

# JAPAN ECONOMIC CURRENTS

A COMMENTARY ON ECONOMIC AND BUSINESS TRENDS

## Climate Change Policies: Vertical Balance, Horizontal Balance

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Global warming is assuredly occurring, and it is causing a variety of unusual changes on the earth. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change states that there is a probability stronger than 90% that the cause of the global warming is the emission of greenhouse gases from human sources. Unless action is taken, GHG emissions are sure to increase at an accelerating pace. The whole world must work together on stemming this trend so as to enable sustainable development of the global ecosystem, humankind included.

Toward this end, global GHG emissions need to be substantially reduced over the long term. But how large should these cuts be? What is the time frame? What are the criteria for answering these questions? The international community's discussion on this matter has not yet reached a state of maturity.

### The vertical balance: How far to take mitigation measures

Article 2 of the United Nations Framework Convention on Climate Change states that the convention's

ultimate objective is to stabilize GHG concentrations in the atmosphere at a level that would prevent "dangerous anthropogenic interference with the climate system." It adds that this level should be achieved "within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner." In respect to the relationship with economic development, the IPCC's Fourth Assessment Report states the problem as one of balancing the risks of global warming against the risks of harming sustainable economic development through the implementation of mitigation measures, and it observes that there is no consensus on what GHG concentration can be deemed not to be dangerous. Science alone cannot define the meaning of dangerous interference with the climate system, the report maintains, as this is a matter requiring value judgments.

As can be appreciated, there is no international agreement on the extent to which policies to prevent global warming should be implemented. At

their 2008 Hokkaido Toyako summit in Japan, the Group of Eight declared the "aspirational goal" of halving the world's GHG emissions by 2050 (without specifying a base year), but this is not a goal the world has agreed on. In this regard, the European Union has unilaterally proposed the target of holding the rise of temperatures to no more than 2 degrees Celsius above preindustrial levels, toward which end GHG emissions would need to peak out by 2020 and be cut at least in half by 2050.

The halving of emissions by 2050 is fine in the sense that while it is an ambitious goal championed by a group of advanced countries, it gives the world an objective toward which to strive. But it is no more than an aspiration. One would find it somewhat unreasonable if this goal were presented instead as an absolute

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target and used to apply pressure to all countries, not just the EU members, with developed countries being asked to make a 30% emissions cut from the 1990 level by 2020 and developing countries also being asked to make deep cuts from BAU, the "business as usual" levels. This halving of emissions by 2050 must not be portrayed as anything more than an aspiration.

One major reason why we should view the goal in this way involves the feasibility of achieving it. Among the greenhouse gases, the primary emission is carbon dioxide from energy sources, for which we have solid data. The volume of CO<sub>2</sub> emitted worldwide was some 23 billion tons in 2000. According to a projection by the Research Institute of Innovative Technology for the Earth (RITE), a Kyoto-based think tank, the volume will rise to 48 billion tons by 2050. If instead emissions are to be cut in half, the volume must be suppressed to 11.5 billion tons.

Under what conditions could this be achieved? Suppose, for argument's sake, that the developed countries manage to attain zero emissions by 2050. That would leave the developing world with room for emissions of 11.5 billion tons. But developing countries in 2000 had emissions of 9.2 billion

tons, and the total increase allowed for them over the 50-year period would be merely 25%. Taking population growth in the developing world into account, we find that these countries would need to reduce emissions per capita from 1.8 tons to 1.4 tons. In view of the trend of increase in the emissions from such countries as China and India (with emissions rising by 67% over the five-year period from 2000 to 2005 in China's case), the developing world would hardly be likely to accept such a scheme. And as for the developed countries, not one of them has committed itself to achieving zero CO<sub>2</sub> emissions by 2050.

