The Local Dimension of Energy and Environmental Policy in Japan

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Abstract: This paper examines the political economy of Japan's surprisingly restricted energy and environmental performance. Japan is generally depicted as a front-runner in addressing energy and environmental challenges. Certainly, the country responded adroitly to the oil shocks of the 1970s. And note Japan's energy-efficient infrastructure: its public transport ranks among the world's best. Indeed, one would expect Japan to lead on environmental and climate issues, especially in developing renewable energy. Japan is rich, has a history of public-sector activism, has virtually no domestic conventional energy reserves, needs an effective regional development policy, and faces daunting threats through the steadily rising wall of spillover effects from the oil age and climate change. But Japan is not leading on energy and climate change, and notably not in the race to develop sustainable energy. The major reason for this is the poor use of the public sector. This paper argues that Japan risks forfeiting an opportunity to revitalize its local economies and its global role with smarter energy and environmental policies.

1 Introduction

Conventional wisdom holds that Japan is a leader in addressing energy and environmental challenges,[2] a reputation that is neither inexplicable nor entirely undeserved. For one thing, Japan responded adroitly to the oil shocks of the 1970s (Lesbirel 1988). And fortuitous for Japan, the world's first formal agreement to cut greenhouse gases – the Kyoto Treaty – is named after one of Japan's iconic cities. The public relations value of this "Kyoto" eponym is simply inestimable. In addition, note Japan's abstemious infrastructure: its public transport systems rank among the world's best for their efficiency as well as their diffusion and ease of use.

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[2] In late March of 2007, for example, the *Boston Globe* newspaper ran a special series of articles on "Japan's Energy Wisdom," and exclaimed that "Japan has confronted the reality of limited oil, especially in its energy conservation efforts." http://www.boston.com/news/globe/editorial_opinion/editorials/articles/2007/03/26/green_and_growing/ (found 12 June 2008).

Moreover, one would expect Japan to lead in tackling energy and climate risks. Among a host of other advantages, Japan is rich, its industry is highly innovative, and it has a history of using the state to accelerate industrial transformation. Japan also has virtually no domestic fossil fuel energy reserves, and thus does not have entrenched domestic fossil fuel extraction industries keen to protect their interests. In addition, Japan is highly vulnerable to the geopolitical and other risks of fossil fuel dependence as well as the physical, political and other effects of climate change.

Yet as we shall show in detail below, Japan is among the laggards in confronting energy and climate risks. This lack of positive activism was especially evident during the December 3-14, 2007 United Nations Framework Convention on Climate Change, held in Bali Indonesia. Japan allied itself with Canada and the United States in blocking binding reductions in greenhouse gas emissions (Dyer 2007).[3] Japan has also been remarkably slow in fostering sustainable energy.[4] Comparative examples show that Japan could be enhancing its security, revamping its international role, and revitalizing its local economies with smarter energy and environmental policies.[5] However, in this paper we argue that the signal reason for Japan's subpar performance is its recent emphasis on voluntaristic, market-centred mechanisms rather than the fiscal, regulatory and other levers of the state, especially the central state. Furthermore, the paper examines the political economy of Japan's surprisingly poor use of the public sector to confront energy and environmental risks.

[3] Japan has in fact a fairly long record of seeking to conciliate the US on climate-change negotiations, both to maintain US-Japan ties as well as avoid potential costs to its own economy (see Miyaoka 2004).

[4] This paper adopts the InterAcademy Council's definition of "sustainable energy" as "energy systems, technologies, and resources that are not only capable of supporting long-term economic and human development needs, but that do so in a manner compatible with (1) preserving the underlying integrity of essential natural systems, including averting catastrophic climate change; (2) extending basic energy services to the more than two billion people worldwide who currently lack access to modern forms of energy; and (3) reducing the security risks and potential for geopolitical conflict that could otherwise arise from an escalating competition for unevenly distributed oil and natural gas resources" (IAC 2007: 1).

[5] Germany's feed-in tariffs for fostering sustainable energy have become the global standard (Mitchell 2008: 181–189) and its renewables policies have fostered a near-doubling in green jobs, from 160,500 positions in 2004 to 249,300 in 2007 (Burgermeister 2008).

2 Is Japan Getting Out of Oil?

It is important to note at the outset that, among the big OECD countries, Japan is quite vulnerable to the mounting risks of our oil-dependent era. Table 1 shows that among the major OECD economies, Japan has the second highest level – 48 percent – of dependence on oil in its primary energy mix.[6] Like many of the other large economies portrayed in the table, Japan relies on imports for virtually all of its oil supply. But Japan's 89 percent reliance on the increasingly unstable Middle Eastern oil producers simply has no parallel among the major OECD countries.

	Japan	US	UK	Germany	France	Italy
Oil Dependence (%)	48	40	35	37	34	53
Import Dependence (%)	100	64	–34	97	103	93
Dependence on ME (%)	89	21	4	7	27	34

Tab. 1: **Dependence on Oil, Imported Oil, and Imports from the Middle East, 2004**

Source: METI, 2007 enerugī hakusho [Energy white paper], Section 4. http://www.enecho.meti.go.jp/topics/hakusho/2007energyhtml/html/3–4–1–1.html (found 12 June 2008).

We also see from table 2 that Japan's energy efficiency and greenhouse gas (GHG) emissions (measured per-capita and per unit of GDP) are at best on par with the big EU countries. No matter what political rhetoric and conventional wisdom suggest, Japan is not the globe's "top-runner" in the energy and environmental fields.[7]

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[6] Primary energy includes fossil-fuels, nuclear and renewable energy sources. Not included among them is, for example, electricity. This is because electricity is generated by these primary energy sources.

