論　文

Tipping Points:

The State of Governing Energy and Food Risks in Japan (1)

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As we entered 2008, the prices of both food and energy on global markets escalated even more rapidly than they had in the previous year. The prices are nearing tipping points that, once overtaken, threaten a cascade of economic catastrophe and human misery. Driving these commodities' costs headlong are supply concerns, speculative activity and strong global growth – especially outside of the OECD countries – rooted in the political economy of the oil age. By that latter term we mean economic growth that is dependent on oil as the primary source of energy (36 percent of all primary energy at present) as well as a critical input into other economic processes. These processes include transportation, where oil provides about 90 percent of the fuels; the manufacture of innumerable goods; and even the production of fertilizers.

The current energy and food crises are hence in many respects intimately related. We can refer to them as concatenating crises because they exert a profound influence on one another. The economy runs on oil and other hydrocarbons, which collectively compose about 85 percent of primary energy. Supply problems and other concerns in energy markets send price shocks throughout the economy, including food production and distribution. After all, the production and transport of food requires enormous amounts of energy, so much that each calorie of food represents about 10 calories of energy. These 10 calories of energy are consumed through fuel for tractors and other equipment, the hydrocarbons used in producing fertilizers, the fuel for shipping, hydrocarbons used in producing the packaging for food items, and so on. Moreover, supply constraints and geopolitical risks in oil have seen a turn towards biofuels production. This biofuel production is heavily reliant on basic food crops (especially corn), thus raising their prices even further. So there is a special irony

that links food to the oil age, because food is being used to extend the oil age. Over 60 percent of non-OPEC countries' liquid fuels production increases in 2008 will be bio-fuels. The inflationary and other fallout from these trends is especially heavy in developing countries, making the energy and food crises significant threats to global peace and prosperity.

Among the developed countries, as we shall explain in greater detail below, Japan's exposure to the energy and food shocks is remarkable. For example, oil provides about half of Japan's primary energy, and Japan imports virtually all of the oil it uses. Further, Japan imports just over 60 percent of its food consumption (calculated on a calorie basis). There are a host of risks inherent in this extreme dependence on external sources, and so one might expect Japan – a stable, developed democracy – to have innovative and effective policy regimes for dealing with them. Indeed, as the risks of this unparalleled external dependence climbed in recent years, one might also expect to see bolstering of such smart policy regimes.

Yet we argue in this paper that Japan's energy and food policy regimes are notable for their failures. The key problems are found in contrasting biases in governance. Energy policy has of late relied too much on the allocative role of markets in a quest for efficiency, exacerbating a wide range of risks. By contrast, food production in Japan has been heavily dominated by poorly-deployed tools of the state. In short, we see policy failures rooted in excessive reliance on, respectively, either side of governance's great institutional divide : the market and the state. Japan needs to work towards a truly innovative "third way" in these policy spheres.

This paper will be split into two sections, running consecutively. The first section will treat energy issues. The second section will focus on food, and will also include an extended set of concluding arguments. Hence, in the below we address the energy problem.

Energy and Japan

Contemporary Japan faces a sobering set of challenges. The most politically prominent of these are demography, debt and the socioeconomic decline of regions outside Tokyo and other globally competitive urban areas. As is well known, Japan is the developed world's most rapidly ageing state, its population is shrinking, and – at roughly 180 percent of GDP – its public debt has reached levels hitherto unheard of for

a country not at war. Inter-regional inequality is also growing rapidly, exacerbated by poor performance in dealing with these other policy challenges. Compounding Japan's problems is the failure to build a domestically-oriented and sustainable new growth engine in the wake of the early 1990s collapse of the bubble economy[1)].

But along with the other developed countries, not to mention the rest of the world, Japan confronts even more bracing challenges in the energy field. The global energy sector, as a whole, is an increasingly fraught narrative of narrowing supply-demand balances, unfavourable geopolitical trends, and other risk drivers. To add to that, energy is part of a further concatenating risk complex : that of climate change. The latter is so bracing that scientific revelations on the current and probable future state of the environment read like dystopic science fiction. In this section, the energy and environmental challenges will be addressed together because they are closely related and afford ample incentives for action.

Conventional wisdom holds that Japan is a leader in addressing the global community's energy and environmental challenges. Japan's reputation in this respect is neither inexplicable nor entirely undeserved. For one thing, Japan responded adroitly to the oil shocks of the 1970s. And fortuitous for Japan, the world's first formal agreement to cut greenhouse gases – the Kyoto Treaty – was drawn up in, and is thus named after, one of Japan's iconic cities. The public relations value of this eponym is simply inestimable. In addition, note Japan's energy-abstemious infrastructure : its public transport systems rank among the world's best in terms of their efficiency, diffusion and other important aspects. Indeed, one would expect Japan to lead on environmental and climate issues. Among a host of other advantages and incentives, Japan is rich, has a history of public-sector activism, has virtually no domestic fossil-fuel energy reserves, and faces daunting threats through global warming and its attendant effects. In short, Japan does not have entrenched fossil-fuel extraction industries using all means to protect their vested interests. Japan is also highly vulnerable to the geopolitical and other risks of fossil-fuel dependence as well as the physical, political and other effects of climate change. So one would think it would be setting the bar for the global community on this issue.

