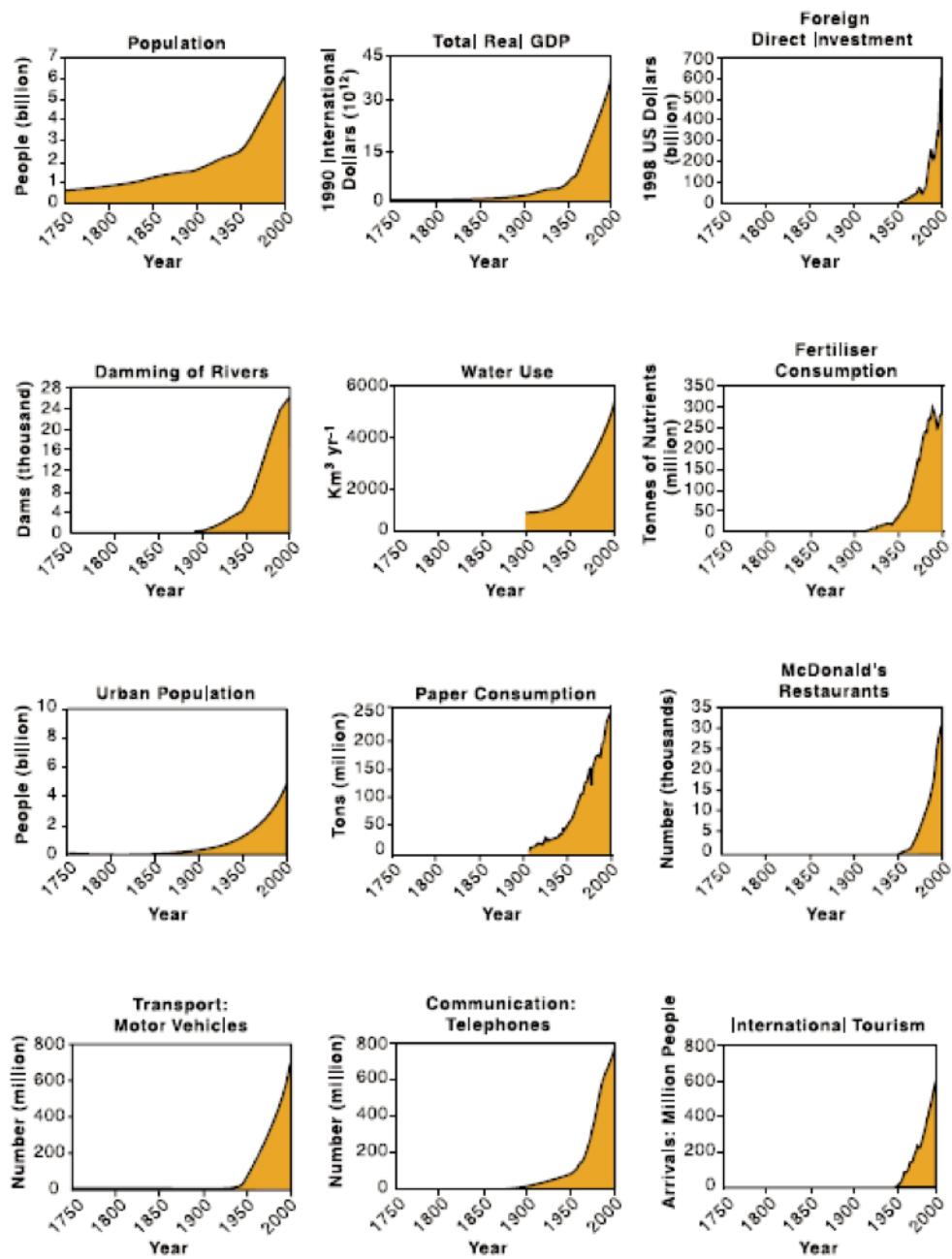


Figure 1. Indicators of industrial growth and 'development'.

Source: Steffen et al., 2004.

