ENERGY AND SUSTAINABLE DEVELOPMENT AT GLOBAL ENVIRONMENTAL SUMMITS: AN EVOLVING AGENDA

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Abstract. This paper presents a framework for understanding energy issues in the context of sustainable development. It posits that there are three important ways in which energy is related to sustainable development: (a) energy as a source of environmental stress, (b) energy as a principal motor of macroeconomic growth and (c) energy as a prerequisite for meeting basic human needs. These three dimensions correspond to the three dimensions of the often-used triangle of sustainable development: environmental, economic, and social. Using this framework, the paper traces how successive environmental summits at Stockholm (1972), Rio de Janeiro (1992) and Johannesburg (2002) have dealt with energy issues. It identifies a slow, surprising and important evolution of how energy issues have been treated at these global discussions. Energy has received increasing prominence at these meetings and become more firmly rooted in the framework of sustainable development. Stockholm was primarily concerned with the environmental dimension, Rio de Janeiro focused on both the environmental and economic dimensions, and the major headway made at Johannesburg was the meaningful addition of the social dimension and the linking of energy issues to the UN's Millennium Development Goals.

Key words: basic human needs, energy, human development, Johannesburg Earth Summit, Millennium Development Goals, sustainable development.

Abbreviations: Btu – British thermal units; CSD – Commission on Sustainable Development; E – Global Energy Use; GDP – Gross Domestic Product; GEF – Global Environmental Facility; GWP – Gross World Product; HDI – Human Development Index; LPG – Liquid Petroleum Gas; MDGs – Millennium Development Goals; NGOs – Nongovernmental Organizations; UNCED – United Nations Conference on Environment and Development (1992); UNCHE – United Nations Conference on the Human Environment (1972); UNEP – United Nations Environmental Programme; UNFCCC – United Nations Framework Convention on Climate Change; WCD – World Commission on Dams; WSSD – World Summit on Sustainable Development (2002)

1. Introduction

The 2002 World Summit on Sustainable Development (WSSD) was the most recent of a series of attempts to deal holistically with global environmental issues by holding high profile, multi-issue policy summits. The last 30 years of such summitry

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have not only yielded a rapidly expanding global environmental agenda but have also witnessed a noteworthy evolution in the policy framing of global environmental issues (Chasek, 2001; Banuri and Najam, 2002; Seyfang and Jordan, 2002).

The first of these mega-meetings, held at Stockholm, Sweden, in 1972, was called the UN Conference on the Human Environment (UNCHE) and dealt with – as its name rightly suggests – a rather small set of issues that were most directly related to the 'human environment' (Rowland, 1973). Twenty years later, a far more elaborate agenda came under discussion at Rio de Janeiro, Brazil, when the more ambitiously titled UN Conference on Environment and Development (UNCED) sought to radically expand the global agenda by moving well beyond the merely environmental and seeking to establish 'environment *and* development' as the central policymaking framework (Adede, 1992; Najam, 1995). By 2002, in Johannesburg, South Africa, the concept of 'sustainable development' which had already begun to assume salience at Rio gained further centrality not only by being incorporated into summit's title, but also by becoming the key motivator of the expanded Johannesburg agenda, which now included such issues as sanitation, HIV/AIDS and poverty eradication.

If this evolution – from a policy framework principally rooted in 'environmental' concerns to one imbedded in the broader and more integrated notion of 'sustainable development' – is to be anything more than rhetorical it should be reflected not only in the titles of the major conferences but also in how particular issues are tackled at these summits. This paper will review one such issue, energy, in terms of (a) how it relates to sustainable development at a conceptual level; and (b) whether there is any noticeable difference in how it was treated at the three major global environmental summits, in particular, at WSSD.

2. Energy and sustainable development: conceptual connections

Smil (1994) has argued convincingly that a direct correlation between changes in energy use – both source and converters – and advances in human well-being is one of the dominant features of human history. Here we refer to the variety of fuels and electricity that people use to meet their wants and needs. The efficient use of energy and supplies that are reliable, affordable and less-polluting are widely acknowledged as important, and even indispensable, components of sustainable development (WCED, 1987; Goldemberg and Johansson, 1995). Although perennial debates linger about precise definitions of sustainable development (Lélé, 1991; Murcott, 1997), there is increasing agreement amongst scholars and practitioners that sustainable development policy relates to three critical elements that need to be treated together: economic, social and environmental (Banuri et al., 1994). In identifying these essential elements, Munasinghe (1992) suggests that one might envision sustainable development in terms of an appropriate vector of economic, social and environmental attributes.

Energy is central to any discussion of sustainable development because it is central to all three dimensions (Munasinghe, 2002). In terms of the economic dimension

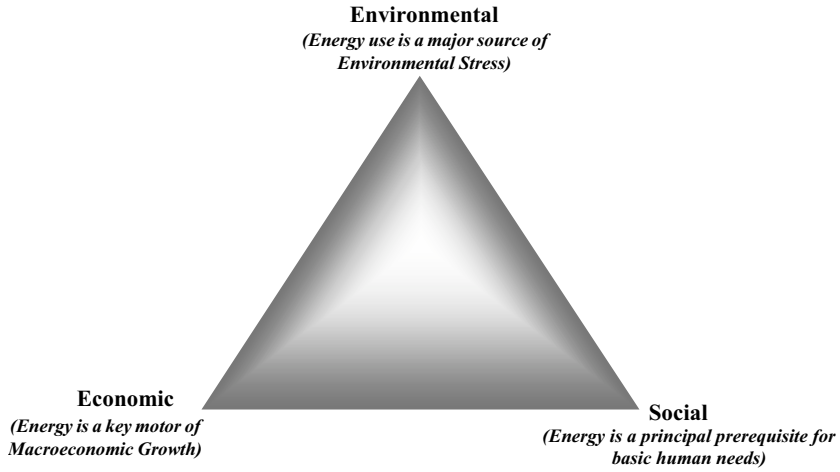

Figure 1. Energy and sustainable development: Deep linkages.

of sustainable development, energy is clearly an important motor of macroeconomic growth. In terms of the environmental dimension, conventional energy sources are major sources of environmental stress at global as well as local levels. In terms of the social dimension, energy is a prerequisite for the fulfillment of many basic human needs and services, and inequities in energy provision and quality often manifest themselves as issues of social justice. Figure 1, builds on the work of Munasinghe (2002) and presents the now-familiar triangular diagram depicting the three essential elements of sustainable development, modified to show how the energy-dimension maps on to each of these elements. The remainder of this section will elaborate upon the conceptual linkages between energy and each of the three dimensions of sustainable development.