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1) Japan's "structural reforms" during the Koizumi and Abe regimes (2001–2007) centred on dismantling the public sector per se rather than revising its role in creative directions. In consequence, Japan's growth has since then has relied largely on exports into the unsustainable nexus of American overconsumption and Chinese overproduction (DeWit 2007)

But Japan is not, in fact, leading on energy and climate change. The signal reason for this is Japan's commitment to voluntaristic, market-centred mechanisms rather than the fiscal, regulatory and other levers of the state, especially the central state. Japan is, in other words, making poor use of the public sector. 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. This paper therefore examines the political economy of Japan's surprisingly restricted energy and environmental performance.

Japan: At the Head of the Dash from Oil?

It is important to note at the outset that, among the big OECD countries, Japan is especially vulnerable to the mounting risks of the oil era. For one thing, Japan remains very highly dependent on oil. In 2004 Japan had the highest level – 48% – of dependence on oil in its primary energy mix[2] among the major OECD economies. Like some of the European countries, Japan also relied on imports for virtually all of its oil supply. But Japan's 89% reliance on the Middle Eastern oil producers simply has no parallel among the major OECD countries. The notion that Japan is surely leading the trek out of the oil age needs to apprehend empirical reality.

The conventional wisdom on what happened after the 1970s oil shocks depicts a Japan that diversified its sources of energy supply, cut its nearly 80 percent dependence on oil in its energy mix, and squeezed as much production as possible from its imported energy. Japan is now often regarded as the world's poster-boy of energy efficiency, not to mention environmental awareness[3]. Japanese business lobbies, especially the peak business association Nippon Keidanren[4], highlight these points in

2) 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.

3) On May 21 of 2008, for example, the Globe and Mail newspaper (Canada) ran a column ("As oil soars, Japan's plan makes a lot of sense") that praised "Japan's remarkable success at reducing its dependence on oil." http://www.boston.com/news/globe/editorial_opinion/editorials/articles/2007/03/26/green_and_growing/

4) Some measure of the stridency of Nippon Keidanren's emphasis on voluntary mechanisms can be gleaned from the English translations of its policy announcements: http://www.keidanren.or.jp/english/policy/index07.html

their lobbying against mandatory GHG emissions cuts, energy-efficiency increases, renewables targets, and related public-sector-led goals. They insist that they have made all the efforts possible, and liken themselves to a "dried-out sponge" (kawaita zoukin) when it comes to the capacity to do more.

Some of this conventional narrative is correct. Among other notable policies, Japan did shift much of its electrical generation from petroleum to nuclear power and natural gas and made great strides in boosting its energy intensity[5]. But most of the other developed economies also took more or less drastic steps to deal with the oil shocks, including shifting away from oil dependence[6], enhancing automotive and other fuel efficiencies, and the like.

As with other oil-importing countries, Japan's incentives to continue aggressively pursuing ever-greater energy efficiencies and renewable energy weakened in the 1980s. For one thing, the 1980s saw a flood of oil from new sources, such as the North Sea, Prudhoe Bay (Alaska), and the Soviet Union. Dreaded OPEC's share of world production dropped to 30% in 1985, and the Saudi and American elite forged stronger bonds. This encouraged the Saudis to use their then ample surplus production capacity to keep oil prices low. The consequent flood of oil from the early 1980s, together with the effects of conservation and the shift to alternatives – such as natural gas – wherever possible, brought about a drastic drop in oil prices. And the 1990s saw even cheaper oil, aside from a brief price spike in the lead-up to Gulf War 1. Prices in the 1990s plunged so far that in its March 6, 1999, edition The Economist declared that the world was "drowning in oil," and fretted that the price might drop to $5 per barrel and destabilize Middle Eastern regimes.

Japan's incentives to act weakened even further in the 1990s, as it coped with the collapse of the late 1980s bubble economy. Multiple rounds of Keynesian stimulus (through large tax cuts and public works packages) failed to pull the economy free of its morass of bad loans. Under the Koizumi Junichiro regime (2001–2006) attention

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5) This refers to the amount of energy – measured in "barrels of oil equivalent" or "BOE" – that is used to generate a given unit of GDP. The less energy used, the better the efficiency.

6) The Swedes, for example, cut their oil dependence from – like Japan – nearly 80 percent in the early 1970s to about 32 percent in 2004 (versus 48 percent in Japan in roughly the same year). Cognizant of the risks we emphasize in this paper, the Swedish state aims to reduce that dependence as much as possible by 2020 (Commission on Oil Dependence 2006), whereas Japan's New Energy Policy of June 2006 aims at getting oil dependence down to 40 percent by 2030.

turned to a determinedly neoliberal approach of deregulation, decentralization and dismantling the state sector. The guiding principle in this reformism has been cutting public-sector costs and rules in order to allow the market as much free reign as possible. The creative role of the public sector, especially at the national level, has been diminished.