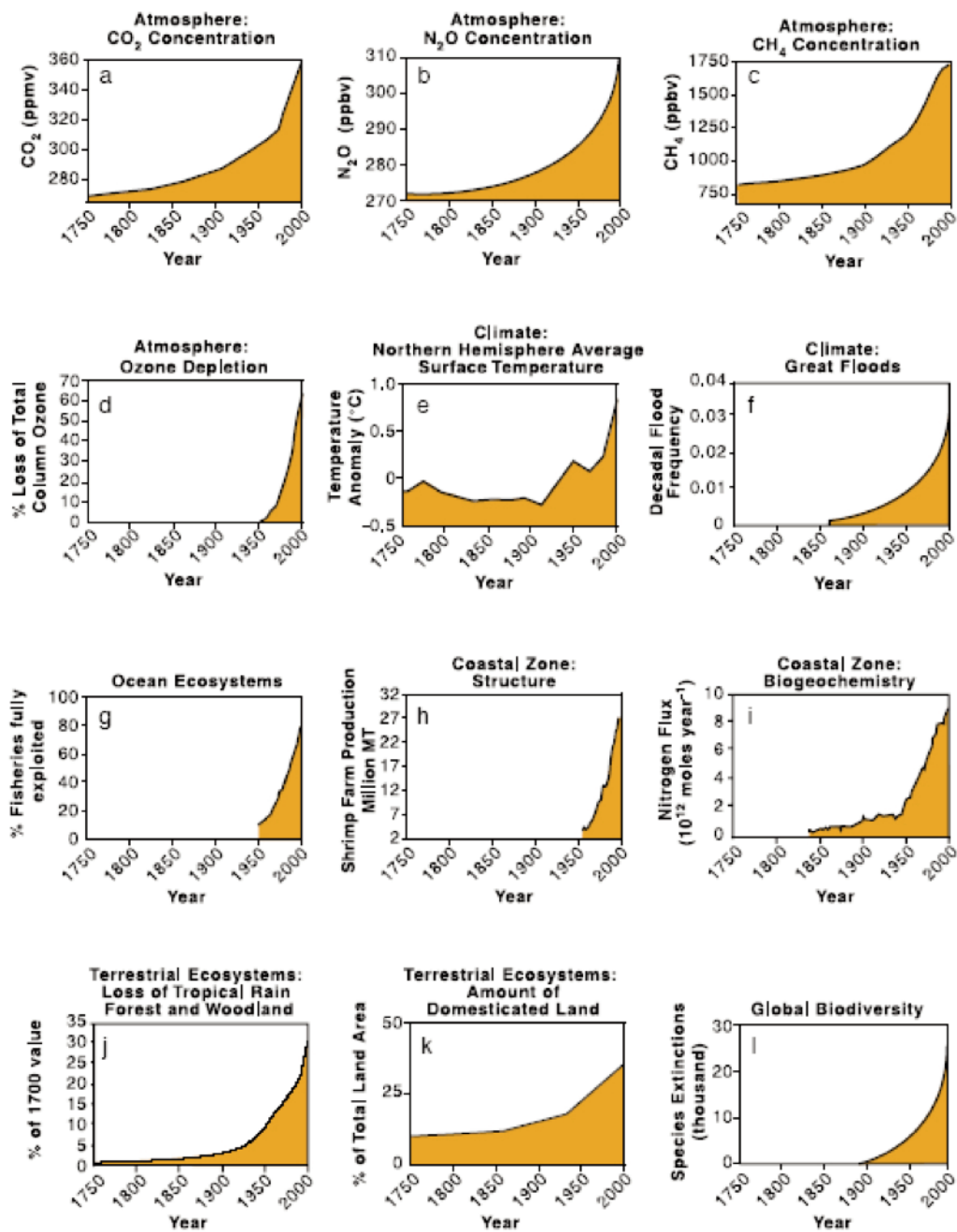


Figure 2. Indicators of changes in physical and ecological conditions (stress).

Source: Steffen et al., 2004.

development itself, sustainable development has been a contentious and contested concept, not only with respect to controversies between advocates of capitalism and those of socialism, between industrialized and developed countries, or between modernization advocates and their diverse opponents. In other words, to earlier contentious issues have been added environmental issues. These have been and continue to be divisive, for instance between those who advocate constraining or blocking much socioeconomic development in order to protect or reclaim the environment (overcoming excessive GHG emissions, climate change, depletion of key resources, deforestation of rain forests, etc.) and those who stress the need of socioeconomic development to alleviate poverty and inequality, if necessary at the expense of the state of the environment. As Opschoor and Van der Straaten (1993: 2) point out: 'A fair and prudent assessment of the extent of the environmental utilization space leaves much less room for economic development than an anthropocentric, egotistic and risk accepting one.'

Historically, the linkage of sustainability and development has been, in large part, the result of global political and administrative processes and the diverse interests driving these processes. The term 'sustainable development' was coined as a political-administrative term to bridge differences between developed and developing countries in the context of UN negotiations and resolutions. The UN World Commission on Environment and Development (hereafter, World Commission), chaired by Gro Harlem Brundtland (former Norwegian prime minister), produced an influential report in 1987, *Our Common Future* (World Commission, 1987). The Brundtland Commission had been established by the UN in 1993 in response to growing awareness of and concerns over the deterioration of the human environment and natural resources at the same time developing countries were pushing for higher levels of economic growth (with the likelihood of increased damage to the environment). The Commission was to address the environmental challenge as it was intertwined with economic and social issues.