[7] A recent edited volume from The Japan Research Institute (Nihon Sōken) concedes that Japan is losing out in the race to develop renewable energy, but asserts that the country has a commanding lead in energy efficiency. However, the basis of the latter claim is a chart that summarizes IEA data using market exchange rates (MER) to compare efficiencies between Japan, the EU, the US and several other entities (see Ikuma 2007: 180). This particular chart is a favorite among Japan's business bureaucracies and lobbies, but has two glaring faults. One is that the EU is a region that groups several very quite energy efficient and several less-efficient economies. The other fault is that – as the IEA itself recognizes (IEA 2007c: 35–36) – PPP comparisons are the international standard. The IEA also notes that "it would be misleading to rank energy-efficiency performance according to a country's energy consumption per GDP measured

	Japan	US	UK	Germany	France	Italy
Energy Intensity	6535	9336	6205	7175	7209	6044
Ton Oil Equiv/Capita	4.18	7.91	3.91	4.22	4.43	3.17
TPES/GDP (PPP)	0.16	0.22	0.14	0.16	0.19	0.17
Tonnes CO2/TPES	2.28	2.49	2.30	2.44	1.42	2.51
Tonnes CO2/Capita	9.52	19.73	8.98	10.29	6.22	7.95
CO2/GDP (PPP)	0.35	0.54	0.32	0.39	0.23	0.31

Tab. 2: **Energy Intensity, Consumption, CO2 Emissions Indicators, 2004**

Note: All data relate to 2004; PPP = Purchasing Power Parity; TPES = Total Primary Energy Supply.

Source: International Energy Agency (IEA Statistics).

3 What is Japan Doing?

Japan is doing less on the environmental and energy fronts than its politico-economic incentives and reputation would indicate. But the data in table 2 suggest that Japan still has respectable levels of energy efficiency and comparatively low per-capita GHG emissions. Japan may not be the world's front-runner, but it is getting some things right. We shall look at those advantages first, and then turn to consider why they have not been developed further as the foundation for global leadership.

Japan boasts significant population density advantages that foster energy efficiency. Japan is, of course, renowned for its world-beating automobile manufacturers, and especially for the hybrid cars produced by Toyota. But Japan's car fleet is not especially fuel-efficient. It is instead in mass transit that Japan has managed to gain significant energy efficiencies relative to its counterparts in the developed world.

In contrast to the European countries, Japan does not rely on high fuel taxes to curb fuel consumption.[8] Japan's highly concentrated population –

using either PPP or MER. The ratio is affected by many non-energy factors such as climate, geography, travel distance, home size and manufacturing structure (IEA 2007c: 32). That is why table 2 in this paper incorporates several measures to get a clearer picture of Japan's comparative CO2 emissions and energy intensity.

[8] In 2006, the percentage of taxes in Japan's automotive fuel prices ranged from 32.8 percent for diesel to 43.9 percent for regular gasoline. Levels among the big EU economies ranged from just over 55 percent to over 60 percent for diesel and over 60 percent for gasoline (OECD 2007: 306–310).

particularly in the major conurbations – has led to massive economies of scale as well as reduced usage of personal automotive transport. The International Energy Association observes that "despite a lower average fuel price than countries in Europe, Japan has the second-lowest energy use per capita. This can be attributed to the high availability and extent of mass transit, and to low travel per capita (Japan is densely populated and travel distances are shorter than in many other countries)" (IEA 2007a: 107). Furthermore, "Japan's low car fuel use per capita relative to fuel price results from modest car use, not from low fuel intensity" (IEA 2007a: 109). In short, Japan's current fleet of motor vehicles is not the most fuel-efficient.[9] But there are attractive substitutes to driving in the reliable and very well-diffused network of trains, subways, buses and other mass transit. And the density of urban areas also reduces the distance that car owners are inclined to drive.

Japan also benefits from a customary practice of relying on single-room heaters rather than central heating in the household. Moreover, though claims of Japan's being the global top-runner in energy efficiency are politicized and thus suspect, it is clear that the country boasts many comparatively efficient industrial processes as well as products (IAC 2007: 37). These factors help curb energy consumption, as does the fact that Japan's population is shrinking.

4 Japan and Local Sustainable Energy

As we have seen, Japan has geographically and demographically given advantages that promote comparatively low energy consumption. These advantages are of course important, but energy conservation and efficiency are only part of the answer to the global challenge of increasingly costly fossil fuels and the mounting scale of anthropogenic climate change caused by greenhouse gases (especially carbon dioxide emissions). New, cleaner, and sustainable forms of energy production are essential to cope with global economic and population growth. Estimates suggest that 40 percent of the current global population lacks access even to conventional fuels for cooking and heating and that about 1.6 billion people in Asia, Africa and other regions do not yet have access to electrical power (Litovsky 2007). Several billion people live in rapidly developing countries – China and India are two striking examples – where energy consumption

[9] Indeed, the Worldwatch Institute (2007: 66) notes that in 2004 European-made cars emitted 161 grams of carbon whereas their Japanese counterparts emitted an average of 170 grams.

has been escalating. Energy consumption by these people is almost certain to increase as development continues, and hence the IEA's most recent forecasts project a 55 percent growth in global energy demand between 2005 and 2030 (IEA 2007b).

In Japan, as elsewhere, sustainable energy production has a long history of local initiatives. One obvious example is the use of geothermal bathing pools, for which Japan is renowned. Sustainable energy now seeks to harness a growing range of natural forces, including the energy in sunlight, wind, tides and waves, temperature gradients at sea and beneath the earth, and so on. Variations in such resource endowments such as average wind velocities, wave heights, and magma reservoirs exist everywhere, of course, yet their exploitation is feasible almost everywhere. The key issue is that the industries and infrastructure to exploit them have to be built. This means that harnessing sustainable power resources is in large measure a local matter. The installations for producing the energy are, after all, constructed in specific communities. These developmental incentives can be added to the incentives posed by the fact that fossil-fuel costs are increasing.