The upshot for the environment and energy is that Japan's green efforts slowed further even as the Europeans (in particular) were initiating and strengthening a raft of policies to foster greater efficiencies and green energy. From the start of the 1990s, for example, Germany has introduced a variety of subsidy and other programmes to foster renewable energy centres in the former East Germany. These policies are paying off handsomely in generating revitalized regions, new export industries, and the global branding of Germany as a green leader[7]. Similar policies undertaken elsewhere, increasingly in China and the United States (at the state level), are generating increasing returns as the global economy rushes to go green[8].

As a result of resting on its ecological laurels while competitors continued with the heavy lifting of further revising their politico-economic institutions, Japan's technological lead has eroded. Japan's energy efficiency and GHG emissions results (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.

As we shall explain in detail below, renewable energy is one of the green growth fields in the global economy. It is indeed quite likely that renewable energy is at the centre of an energy and environmental revolution comparable to the industrial revolutions of the past[9]. But this is one area where Japan is lagging. Japan's use of

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7) The geography of Germany's renewable energy boom is striking. Its photovoltaic industry is centred in the former East Germany, as 33 of Germany's 45 producers are start-up from the east and employ 70 per cent of the industry's workers (Dumiak 2007).

8) The United Nations Environment Programme reported on June 20, 2007, that investment in renewables leapt 158 percent from 2004, to reach over USD 100 billion in 2006. The pace of growth is expected to increase even further, especially as investment is ramping up in China, India and other developing countries (UNEP 2007).

9) 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 "If we take the right decisions now, Europe can lead the world to a new industrial revolution : the development of a low carbon economy" (Europa 2007).

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 in Denmark and 17.7 percent for Sweden[10]. Moreover, Japan is low-ranked on the "All Renewables Index" compiled by Ernst and Wiley in their Renewable Energy Country Attractiveness Indices. In the 3rd Quarter of 2007, Japan was 20th overall, whereas the US was number one and Germany number 2 (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[11].

Japan is also not apparently fostering innovators in these key sectors. The journal CNBC/European Business compiled a list of "The Top 100 Low-Carbon Pion eers," meaning firms that are at the cutting-edge of reducing emissions. Only one Japanese firm, Honda, made it to the list, and only at 30th place[12]. As surprising, Japan's world-beating Sharp lost its global lead in market share in 2007, at least partly due to poor public-sector supports (Nikkei Bijinesu 2008).

As to activism on climate change, per se, Japan was also behind most of its developed-country counterparts. German Watch's Climate Change Performance Index – a "comparison of emissions trends and climate protection policies of the top 56 CO2 emitting nations" – ranks Japan in 42nd place for 2008. The index weights emissions trends at 50% of the overall score, followed by emissions levels per se (30 percent weighting) and climate policy (20 per cent weighting)[13]. 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.

It matters when the world's second-largest economy is not gearing up to produce low-cost and sustainable energy technology. We are clearly in a protracted crisis wherein what the public sector does matters a great deal concerning the structure of incentives confronting investors, consumers and other economic agents. Momentum matters as well, which makes Japan's slowness to respond of particular

10) 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).

11) http://www.ey.com/Global/assets.nsf/International/Industry_Utilities_RenewableIndices-Q3-07/$file/Industry_Utilities_RenewableIndices-Q3-07.pdf

12) http://cnbceb.com/2008/01/01/the-top-100-low-carbon-pioneers/

13) The top five countries for 2008 were Sweden, Germany, Iceland, Mexico, and India. The index is viewable on-line (in English) at : http://www.germanwatch.org/klima/ccpi2008.pdf

concern. The contemporary energy and environmental crises bear little resemblance to the previous oil shocks. We shall devote considerable space below to describing these risks, as they are of a scale hitherto unseen. Taking on these challenges offers Japan the growth engine it has lacked. Not taking them on risks a costly worsening of the other problems.

Increasingly Costly Energy

The escalating cost of energy is perhaps the most visible of the numerous problematic energy and environmental trends in the present. The market costs of fossil-fuels have skyrocketed in the 2000s, with the benchmark West Texas Intermediate price of oil rising from about USD 28 per barrel in 2000 to over USD 130 per barrel in early May of 2008. The price of coal also climbed from about USD 30 per tonne in 2000 to about USD 130 per tonne in early 2008. It is anyone's guess whether, in the short term, these prices will rise further. They may, or they may fall substantially for a brief period if the global economy goes into a deep recession due to the spreading fallout from the subprime-driven financial crisis.

But even if 2008–2009 sees a deep recession with plenty of "demand destruction," demand for fossil fuels will bounce back. The economic take-off of China, India and other populous countries ensures increasing demand for energy. Much of that energy will be derived from fossil fuels unless alternatives can be scaled-up rapidly. One reason for this gloomy forecast is that over 80 percent of primary energy is at present provided by fossil fuels. The International Energy Agency's (IEA) data for 2006 show that oil provided 35 percent of primary energy, coal 25 percent and natural gas 21 percent (IEA 2007). The IEA's 2007 projections also indicate that a "business as usual" (ie, no change to present policies) scenario will lead to a 53 percent increase in energy demand between 2004 and 2030 (IEA 2007). Moreover, the IEA also forecasts that fossil fuels will satisfy 84 percent of that demand. Therefore, pressures on fossil-fuel prices seem unlikely to let up over the medium and long term.