The Commission consisted of 21 different developed and developing countries including Canada, Germany, Hungary, Japan and the USA as well as Brazil, China, India, Indonesia and Sudan. The 900-day international exercise in discussion and negotiation dealt with written submissions and expert testimonies from a wide range of global stakeholders, industrialists, government representatives, NGOs, researchers, etc. The Commission concerned itself with environment and growth/development as well as a number of related issues. The term 'sustainable development' was intended to build bridges between

the economic, ecological and social areas of concern. Above all, the concept was meant to refer to development that meets the needs of the present generation without compromising (or jeopardizing) the ability of future generations to meet their needs (World Commission, 1987). (Numerous other definitions have been proposed: among others see Drummond and Marsden, 1999; Goodland, 1995; Opschoor and Van der Straaten, 1993: 1–2; Sachs, 1997; WWF, 2002: 20.)

During the course of negotiations, the developed or industrialized countries stressed, in general, the need for societal constraints and the strict regulation of hazardous emissions and waste management, the mitigation of depletion of resources and environmental degradation generally. The developing countries, on the other hand, stressed their ambitions for economic growth and development, even if it entailed hazardous emissions and environmental degradation. The Brundtland report (World Commission, 1987) recognized that perceived needs are socially and culturally determined, and sustainable development requires the promotion of values that encourage consumption standards that are within the bounds of the ecologically feasible and to which all can reasonably aspire. Moreover, the report argued that economic growth is a necessity in developing countries, while economic growth should be curbed in the developed parts of the world. The 1992 and 2012 Earth Summits in Rio de Janeiro engaging thousands of participants from all over the globe are, in part, derivatives of the Brundtland Commission and its influential report. Of particular significance, the report brought the problem of environmental deterioration and ruthless exploitation of natural resources into the global context of the relations between North and South. Thus, issues of equity and distributive justice were raised and became part and parcel of the global discourse.

It is not feasible to construct a precise *definition of sustainable development*, based on entirely technical or ecological criteria; concepts such as 'sustainable development' and 'sustainability' are normative and political ones (Opschoor and Van der Straaten, 1993), much like 'democracy', 'social justice', 'equality', 'liberty', etc., rather than precise and scientific concepts; as such, they are contested and part of struggles over the direction and speed of social, economic and political initiatives and developments (Baker, 1996, 1997; Lafferty, 1995). Baker (1996, 1997) emphasizes that they become particularly meaningful and effective in concrete settings where they are to be operationalized, put into practice – they thus serve constructive purposes. Their definition and implementation entail political processes, in which diverse agents and institutions

with varying conceptual and value orientations are engaged.

Consequently, sustainability, as a normative and political concept, is used, among other things, to refer to a fair distribution of natural resources among different generations as well as among populations of the world today. It has also concerned values and 'rights' to existence of other species as well as notions on how much environmental capital one generation should bequeath to the next (Opschoor and Van der Straaten, 1993: 2). In the language of policymaking, some refer to the three pillars or fields of sustainable development: economic functioning and prosperity, social welfare and justice and environmental protection. The difficult challenge is to determine how one balances or combines these in a sustainable way, particularly since under some conditions they are contradictory: economic growth versus environmental protection and conservation, or sustained growth versus fair public welfare and distributive justice.

The concept's power and also contentiousness relates to it bringing together these apparently contradictory environmental, economic and social imperatives (Woods, 2010). Harris (2001: 3) emphasizes, 'Its contestation arises both from the emphasis placed on these three imperatives and from the difficulties encountered in the practical application of the concept.' Doubts have been raised about whether maintaining a given level of 'natural capital' is compatible with maintaining or improving welfare per capita (at least for some measures of welfare).

III Responses of selected sociological theories to the sustainable development challenge

Merging development and environmental considerations

The focus here will be limited to selected sociological systems approaches that have a history of considering development issues and at the same time have combined development and environmental concerns: ecological modernization theory, world systems theory and one of the several Marxist inspired theories ('threadmill of production' theory), and modern systems theory (ASD), all of which developed considerations of materiality and the physical environment within their diverse 'development frameworks'. (Other relevant approaches to sustainable development include such diverse scholars as Baker, 1996, 1997; Beck, 1992; Beck et al., 1994; Grin et al., 2010; Kasperson et al., 2010; Lafferty, 1999, 2006; Lafferty and Meadowcroft, 2001; Redclift, 1987; Opschoor, 1996; Opschoor and Van

der Straaten, 1993; Sachs, 1997; Stern et al., 1992; and Rosa et al., 2010. This overview does not do justice to substantial and expanding work being conducted by sociologists in all parts of the world. Hundreds of sociologists from Africa, Latin America, Asia, the Middle East, Europe and North America are investigating sustainable development issues on macro, meso and micro levels.)