2.1. Energy and environmental stress

An important connection between energy and sustainable development concerns the environmental dimension in terms of the relationship between energy extraction, processing and use, and environmental quality. This link is now well established in the scientific literature and is increasingly recognized in policy circles (IPCC, 2001). Atmospheric releases from fossil fuel energy-systems comprise 64% of global anthropogenic carbon dioxide emissions from 1850 to 1990 (Marland et al., 2002; Houghton and Hackler, 2001), 89% of global anthropogenic sulfur emissions from 1850 to 1990 (Lefohn and Husar, 1999), and 17% of global anthropogenic methane emissions from 1860 to 1994 (Stern and Kaufmann, 1996). Fossil energy combustion also releases significant quantities of nitrogen oxide; in the US, 23% of such emissions are from energy use (EIA, 2001). Power generation using fossil fuels, especially coal, is a principal source of trace heavy metals such as mercury, selenium and arsenic. These emissions drive a range of global and regional environmental changes, including global climate change, acid deposition and urban smog.

Upstream energy sectors also have significant local impacts on the environment. Coal mining disturbs vast areas of natural habitat. In the US, for every ton of coal mined, 6 additional tons of overburden and waste are generated (Matthews et al., 2000). The exploration for and extraction of oil and natural gas can have significant impacts, particularly in sensitive ecosystems such as wetlands and tundra, and it releases hazardous and toxic wastes from drilling and field processing operations. While a potentially renewable source of energy, hydropower development can have significant environmental and social costs depending on its location and mode of development. Between 30 and 60 million people – the majority residing in China and India – have been displaced by large dams; about 500 000 km^2 of land – almost the size of France – are covered by large hydroelectric reservoirs (WCD, 2001; McCully, 2001). Much of this is river valley land that supports fertile farmland and diverse forest and wetland ecosystems. Anaerobic decomposition of organic material in these reservoirs may be a significant source of methane, a potent greenhouse gas (St. Louis et al., 2000).

In terms of sustainable development, energy extraction, processing and use are major sources of environmental stress at global, regional and local levels. Although the potential of global climate change resulting from the excessive use of fossil fuels is the most dramatic and obvious of such concerns, the environmental impacts of energy use are broader than just fossil fuel use and global climate change. At a minimum, then, sustainable development policy must reflect the environmental stress resulting from the energy choices made by nations, corporations and even individuals on the global, regional and local environments.

2.2. Energy and economic growth

Energy plays an equally central role along the economic dimension of sustainable development as a key driver of macroeconomic growth. At root, economic growth is a physical process: energy is used to transform materials into useful goods and services. At an aggregate level, therefore, it is not surprising that there is a strong relationship between the quantity of energy a nation uses and the size of its economy, i.e., the quantity of wealth it produces (Figure 2). Therefore it follows that the largest economies (US, China, Japan) use considerably more energy than smaller economies. It stands to reason, then, that the rise in material living standards in the poorest nations – a central goal of sustainable development – is likely to be accompanied by a substantial increase in their aggregate energy use. A similar spread appears if one compares per capita Gross Domestic Product (GDP) and energy use.

This development path is evident in the dynamics of energy and economic growth. Both Gross World Product (GWP) and Global Energy Use (E) increased steadily from the end of the second oil price shocks of 1981–1982 through 2000 (Figure 3). Although the general pattern is clear, energy use and GWP do not move in lockstep. Indeed, the E/GWP ratio declines by an average of 1% per year over this period. Analysts attribute this improvement to the shift to higher quality fuels, improvements in fuel efficiency caused in part by higher fossil fuel prices in industrial

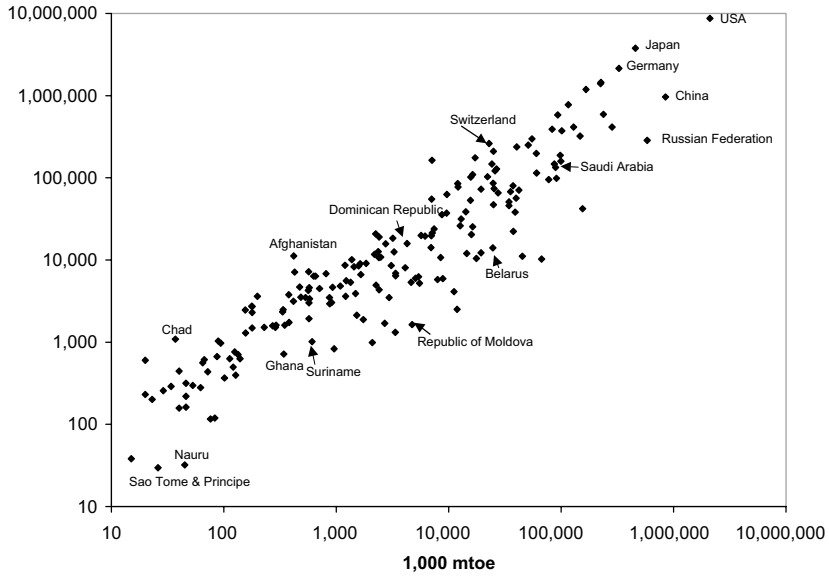

Figure 2. The international relationship between energy use (1000 million tonnes of oil equivalent) and GDP (million US dollars, 1998) (WRI, 2002).