There is another factor at work here : peak oil production. As with any of the myriad arguments about energy outlooks, technologies and the like, the peak oil debate runs the gamut from reasoned discourse[14] to such extremist claims that

14) Note, for example, the US Government Accountability Office's 2007 report on peak oil concerns (GAO 2007).

civilization is in imminent peril of plummeting back into the prehistory of the Olduvai Gorge (eg, Duncan 2005–2006). But the sensible core of the peak oil debate is that oil is a finite resource and therefore has a production maximum, after which production volumes will taper off[15]. It is not an assertion that the world is "running out of oil." Complete exhaustion of oil reserves is in fact physically impossible, not least because even the best recovery rates in oilfields see nearly half the oil remaining in the source-bearing rock it is drawn from.

But note that satisfying increasing oil demand requires making up for depleting production from existing, older wells[16] and then adding the increments of supply from new projects. Current oil production levels of over 85 million barrels per day cannot, in other words, be taken for granted as a big bucket of production into which new supply is simply added. Rather, the current production level perhaps ought to be seen as it is : the collective output of oil wells whose individual production profiles follow a fairly predictable, parabolic pattern of discovery, exploitation, peak and decline.

No one knows whether the world's oil production maximum will be hit next year or in a decade or two (or three). What we do know is that low-cost and high-quality (ie, containing little sulphur and other impurities) reserves of oil are in large measure depleted (King 2008)[17]. The end of so-called "easy oil" is forcing international oil firms to turn to increasingly deep offshore oil as well as such unconventional (and quite environmentally destructive) sources as the tar sands in Canada. Project costs have been increasing accordingly. These cost increases are amplified by technological difficulties, escalating commodity and equipment costs (eg, for steel and drilling rigs), and are further exacerbated by the energy industry's severe and protracted shortage

15) Perhaps the best on-line sources concerning peak oil is the web site of the "Association for the Study of Peak Oil&Gas (http://www.peakoil.net/) and "The Oil Depletion Analysis Ce ntre" (http://www.odac-info.org/).

16) The furious debate over precise depletion rates is impaired by the lack of transparent and comprehensive data. But even the most optimistic of sources, Cambridge Energy Research Associates, declared in January 2008 that global average depletion rates are about 4.5 percent per year. The Wall Street Journal's in-house energy expert noted that even at this rate of depletion, coupled with rising demand, by 2017 we would "require adding 59 million barrels a day in new capacity – or more than six times today's output from Saudi Arabia, the world's largest exporter" (King 2008).

17) Shell Europe's Vice President of Exploration made that fact clear on February 12, 2008, when he said "[t] here is no more easy oil." See Offshore Oil & Gas News, February 12, 2008 : http://www.energycurrent.com/index.php?id=2&storyid=8801

of talent and infrastructure (Acerra 2008, England 2007, Platts 2007).

Such trends not only suggest that market prices for fossil fuels will continue rising. They also imply a new set of risks as fossil-fuel demand vies with supply and erodes global spare production capacity. Oil is only the most striking case of this phenomenon. As the International Energy Association noted in its June 2007 "Medium Term Oil Market Report," "Despite four years of high oil prices, this report sees increasing market tightness beyond 2010, with OPEC spare capacity declining to minimal levels by 2012."

This projected decline in already tight spare capacity adds upward pressures on prices and also worsens the risk of an "oil shockwave."[18] Even though all IEA countries hold strategic reserves of oil to cover short-term disruptions in supply, the exogenous shock to financial and other markets through a terrorist attack, regional war, or other such catastrophic event would be considerable and likely quite destabilizing.

Thus mounting geopolitical risks can be added to these increasing pecuniary costs and risks. We have seen that swelling demand and difficulties in boosting supplies are among the main drivers of energy risks. Another driver is the geopolitical fact that the most sought-after fossil-fuel reserves (ie, oil and natural gas) are becoming ever more concentrated among unfriendly or potentially unstable regimes in the OPEC countries, Russia, Iran, Nigeria and elsewhere. The international oil firms are generally depicted as the "bad guys" when energy prices go up. But in fact they are losing their clout in the energy marketplace as well as in the global councils of power, as they now produce only 10 percent of the world's oil and hold only 3 percent of its reserves. By contrast, the "new seven sisters" – the huge nationalized firms that include Russia's Gazprom, Saudi Aramco, and China's CNCP – control about one-third of known oil and gas reserves as well as comparable shares of oil and gas production. They are also expected to dramatically increase their level of control and hence their leverage over consuming countries (Hoyos 2007).

This all matters a very great deal, as oil is the kingpin of the three fossil fuels, being at present largely irreplaceable as a fuel for transportation. As we shall describe in more detail in sections 2, seeking to replace even part of oil through so-

18) This threat is taken very seriously, especially in the American national-security community. See, for example, the description of their June 23, 2005 "scenario exercise," which was subsequently run at the January 26, 2006 Davos conference of the World Economic Forum : http://www.secureenergy.org/shockwave_overview.php

called biofuels has succeeded largely in driving up grain and soybean prices to dangerous levels[19].