World systems theory, in particular, extended its past conceptualization of structural differentiation (core, semi-periphery, periphery) to argue that environmental hazards and degradation were being shifted from the core to the periphery and semi-periphery (Frey, 2006). Such exploitation is based on a type of 'unequal exchange', corresponding to the global production of inequalities in power and wealth, argued and elaborated in world systems theory's earlier work. Just as in the case of world poverty, responsibility for the ecological degradation in developing countries lies with core countries, their multinational corporations, governments and diverse groups including labour unions that tend to align with periphery corporations and governments when it comes to environmental issues. Rosa et al. (2010: 110) summarize world systems theory as follows:

... Importantly the accumulation of wealth occurs in the core while environmental degradation occurs primarily in the periphery and semiperiphery. Thus core nations where capital accumulation occurs are often spared local environmental impacts that occur in the periphery and semiperiphery.

According to world systems theory, substantial ecological improvements may occur in the most developed parts of the global system (the centre) at the expense of any accomplishment in the periphery and semi-periphery (Roberts and Grimes, 2002). Such unequal development will continue as long as the global capitalist system is maintained. The political forces supporting maintenance and reproduction of the system are formidable. At the same time, the global system is not, according to world systems theory, ecologically sustainable over the long run.

The theory remains an important approach to issues of sustainable development because it is attentive to factors of power and contradiction. It has, however, been somewhat rigid in its structural distinctions between core, periphery and semi-periphery. Sustainability is arguably not just taking place in the core. It is part and parcel of many successful initiatives of developing countries in the periphery and semi-periphery. ASD's empirical research (see below) shows that there are important initiatives in the 'periphery' and 'semi-periphery' countries to protect the environment, to resist attempts by core multi-

nationals and governments to extract resources from, and to export waste to, the periphery. Also, there have been relatively successful initiatives and innovations in regulating the use of resources such as forests, water and land (de Man and Burns, 2006; Nikoloyuk et al., 2010; Ostrom, 2005).

Several neo-Marxists extended their legacy of societal development and transformation studies to address issues of sustainability. Of particular prominence in this regard are Schnaiberg (1980) and Gould et al. (2008) – with their ‘treadmill of production’ theory (for other neo-Marxist approaches, see Benton, 1989; Dickens, 1992, 1997, 2002; Foster, 1999, 2000; O’Connor, 1994; Wehling, 2002, among others). They single out the capitalist system as the driver not only of increased production, technological development and the accumulation of wealth but also of systematic environmental degradation. The system exploits environmental resources at such a rate that it is undermining its natural resource base. Capitalist agents are driven to do this by the competitive spirit engendered in capitalism and the supporting (aligned) interests of governments and other societal agents who adhere to (or, at least, support a highly expansive, wealth-producing capitalism). In addition to producing goods and services, capitalist enterprises along with household consumers and government agencies produce and deposit waste, much of it hazardous and destructive, in the environment. The immense pressures towards growth and capital accumulation tend to countervail or even negate efforts and programmes aimed at protecting or recovering environmental health and achieving sustainability. Like world systems theorists, Schnaiberg sees an alignment in modern capitalism of business interests, organized labour and governments as well as the multitudes of people participating in consumerism; they are aligned to externalizing costs of production and consumption and resisting many of the attempts at environmental protection and regulation. In other words, in his perspective the integration of working classes and the formation of the welfare state and consumerism in developed industrial states have gone hand in hand with sustained economic growth as well as environmental degradation. At the same time, an unequal distribution of environmental problems and risks is generated globally (world systems theory has stressed such externalization in the ‘exports of hazards and costs’ to peripheral parts of the world, therefore enabling the accomplishment of some degree of sustainability in developed countries; see above).

This sustained and systematic exploitation of the environment constitutes the ‘second contradiction’ of capitalism (O’Connor, 1994; Rosa et al., 2010: 103). For Schnaiberg, *capitalism is not sustainable*,

eventually it will undermine its natural resource base, which has been taken for granted for so long. Reform efforts driven by the environmental movement serve to countervail to some extent the juggernaut of ‘treadmill production’ and manage to force some limitations and improvements (Gould et al., 2008). (Buttel [2002: 45], however, is highly critical of the strong assumption in much sociology of the decisive role of environmental movement mobilization in bringing about state policy change as the master process. He justifies his critique in a conception that there are multiple mechanisms of change that have operated in the past and operate now in the ‘sustainability revolution’; see later.) But in this perspective, the only solution, ultimately, will be to transform capitalism into another kind of institutional arrangement – in a certain sense, eliminating capitalist economics with their endless pursuit of monetary growth, excessive production and wanton environmental destruction.