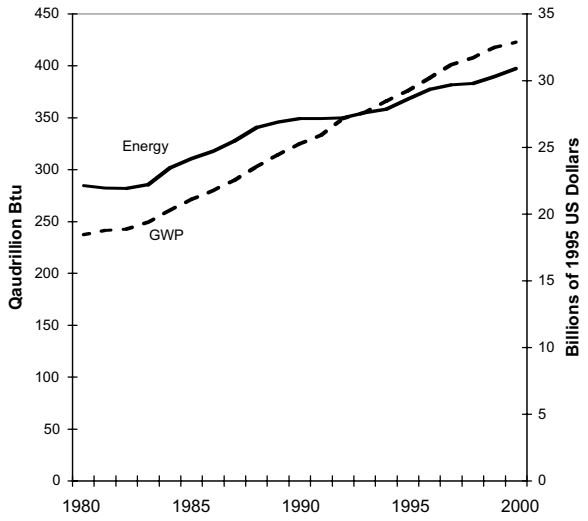

Figure 3. Global energy use (quadrillion Btu) and GWP (billion US dollars, 1995), 1980–2000 (World Bank, 2002).

nations, and structural changes in the global economy (Kaufmann, 1992; Cleveland et al., 1984). Despite the decline in the E/GWP as well as national E/GDP ratios, there is a significant body of econometric research that suggests energy use and GDP are tightly linked. In particular, Granger causality running from energy use to GDP has been established for many industrialized (Stern, 2000), emerging (Hondroyiannis et al., 2002) and developing economies (Ebohon, 1996). This

means that an increase in GDP is likely to require an increase in energy usage; energy, therefore, is a principal ingredient of economic growth.

Given the importance of energy, it is not surprising that energy prices have an important effect on almost every major barometer of macroeconomic performance. For example, both economic theory and the empirical evidence link rising oil prices to real GDP losses. Hamilton (1983) was the first to demonstrate this, showing that all but one of the US post-WWII recessions were preceded by rising oil prices, and that other business cycle variables could not account for the recessions. Oil prices are an important driver behind stock price movements (Sardorsky, 1999). Countries that are net importers of oil and gas tend to have a negative correlation between oil price changes and stock returns, while net exporters of oil and gas tend to have positive relationships. Energy prices are also key determinants of inflation and unemployment (Hooker, 1999). Recent work suggests that some of these relationships may have weakened in the past two decades (Brown and Yucel, 1999), although some of this debate centers around technical arguments about econometric specification and estimation techniques.

The point to be made here is that even if energy had no environmental impacts whatsoever, it would be a key issue for sustainable development policy on economic grounds alone. The fact that energy is, in fact, both a key motor of economic growth and a key source of environmental stress only makes the issue more confounding for sustainable development policy; the goal of such policy now becomes to optimize the economic virtues of increased energy use with its potential for environmental damage.

2.3. Energy and basic human needs

The connections between energy and sustainable development become all the more complex and compelling when one also focuses on the social dimension of the sustainable development equation, particularly in terms of its role in meeting basic human needs. Energy *per se* is not a need, but it is absolutely essential to deliver adequate living conditions, food, water, health care, education, shelter and employment. For example, energy availability is a key determinant of how and how much food is grown, how food is cooked, the health impacts of how food is cooked or how living spaces are heated, the time required to 'procure' household energy, and so on. The human implications of insufficient energy choices in the face of abject poverty are immediate and pressing. For example, millions of women in developing countries, particularly in Africa, have to walk long distances and spend substantial proportions of their day in gathering fuelwood, they are more susceptible to diseases of the lungs and eyes because of the energy choices they are forced to make, and they have to raise families in circumstances of extreme indoor air pollution (Wamukonya, 1995; Masera et al., 2000). Indeed, a strong relationship is evident between per capita energy use and a number of social indicators (Goldemberg and Johansson, 1995). For example, Figure 4 charts the relationship between commercial energy use and the Human Development Index (HDI). At low levels of the

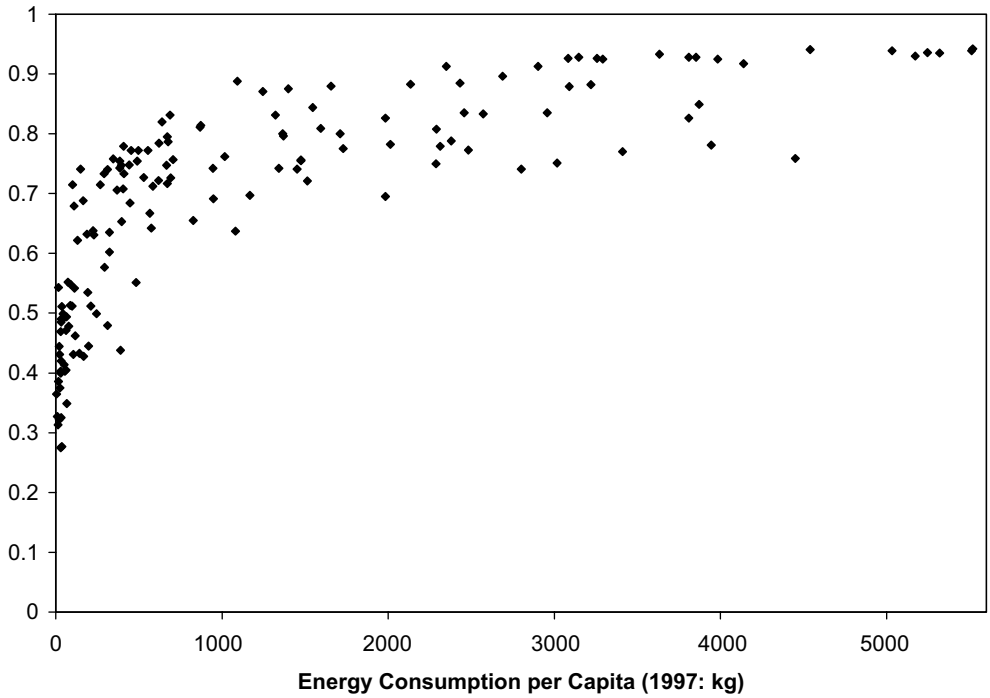

Figure 4. The international relationship between energy use (kilograms of oil equivalent per capita, 1997) and the HDI (2000) (UNDP, 2002; WRI, 2002).