Next let us consider the halving goal from the technology perspective (in this case, 1990 is used as the base year). The following equation is the simplest version of the well-known Kaya identity, which was developed by Dr. Yoichi Kaya for the analysis of CO<sub>2</sub> emissions:

$$CO_2 \text{ emissions} = \frac{CO_2 \text{ emissions}}{GDP} \times GDP$$

Here, *GDP* is world gross domestic product and  $CO_2 \text{ emissions} / GDP$  is the volume of CO<sub>2</sub> released per unit of GDP, which is one way of expressing the technological level. Accordingly, the equation can be restated like this:

$$CO_2 \text{ emissions} = \text{Technological level} \times GDP$$

Differentiating this equation, we obtain  $\Delta CO_2 \text{ emissions} = \Delta \text{Technological level} + \Delta GDP$

Here  $\Delta$  denotes a rate of change:  $\Delta \text{Technological level}$  is the technology improvement rate and  $\Delta GDP$  is the GDP growth rate. In short, in order to reduce CO<sub>2</sub> emissions, either technology must be upgraded or economic growth must be slowed down. (Changes in lifestyles and industrial structure also affect the technology improvement rate, but for achieving a large cut in emissions, the two factors in this formula are of greatest importance. Industrial structure in this case is the structure of the world economy, not that of individual countries, so a rapid contraction in energy-intensive industries can be ruled out. Strictly speaking, the technology improvement rate is the sum of two factors: the energy efficiency improvement rate and the de-carbonization rate.)

According to the International Energy Agency, the average annual rate of technology improvement has been 1.2% since 1970, the first year for which data is available. According to a projection by RITE based on forecasts of the World Bank and the B2 (middle-of-the-road) scenarios of the IPCC, the average annual rate of

economic growth until 2050 will be 2.7%. Using these figures as base rates, let us examine the relationship among the CO<sub>2</sub> reduction rate, technology improvement rate, and GDP loss rate (Tables 1 and 2).

It would be possible to cut world CO<sub>2</sub> emissions in half between 1990 and 2050 if one of two conditions were met. First, assuming that technological progress moves at the same rate as in the past, world GDP must be suppressed 76% below where it would have arrived with the business-as-usual growth rate (Table 2). Second, assuming instead that there is no GDP loss against BAU, the annual average technology improvement rate must be speeded up to 4.1%, almost 3.4 times the base rate of 1.2%. In the first case, world GDP in 2050 would amount

to \$29.2 trillion, some 20% below the 2005 figure of \$36.3 trillion. This is a completely unrealistic supposition. (It should be noted that even in the case of no reduction in CO<sub>2</sub> emissions from the 1990 level, there would still be a GDP loss against BAU of nearly 50%.) In the second case, meanwhile, there is simply no way to make technological progress move 3.4 times faster than the past average rate by fully utilizing existing technologies. Revolutionary, breakthrough technologies would be essential, and they would have to be quickly developed and disseminated. The realism of this happening needs serious consideration, as do the costs that would be entailed.

What all this means is that further thought should be given to the GHG concentration level we aim at (the

ultimate objective), taking into account the feasibility of attaining them, and the balance between the damage from rising temperatures and the cost (adverse economic impact) of suppressing temperature increases. This is what I mean here as the vertical balance.

### The benefits of a sectoral approach

The foregoing comments notwithstanding, no argument is possible over the long-term need to make large cuts in emissions. In this connection, consideration of the Kaya identity leads to one more point: Major cuts cannot be made without technological innovations and their diffusion. Thus far, four criteria have been advocated for evaluating global warming policies: environmental effectiveness, cost effectiveness, distributional effect, and institutional feasibility (IPCC Fourth Assessment Report). I believe that one more important criterion should be added to these: the effect policies have on promoting innovation and diffusion of technologies.

From the standpoint of technology promotion, the sectoral approach deserves a second look. There are various interpretations of what the sectoral approach involves, and

**Table 1**  
**GDP Loss and Technology Improvement for 50% Reduction in CO<sub>2</sub>**

GDP loss against BAU (%)	Technology improvement (%)
0	4.07
10	3.86
20	3.62
30	3.36
40	3.05
50	2.68
80	0.85

**Table 2**  
**CO<sub>2</sub> Reduction and GDP Loss with Unchanged Technology Improvement Rate**

CO <sub>2</sub> reduction (%)	GDP loss against BAU (%)
0	51.75
10	56.57
20	61.40
30	66.22
40	71.05
50	75.87

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precisely defining it is difficult. The following discussion sees the approach as one in which the sectors of the major emitting countries engage in an exchange of information and use the information to spur efforts toward efficiency improvement and low-carbon technologies, with each sector acting in accord with its own circumstances. Ultimately, the players in each sector strive to overtake the world's front runner in their industry. Accordingly, this approach is not concerned with a "sectoral crediting mechanism," which is also known as a kind of sectoral approach.