Another influential sociological theory in the area of sustainability – *ecological modernization* (ecological modernization theory) – differs substantially from world systems theory and the neo-Marxist frameworks including that of Schnaiberg and his collaborators. Ecological modernization theory was developed in the early 1980s; in a certain sense, it continued the earlier modernization ideas but with several significant differences (see earlier section on development research in part I). The theory challenged the environmental movement’s conventional wisdom that a fundamental reorganization of the core institutions of modern society – in particular the industrial production system, the capitalist organization of the economy and the centralized state – were essential to achieving long-term sustainable development. Adjustments and reforms, yes, but, according to ecological modernization theory, there was no need to do away with or transform major institutions of modern society.

A key ecological modernization theory principle is that as socioeconomic development advances and society becomes maturely developed (‘late industrial society’), cultural patterns, institutional arrangements and organizations become increasingly ‘environmentally rational’ and decision-makers take into account environmental criteria and try to minimize human environmental impacts (Cohen, 1999; Janicke and Weidner, 1995; Mol and Sonnenfeld, 2000; Mol et al., 2009; Rosa et al., 2010: 104–105; Spaargaren and Mol, 1991, 2006; York and Rosa, 2003). ‘Externalities’ become internalized, and *social production and consumption* become cleaner, and the production of goods and services becomes environmentally compatible, according to their perspective on advanced modernized society. Thus, the theory

implies that late capitalism is environmentally competitive, and both at home and abroad there is convergence and compatibility between the aims of capital and the environmental goals of society – as a new societal environmental logic.

In the ecological modernization perspective, this type of development trend is the result of broad and effective coalitions (group alignments) emerging in advanced industrial society to concern themselves with, and to try to protect, the environment. This presumably leads not only to reduced environmental impact but to continuation of further economic growth: that is, the quantity of resources used per unit of output is minimized, and the wastes emitted per unit are also reduced. The underlying principle of environmental rationality becomes incorporated into corporate, government and organizational policies and strategies. Ultimately, these ideas and policies drive technological innovation, market dynamics and government regulation.

The theory purports to offer a general explanation of the current transformations of environmental institutions, practices and discourses in advanced phases of modernization. Major changes can be observed currently in the organization of production and consumption in ways that bring about environmental improvements. The theory focuses on those institutions, in particular economy and technology, most important to bringing about a transition to more sustainable production and consumption. It stresses that environmental questions do not enjoy undisputed authority but share this with other societal objectives and considerations.

According to ecological modernization theory, as countries reach advanced or late capitalist development, they will increasingly adhere to ecological rationality which complements economic rationality. Sustainable development will be the next phase of modernization, following the phase of advanced industrialization. Spaargaren and Mol (1991) argue that environmental problems can best be solved through further advancement of technology and industrialization.

Productive use of natural resources and environmental media (air, energy, water, soil, ecosystems) – that is, ‘environmental productivity’ – can be a source of future growth and development in the same way as labour productivity and capital productivity had been for industrial development. Research is particularly focused on eco-innovations, and the interplay of various societal factors (scientific, economic, institutional, legal, political, cultural) which foster or hamper such innovations (Klemmer et al., 1999; Olsthoorn and Wiczorek, 2006): product and process innovations such as environmental management and sustainable supply chain management,

clean technologies, benign substitution of hazardous substances and product design for environment. The approach assumes ‘sustainable development’ growth – but failing to problematize that such growth, as currently envisioned, entails the consumption of natural and human capital at substantial cost to ecosystems and society (Fisher and Freudenburg, 2001).

In the ecological modernization perspective capitalism is neither an essential precondition nor an obstruction to stringent or radical environmental reform. It becomes redirected so that it causes less and less environmental harm and increasingly contributes in a fundamental way to sustainability (and society’s sustenance). While there continue to be ‘environmental issues’, fundamental conflicts about environmental reform programmes in industrialized countries have in the ecological modernization view been decreasing since the late 1980s – although this certainly does not apply to the USA and several of the newer members of the EU (which are very observable in relation to, for instance, climate change issues and IPCC/COP meetings) nor to Brazil, China, India and other developing countries opposed to modern industrialized countries.

In sum, ecological modernization assumes then a more or less linear development – a further phase of modernization largely with minimal conflict and struggle; assumptions that it shares with the original modernization theory. However, it is much more sophisticated and conceptually rich – for instance, it gives greater attention to concrete innovation processes and developments – than the earlier modernization theory.

Ecological modernization theory can be criticized for its overemphasis on and optimism about technological innovation – and for ignoring the fact that many of the technological efforts to save the environment and humanity are likely to lead to negative unintended consequences. One cannot have blind faith in technological breakthroughs and progress in that they may not come on stream quick enough (see later) and inevitably will generate unintended risky consequences.