Japan does have some outstanding community-scale applications of sustainable energy technology. Perhaps the most striking of these cases is seen in the town of Kuzumaki in Iwate Prefecture. Kuzumaki is a 435-square-kilometre community in the northeast of Japan's main island of Honshū, and has attracted international and domestic attention.[10] The town's population as of January 1, 2008 was just under 7,554 people, and the major industries are raising dairy cows, growing grapes and – increasingly – tourism. In the mid-1990s, Kuzumaki found itself confronting the bleak prospect of becoming a dumping ground for industrial waste, clearly not an ideal venture for an agriculture-based community. This prospect, together with the ideas and incentives that emerged through the Kyoto climate change discussions of 1997, saw the town's leadership move in a radically different direction.[11]

Kuzumaki's officials worked with the central government's New Energy Foundation and the New Energy and Industrial Technology Development Organization (both agencies were set up in 1980) and drafted a "New Energy Vision" in March 1999. This was remarkably fast movement for a local authority enmeshed in Japan's dense thicket of intergovern-

[10] Kuzumaki has in fact been enjoying a tourist boom as a positive spillover from its environmental efforts. Its annual tourism reached 500,000 visitors in 2007, with 20 percent annual increases (Nakamura 2008).

[11] The former mayor of Kuzumaki, Nakamura Tetsuo, provides a detailed description of Kuzumaki's incentives and efforts in Nakamura (2004).

mental institutions. Implementation of the energy vision began in June of the same year, 1999, when Kuzumaki installed its first wind turbines (each 400 kilowatt). This progress has been followed by a succession of projects that included solar energy installations, waste and wood biomass operations, and more wind generation. The town is now one of Japan's most energy self-sufficient local communities, as it generates about 233 percent of its energy requirements via renewables (Nakamura 2008).

Kuzumaki is also able to sell its excess power to the regional electricity grid. This is because Japan implemented such sales to electrical power producers in 1999, as part of ongoing deregulation. A further background feature that enabled the Kuzumaki effort was the existence of the "surplus electricity purchase menu" (*yojō denryoku kōnyū menyū*). The electrical utilities first introduced this system in 1992 as a voluntary effort to foster solar power. The menu was amended in 1996 to also include wind power. The system paid producers a higher rate for renewably-generated electricity (e.g., via solar panels installed on a home).[12]

There are several other examples of local areas in Japan with notable levels of renewable power generation. These include several small towns with large geothermal plants, wind installations, and the like, and represent the creaming of the concentrated renewable resources with low political cost, because the sites generally do not have alternative uses (e.g., as tourist sites). One such case is the town of Yanaizu in Fukushima Prefecture, which hosts the Nishiyama Geothermal Power Plant. This geothermal plant is Japan's largest, a 65-megawatt facility put into operation in May 1995. This scale is quite small, of course, compared to the "The Geysers" facility in California. The latter is the world's largest geothermal plant with a capacity of about 1000 megawatts.[13] The Nishiyama plant and other examples do indicate, however, that considerable potential exists in Japan for exploiting a variety of renewable resources.[14]

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[12] The utilities were a regulated monopoly at the time, and thus appear to have felt obligated to play a "public policy role" via subsidizing renewable production (Kai 2003: 36).

[13] This generating capacity is roughly equivalent to that of a large nuclear power plant. For further information on "The Geysers," see: http://www.geysers.com/ (found 1 August 2008).

[14] On Japan's large potential, see ISEP (2003). Note also that a review of several studies shows that current global energy consumption is about 425 exajoules per year, and today's technology is capable of delivering over 1,600 exajoules of solar power, 600 exajoules of wind power, 500 exajoules of geothermal power, etc. The review notes that "resource availability will not be a limiting factor as the world seeks to replace fossil fuels" (Flavin 2008: 82).

5 The Oil Age and Externalities

As noted earlier, Japan has a host of incentives and opportunities to act on energy and climate change risks. This is especially true concerning incentives to foster sustainable energy in order to further reduce the reliance on oil and other fossil fuels, as well as to promote local development. Sustainable resources exist in abundance, and so do the technologies for exploiting them. What is missing from the mix is sufficiently aggressive fiscal and regulatory action from the central government. The main reason why central state intervention is essential relates to externalities. Simply put, the scale of the externalities involved in climate change and sustainable energy is too large to leave action to subnational governments alone.

A brief definition is in order. In economics an externality exists whenever the condition of one or more actors (generally meaning an individual or a firm) is significantly affected by the consumption or production activity of one or more other actors (Pearce and Turner 1990: 61–67).

There are also two types of externalities: positive and negative. Positive externalities arise when the actions of an individual bring unintended and financially uncompensated benefits to others. One simple example is seen when an individual acquires education. An individual's attainment of basic literacy, and even more so of advanced education, benefits the larger community as well. The positive externalities of fostering sustainable energy are thought to be very large, and include such benefits as the domestic production of power itself (reducing reliance on potentially unstable and costly imports) as well as fostering regional employment and business opportunities.[15]

On the other hand, negative externalities arise when the unintended consequences of what actors do are detrimental to others. Pollution is the classic example in this case. Pollution is deemed a negative externality because one actor's consumption – for example, operating an incinerator – imposes on other actors and the larger community the costs of noxious gases and their health effects. The oil age has a profusion of such negative

[15] Few detailed studies of employment gains in Japan exist, but NEDO projected that a 2010 to 2030 tripling of the domestic renewables market from about 1 trillion to 3 trillion yen would bring a sixfold increase in employment; that is, from 50,000 jobs to 310,000 (METI 2004). These figures seem very conservative. By contrast, Germany's Federal Minstry for the Environment, Nature Conservatory and Nuclear Safety reports that employment in renewables increased 50 percent between 2004 and 2006, going from about 160,000 jobs to 235,000 jobs; see http://www.bmu.de/english/current_press_releases/pm/40029.php (found 12 June 2008).

externalities, and they are rapidly worsening. Climate change is the most salient of all, of course, being a negative externality of global and potentially catastrophic scale.