HDI, dramatic improvements come with relatively small increases in energy use (Suarez, 1995; Reddy, 2002).

Developing nations, and particularly the poorest ones, consume far less energy per capita than developed nations. Based on this relationship, and on the energy requirements for basic household needs, Reddy (2002) estimates that about 100 watts/capita is required to achieve a reasonable quality of life corresponding to safe, clean and efficient cooking with a Liquid Petroleum Gas (LPG)-like fuel and home electrification for lighting, fans, a small refrigerator and a television. It should be noted that this 100 watts per capita is only about one tenth of the level required to support a western European living standard with modern energy sources and energy-efficient converters. Whether the number suggested by Reddy is correct or not, it is clear that some minimum amount and quality of energy is required by each person, each day, in order for him or her to meet basic human needs and sustain a decent quality of life. Indeed, one could conceive of such a minimum energy requirement as a basic human right since the inability to procure such energy can only lead to deprivation. The social dimension of sustainable development demands that the incidence of energy deprivation be determined and tackled at the human level rather than the national level, just as we seek to determine and tackle economic poverty at the human rather than the national levels (see UNDP, 1990).

Energy quality matters as well as energy quantity. Energy use is typically measured in heat units (joules, Btus, etc.). However, fuels vary in their ability to provide a service *per heat unit used* (Kaufmann, 1994; Cleveland et al., 1984). This is due to fact that the 'quality' of a fuel is a function of a host of attributes: amenability to storage, ease and cost of conversion, energy density, emissions, etc. Heat content is just one part of this picture. Based on this, coal is higher quality than wood; oil is greater than coal; and electricity higher than directly burned solid, liquid or gaseous fuels. Poor nations not only use small amounts of energy, they also tend to rely on lower quality fuels such as animal dung, agricultural wastes and fuelwood. Reliance on these fuels limits the amount of service that can be gained per heat unit used. The goal of climbing the 'energy ladder' in developing nations reflects the greater expansion of service available per heat unit of fossil fuels and electricity. An equally important ingredient of the 'quality' of energy is its direct health impacts, particularly in the case of biomass sources and their role in indoor air pollution (Ndiema et al., 1998). From the sustainable development perspective, the health dimension of energy quality would be as important as the efficiency dimension.

Just as the social dimension of sustainable development forces policymakers to look beyond aggregate development performance, it also demands that we look beyond aggregate energy performance and availability. The human development focus imposed by the social dimension of sustainable development requires us to look not simply at GDP but also at distribution of resources and opportunity across society, and particularly at that portion of the population that is most deprived (e.g. the proportion that lives at less than one dollar a day). Analogous to this, a sustainable development focus would demand that in addition to looking at the national structure of energy availability and use, policymakers pay attention to the distribution of energy within societies in terms of both quantity and quality. Once again, those most deserving of policy attention are those who are most deprived in terms of their energy options; those whose energy limitations keep them from meeting their basic human needs.

3. Global policy on energy and sustainable development

Having defined a framework for examining the conceptual relationship between energy and sustainable development, let us now examine how the issue of energy has been dealt with at the three major global environmental conferences held at Stockholm (1972), Rio de Janeiro (1992) and most recently in Johannesburg (2002). While these are not the only events of importance to have taken place in this period, they are the three most important policy conferences that have been attended by government representatives at the highest level and which have focused on a wide range of issues related to what has come to be known as sustainable development. For this reason we have not focused on a host of energy-specific conferences that have been held over this period or specific policy negotiations on energy-related

issues such as global climate change. Our goal is not as much to focus on the development of energy policy, but to concentrate on the evolution of sustainable development policy in order to highlight how energy issues have featured within these discussions. Our purpose is to chart the evolution of the policy response and, in particular, to examine whether a perceptible trend of moving from a purely 'environmental' focus to a broader 'sustainable development' focus is evident in how these summits have dealt with energy issues. We will do so by examining the key documents negotiated at each of the three summits in terms of the three dimensions of energy-sustainable development linkages defined above.

3.1. STOCKHOLM, 1972

The UNCHE, held in Stockholm, Sweden, from 5 to 16 June, 1972, was a 'first' in many respects: it was the first meeting that brought the nations of the world (113 countries participated) together to discuss the environmental future of the planet; it was the first UN Conference on a single global issue; it was the first global meeting that saw a large presence and influence of non-state actors, including nongovernmental organizations (NGOs) and scholars; and it was the first meeting to seek global policy consensus on issues related to the environment.

Triggered by increasing scientific evidence of human-induced environmental degradation and a concurrent wave of growing environmental awareness in the industrialized nations of North America and Western Europe, the conference was an attempt to turn the environment into a more 'global' issue, particularly by more meaningfully incorporating the developing countries of the South into the emerging global environmental discourse. The conference turned out to be unexpectedly contentious – with most Soviet bloc countries boycotting it due to the exclusion of then East Germany and with developing countries apprehensive of the North's newfound environmental concern. However, despite the intense North–South differences, and possibly because of them, the conference stumbled towards a more authentic global agenda; one that sought to merge the North's growing concern about environmental quality and the South's long-held interest in human development. Eventually, but much later, the desire to formulate the two interests into a single composite framework would lead to the concept of sustainable development (Founex, 1972; Kay and Skolnikoff, 1972; Rowland, 1973; Pirages, 1978; Najam, 1994).

The major institutional legacy of the conference was the creation of the UN Environmental Programme (UNEP). This was accompanied by two declaratory documents – The Stockholm Declaration and the Stockholm Action Plan – ideas from which have been carried forth by subsequent summits, including at Rio de Janeiro and Johannesburg. In addition to these, a few more ritualistic declarations were also adopted: one calling for a second UN Conference on the Human Environment (which was never actually held), another establishing an annual 'World Environment Day' (which is now observed in most countries each June), and one

calling for a stop to nuclear testing, particularly atmospheric nuclear testing (in fact, this was the single most hotly debated issue at the conference and inspired by the global politics of the time).