Ecological modernization theory, while representing a type of systems theory, suffers from some of the same failings as the earlier modernization theory: insufficient attention to human agency, conflict and power, and to the many unintended consequences of system change; its linearity; its optimism about the course of societal development (in particular, a high level of technological optimism), boosted by using relative, intensity based environmental indicators (e.g. per unit) rather than using measures of increases in absolute levels, for instance the increase in absolute levels of carbon in the atmosphere and

heavy metals in water, air and earth, and the decline in overall biodiversity, etc. It is important to mention that there are differences in perspective within the ecological modernization research programme, namely between those who are techno-corporatist in orientation claiming that the market and technological development will solve sustainability problems more or less spontaneously, on the one hand, as opposed to those who have a more institutional and democratic political orientation which considers state governance in steering through, for instance, environmental policies, taxation, subsidies, caps on pollution, etc., markets and innovation processes, on the other. But this discussion would take us beyond this overview.

The fourth type of systems theory applied to sustainable development issues has been developed by Buckley, Burns and their associates in the form of a dynamic systems analysis, actor system dialectics (ASD). In ASD, there is no one factor explaining environmental degradation – or that guarantees a sustainable development, for instance, by simply controlling or eliminating capitalism or the world system. The global environmental problem complexes are systemic phenomena – in particular, associated with industrial systems and their functioning and evolution. The systems are institutional arrangements and cultural formations powerful in relation to their human populations but also in relation to the material/ecological environment (Burns and Hall, 2012). Established institutional arrangements and cultural formations associated with industrial systems with mass consumption and/or mass exports not only include advanced capitalism but socialism (as practised in the former Soviet Union and its satellites) and kingdoms such as Saudi Arabia. These all have proved their capability to contribute to ecological degradation. Change towards sustainability is difficult – there are powerful institutional and cultural barriers – inertia inherent in the industrial institutions and cultural formations. At the same time, vested interests are able to mobilize and exercise power – and block or derail many sustainability initiatives.

Industrial/modernized systems are historic constructions – and in part operate as they were designed, but in part they operate in unintended ways, for instance in degrading the planet. Established institutional arrangements and practices – an industrial paradigm of values, power arrangements, governance structures, technologies, infrastructures – are destructive factors, degrading the environment beyond sustainable limits and threatening to undermine the resource base of systems of production. At the same there are counter-move-

ments and tendencies towards accomplishing some aspects of sustainable development – but not without the need of change agents to mobilize power, to overcome institutional barriers and/or the opposition from vested interests. There is then a micro-, meso- and macro- politics of sustainability.

ASD teams have worked on three types of studies/investigations relating to particular ways in which sustainability initiatives take place, succeed or fail and, thus, the ways more sustainable technological, institutional and policy and societal transformations take place:

1. Sustainable technological innovations.

ASD theorizing about technological innovations and development has been combined with numerous case studies of technological innovations relating to sustainability (wind, solar, geothermal, wood and hay heating systems, garbage burning for heating, reclaiming of gas byproduct for district heating, among others). Also, constraining factors and blockages have been investigated, e.g. in the case of solar heating in California, heat pumps in Germany, geothermal in the USA (Baumgartner and Burns, 1984).

2. Sustainable policy and programme initiatives.

A second major area of relevant theoretical and empirical research has concerned policy and programme initiatives, public as well as private (Burns and Stohr, 2011a, 2011b; Carson et al., 2009; de Man and Burns, 2006; Nikoloyuk et al., 2010). One study concerned an investigation of arguably the most radical regulatory framework for chemicals ever instituted, the EU REACH scheme (REACH = Registration, Evaluation, Authorization and Restriction of Chemicals, passed in 2006, and resulting in the establishment of a major regulatory agency, the European Chemical Agency [ECHA] located in Helsinki). This framework took almost 10 years to accomplish, engaged thousands of actors and involved the mobilization of sector, national, EU and global powers (for instance, the opposition of the European, American and Japanese chemical industries as well as the political leadership of Germany, France and the UK). Another major EU initiative was the establishment of the Baltic Fisheries regulatory regime, which was successfully established but failed to function properly in effectively regulating fish catches and securing fish stocks. Another EU failure was in not being able to pass a carbon or energy tax, although this was a priority for the Commission, several member states (and the EU Parliament); the initiatives were blocked by powerful interests and a few key member states. Ultimately, the EU successfully established an emissions trading

system – which however failed initially because of design but continues to function, though its future is uncertain.