The crucial point for our purposes here is that significant externalities call for some form of public-sector intervention in order to internalize them, since market mechanisms and voluntary efforts will not suffice. Without state action via smartly targeted taxes, subsidies and regulations (among other policy options), there will be too little of the production or consumption that give rise to positive externalities and too much of the production or consumption activities that bring on negative externalities. Indeed, it is because of the existence of significant externalities that public sectors finance all or some amount of primary education and vaccination, impose penalties for pollution, and the like.

Moreover, the geographical scale on which an externality renders its most salient effects, also points to the level at which the state needs to intervene. An externality whose ambit is primarily local can be dealt with at the local government level, such as through a subsidy (for a positive externality) or an ordinance or fine (for a negative externality). Yet the broader the geographical scale of an externality's impact, the higher is the level of government that is called upon to act. Thus, higher education and basic research are heavily financed by the central or federal government. This is because their benefits spill over the borders of local governments and accrue to the national community as a whole.

The link between externalities and public sector action remains at the core of common sense in economics, particularly environmental economics. The link is also shaping the broader policy-oriented discourse on realistic strategies to deal with climate change. This fact was evident in the October 30, 2006 Stern Review on the economics of climate change.[16] The Stern Review argued that climate change is history's largest market failure, because emitting greenhouse gases into the atmosphere (a global negative externality) is in pecuniary terms "cost-free," whereas it exacerbates the unparalleled problem of climate change.

By definition, then, the environmental problem cannot be left to the market to resolve. Rather, alleviating it to a degree consistent with the threat it poses requires a global solution via an international framework of binding rules.[17] For one thing, the damages from global warming are

[16] See page 1 of the Stern Review, which is available at: http://www.hm-treasury.gov.uk./independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm (found 28 July 2008).

[17] The most recent expression of this argument is seen in the Australian Government's "Garnaut Climate Change Review." The Review's February 21, 2008 in-

visited on the global community as a whole, even though there are local variations in severity. Compulsory and large-scale intervention is also necessary because a non-binding and non-global framework of rules would leave too many opportunities for "free-riding." Free-riding in this case would be evident where some countries or regions leave it to others to deal with the challenges. This is in fact precisely the problem we witness at present. The supranational governance of the European Union has coordinated regional (EU 15) compliance with its Kyoto target of 8 percent reductions as well as launching a new mechanism for 20 percent reductions (compared to 1990 emissions) by 2020. Yet most other countries, including Japan,[18] seem unable to meet their Kyoto targets let alone forge a political consensus on doing more through more stringent emissions targets as well as via fostering sustainable energy.

At present, then, we see a weak regime of rules in the Kyoto Treaty, and the absence of anything to take its place after 2012. Yet we also have increasingly strong and credible warnings that the negative externalities are enormous, and that emissions-reduction targets far surpassing those of the Kyoto Treaty are required. The most recent of these warnings has come from Australia's Garnaut Climate Change Review's mid-term report of February 21, 2008. The report suggests that emissions cuts in excess of 60 percent by 2050 (versus 1990 levels) will be required, and that very strong measures will have to be in place before 2020.[19]

At the same time, the positive externalities of sustainable energy are also enormous. But most sustainable energy sources are at present hindered by cost disadvantages compared to fossil fuels, notably coal. With the exception of some wind-power facilities, sustainable energy is generally more costly than conventional fossil fuel-derived energy, especially when the negative externalities of the latter are not priced in (such as through a carbon emissions tax or carbon trading regime). Most forms of sustainable energy remain infant industries that require market guarantees. These guarantees help to attract investment for further technological

terim report is available at: http://www.garnautreview.org.au/CA25734E0016A131/pages/news (found 12 June 2008).

[18] Japan's obligation under the Kyoto Treaty is to achieve a reduction of 6 percent of its 1990 level of emissions.

[19] As the Review's lead author, Ross Garnaut, argued at a February 21 press conference that "[w]ithout strong action by both developed and major developing countries alike between now and 2020 it will be impossible to avoid high risks of dangerous climate change. The show will be over." See http://www.theage. com.au/articles/2008/02/20/1203467189745.html (found 12 June 2008).

advance as well as for scaling up and thus bringing down unit costs while raising energy-output efficiencies (Mitchell 2008: 178–197).

It is also clear that fostering these positive externalities requires public sector intervention in order to augment investment incentives and accelerate the steps leading to commercialisation of technologies. One can perhaps imagine an international regime wherein such organizations as the United Nations and the World Bank foster sustainable energy research and development as well as investment globally. But aside from a smattering of international projects, and the regional activities of the EU, the core of publicly supported sustainable energy development and installation takes place within countries and by their local, regional and national governments.

The benefits of these projects accrue heavily to local communities, as was seen above with the case of Kuzumaki Town. To some, that heavy local incidence of benefits might suggest that such projects can be left to the local community. Yet, even in the case of Kuzumaki, one major incentive for its investment in sustainable energy is the ability to sell excess power to the local grid. That fact indicates that the externalities spill over local borders and into the regional and national levels. Indeed, it is the national level where the externalities figure most prominently. Escalating fossil fuel prices and geopolitical risks are at the core of any consuming country's national security. Hence, reducing dependence on these fuels is part of the nation's business. The national market also offers the economies of scale to bring ample incentives for research and development as well as investment in installations. This means big business domestically as well as the potential for large export markets.

National rules for subsidies and sustainable energy output targets also provide, at present, the strongest incentives. It is thus clear that the scale of externalities associated with sustainable energy requires a framework of national action to accelerate developments at the local level.

6 Politics and Perverse Incentives at the Centre

In light of the above, it is ironic that the Japanese central government had a comparatively robust national regime of sustainable energy incentives until the 2000s. In 1974, Japan introduced the "Sunshine Project" (*Sanshain keikaku*), followed later by the subsidiary "Moonlight Project" (*Mūnraito keikaku*) in 1978.[20] The former sought to promote research and develop-

[20] On the "Moonlight Project," see http://www.atomin.gr.jp/atomica/01/010502 06_1.html (found 31 May 2008).

ment in energy alternatives, especially solar power, while the latter focused on energy saving. In 1980, the project was designated as the responsibility of a new agency, the "New Energy and Industrial Technology Development Organization" (NEDO). The creation of NEDO also saw the institution of project subsidies, national targets, and the development of a legal framework for fostering sustainables (Usami 2004).