Surprisingly little was said or discussed at the conference or in any of its formal products regarding issues related to energy (see full text of Stockholm documents at http://www.unep.org). The conference Declaration, which was the major political document emerging from Stockholm, has no direct reference to the energy issue. Of the 26 'principles' laid out in the declaration, the one that can be construed to be of most relevance to energy-issues is Principle 5, which states: 'The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind.' A little more than one year later, energy was thrust on to the international agenda when the oil crisis nearly doubled real energy prices and plunged many national economies into recession.

The Stockholm Action Plan on the Human Environment is a more comprehensive document that includes a 'Framework for International Action' accompanied by a list of 69 specific recommendations; three of which do, in fact, deal with energy (emphasis added):

- Recommendation 57 called upon the UN Secretary-General to 'take steps to ensure proper collection, measurement and analysis of data relating to the *environmental effects* of energy use and production'.
- Recommendation 58 called for better exchange of information on energy. The recommendation is motivated by the need for 'the rationalization and integration of resource management for energy' and seeks mechanisms (such as exchange of national experiences, studies, seminars, meetings, and a 'continually updated register of research') for accessing existing information and data, particularly on 'the *environmental consequences* of different energy systems'.
- Recommendation 59 called for a 'comprehensive study to be promptly undertaken with the aim of submitting a first report, at the latest in 1975, on available energy sources, new technology, and consumption trends, in order to assist in providing a basis for the most effective development of the world's energy resources, with due regard to the *environmental effects* of energy production and use'.

Even at Stockholm itself, none of these recommendations was particularly inspiring in its scope or aspiration. They are even less so with the 30-year hindsight we now enjoy. Indeed, between them they call merely for better data collection and analysis, and the mechanisms envisaged for doing so are not particularly innovative or exciting. More importantly, even the minimal level of 'action' that the Action Plan envisaged on the energy issue never really materialized. For example, the official documents make no mention of Stockholm's implementation of the 'comprehensive study' that was sought by 1975 (Recommendation 59). The one issue related to energy that did gain wide political and policy prominence at Stockholm was atmospheric nuclear testing. This was a subject of great and heated debate at the

conference, became the subject of a separate resolution, and made the International Atomic Energy Agency a frequently mentioned organization within the Stockholm Action Plan. This discussion was very much an artifact of the Cold War politics of the time and was at its root far more concerned with nuclear weapons than with energy and its role in the economy and as an agent of environmental change.

The lack of imagination or urgency on the energy issue should not be entirely surprising. Held in mid-1972, the Stockholm Conference came before the great oil shock of the 1970s (see Askari and Cummings, 1978; Allen, 1979). State delegates attending Stockholm still lived in a relatively calm world of declining real oil prices, and the possibility of spiraling energy prices or oil scarcity could not have been high on their mental maps. Similarly, global climate concerns had not yet taken root in 1972 and environmentalists were more focused on the pollution outputs of industrialization than the energy inputs for economic production. While those attending UNCHE were well aware of the many environmental implications of energy issues, these were not their most pressing priorities at that time.

What is clear from the recommendations, however, is that to the extent that energy was considered an issue of any importance, that importance derived directly from the 'environmental effects' of energy extraction, processing and consumption. While the recommendations slightly hint at the importance of energy as a motor of economic growth, their principal preoccupation is with the potential for environmental stress from the chain of energy supply and use. The dimension of energy as a prerequisite for meeting basic human needs does not figure into the equation at this conference.

3.2. Rio de Janeiro, 1992

The UNCED, popularly know as the Earth Summit, was the crowning moment not only of environmental summitry but of UN mega-summitry as a genre. Held at Rio de Janeiro, Brazil from June 2 to 14, 1992, it brought together more than one hundred heads of state and government, 150 nations, over 1,400 NGOs, 8,000 journalists, and nearly 35,000 participants. More than that, it caught the public imagination like no conference before or since. Some consider the summit to have failed its potential, if not its mandate in terms of the content of its substantive agreements (see, e.g. Khor, 1992; Agarwal et al., 1999). But most commentators and experts consider this Summit to have been a success in terms of elevating the global profile of environmental issues and raising awareness regarding sustainable development (Hass et al., 1992; Johnson, 1993; Gardner, 1992; Najam et al., 2002).

Held to mark the twentieth anniversary of the Stockholm Conference, the Rio Earth Summit became everything that an earlier 'Stockholm plus ten' conference, held in Nairobi in 1982, could not (see Clark and Timberlake, 1982). Indeed, it became more than even its proponents had hoped for. Instead of being the 'second' United Nations Conference on the *Human Environment*, Rio was the United Nations Conference on *Environment and Development*; putting those two terms together,

which had been so much at odds at Stockholm, might itself have been Rio's most important achievement (Najam, 1995). In particular, it broadened the scope of global environmental diplomacy by adopting the notion of sustainable development, which had been advocated 5 years earlier in by the World Commission on Environment and Development (WCED, 1987) as one of its key policy frameworks (Susskind, 1994; Tolba, 1998; Chasek, 2001).

The world at Rio was, of course, very different from the world at Stockholm. In the intervening two decades the Cold War (which was the defining political framework at UNCHE) had disappeared, the level of public interest in the environment was greatly increased, environmental issues such as stratospheric ozone depletion and global climate change were now squarely on the global policy map, and energy had become a major concern for economic security in the aftermath of the oil price shocks of 1973–74 and 1980–81.

The 'products' coming out of UNCED included a political Declaration enunciating 27 principles of environment and development, a 700 page action programme called Agenda 21, a non-binding set of principles for sustainable forest management, and specific conventions on climate change and biodiversity. The institutional innovation resulting from the conference included an agreement on the operating rules for the Global Environmental Facility (GEF) and the establishment of a Commission on Sustainable Development (CSD) on the basis of an Agenda 21 recommendation. Technically, the 'official' products of UNCED were only the Rio Declaration on Environment and Development, the 'Authoritative Statement of Forest Principles', and Agenda 21; all of which were adopted by consensus (without vote) by the conference. The conventions on climate change and biodiversity were products of independent, but concurrent, negotiating processes that were opened for signatures at UNCED (full texts of all UNCED documents are available in Johnson, 1993 and at http://www.unep.org).