Several ASD investigations concerned private initiatives: BP set up an emissions trading programme within its global organization; WWF and Unilever launched a regime to regulate palm oil plantations and to protect rain forests in South East Asia (Indonesia and Malaysia); Greenpeace and Springer Publishing took initiatives to make Nordic paper and pulp production more sustainable and to protect Russian forests and forest workers. All in all, these initiatives have been partially successful, but, in general, there is no easy ‘march’, contrary to the optimism of ecological modernization theory. ASD studies were also conducted during 1980–5 of municipality initiatives to save energy and/or to develop renewable energy sources for oil (Woodward et al., 1994) (it needs to be emphasized that sustainability was not part and parcel of the language and discourses of the times). The studies showed that change towards greater sustainability could be initiated by diverse actors and emerge from differing institutional spheres: politicians, bureaucrats, public utilities, grassroots engaged citizens, consultants. Conflicts and struggles were common. Not only did new paradigmatic concepts emerge but also the initiators often improved their capacities to mobilize resources – or to convince others to do so – and to exercise to a greater or lesser extent effective transformative powers; there were however stalemates and failures.

3. Major transformations of social orders.

ASD researchers have conducted a number of studies of social transformation, with a focus on identifying the key mechanisms of paradigm shifts and restructuring of social order: that is, complexes of institutional arrangements and their paradigms – where significant changes taking place on all levels and in diverse sectors (Burns and DeVillie, 2006; Burns and Hall, 2012; Carson et al., 2009). The development relates to: (a) Transitions where autocratic power is combined with a paradigm shift in the cognitive-normative framework for governance and policymaking (if hegemonic power remains committed to the old order, then change, a paradigm shift, is unlikely to take place, except due to external forces, for instance major change in material and social structural conditions). (b) Pluralist distribution of powers where multi-agency negotiations can lead to a new paradigm, while key shifts have taken place through central or multi-agent negotiation: Kyoto agreement, EU fisheries and REACH. But also, there are cases of blocked or a stalemated state so the status quo and business as usual continues

(this was the case in the EU multi-agent negotiations about an EU energy or carbon tax; Burns and Hall, 2012; Carson et al., 2009). (c) Polyarchy, where major changes take place through the diffusion of ideas, techniques and technologies. Material and social structural conditions make up a ‘selective environment’ which favours one institutional arrangement, or makes obsolete or defunct existing arrangements (Burns and Dietz, 2001; Dietz and Burns, 1992). These organic change mechanisms are characterized by processes of diffusion and emulation (mimetic function) where a multitude of actors make autonomous yet similar decisions to bring about a transition to a new order (Burns, 2012). ‘Organic’ is a more encompassing notion than ‘grassroots’, since the innovation and transformation processes are being launched and developed at multiple levels by collective agents that in some cases are very large and globally active and would not be understood as ‘grassroots’ actors. (d) Power shifts take place in such a way that a group with a paradigm differing from the established or hegemonic paradigm emerges (Green parties entering into coalition governments have made a difference in sustainability policies in several European countries, Germany and Sweden, among others).

Key transformation factors concern then not only power factors (and agents exercising power) but their values and interests and the formulation and development of models or paradigms concerning the design and functioning of societal governance and development in new areas such as that of sustainability. (Stinchcombe [1968] stresses the structural factors – including the power positions of actors in social structures – enabling them to initiate developments of new organizational arrangements *within* existing social structures.) In general, the focus on agency (on, for instance, entrepreneurs and movements) and structure (institutional arrangements, rule regimes, infrastructures and the material/ecological environment) in relation to processes of social constructions and transformation has been a hallmark of ASD. (Along somewhat similar lines, Ostrom and associates [e.g. 1990, 2005, 2007] developed and applied an institutional and systemic approach, the ‘institutional analysis and development’ (IAD) framework. And on the basis of their global empirical work, they constructed a massive archive of commons governance and its relation to the conservation of water, forest, grazing resources and fish stocks, among other areas.)

In sum, the four systems approaches, ecological modernization theory, world systems theory, treadmill of production theory and ASD, offer substantially different perspectives, although there are

several overlaps. World systems theory, treadmill of production theory and ASD pay particular attention to social structure, power, class and global relationships, although the structures and stratifications they consider differ to a greater or lesser extent. Ecological modernization theory contends that capitalism is, in general, not a deterrent to the accomplishment of sustainable development, whereas treadmill of production theory and world systems theory stress that sustainable development will require the elimination of capitalism; for world systems theory, this means the elimination of capitalism at the global level. ASD is more ambiguous in this regard in that from an institutional perspective, the shift to a substantially different capitalist paradigm – along with other systemic changes, for instance in governance and in education and research – *might* make a path to sustainability achievable retaining some features of capitalism (Burns and Witoszek, 2012). However, although substantial changes are already taking place, it is doubtful whether the movement to another paradigm will be rapid and encompassing enough (see Concluding remarks). Both ecological modernization theory and ASD emphasize eco-innovation on multiple levels, but ASD takes notice of the mobilization of change initiatives as well as opposition, the importance of established and mobilized powers; that is, while new ecological development is ‘a march’ according to the former, it is often a struggle according to ASD (with numerous such struggles, some relatively successful, currently going on). There is an assuredness and optimism in the ecological modernization perspective that is not found in the social structural and power-oriented theories of world systems theory, treadmill of production theory and ASD.