Approaches that involve credits, such as the sectoral crediting mechanism and the "cap and trade" approach, provide incentives to pursue technological development over the short run, but companies will opt to purchase credits if this is less expensive than developing technology in-house. Another problem with these approaches is that the prices of credits can be volatile for institutional reasons, as the EU has found from its own experience with its scheme. Price volatility impedes the inclination to invest in low-carbon technologies. When efficiency standards are prescribed, by contrast, companies cannot circumvent them by acquiring credits, and because the

standards are clearly spelled out, there is no wavering over judgments on investment decisions. Each company is motivated to put hard effort into technological development, and the technological level rises as a result.

The application of environmental standards to automotive exhaust in Japan offers one of the best examples. In the 1970s Japan, following the lead of the United States, established strict standards for automotive exhaust. Even as American automakers were lobbying the US government to get the standards relaxed, Japanese automakers engaged busily in technological development, came up with such advances as Honda's CVCC (compound vortex controlled combustion) engine technology, managed to attain compliance with the standards, and used their new strengths to advance into the world's markets. Probably this technological innovation would not have made so much progress if the automakers had had the option of clearing the regulatory hurdles by purchasing credits inexpensively from other entities/countries. The author often notices that people wonder why, in the absence of the incentive of selling credits by reducing its own emissions, a company will devote extra effort to reducing emissions. The

response is that there is incentive. In the case of Japan's manufacturers, the foremost incentive is the wish to sustain efficiency at a world-leading level. It is because of this incentive that Japanese technology has made so much progress.

Because what is required to combat global warming is not short-term emission cuts but deep slashes over the long term, the development and diffusion of innovative technologies will play the central role. In such a situation, it goes without saying that the sectoral approach can be an effective tool, since it will promote international cooperation in each sector's efforts for efficiency improvement and de-carbonization. Naturally any country requiring support should be given the maximum assistance. In response to these needs, developing countries should be supplied with technologies, funds, and personnel.

To be sure, the sectoral approach is theoretically less efficient than approaches based on market-based mechanisms. As far as promoting technological development is concerned, however, it clearly offers a better solution. We should also note that the efficiency of an economic approach will be dependent on securing global participation, which is

not a very realistic proposition. When this is taken into account, we find that in practical terms the difference of efficiency between the two approaches is not so large as textbooks might tell us.

### The horizontal balance: Efficient allocation of limited resources

The resources of the earth are finite and often scarce, and they need to be spread around to deal with a host of pressing issues requiring international cooperation. These issues involve reconciling the three Es—environment, economy, and energy—and have been spelled out in the millennium development goals (MDGs) adopted by the United Nations Millennium Summit in 2000. There are eight goals, including eradicating extreme poverty and hunger, combating diseases, and reducing child mortality; one of them is ensuring environmental sustainability. Relationships of both synergy and trade-offs exist among these goals. Consider the case of malaria. Climate change measures can be expected to have a synergistic effect of suppressing increases in the population suffering from malaria in the future, but there is a trade-off when today's resources are allocated to global warming mitigation instead of being devoted to treating

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the many children currently afflicted with this disease. Accordingly, when political leaders make decisions on what portion of scarce resources to devote to which needs, they must always ask themselves what is the most efficient way to put the resources to use.

One useful tool for the decision-making process is cost-benefit analysis. Granted, measuring benefits (the monetary value of avoided damages) can be extremely difficult in the case of global warming. Because the damage will occur over the long term, the question of what discount rate to use for computing future benefits (avoided damages) in present-day values is sure to be controversial. The problems of assigning monetary amounts to nonmarket values and assessing irreversible damages further complicate the picture.