Confronting Climate Change

But climate change appears to be an even larger threat over the medium and long-term. The four reports of the United Nations Intergovernmental Panel on Climate Change (IPCC), published through 2007, showed that the scientific evidence is conclusive : The consumption of fossil fuels has driven atmospheric greenhouse gases levels to well beyond those recorded in samples dating as far back as 650,000 years ago. The reports warn of 20 to 30% of plant and animal species being rendered extinct by even a 2 degree Celsius rise in average temperature (largely believed to be unavoidable due to the effects of greenhouse gases already emitted). The reports also highlight the mounting risks of drought, further acidification of the marine environment, the accelerated melting of Greenland and Antarctic ice sheets, and a plethora of other sobering consequences.

The IPCC's 2007 revelations are frightening enough, yet many climatologists regard them as rather optimistic. For one thing, the process of creating the reports necessarily takes considerable time, thus dating the observations. The fact that the IPCC is a UN body has also led to considerable political interference in its publications. And that is in addition to the normally conservative approach of natural scientists towards the release of research findings and announcement of conclusions. In concrete terms, the IPCC reports do not include recent evidence of accelerated melting of the icecaps, the warming of the sub-arctic tundra and so on, plus the frightening feedback effects associated with these developments (Hansen, et al).

So the threat is likely even greater than the already bracing warnings from the IPCC would indicate. Most germane to our immediate purposes here, Japan's exposure to the fallout from climate change has been ranked among the highest in the world. In cooperation with Munich Re (the world's second largest reinsurance firm), the climate-change specialist NPO German Watch rated Japan as 8th in the world for losses from extreme weather events in 2004[20]. At a mere 40% of overall consumption,

19) As Lester Brown of the Earth Policy Institute notes, the world began 2008 with "the lowest grain stocks on record [and] the highest grain prices ever" (Brown 2008).

20) The Report is available at the following URL : http://www.germanwatch.org/ccpi.htm

Japan also has the industrialized world's lowest level of self-sufficiency in food supplies[21]. This is a particularly important figure because the Food and Agricultural Organization also reports that rising energy prices, the production of biofuels, climate change and other factors have combined to raise grain prices by approximately twice their levels in 2000 (Blais 2007). Though some optimistic projections of climate change suggest we can expect an agricultural cornucopia from elevated CO2, recent evidence suggests otherwise (McKenna 2007)[22]. As a consequence of climate change (in addition to the biofuels boom), Japan may very well face long-term cost increases for food as well as the threat of outright scarcity in the overseas markets upon which it depends so heavily.

To Japan's enormous mix of risks from climate change, we can add climate-related diseases, worsening natural disasters, regional political destabilization from environmental refugees (especially in Bangladesh) and water shortages, and a host of other serious threats[23].

Climate change is especially difficult to deal with because it stems from our core consumption activity (ie, energy consumption), is global and is largely generational. The 2006 Stern Review on the Economics of Climate Change rightly deemed it "the greatest market failure the world has seen."[24] The free-rider problem, wherein agents are able to leave it to others to act, seems insurmountable without global cooperation. And current generations will perhaps always confront the temptation to skimp on counter-measures since the worst consequences of "business as usual" will accrue to future generations. Add to these facts the political power of vested interests, especially in the energy field, and one has a recipe for a dangerous do-nothingism ; or at the very best a policy incrementalism that simply cannot keep pace with the worsening of the phenomenon and its attendant risks.

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21) Figures for France, Germany, the US, UK, http://www.chushi.maff.go.jp/jikyu/toha/toha_3_2.htm

22) Economist William Cline, one of the world's foremost authorities on agriculture, reports that climate change could see yield losses by the 1980s of 5 to 20 percent globally, but with a strong concentration in India (30–40 percent) and Africa and Latin America (upwards of 20 percent). See Cline 2007.

23) The threat to the Asian region was studied in depth in the 2006 report "Heating up the Planet : Climate Change and Security," by Australia's Lowy Institute for International Policy (see Dupont and Pearman 2006).

24) http://www.hm-treasury.gov.uk/newsroom_and_speeches/press/2006/press_stern_06.cfm

Multiple Incentives

These challenges are extreme, especially for developing countries, but also for wealthy countries such as Japan. At the same time, however, the opportunities that decisive action on energy and environmental technologies present are also of enormous scale. For one thing, countries can expect appreciable political benefits, or so-called soft power – from taking global leadership on these issues[25]. Equally important, energy and the environment are enormous and rapidly growing economic fields. I have already noted that Japan's oil bill alone totaled over JPY 11 trillion in 2007, out of about JPY 71 trillion in total imports. The scale of the global energy business is plainly evident if one looks, for example, at the Forture 500 list for 2007[26]. No fewer than 6 of the top 10 American firms are centred in the oil business alone. And the Forbes Global 2000 list of top publicly traded firms for 2007 lists 2 of the world's top ten firms as being in the oil and gas industry[27]. The enormity of energy – which may total USD 6 trillion of transactions per annum – and related markets indicates the potential payoffs from dealing with the risks entailed in current patterns of energy production and consumption. It is increasingly clear that we are in the midst of a green industrial revolution and that the opportunity to get out in front of its various fields is open to all with capital, inventiveness, and the political capacity to use domestic markets to foster technology and scale it up.