The Rio Declaration on Environment and Development, like its predecessor at Stockholm, had nothing specific to say about energy. Indeed, the clause about the depletion of natural resources contained within the Stockholm Declaration was dropped. While a number of the principles articulated in the Declaration could be construed to have bearing on energy, none deals with the issue directly.

Although the climate and biodiversity conventions were not direct products of the Rio process, the former is of direct relevance to the energy issue. Indeed, the UN Framework Convention on Climate Change (UNFCCC) is the nearest thing we have to a global convention dealing directly with energy concerns. Since energy production and consumption is the biggest source of anthropogenic greenhouse emissions, climate policy in the UNFCCC, and subsequently in the 1997 Kyoto Protocol, has been discussed mostly through the lens of energy policy in a wide variety of ways. Two examples, amongst many, of how climate policy becomes energy policy are the intense policy debates about the variable ability and responsibilities of different nations to change their energy consumption and production patterns (Najam and Page, 1998; Zhang, 2000; Brown et al., 2001), and the role of energy taxation as a means of emissions control (Speck, 1999; Baranzini et al., 2000; Varma, 2003).

These debates during and after Rio have been defined principally by compulsions that lie at two distinct corners of the sustainable development triangle: the environmental compulsion emanating from the ecological stresses associated with specific energy production and consumption choices, and the economic compulsion derived from the central role of energy in economic growth. The saliency that the climate issue had assumed by 1992 meant that the discussion on energy at Rio was not only more intense than it had been at Stockholm but also broader. Whereas UNCHE had been principally concerned with the role of energy as a source of environmental stress, Rio's energy concerns related to both economic and environmental dimensions.

This evolution of the energy focus was quite evident in Agenda 21, the most comprehensive of the Rio documents. Interesting, Agenda 21 (which has a total of 40 chapters) does not have a chapter on Energy. However, Chapter 9 of Agenda 21 which deals with 'Protection of the Atmosphere' serves as a *de facto* energy chapter since it focused on global climate change and related issues of fossil fuel use. In addition, the chapters on changing consumption patterns (Chapter 4), promoting sustainable human settlements development (Chapter 7), and promoting sustainable agriculture and rural development (Chapter 14) also have significant discussions on the energy issue. The vast bulk of this discussion is contextualized in the need to balance the 'environmental' and 'economic' nodes of the sustainable development triangle. What is carried over from Stockholm is a clear emphasis on the 'environmental impacts' of energy production and use (especially in terms of global climate change). New additions are the prescriptions contained in these various chapters – or the energy message of Agenda 21 – which fall into familiar categories: decrease energy consumption (see Agenda 21, Sections 4.24, 7.5), increase energy efficiency (see Agenda 21, Sections 4.18, 7.49), and develop cleaner sources of energy (see Agenda 21, Sections 9.12, 9.18).

The third dimension of the sustainable development triangle dealing with social concerns such as the role of energy as a human need do not figure as prominently in Agenda 21 as the environmental and economic dimensions. However, glimpses of such concerns do occasionally surface in the document. For example, the chapter on human settlements (Chapter 7) mentions energy as a human need at par with other needs such as water (see Agenda 21, Sections 7.27, 7.40). Section 9.9 goes the furthest by defining energy as an 'essential' component of economic as well as social development and as a prerequisite for an 'improved quality of life'. Although these references are quite general and made in passing, with very little prescriptive policy content, they do signify an important evolution from the Stockholm texts where these issues were conspicuous only by their absence.

Overall, then, one finds that UNCED did treat the energy issue very differently from UNCHE. At Stockholm energy was discussed in the most general, even cursory, fashion, and only in terms of its environmental impacts. In the years between Stockholm and Rio, concerns about the environmental stress imposed by energy production and use became more precise with the mounting evidence of global climate change. As a result, Rio was relatively more precise and prescriptive in terms of

energy policy in that it went beyond simply calling for more information collection and dissemination to highlighting the need for decreasing consumption, increasing efficiency and transitioning to cleaner sources. In doing so, Rio broadened the focus from merely environmental concerns to the balance between environmental and economic concerns. However, the third node of the sustainable development triangle, the social dimension signified by energy as a human need, still remained in the shadows and peeped through the Rio documents only infrequently and rather unimpressively.

3.3. JOHANNESBURG, 2002

Few expected the 2002 WSSD to be as impressive as UNCED (Najam, 2002). Held to mark the tenth anniversary of the Rio Earth Summit and to take stock of progress on Agenda 21 in those 10 years, the run-up to Johannesburg was singularly dismal and uninspiring. The world had, once again, changed. The high hopes of a new era of global environmental cooperation that had been ignited by Rio, soon proved false. The industrialized countries of the North had remained unwilling to provide the developing countries of the South with the resources or support that had been implied at Rio, meanwhile the promise of a post-Rio harvest of global environmental treaties and implementation proved unfounded as key states, particularly but not solely the US, dragged their feet on key issues such as climate change. As a result, a malaise had set in well in advance of WSSD which was only made worse by events at the geopolitical level, where the global mood had gone sour after the tragic terrorist attack on the US and a growing sense of insecurity and violence around the world (Gardner, 2002). Held in Johannesburg, South Africa from August 26 to September 4, 2002, WSSD was different from both Stockholm and Rio in that it was not born within the optimism and high hopes that had accompanied earlier summits (Agarwal et al., 1999; Sachs, 2002).

In terms of sustainable development, the World Summit on Sustainable Development had the distinction of actually having those two magic words in its very title. However little had been achieved in the 10 years since Rio on other counts, Johannesburg was testimony to the fact that the term 'sustainable development' had gained policy acceptance. Even though some argued that the term had lost its 'edge' and was mostly being used rhetorically (Najam, 2002), the fact remained that it had also become a political necessity. For those who believed in the concept, this was a chance to put meaning into it. At best, Johannesburg was viewed as a chance to advance the agenda that had been set by Rio; at the very least, it was an attempt to keep the Rio agenda alive.