Concluding remarks

To sum up, the sociology of development was relatively separate from environment research in sociology. For much of its history, the sociology of development had little to say about the environment, and, at the same time, most environmental sociologists neglected issues of development. Until recently, there were, quite simply, two distinct epistemic and paradigmatic communities in sociology, each with its own concepts, discourses, research designs, analyses and publications. The emergence of the concept of sustainable development has contributed to bringing these research traditions closer together. In the past two decades or so, there has been growing focus on environmental concerns, globalization and (alternative) development issues. As suggested in this article, conceptualization and

research programmes concerning ‘environment *and* development’ have emerged, and the notion of ‘sustainable development’ is being given increasing sociological attention. This has also given new life to systems theorizing (since arguably such theories are more oriented to societal and global functioning and change).

Related research on contemporary societal development suggests that there appears to be an ongoing ‘sustainability revolution’ comparable in several ways to the Industrial Revolution and that numerous case studies and observations indicate some of its features (Ayers, 2011; Burns, 2012; Edwards, 2005; Neeman, 2011). Sustainable development in thinking, planning and constructing is spreading and elaborating what might turn into a major societal paradigm shift, eventually matching the Industrial Revolution in the transformation of technical and economic, sociopolitical and cultural conditions.

While ‘sustainability’ initiatives grow and spread by the many tens of thousands, the ongoing transformation will be no walkover. This is not a case of ecological modernization; rather, it is a development taking place in the context of established social structures and power configurations (capitalist, socialist, Saudi Arabian monarchy, etc.) and the elaborated institutionalization of what in many ways has been an historically successful industrialization/modernization paradigm. *There is a formidable opposition (including deniers of climate change and other environmental hazards as well as believers in technical fixes) among the powerful, for instance, many in the established industrial–commercial–banking complexes and their allies. The struggle will be long and difficult.* Particularly troublesome are efforts to deal with climate change, GHG emissions, the mammoth auto and related industries (Dietz and Burns, 1992) and the continuing use and sustained extraction (including new forms of extraction) of fossil fuels. Whether the sustainability revolution will be fast enough or comprehensive enough to save the planet remains to be seen. History provides numerous examples of great societies that collapsed, and visions that failed or were never realized.

One might envision sociology developing a major scientific and policy analysis role in relation to the emerging revolution of sustainable development similar to its role vis-a-vis the Industrial Revolution, through data collection and monitoring, analysing, explaining, identifying and providing assessments of the mobilization processes, struggles and social impacts and related developments in what are already highly complex social transformations.

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résumé Cet article analyse et discute le concept de développement soutenable d'un point de vue sociologique. Il comporte trois parties. La première présente des éléments de recherche sociologique avant même que ne soit développé ce concept de développement soutenable. Le point de vue adopté est d'examiner les travaux qui relèvent de la sociologie de l'environnement et de la sociologie du développement. La deuxième partie analyse brièvement le contexte et le processus qui ont conduit à la conceptualisation du développement soutenable. La troisième partie aborde les réponses apportées par différentes théories sociologiques aux problématiques soulevées par l'approche du développement soutenable. L'accent est mis quatre importantes théories de système: la théorie du système-monde, la théorie neo-marxiste du 'tapis roulant de production', la théorie écologique de la modernisation, la théorie des systèmes dans sa version 'moderne'. Chacune d'entre elles ont envisagé la problématique du développement avec, le cas échéant, des questions portant sur la soutenabilité.

mots-clés développement soutenable ♦ environnement ♦ industrialisation ♦ sociologie de l'environnement ♦ sociologie du développement ♦ structure sociale ♦ théories du système

resumen Este artículo proporciona una visión general del desarrollo sustentable desde una perspectiva sociológica. Se divide en tres partes. Parte I presenta la investigación sociológica relevante antes de que fuese utilizado el concepto de 'desarrollo sustentable' incluida en los rubros de la sociología ambiental, así como la sociología del desarrollo. Parte II analiza brevemente el contexto y el proceso que llevó a la conceptualización de 'desarrollo sustentable'. Parte III considera la respuesta de varias teorías sociológicas en relación al desarrollo sustentable, particularmente cuatro de las más importantes teorías de sistema: teoría del sistema-mundo; la teoría neo-marxista de la 'rueda de molino'; teoría de la modernización ecológica; y la teoría de los sistemas modernos, todas de los cuales han abordado las cuestiones de desarrollo e indirectamente el problema de la sustentabilidad.

palabras clave desarrollo sustentable ♦ estructura social ♦ industrialización ♦ medio ambiente ♦ sociología ambiental ♦ sociología del desarrollo ♦ teorías de sistemas