In this light, it is clear that allocating resources among the respective

pressing needs simply cannot be accomplished on the basis of cost-benefit analysis alone. On the other hand, it is also true that allocations of resources to climate change measures will mean a reduction by the same amount in the resources available for other urgent issues, and vice versa. In this context, the available resources need to be allocated among policy tasks as rationally as possible. To state this in simple terms, the allocation of resources to climate change and other top priorities must be carried out in a balanced fashion. When making decisions, this horizontal balance, as I call it, must always be kept in mind.

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## Towards a Global Compact for Managing Climate Change: One Indian's Perspective

BY RAMGOPAL AGARWALA, RESEARCH AND INFORMATION SYSTEM FOR DEVELOPING COUNTRIES

Despite the dangers of climate change, there is little progress toward a global climate agreement. This paper presents an approach that could reconcile the perspectives of developing and developed countries, differences which have deviled potential agreements for quite some time.

The primary factor behind lack of progress in multilateral negotiations is the changing power equation in the global economy. Until recently, the developed countries were the undisputed leaders in these negotiations. However, the global South has stood up and is determined to make its voice heard. In view of the serious risks that humanity faces from continued global warming, a paralysis on agreement on managing climate change would be most unfortunate.

### Disputing the Details

Perhaps the most dramatic demonstration of the differences in perspectives of developed and developing countries on climate change came out in July 2008 summit meetings of G8 and G5 countries in Hokkaido, Japan. The G8 declaration calls for adoption of the goal for achieving at least a 50% reduction of global emissions by 2050 while emphasizing the need

for "contributions from all major economies," the code words for including major economies such as China and India in the compact. But it does not specify the base from which this reduction is to be achieved. Nor does it specify the targets for developed countries for 2050 or 2020. It also asserts that "all major economies will need to commit to meaningful mitigation actions *to be bound* in the international agreement to be negotiated by the end of 2009" (italics added). The need for resource transfers to developing countries for adaptation and mitigation and for technology development and dissemination is recognized in broad general terms without any commitment to numerical targets. On the other hand, the G5 declaration states that a shared vision on climate change must be "based on an equitable burden-sharing paradigm that ensures equal sustainable development potential for all citizens of the world and takes into account historical responsibility and respective capabilities as a fair and just approach." The G5 leaders do not mention a global target for mitigation but call for quantified emission targets for the developed countries under Kyoto Protocol of at least 25–40% below 1990 levels by 2020, and by 2050, between 80% and 95% below those levels. They do not

call for any commitments on mitigation by developing countries, either in aggregate or in per capita terms or in terms of emission per unit of GDP. They call upon the international community to work towards a strengthened scheme for technology innovation, development, transfer and deployment, and a comprehensive review of intellectual property rights regimes for such technologies in order to strike an adequate balance between rewards for innovators and global public good. They also call upon developed countries to commit clearly to significant additional funding for both mitigation and adaptation in developing countries. The additionality should be obtained not only in relation to current programs of official development assistance but also the financial arrangements under the Kyoto Protocol. They welcome further exploration of the Chinese proposal for setting up a climate financing goal for all developed countries, such as 0.5% of GDP (in addition to ODA) for climate action in developing countries. Clearly, if the Hokkaido G8 Summit is any indication, the developed and developing countries are not on the same page for managing climate change.

The nature of the problems in the international dialogue on climate

change is also clearly shown by the "National Action Plan on Climate Change" published by a high-level Council chaired by the Prime Minister of India (Government of India, 2008). The paper begins with a clear statement on historical responsibilities of developed countries for the global threat of climate change and calls for the transfer of new and additional financial resources and climate-friendly technologies to support both adaptation and mitigation in developing countries. At the same time, the report shows great agnosticism so far as the adverse effects of global warming on India are concerned. The report highlights the need for low carbon growth but avoids any quantification of targets on energy efficiency or carbon efficiency even to the extent that other Government of India documents on energy policy seem to do. There is obviously a concern that any national targets may be seized upon by the international community as national commitments irrespective of the availability of resources and technology to achieve these targets. The only target that is mentioned is that India is determined that its per capita greenhouse gas emissions will at no point exceed that of developed countries. Since that is not a likely outcome for decades, this approach could become an alibi for

inaction in the foreseeable future. So far as the global climate change architecture is concerned, the Indian position is that the Kyoto Protocol does not expire in 2012, but rather a new phase of the Kyoto Protocol shall be discussed for the period beyond 2012. Thus the commitments for mitigation will be made by developed countries only and the developing countries will benefit from resources made available under the Clean Development Mechanism and funds for adaptation.