Indeed, there are a multiple of potential policy responses to the energy and environmental challenges we sketched above. As many observers note, there is no single "silver bullet" solution to our collective energy and environmental conundrums. For example, reducing energy consumption through conservation will not, in itself, solve the problems. This is because billions of people in the so-called BRICs (Brazil, Russia, India and China) as well as other rapidly growing countries are using

25) The payoffs from action are now so obvious that even the CEO of ConocoPhillips, America's third-largest oil firm, has warned that America risks losing geopolitical influence if it does not act on climate change (McNulty 2008).

26) The list can be viewed on-line at : http://money.cnn.com/magazines/fortune/fortune500/2007/full_list/.

27) The Forbes Global 2000 list can be viewed at : http://www.forbes.com/2007/03/29/forbes-global-2000-biz-07forbes2000-cz_sd_0329global_land.html

increasing amounts of energy. Nor is it possible, for example, to shift all energy supply to a single low- or no-emission technology, since there are none yet ready to supplant fossil fuels.

Hence, it is almost certainly the case that the solutions will be made up of a variety of "wedges" (Pacala and Scolow 2004). These wedges will include increased energy efficiency, renewable energy alternatives, conservation, and the like. The associated technologies are already showing themselves to be critical to the next economy, and their development will both enrich the communities in which they are designed as well as reshape the lifestyles of their residents (DeWit and Kaneko 2007). They are also germane to this paper because they are a crucial element of regional policy as well. They are thus intimately related to regional policy and local governance. And the choices that are made will be shaped in large part by the structure of domestic policy coalitions as well as the options they perceive to be most feasible and rewarding.

What is Japan Doing?

As we have seen, Japan is doing far less on the environmental and energy fronts than the above sketch of its politico-economic incentives would indicate. But Japan still has respectable levels of energy efficiency and comparatively low per-capita GHG emissions. The data suggest that, behind the hype about Japan's being the world's top-runner, the country is getting some things right.

The first item to note is that Japan boasts significant density advantages. Japan is, of course, renowned for its world-beating automobile manufacturers, especially the hybrid cars produced by Toyota. But it is actually in mass transit that Japan has managed to gain significant efficiencies relative to its counterparts in the developed world. In contrast to the European countries, Japan does not have to rely so much on high fuel taxes to curb fuel consumption. Japan's highly concentrated population, especially in the major urban conglomerations (eg, Tokyo and Osaka) has led to massive scale economies as well as reduced usage of personal automotive transport. The International Energy Association notes 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 2007, 107). Further, "Japan's low car fuel use per capita relative to fuel price results from modest car use, not from low fuel inte nsity" (IEA 2007, 109). In short, Japan's current fleet of motor vehicles is not particularly efficient[28]. But there are attractive substitutes 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 and Renewables

Though Japan's use of renewable energy is not comparatively high, Japanese firms are prominent in the renewable energy and low-carbon businesses. Japan is especially in the solar-energy field. Indeed, it led the world in installed solar energy capacity until 2005, and in 2007 remained the second-largest market (at 287 Megawatts of shipments versus Germany's 950 Megawatts)[29]. Japan also boasts some of the world's leading solar firms, in Sharp, Kyocera, Sanyo, and other makers. Their collective share of the global market in 2006 was 36.4 percent, a strong lead over next-placed Germany (20 percent) and third-place China (15.1 percent)[30].

The potential in solar energy alone appears to be enormous, due to the mounting price and other risks of fossil fuels noted above. In addition, the technology is advancing at a remarkable pace, as it receives increasing interest from investors and governments. Over the past 20 years, the cost of solar-generated electricity has declined by about 5 percent annually and conversion efficiencies (of sunlight to electricity) have accelerated. The cost of power production from solar averages about 30 cents US per kilowatt versus a global retail average of about 15–18 cents US per kilowatt for electricity. The technology has not, in other words, achieved "grid parity" (matching the cost of conventional power sources), but it is widely expected to achieve that in about 2012 (Marsh 2008).

Similar developments are taking place in other renewable technologies. These technologies include geothermal, offshore and onshore wind, marine, sustainable

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

29) Nikkei Weekly (2007).

30) See Imoto 2007, p. 89.

biofuels, and others. Even at current technological levels, these renewable resources are enormous[31].

Moreover, Japan has some outstanding applications of environmental technology as the basis of community energy supply and conservation. Perhaps the most striking of these cases is seen in the town of Kuzumaki in the prefecture of Iwate. Kuzumaki is a 435 square kilometer community in the northeast of Japan's main island of Honshu, and has attracted international attention and domestic attention (with 20 percent annual growth 500,000 tourists per year versus how many before)[32]. 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 agriculturally 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.

Kuzumaki's officials worked with the central government's New Energy Foundation and the New Energy and Industrial Technology Development Organization (both are agencies set up in 1980) and drafted a "New Energy Vision" in March of 1999. This was remarkably fast movement for a local authority enmeshed in Japan's dense thicket of intergovernmental institutions. The energy vision began to be implemented 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% of its energy requirements via renewables (Nakamura 2008). Kuzumaki is able to sell the excess to the regional electricity grid. This is because Japan implemented sales to electrical power producers in 1999, as

31) 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 1600 exajoules of solar power, 600 exajoules of wind power, 500 exajoules of geothermal, and etc. The review notes that "resource availability will not be a limiting factor as the world seeks to replace fossil fuels" (Flavin 2008 : 82).