It became clear fairly early on in the Johannesburg process that WSSD would not be able to match the ambition or scope of UNCED; certainly not in terms of its products. Like Stockholm and Rio before it, the Johannesburg Summit also sought a political Declaration as its principal output. In addition, it also sought a Plan of Implementation; one that was much less ambitious in scope or scale

than Agenda 21 but more extensive than the Stockholm Plan of Action. The major innovation at Johannesburg were the so-called 'Type 2' agreements. These were informal agreements involving non-state parties, sometimes amongst themselves and sometimes with individual governments. On the one hand, Type 2 agreements were a reflection of the massive change in landscape that had occurred over the previous 10 years, with NGOs and business taking a far more important role in international environmental affairs. At the same time, however, they were a reflection of the WSSD organizer's desperation and desire to get something memorable out of the summit. According to the rough count by the summit organizers, over 220 Type 2 agreements were reached at Johannesburg, signifying around US$ 235 million in pledged resources; thirty-two of these Type 2 agreements relate to energy, accounting for US$ 26 million in resources; the vast majority of these are programmes of technical cooperation in energy generation and conservation (http://www.johannesburgsummit.org/). It should be noted that a systematic accounting of these agreements has not yet been accomplished, and it is not yet clear how many of these agreements and how much of these resources are, in fact, new and unique. The other innovation at Johannesburg, in comparison to previous summits, relates to the fact that the Johannesburg Plan of Implementation sought agreement on actual targets and timetables rather than simple statements of intent. While it is true that in many cases (including renewable energy) such targets and timetables were not forthcoming and in others they were merely restatements of targets that had already been set (such as in access to clean water), it is also true that in a few areas (such as sanitation) meaningful headway was made in terms of reaching agreement on targets and timetables where there had previously been none (for full texts of these documents see http://www.johannesburgsummit.org/).

Looking carefully at the various products it does seem that amidst the many disappointments of Johannesburg, energy might be one of these few areas where progress was made. First, and quite strikingly, the Johannesburg Declaration is different from its predecessors from Stockholm and Rio in that it actually does have a direct reference to energy. More importantly, the Declaration (clause 18) clearly identifies energy as a human need at a par with needs such as clean water, sanitation, shelter, health care, food security and biodiversity. Although this is a declaratory clause with no enforceability, it does signify a demonstrable shift from the previous summits. It clearly defines energy as a basic human need, thereby evoking the social dimension of the sustainable development triangle more clearly than either Stockholm or Rio had done.

The Johannesburg Plan of Implementation breaks similar new ground in terms of how it deals with the energy issue. While the focus on the environmental stress-economic growth axis that had emerged at Rio is not at all lost, the Johannesburg Plan is strikingly different from its predecessors in two distinct and important ways. First, it clearly deals with energy as an issue in its own distinct right rather than as a facet of other issues. Second, it firmly adds the social dimension to the existing environmental and economic dimensions to begin dealing with the entirety of the sustainable development triangle for the very first time.

The concerns about energy in terms of environmental stress and economic growth show up very similarly to how they had surfaced at Rio. The principal arena for these concerns remains climate change and the need for a balanced approach is once again reiterated, as are the preferred mechanisms for achieving such balance: decrease energy consumption, increase energy efficiency, and transition to cleaner energy systems. This discussion is most clear in Article 19 of the Johannesburg Plan whose 23 sub-clauses relate to various environmental and economic aspects of energy in relation to sustainable development. The environmental dimension of sustainable development is most clearly and persistently manifest in the many references to the need for enhanced energy efficiency, in particular the call for establishing domestic programmes for energy efficiency (sub-clause h), the need to accelerate the development and dissemination of energy efficiency and energy conservation technologies (sub-clause i) and the call to promote and invest in research and development of such technologies (sub-clause k). The economic dimension is also strong in Article 19, parts of which call for removing market distortions including the restructuring of taxes and the phasing out of harmful subsidies (sub-clause p) and the call to support efforts to improve the functioning, transparency and information about energy markets with respect to both supply and demand (sub-clause o). One area in which Johannesburg tried, but failed, to make new headway within the environmental-economic axis relates to renewable energy. WSSD saw heated debates about setting up quantifiable targets and timetables for renewable energy use. These discussions eventually failed to yield actual timetables and targets (principally because of US opposition to them) but they did succeed in introducing more detailed language regarding energy issues than had been present in Agenda 21. The sub-clause (e) of Article 19 is, therefore, crafted in general language and calls for diversifying energy supply and 'substantially' increasing the global share of renewable energy sources.

What is new and quite intense in the Johannesburg Plan on Implementation are the repeated references to 'energy and sustainable development.' Here, the document goes beyond Agenda 21 by focusing more on the social dimension of energy and sustainable development and by concentrating on the role energy plays as a prerequisite for basic human needs including those defined in the UN's Millenium Development Goals (MDGs). The most significant of these references is made in Article 8 of the Plan of Implementation, which falls within the section on poverty eradication. New ground is covered here when the Johannesburg Plan clearly and unambiguously calls for:

> ... access to reliable and affordable energy services for sustainable development sufficient to facilitate the achievement of the millennium development goals, including the goal of halving the proportion of people in poverty by 2015, and as a means to generate other important services that mitigate poverty, bearing in mind that access to energy facilitates the eradication of poverty.

This is not only interesting but groundbreaking, because the original Millennium Development Goals (MDG) – a set of quantitative targets proposed by the UN Secretary General to the 2000 Millennium Summit as the foundation of the

United Nations' work programme from the next decades and as a framework for measuring development progress (see http://www.developmentgoals.org, Devarajan et al., 2002) – do not mention energy at all. The case for energy as a prerequisite for basic human needs is made, instead, by the Johannesburg Plan of Implementation. Indeed, it is made rather convincingly. Sub-clause (a) of Article 8, e.g., calls for improving:

> ... access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services and resources, taking into account national specificities and circumstances, through various means, such as enhanced rural electrification and decentralized energy systems, increased use of renewables, cleaner liquid and gaseous fuels and enhanced energy efficiency, by intensifying regional and international cooperation in support of national efforts, including through capacity-building, financial and technological assistance and innovative financing mechanisms, including at the micro and meso levels, recognizing the specific factors for providing access to the poor.