### Facing Facts

The Indian climate policy report is a good example of how the developing countries are not on the same page as the developed countries on post-2012 agreement on climate change.

Marking real progress towards an agreement will require being frank about the problems underlying climate negotiations. Both developed and developing nations must face up to some "inconvenient truths." First, developed countries must accept responsibility for their historic emissions of greenhouse gases. Second, if the western lifestyle is not replicable for the world as a whole, it must be modified in both the developed and developing countries. Third, the global South needs to do

its own research to understand that climate change discussions are not a tool that the North is using to slow the economic and political rise of the South. Fourth, the developing countries must stop hiding behind the poor. Fifth, the present discussions of climate change impacts concentrate too much on the long-term. Something more immediately relevant is needed.

Despite these challenges, a credible global compact is possible. It will need to satisfy five criteria. First, it has to be made comprehensive by including both developed and developing countries. Second, it has to be equitable. Third, the targets on emissions have to be realistic. Fourth, the program has to be efficient. Fifth, the program has to develop an institutional mechanism for effective implementation.

The Kyoto Protocol satisfies none of the five criteria described above for a credible global compact. First, the Protocol, which covered only 30% of global emissions in 2003, does not provide a comprehensive mechanism for emission control. Second, the Protocol's targets are based primarily on political bargaining, not on equity. Third, the Protocol does little to indicate, even in broad terms, the programs of technological dissemination, incentives, and resources needed for achieving the

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targets. Fourth, the Protocol's cap-and-trade system faces severe practical problems. Fifth, the Protocol relies on voluntary self-enforcement and allows countries to withdraw from the agreement without penalty. In view of these limitations, it is not surprising that the Protocol is not achieving its objective of reducing carbon emissions.

A post-Kyoto agreement should set a realistic target of stabilizing global CO<sub>2</sub> emissions at 2003 levels until 2050 and reducing them by 50% by 2100. If emissions are allocated on a per capita basis, this will require a reduction in emissions in developed countries of about 70% by 2050 and allow about a 70% increase in developing countries' emissions. This will allow 6% annual growth in GDP in developing countries provided they can reduce the carbon intensity of their GDP by 5% per year.

The ideas in this paper are undoubtedly ambitious. However, with the fate of humanity at stake, the world needs nothing less.

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### Key Findings and Recommendations

**The agreement should set appropriate carbon prices by eliminating subsidies to emitters (particularly energy subsidies) and establishing a carbon tax.** This approach would minimize bureaucratic intervention, provide appropriate incentives, and raise revenue for mitigation and adaptation.

**The agreement should support development and dissemination of carbon-saving technologies.** The massive programs popularizing family planning in developing countries provide an example of what should be done for climate change. More specific suggestions include patent buy-outs, reduction of tariffs on sale of technologies, a global clean-energy venture capital fund, transfer of technologies to public domain, licensing schemes with reduced duration of intellectual property rights, and flexible technology transfer mechanisms.

**The agreement should be negotiated at the United Nations, but should be implemented using Bretton Woods Institutions, namely the International Monetary Fund and the World Bank.** The UN system is the appropriate forum for negotiations and agreements on a global program for climate change. However, implementation of the agreements is likely to require substantial financial resources as well as formulation of concrete projects and programs. The IMF could be an ideal agency for reviewing the issues of carbon subsidies and carbon taxation at national and global levels. The World Bank could serve as an ideal agency for supporting projects and programs for carbon reduction.

**Seigniorage (revenue from printing currency) from the creation of a new global currency to replace the dollar could be used to generate revenues to fund adaptation efforts.** It appears increasingly likely that global warming of more than two degrees Celsius may be unavoidable and that funding of adaptation efforts will be needed. However, developed nations may be reluctant to transfer large sums to developing nations. The revenues from printing and issuing a new global currency could be a good alternative source of funding available only to those countries that comply with emission targets.

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