32) Kuzumaki has in fact been getting 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 2007).

part of ongoing deregulation.

A further background feature that enabled the Kuzumaki effort was the existence of the "surplus electricity purchase menu" (yujou denryoku kounyuu menyuu). The electrical utilities first introduced this system in 1992, as a voluntary effort to foster solar power. The menu was amended in 1996 to include wind power as well. The system paid producers a higher rate for the purchase of renewable-generated electricity (eg, via solar panels installed on a home)[33].

On April 1 of 2003, the menu was further amended to with the introduction of a Renewable Portfolio Standard Law. The previous menu offered differential prices for electricity produced by renewable means, with the price adjusted for the relevant technologies.

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 renewables resources with low political cost[34]. One such case is the town of Yanaizu Town, which hosts the Nishiyama Geothermal Power Plant. This geothermal plant is Japan's largest, a 65 megawatt facility put into operation from May of 1995. This scale is quite small, of course, compared to the "The Geysers" facility in California, which is the world's largest and has an installed capacity of 1360 megawatts. The Nishiyama plant and others do show, however, that considerable room exists in Japan to exploit a variety of renewable resources.

Kuzumaki is a special case in Japan, as most local governments lack the visionary leadership and other particular incentives behind the town's success. Japan is still largely a centre-led polity, a heritage of institutional centralization for warfighting and postwar reconstruction (Ando 2007 : 319). Recent moves to decentralize Japan's intergovernmental 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 renewable are a "boutique" area and limited in their potential.

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33) The utilities were a regulated monopoly at the time, and hence complied with playing a "public policy role" via subsidizing renewable production (Kai 2003 : 36).

34) Low political cost because the sites generally do not have alternative uses ; ie, as tourist sites.

Only very recently have we seen the biggest local government in Japan, the mega-city of Tokyo, seeking to move decisively on energy projects. Tokyo's package of incentives is a work in progress as of this writing (February 2008), but one thing is clear. Tokyo will aim at achieving a target of 20 percent renewables in its power generation by 2020 (versus the central government's target of 1.63 percent by 2104)[35]. Whether this moves the central government to match or exceed the target is unclear.

Perverse Incentives at the Centre

On April 1 of 2003, the menu system that had assisted in Kuzumaki Town's renewables drive was further amended with the introduction of a Renewable Portfolio Standard (RPS) Law. It continued to offer differential prices for electricity produced by renewable means, with the price adjusted for the relevant technologies. But it also came with paperwork-processing requirements and subsidy reductions that renewables producers argue grossly impaired their incentives.

Moreover, Japan has opted for a very low RPS law of 1.63 percent by 2014. This contrasts sharply with the obligations imposed in most of the other advanced countries[36]. Japan's target is even below its extant renewable generating capacity, so the electrical utilities simply "bank" the excess and apply it to their obligations. The net effect is to further erode incentives for expanding renewables generation[37]. Moreover, the mechanism that Japan has opted to use – the RPS – also differs in kind from what appears to be the most successful incentive system : the feed-in tariff (FIT). The difference between the RPS and the FIT style is not at the level of setting targets. Both systems do this. 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 seek to achieve the mandated targets by purchasing green electricity certificates (in Japanese "guriin denryoku shousho")[38] from wind farms and other sources of electric-

35) http://www.renewable2020.jp/PDF/reference.pdf

36) Germany aims at 45 percent of 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 : http://gov.ca.gov/issue/energy-environment/

37) http://www.kikonet.org/iken/kokunai/archive/release20070308.pdf

38) A description of Japan's certificates is available at : http://www.naturale.co.jp/green/how_about.html

ity generated by renewable means.

In other words, this system seeks to use market forces as much as possible in order to achieve the targets. There is often minimal discrimination among renewable technologies (in terms of their level of support). More importantly, there is no clear long-term commitment to supporting the development of the renewables industry. 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[39]. Moreover, the FIT does this with remarkably little state intervention compared to the often cumbersome and bureaucratic business of, say, Japan and the UK's green certificates. The FIT also costs the German state itself little, as the subsidization is done through adding the cost of supporting renewables to the utility customers' electricity bill. Spreading the costs so broadly allows for the individual consumer's levy to be quite small. Germany's FIT is becoming the world's best known (indeed, a global standard), as it has had the most conspicuous success in fostering technological innovation, regional development and other positive externalities (Mitchell 2008 : 180–84)[40].

Japan : Betting on Efficiency and Nuclear

Whether Tokyo's renewables target pushes the central government to match or exceed the target is unclear. But it seems unlikely at present. The Japanese central government appears caught in a vice of interests that leaves it little leverage to lead. It appears instead largely inclined to move incrementally along policy patterns from the past, betting heavily on efficiency and nuclear energy.

As to the former, on January 26, 2008, 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 percent improved energy efficiency by 2020[41].