The Sunshine Project was given a further boost in 1993, with the launch of the "New Sunshine Project" and the consolidation of various sustainable energy projects into a co-ordinated effort. This reorganization was accompanied by the introduction of various subsidy programmes to encourage public institutions, households and commercial facilities to install solar and other sustainable technologies. The overarching goal of these projects was to use the public sector to spark innovation as well as foster the markets needed to scale up technology and thus bring down the price of sustainable energy supplies.

Moreover, on April 1, 2003, the menu of sustainable energy subsidies – which assisted the efforts of Kuzumaki Town – was further amended with the introduction of a Renewable Portfolio Standard (RPS) Law. RPS Laws are regulatory mechanisms that generally require electrical producers to produce and otherwise acquire (such as by purchase from independent installations) a specified fraction of their electricity from sustainable energy by a specified year. These laws have been adopted by Belgium, Italy and the UK, as well as 27 US states plus the District of Columbia. In most cases, the RPS target is expressed as a fraction of electrical power as a whole, though in some cases it is expressed as a volume of power.

However, Japan's RPS law has a very low target of merely 1.63 percent of electricity output by 2014. This barely visible target contrasts sharply with the obligations imposed in most other advanced countries. Germany, for example, has already exceeded 10 percent and aims to have 45 percent of its electricity produced via renewables by 2030. Nearly half of US states have RPS systems, with California's targets to be accelerated to 33 percent by 2020.[21] Japan's RPS target is so low that it is actually less than its extant renewable generating capacity. Hence, the electrical utilities simply "bank" the excess of sustainable energy production and apply it to their

[21] A list of US state-level targets is available at: http://gov.ca.gov/issue/energy-environment/ (found 1 August 2008). The US Energy Bill of 2007 was initially slated to install a national RPS of 15 percent by 2020, but opposition by the Bush Administration led to the elimination of the RPS target. Many observers expect that the US will adopt an RPS of at least that scale, once the Bush Administration is out of office in late January 2009 (Lacey 2007).

obligations. The net effect is to further erode incentives for expanding renewables generation.[22]

Japan's low RPS figure was adopted after a protracted and politicised fight in 2001 and 2002. This fight saw market fundamentalists square off against advocates of public-sector action in the face of externalities. The former antagonists included the electrical industries and the METI mainstream, while the latter centred on METI New Energy bureaucrats and a caucus of Diet members (led by former Prime Minister Hashimoto Ryūtarō). The latter lost, and participants describe the episode as a political "trauma" that made it difficult to put sustainable energy back on the policy agenda (Iida 2007).

One fault with Japan's meagre RPS target is easily understood. Whether it is negligible RPS targets or inadequate fuel-efficiency rules, lax public sector goals can bring perverse results. Rather than foster positive externalities, the rules can actually risk blunting incentives by setting a dangerously low ceiling. In this respect, America's low fuel efficiency rules and its domestic auto industry's eroding competitive position seems a useful comparative case for Japan's RPS goals (Carson and Vaitheeswaran 2007).

Additional problems with Japan's RPS have recently become evident through comparative studies of how best to foster sustainable energy. The mechanism that Japan has opted to use – the RPS – differs in kind from what appears to be the most successful incentive system: the feed-in tariff (FIT) with a target. The latter system is seen in Germany and about 46 other countries. The difference between the RPS (or, in the UK, the Renewable Obligation) and the FIT style is not in terms of setting targets. Both systems do this, as we saw with Germany's target of 45 percent by 2030. The difference is in how the market is shaped in order to achieve the targets. The RPS is a quota style arrangement. It sees electrical utilities seeking to achieve the mandated targets by purchasing green electricity certificates (*gurīn denryoku shōsho*)[23] from wind farms and other sources of electricity generated by renewable means.

A further hindrance from the generalised RPS system is that it ostensibly relies on market forces as much as possible in order to achieve its targets. The result is often minimal discrimination among renewable technologies (in terms of their level of support), even though, for example, solar is in need of greater support than windpower, a more established

[22] See http://www.kikonet.org/iken/kokunai/archive/release20070308.pdf (found 12 June 2008).

[23] A description of Japan's certificates is available at: http://www.natural-e.co.jp/green/how_about.html (found 12 June 2008).

technology. In addition, RPS provides no clear and long-term commitment to supporting the development of the renewables industry (Mitchell 2008: 6–14). In Japan, the RPS system is even more acutely hobbled by the ten regional utility monopolies' virtual control of the certificate market. They dominate 99.5 percent of the certificates and apparently coordinate their purchases of renewable power.

The FIT, on the other hand, represents a long-term commitment to the renewables industry because it guarantees the long-term price of the power delivered by renewables producers. At the same time, the FIT incorporates a sliding scale of price guarantees to encourage technological innovation.[24] Moreover, the FIT does this with remarkably little state intervention compared to the often cumbersome and bureaucratic procedures involved in Japan's green certificates as well as those of the UK (Mitchell 2008: 128–129). The FIT also costs the German state itself little, as the subsidising is done through adding the cost of supporting renewables to the utility customers' electricity bill. Spreading the costs so broadly means that the levy for individual consumers is quite small.[25] Germany's FIT is becoming the world's best known, as it has had the most conspicuous success in fostering technological innovation, regional development and other positive externalities (Mitchell 2008: 180–184).[26]

Adding to the problems, Japan scaled down and then eliminated its solar subsidy in 2005 just when the market was taking off globally. This elimination of the subsidy greatly eroded the incentives in Japan's national regime. In financial terms, the amount of the subsidy was not great, but it appears to have played a key role in signalling opportunities to the markets. Japan's growth in solar energy installation and production capacity led the world until the mid-2000s, after which it began being left far behind by Germany's spectacular performance. In 2006, the generating capacity of new solar installations in Germany was 750 megawatts compared to only 300 megawatts in Japan. At least partly due to poor public-

[24] In Germany, installed solar equipment, for example, has the purchase price of its power guaranteed for 20 years. However, the guaranteed purchase price declines 5 percent per annum. This means that new installations will have a guaranteed price that is 5 percent lower than the previous year's price. The ratcheting down of support promotes technological development and efficiency (EPIA no date).