Sub-clause (g) of the same article, elaborates the case further by calling for:

> ... access of the poor to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services, taking into account the instrumental role of developing national policies on energy for sustainable development, bearing in mind that in developing countries sharp increases in energy services are required to improve the standards of living of their populations and that energy services have positive impacts on poverty eradication and improve standards of living.

Here, then, is an example of all three dimensions of the sustainable development triangle being invoked together and in a way that was not seen in any of the Stockholm or Rio documents. Although this is still preliminary, it is nonetheless a novel and welcome attempt to deal with energy fully in the context of sustainable development by seeking policy that responds to the environmental, economic as well as the social impulses of the concept. Policy made under the guidelines set here would need to be evaluated not only in terms of the environmental stresses being imposed, or effects on economic growth, but also in terms of social justice and especially in terms of how it affects the poorest and the most vulnerable.

3.4. An evolving agenda

The process of evolution that seems to have taken place between the 1972, 1992 and 2002 environmental summits is depicted in Figure 5, which builds on the three dimensions of sustainable development to illustrate how the documents emerging from each successive conference have dealt with energy issues. Figure 5 suggests that a rather neat evolution of the agenda has happened with the Stockholm summit of 1972 dealing with energy issues principally as a source of environmental stress, the 1992 Rio summit added a clear economic focus to its treatment of the subject, while the 2002 Johannesburg Conference built upon the existing environmental and economic focus and added the element of energy as a requisite for basic human needs to the equation for the first time. Of course, the fact that these summits have dealt with energy in a particular way does not imply that global energy policy has

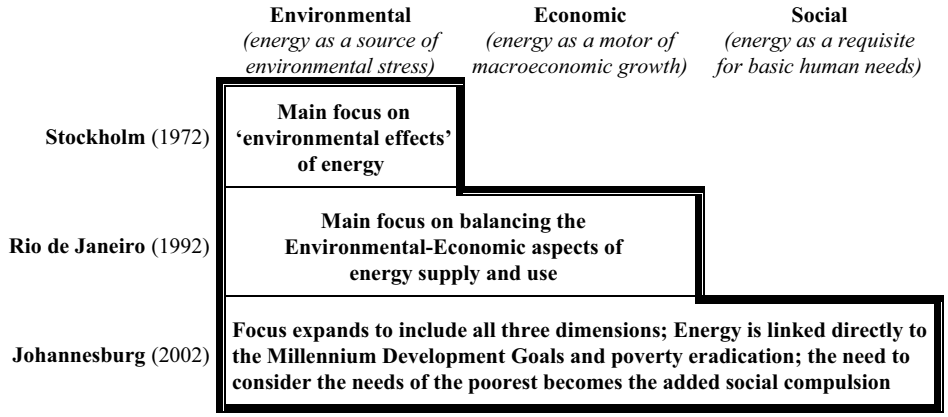

Figure 5. Energy and sustainable development: An evolving agenda.

moved in that direction automatically. The purpose of such summits is principally declaratory. However, the value of these declaratory proclamations must not be underestimated. They serve not only to advance the conceptual agenda but also tend to eventually influence the actual policies, although usually with some time lag (Susskind, 1994; Chayes and Chayes, 1995).

In terms of general conclusions, there are a number of surprises that can be highlighted:

- First, although conventional wisdom maintains that Johannesburg is a pale comparison to conferences before it (Najam et al., 2002), on the specific issue of energy it has actually made major conceptual headway by incorporating the energy issue more fully into a sustainable development framework. While the conference as a whole may not have been inspiring, on this one issue it has traversed into new and important territory.
- Second, it is rather surprising that the UN MDGs fail to identify energy as a key human development and human needs theme. However, the Johannesburg Plan of Implementation has partially filled that gap and made the argument that would have better come from the MDGs. That energy is a prerequisite for many human needs and for poverty alleviation merits explicit inclusion in the MDGs. Because of Johannesburg, this notion now has the endorsement of the comity of nations and there seems to be a strong case for incorporating energy issues explicitly within MDG programmes.
- Finally, there is a need for the practice of energy policy as well and the scholarship on energy policy to catch up with the realization imbedded in the Johannesburg Plan on Implementation regarding the importance of energy as a prerequisite for basic human needs.
- Finally, a broader argument can now be made that mega-conferences can advance global agendas in significant ways, as they have done with energy. The energy case gives cause for more optimism than many scholars invest in these conferences

(Fomerand, 1996; Haas, 2002; Seyfang and Jordan, 2002). However, a corollary to be investigated further, would be whether such impact is more likely to be noticeable on specific issues rather than on the general agenda as a whole.

4. Conclusions

In focusing on the actual text of the documents negotiated at various global environmental summits and using a framework of how energy policy relates to various aspects or dimensions of sustainable development, this paper finds that there has been a slow but demonstrable evolution in how these conferences have dealt with energy. Not only has energy assumed a successively more prominent role in these global summits, but a noticeable evolution has occurred in the dimensions of energy policy that have been addressed. Moreover, this evolution has been along the trajectory of sustainable development. Although energy policy *per se* might not have made this transition as yet, these summits have given a clear signal to national and international policymakers to align energy policy more firmly to sustainable development, and to do so in more intricate ways.

In terms of evaluating the impact of the Johannesburg Earth Summit on the energy and sustainable development agenda, it seems that the one summit that had started with the worst prospects might well have achieved the most important advance in terms of conceptualizing energy policy within a framework rooted in all dimensions of sustainable development. Both the Johannesburg Declaration and the Johannesburg Plan of Implementation are remarkable in that they highlight the human need aspect of energy, in addition to the environmental and economic dimensions that had already been incorporated at Stockholm and Rio.

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