39) In Germany, there is an annual reduction of 5 percent in the renewables tariff over 20 years.

40) Fully 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 facilites : http://www.cpuc.ca.gov/PUC/energy/electric/RenewableEnergy/feedintariffs.htm

41) A English translation of Prime Minister Fukuda's speech can be accessed at : http://www.

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.

The problem with stressing energy efficiency is that it is not a solution to the climate problem in the absence of costing carbon emissions. Energy efficiency can actually encourage greater energy consumption, through what is known as Jevons' Paradox or the rebound effect. That is, a more efficient use of the fuel 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 found a variety of results. Sometimes there is only a limited rebound effect.

But 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 kilometer for a car, per kilowatt for a coal-fired power plant) while neglecting to address the problem with emissions of GHG.

Japan is betting heavily on expanding nuclear power as the answer to the problem of power supply as well as GHG emissions cuts[42]. The above-noted New Energy Policy aims at making nuclear power the key driver in Japan's electricity supply by upping its role to 30 to 40 percent of supply by 2030. The nuclear lobby appears to have much of the R&D budget locked up[43] and to have the attentions of

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kantei.go.jp/foreign/hukudaspeech/2008/01/26speech_e.html

42) One astute observer of the Japanese political economy has even declared Japan "nuclear obsessed" due to put plutonium at the centre of its energy economy (see McCormack 2007).

43) 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.

the political and bureaucratic elite in the central government. They appear to see nuclear as the only realistic option for reducing dependence on fossil fuels and cutting emissions. They are also keen on making nuclear power a major export business.

Yet even the IPCC sees at best a small role for nuclear 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." An April 2007 study published by the US Council on Foreign Relations concurs with the IPCC. The study concludes that "Nuclear 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." The reasoning behind this conclusion is that the only way for nuclear 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)[44].

What is Missing?

The Japanese policy elite are 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 marginalized as well as losing the local development benefits that are accruing in particular to Germany and to the US.

We have seen in the above, of course, that there is movement at the local level in Japan. Some of the activism includes proposals for prefectural and urban carbon taxes (Kanagawa and Kyoto). There has even been an "environmental tax" imposed inside Kyoto University on electricity consumed across the campus[45]. But like Kuzumaki Town's efforts, these are likely to remain marginal, with just a trickle of spillovers,

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44) The Oxford Research Group's March 2007 report "Secure Energy ? Civil Nuclear Power, Security and Global Warming" notes that nuclear is both very dangerous and will not reduce GHG emissions by much in any reasonable time horizon. http://www.oxfordresearchgroup.org.uk/publications/briefing_papers/secureenergy.php

45) http://sankei.jp.msn.com/life/environment/080121/env0801212218003-n1.htm

in the absence of national leadership and rules. Without strong decentralized governance (even after several years of decentralization), the national government's leadership remains critical in Japan. There is also the fact that Japan is not geographically large. It is not as small as the rhetoric about "semai kuni" would have it – since Japan ranks alongside most of the European States in terms of area – but it is not a continental-scale country where decentralization is generally a geographical fact of effective governance.

Regional and national leadership is critical in all cases, because the scale of the challenge is global. But some areas are more advantaged 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 latter's incentives 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 as well, the lack of activism at the federal level during the Bush Administration has seen 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 turn to adopting FIT rules as well in order to achieve the targets[46]. What is of particular note is the geography of the rules. The most activist US states are in the West and Northeast, such as California and New York. These are America's most technolopoles, 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 as well as the rest of the world. That process is likely to go nationwide in the US with the end of the Bush Administration as well as the further decline of its supporters in the US federal Congress[47].

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46) The US Department of Energy has an on-line map (current to June 2007) that displays the individual states' targets : http://www.eere.energy.gov/states/maps/renewable_portfolio_states.cfm

47) 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.

We have seen that at the national level Japan has opted for a very light regime of targets and other mechanisms to foster energy alternatives and efficiency. Japan is, of course, obligated by the Kyoto Treaty to achieve a reduction of its greenhouse gas emissions. Japan's target for the period 2008 to 2012 is a reduction of 6 percent of its 1990 level of emissions. It seems unlikely that Japan can even achieve this light target.

As noted, 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. A second governance problem is the continued concentration of decision-making in the central state. This perpetuates the lock-up on funding and other policy levers enjoyed by the fossil-fuel and nuclear interests. Centralization also inhibits initiative at the local level in favour of policy preferences determined at the centre. Exacerbating these problems is the lack of leadership at the centre. 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 is, surprisingly, little recognition that serious policies to address energy and climate change risks can also help resolve other challenges.

Japan's key problem is that it is spinning its wheels while an already sobering energy and environmental crisis threatens to overtake global governance. Japan is committed to a very risky 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 and efficiency turn out to be the wedges that shape the future. But as we have seen both are fraught with risks. Nuclear is clearly dangerous, not mention highly capital-intensive with minimal if any benefits for local areas[48]. Efficiency is a better 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

48) 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.

cut, and we can expect all reductions from conservation in the developed countries to be more than made up for by energy demand growth in the rest of the world. Efficiency and conservation are touted as virtues, and 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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