[25] The cost of the feed-in tariff is about 1.50 euro per month (Seager 2007).

[26] No less than 18 of the 25 EU countries use FIT (Mitchell 2008: 181). As of February 14, 2008, California's Public Utilities Commission has turned to FIT for 480 MW of renewable power for small generating facilities; see http://www.cpuc.ca.gov/PUC/energy/electric/RenewableEnergy/feedintariffs.htm (found 13 June 2008).

sector support, Japan's world-beating Sharp Corporation lost its global lead in manufacturing market share in 2007 (*Nikkei Bijinesu* 18 February 2008: 46).

Sustainable energy is now clearly a rapidly growing field in the global economy. It may in fact be the case that renewable energy is at the centre of an energy and environmental revolution comparable to the industrial revolutions of the past.[27] But this is one area where Japan is lagging. The most recent comparative data indicate that Japan's use of renewable energy in its primary energy mix was only 1.9 percent in 2005, versus 4.4 percent for Germany, 3.7 percent for the US, 16.3 percent for Denmark and 17.7 percent for Sweden.[28] The gap has likely grown considerably in the past few years; and barring a major policy shift in Japan, seems set to widen further. As we have seen, Japan's public-sector incentives to expand renewables have become comparatively meagre just as the sector is taking off elsewhere.

This fact has begun to be recognized in international investment and other circles. For example, Japan is ranked low in the "All Renewables Index" compiled by Ernst and Young in their Renewable Energy Country Attractiveness Indices. In the third quarter of 2007, Japan was 20th overall, whereas the US was number one and Germany number two (followed, in this order, by India, Spain, the UK and China). The index is a comprehensive measure of the attractiveness of the subsidies, targets, feed-in tariffs and other supports for renewable energy.[29]

Japan is also not apparently fostering the most notable innovators in these key sectors. The January 2008 edition of the *CNBC/European Business* journal compiled a list of "The Top 100 Low-Carbon Pioneers," meaning firms that are at the cutting-edge of reducing emissions. Only one Japanese firm, Honda, made it to the list, and only in 30th place.[30] Further-

[27] The EU certainly believes this. In a January 10, 2007 press release on a new Energy Policy for Europe, the EU Commissioner for Energy Policy was quoted as declaring that "[i]f we take the right decisions now, Europe can lead the world to a new industrial revolution: the development of a low carbon economy" (Commission of the European Communities 2007).

[28] Note that these figures exclude large-scale hydro, and include wind, solar, marine, small-scale hydro, biomass and other renewables. The figures were compiled from the individual country energy profiles in IEA (2007c).

[29] The index can be accessed via Ernst and Young homepage at: http://www.ey.com/GLOBAL/content.nsf/International/Oil_Gas_Renewable_Energy_Attractiveness_Indices (found 29 July 2008).

[30] The "Top 100 Low Carbon Pioneers" report can be accessed at: http://www.cnbceb.com/Articles/2008/June/38/the-top-100-low-carbon-pioneers.aspx (found 29 July 2008).

more, Japan's daily business newspaper, the *Nihon Keizai Shinbun*, noted on its February 14, 2008 front page that many of Japan's small and medium-sized enterprises have competitive energy and environmental technologies. But they are compelled to seek venture capital and tie-ups overseas due to insufficient opportunities at home.

7 Emissions Reduction Agreements

As to activism on climate change per se, we have already noted Japan's retrograde performance at the 2007 COP conference in Bali. Japan's support for the Bush Administration's efforts to prevent a binding and robust agreement was not out of step with the country's overall policy. This policy has also attracted mounting critical attention. A quantitative approach to assessing individual country's performance in dealing with climate change is offered by the NGO German Watch's Climate Change Performance Index. The index is a "comparison of emissions trends and climate protection policies of the top 56 CO2 emitting nations," and ranks Japan in 42nd place for 2008. The index weights emissions trends at 50 percent of the overall score, followed by emissions levels per se (30 percent weighting) and climate policy (20 percent weighting).[31] Japan's performance actually dropped from 39th place in 2007, whereas China moved up from 44th place in 2007 to 40th place in the 2008 index.

8 Japan: Betting on Efficiency and Nuclear Energy

In the absence of a serious sustainable energy and climate strategy rooted in its own local interests, the Japanese central government appears caught in a vice of free-market and pork-barrel interests that leaves it little leverage to lead. Energy and climate risks spilled into the international debate in the mid-2000s. But Japan seemed unable to move decisively. It appears instead largely inclined to move incrementally along remaining policy patterns from the past, betting heavily on efficiency and nuclear energy.

As to the former, on January 26, 2008, the then Japanese Prime Minister Fukuda Yasuo addressed the World Economic Forum in Davos, Switzerland, and offered to lead the global community towards a target of 30 per-

[31] The top five countries for 2008 were Sweden, Germany, Iceland, Mexico, and India. The index is viewable online (in English) at: http://www.germanwatch.org/klima/ccpi2008.pdf (found 13 June 2008).

cent improved energy efficiency by 2020.[32] This is a slight hastening of Japan's 2006 "New Energy Policy" target of 30 percent efficiency gains by 2030. We saw in table 2 that Japan's energy efficiency is indeed among the first-rank, especially when compared to the relatively low average efficiency in the United States. Japan's "energy intensity" (which measures how much energy is consumed in producing a given unit of economic output) is comparatively low, as is its consumption of "oil equivalent" (energy measured in units of oil) per capita. Japan's CO2 emissions per capita and per unit of economic output are also quite good.

One significant problem with stressing energy efficiency is that this approach risks worsening the GHG and climate change problem in the absence of a robust regime for pricing carbon emissions. Energy efficiency can actually encourage greater energy consumption, through what is known as "Jevons' Paradox" or the "rebound effect" (Polimeni *et al.* 2008). That is, more efficient use of the fuel for powering a device (such as a car) leads to lower operating costs. This cheapening of operating the device can lead to greater overall consumption of fuel by encouraging individual users to consume more (as in driving much greater distances) or in making the purchase and use of the device more economical for many more people. Most tests of the rebound effect have been conducted in countries or regions, and have led to a variety of results. Sometimes there is only a limited rebound effect, as a circumscribed population often has a limit in its excess consumption. Put another way, most people might not be inclined to drive increasingly long distances just because their vehicles get better mileage.

But it is clear that the rebound effect has to be thought of, potentially, in terms of several billions of consumers, and not just the consumers in the industrialized societies. In short, here again our current challenges are global in scale. We confront rapidly escalating demands for fuel in a regime of rising prices as well as very high growth in countries with enormous populations. Stressing efficiencies only risks encouraging even higher rates of fossil fuel consumption by reducing operating costs (per kilometre for a car, per kilowatt for a coal-fired power plant), while neglecting to address the problem of GHG emissions.

Japan is betting heavily on expanding nuclear power as the answer to the problem of power supply as well as GHG emissions cuts.[33] The above-

[32] An English translation of Prime Minister Fukuda's speech can be accessed at: http://www.kantei.go.jp/foreign/hukudaspeech/2008/01/26speech_e.html (found 13 June 2008).

[33] One astute observer of the Japanese political economy has even declared Japan "nuclear obsessed", because it puts plutonium at the centre of its energy economy (see McCormack 2007).

noted New Energy Policy aims at making nuclear power the key driver in Japan's electricity supply by raising its role to 30 to 40 percent of electricity supply by 2030. The nuclear lobby appears to have much of the R&D budget locked up[34] and to have the attention of the political and bureaucratic elite in the central government. They appear to see nuclear power as the only realistic option for reducing dependence on fossil fuels and cutting emissions, and are also keen on making nuclear power a major export business.

There is considerable literature on the dangers posed by Japan's nuclear programme and the political legacy left by its seemingly routine mishaps. The politics of getting a large number of new nuclear plants off the drawing board and into local sites seems difficult indeed (McCormack 2007). Moreover, even the IPCC sees at best a small role for nuclear energy at the global level, increasing from the current 16 percent of world electrical generation to about 18 percent by 2030. For the IPCC, this limited role stems in large part from the fact that "safety, weapons proliferation and waste remain as constraints" (IPCC 2007: 13). An April 2007 study published by the US Council on Foreign Relations concurs with the IPCC. The study concludes that "[n]uclear energy is unlikely to play a major role in the coming decades in countering the harmful effects of climate change or in strengthening energy security" (Ferguson 2007: v). The reasoning behind this conclusion is that the only way for nuclear power to play a significant role would be to opt for very rapid deployment of reactors. But such a rapid deployment policy would present unacceptable risks: "[the] nuclear industry would have to expand at such a rapid rate as to pose serious concerns for how the industry would ensure an adequate supply of reasonably inexpensive reactor-grade construction materials, well-trained technicians, and rigorous safety and security measures" (Ferguson 2007: 3).[35]

[34] According to the International Energy Association's 2006 publication "Energy Policies of IEA Countries 2004 Review," fully 64 percent of Japan's budget for energy R&D went to nuclear energy (IEA 2006: 33).

[35] Note that the Oxford Research Group's March 2007 report "Secure Energy? Civil Nuclear Power, Security and Global Warming" also declares that nuclear power is both very dangerous and will not reduce GHG emissions by much in any reasonable time horizon; see http://www.oxfordresearchgroup.org.uk/publications/briefing_papers/secureenergy.php (found 13 June 2008).

9 What is Missing?

Faced with the central government's political immobility over energy and climate risks, there is new movement at the local level in Japan. Some of the activism includes proposals for prefectural and urban carbon and environmental taxes (in Kanagawa and Kyoto, respectively). There has even been an "environmental tax" imposed inside Kyoto University on electricity consumed across the campus.[36] In addition, the biggest local government in Japan, the mega-city of Tokyo, is seeking to move decisively on energy projects. Tokyo's package of incentives is a work in progress as of writing (February 2008), but one thing is clear: Tokyo will aim to achieve a target of 20 percent renewables in its power generation by 2020 (versus the central government's target of 1.63 percent by 2014). Whether this moves the central government to match or exceed the target is unclear.

Most of these new efforts certainly have the potential to have a stronger national impact than Kuzumaki Town's efforts. Even so, there is a risk that their spillovers will be inadequate in the absence of national leadership and rules. Without strong decentralised governance (even after several years of decentralisation), the national government's leadership remains critical in Japan.

Indeed, national and supranational leadership is critical in all cases, because the scale of the challenge is global. But some countries are more advantaged in this respect than others. If we think of the EU as a political and economic region, we can see that the activism of Germany is generating a host of positive political and economic externalities. Among other things, Germany presents a visible model of success that is pulling the EU along and enhancing the incentives of the latter to adopt region-wide rules. The existence of the EU, and the relative lack of vested oil-age interests in the EU political economy, is opening the door to regional diffusion of targets, technology and all the opportunities that go with them.

In the United States too, the lack of activism at the federal level during the Bush Administration has seen at least 24 states (as well as the District of Columbia) turn to RPS laws. The bulk of these state rules incorporate double-digit targets over the next 15 years, and there is a recent trend to adopt FIT rules as well in order to achieve the targets.[37] What is of partic-

[36] See http://sankei.jp.msn.com/life/environment/080121/env0801212218003-n1.htm (found 13 June 2008).

[37] The US Department of Energy has an online map (current to June 2007) that displays the individual states' targets; see http://www.eere.energy.gov/states/maps/renewable_portfolio_states.cfm (found 13 June 2008).

ular note is the geography of the rules in America. The most activist US states are in the West and Northeast, such as California and New York. These are America's most advanced technopolises, with the richest networks of research centres, venture capital and other advantages. These regions set the trends and develop the technologies that are later diffused throughout the US and the rest of the world. This process is almost certain to go nationwide in the US with the end of the Bush Administration in January 2009, as well as the further decline of its ideological allies in the US federal Congress.[38]

In spite of this movement and success elsewhere, we have seen that at the national level Japan remains stuck with a very light regime of targets. Outside of the plentiful subsidies, and other support flowing to nuclear power, Japan's emphasis is on free-market or voluntary mechanisms to foster energy alternatives and efficiency.

There is no single, overarching reason for Japan's political immobility at present. But several can be elucidated. It would appear that one of the most salient roadblocks in the Japanese case is the turn towards free-market mechanisms since the mid-1990s, at the expense of concerns for coping with externalities through the agency of the public sector. This approach was clearly bolstered by the rush of enthusiasm for free-market mechanisms under the 2001–2006 prime ministership of Koizumi Jun'ichirō. The failed challenge to the electrical industry and its allies in METI has seen a preservation of monopoly political and economic markets under the banner of market fundamentalism. This approach has in turn been bolstered by support from Nippon Keidanren (the industry's peak association), with its emphasis on voluntary GHG emission-reduction agreements and staunch opposition to carbon taxes and cap-and-trade mechanisms.[39]

A second problem is the continued concentration of decision-making in the central state and its diffusion among several agencies. For one thing, centralisation inhibits initiative at the local level in favour of policy preferences determined at the centre. Japan is still largely a centre-led polity, a heritage of institutional centralisation for war-fighting and postwar reconstruction (Andō 2007: 319). Recent moves to decentralise Japan's inter-

[38] The original draft of the US Energy Bill for 2007 included a 15 percent (by 2020) nationwide RPS rule and other measures to foster renewables, but these were removed after the Bush White House threatened a veto. Most observers expect similar, and probably tougher, rules to come back on the agenda in 2009.

[39] Some measure of the stridency of Nippon Keidanren's emphasis on voluntary mechanisms can be gleaned from the English translations of its policy announcements; see http://www.keidanren.or.jp/english/policy/index07.html (found 13 June 2008).

governmental relations have succeeded mostly in passing costs (especially those related to ageing) down to lower levels of government. This shifting of fiscal risks likely detracts from local government incentives to move out in front of the central government; that is, in addition to the previous blunting of incentives through the strong perception that renewables are a "boutique" area and limited in their potential. All of this reduces the "pressure from below" (i.e., from local governments) to act on the externalities reviewed earlier.

Moreover, environmental and energy issues are a vast area of policy-making, with multiple agencies in charge of different aspects of it. This diffusion of responsibility helps perpetuate the lock-down on funding and other policy levers enjoyed by fossil-fuel and nuclear interests.

Exacerbating this problem is the return to a lack of leadership at the centre. In spite of its commitment to market mechanisms and to staying politically close to the Republican Administration in America, were the Koizumi Administration still in power, it might have realised by now that Japan's national interests were at risk by leaving externalities to the market and voluntary efforts. Koizumi and his allies at least possessed the political skills and credibility to give them a chance to make changes to institutions as well as to fiscal flows. But in the wake of Koizumi, there have been only weak Prime Ministers. The Abe regime (2006–2007) lacked both the interest and the authority to act strategically on sustainable energy environment and climate. And while the Fukuda regime (2007–2008) seemed more interested in energy and the environment than was the hapless Abe, it lacked the authority to make serious changes. This appears evident in the concentration on nuclear energy and efficiency as well as the bizarre prospect of Japan's adopting a ten-year, 59 trillion yen road-building programme in advance of hosting the G7 summit on the environment in July of 2008. It is the dominance of special interests in spite of an increasingly precarious national interest.

Japan's central government is certainly hard-pressed to act on any issues outside of those immediately concerned with ageing, public debt and economic recovery, but the past several years of internecine politics in the LDP have evidently sapped the centre's capacity to deal with other pressing matters. There remains, surprisingly, little recognition that sustainable energy offers a growth machine that could alleviate growing inter-regional and inter-personal inequality. The Japanese policy elite is caught in an outmoded policy paradigm that ignores the critical role of the public sector in shaping efficient and effective markets. Japan therefore risks being marginalised as well as losing the local development benefits that are accruing in particular to Germany as well as to the US.

It is unclear how long Japan will continue spinning its wheels while an already sobering energy and environmental crisis increasingly spills over into a host of policy areas, including food costs. As head of the G7 in 2008, Japan risks appearing irrelevant. Yet Japan also seems committed to its bet on nuclear power as virtually the only energy alternative, supplemented with increased efficiency, when much of the rest of the developed and developing world is seeking to foster renewable technologies. It may be the case that nuclear power and efficiency turn out to be the wedge technologies that shape the future. But as we have seen both are fraught with risks. Nuclear power is clearly dangerous, not to mention highly capital intensive with minimal, if any, benefits for local areas.[40] Efficiency seems a smarter bet as a wedge, but not without simultaneously costing carbon emissions (through carbon taxes or cap-and-trade) in order to contain the potential for a massive, global rebound effect.

Moreover, there is a practical limit to how much energy consumption can be cut. It seems likely that all reductions from conservation in the developed countries will be more than made up for by energy demand growth in the rest of the world. Efficiency and conservation are touted as virtues, and they are to an extent, but we should not be misled about their limits. The key to our collective energy and climate crises is plenty of clean power, and fast.

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[40] Indeed, in Japan the local subsidies that come attached with accepting nuclear energy plants are often less than the erosion of the local economic base as businesses and residents decamp.

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