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Assessment of GHG emission reduction pathways in a society without carbon capture and nuclear technologies

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ABSTRACT

Every possible technology is pursued in order to achieve strict radiative forcing targets. Nuclear energy and Carbon Capture Storage (CCS) are regarded as important mitigation options. However, harsh criticisms have been directed at Japanese nuclear energy policy after the Fukushima nuclear accident, and the Japanese government will be required to re-evaluate not only its energy policy, but also the GHG reduction target itself. Like nuclear energy, CCS might not be regarded as a suitable option for GHG mitigation because its long-term safety has not been revealed. In this paper we analyze the energy policy response to an absence of nuclear energy and CCS, especially focusing on Japan, China and India. We find that the appropriate energy strategies against the unproven technologies differ between regions due to the uneven pre-existing nuclear energy, CCS potential and renewable energy potential, and the resource endowments and the levels of economic development. We also find that the strict mitigation target can be achieved even if nuclear energy and CCS are not available. In such a case, however, significant enhancement of renewable energy is needed, as well as particular fossil fuel alternatives based on region-specific availabilities and costs.

1. Introduction

There exist many studies to quantify the future GHG emission pathways to mitigate climate change. For example, van Vuuren et al. (2011) estimate several emission pathways to meet the Representative Concentration Pathway (RCP) including 2.6 W/m^2 radiative forcing. However, there are large gaps between those emission pathways to achieve such strict targets as the 2.6 W/m^2 radiative forcing and the separate national targets which have been presented by countries after the COP15 (UNEP, 2010). Therefore, they would be required to reduce much more amount of GHG emissions than their current pledges and the Working Group III Report of the IPCC Forth Assessment Report pointed out that every possible technology is inevitable to achieve the strict targets (IPCC, 2007).

The Japanese government had been considering nuclear energy as a countermeasure against climate change before the East Japan earthquake on March 11th, 2011. According to the proposal of the committee on the mid-term and-long term roadmap for GHG mitigation options under the Ministry of Environment published in December 2010, (MoE, 2010) the nuclear capacity factor would increase to 90% from the current 64.7% and 14 nuclear power plants would be newly constructed by 2030 according to the Energy Basic Plan. They also proposed that the share of renewable energy to total primary energy supply be increased to 20% by 2030 and to 40% by 2050. However, the tsunami caused by the earthquake hit the Fukushima nuclear power plant and caused severe damage to the cooling system in March 2011. Harsh criticisms have been directed at the Japanese nuclear energy policy, and operations of most of the nuclear power plants in Japan are under consideration. The Japanese government is required to re-evaluate not only its energy policy, but also the GHG reduction target itself.

Not only Japan, but many other developed countries are also rethinking their nuclear energy policies after the Fukushima nuclear accident. Germany has decided to shut down all seventeen nuclear power reactors by 2022 and to shift to renewable energy as the mainstay of its new energy policy although it reviewed the denuclearization policy due to the necessity of GHG emission reductions. It is unlikely that all nuclear power reactors will be shut down all over the world. However, this nuclear accident and the German response clearly demonstrate that we always face an uncertainty about the political availability of a technology.

The CCS also has uncertainty about its availability. There is an argument on the long-term safety of CCS (IPCC, 2005). The stored CO_2

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might rise up from the underground or ocean by earthquakes or unknown geological system change. It makes the problem worse that the danger of leaked CO_2 has not been revealed yet. The government might not be able to get public acceptance of CCS because people fear unproven technologies. CCS as well as nuclear may not be regarded as a suitable option.

The experience of the nuclear power accident in Japan represents the weakness of the GHG mitigation scenario relying on specific technology. The purpose of this study is to analyze scenarios on the energy policy response to the absence of specific technologies, nuclear energy and CCS, in order to draw more robust GHG mitigation pathways. We focus on not only Japan, but also China and India which will achieve rapid economic growth.

Section 2 describes the structure and assumptions of the modeling framework. We explain the simulation scenarios and results in Section 3. Finally, Section 4 concludes the study and findings.

2. The modeling framework

In order to assess the emission pathways with a variety of technologies under the constraints on GHG emission reductions, the following models of the AIM, Asia-Pacific Integrated Model (Kainuma et al., 2002) are used:

- AIM/CGE [Global] to represent consistent regional GHG emissions under a set of technologies and emission constraints
- AIM/Enduse [Global] to provide the projection of energy enduse technologies in the future
- AIM/Impact [Policy] to estimate a global emission pathway from the targets for concentration, radiative forcing or temperature.

The relationship among the three models is represented in Fig. 1. When the climate target is given, the AIM/Impact [Policy], which is a dynamic optimization model with a simple climate model, estimates the optimal global GHG emission pathways so as to maximize a utility (Hijioka et al., 2008). Using the AIM/CGE [Global], these global emissions are broken down into the regional emissions with detailed emission sources. Generally, a top-down model such as the AIM/CGE [Global] calculates a result consistent with the economic systems under the specific efficiency change. On the other hand, a bottom-up model such as the AIM/Enduse [Global] can simulate the detailed selection of energy technologies based on the specific service demands. These two types of models complement each other. In this simulation, we use the results of the AIM/Enduse [Global] to represent the reality of technology change. These are used to provide the inputs of technological efficiency improvement in the AIM/CGE [Global]. The remaining part of this section describes the AIM/CGE [Global] in more detail.

The AIM/CGE [Global] is a recursive dynamic global computable general equilibrium (CGE) model. The CGE model can describe how demand and supply change due to relative prices among goods and services. Carbon pricing policies such as carbon tax and emission trading change the relative prices according to GHG intensity of goods. Many climate policy designs have been evaluated quantitatively by CGE modelers all over the world (Chen et al., 2011; Saveyn et al., 2011).

Table 1 shows the regional and sectoral definitions used in our model. The power sector is disaggregated into detailed technologies such as thermal power, hydro power, nuclear power, solar power, wind power, and others. CCS technology can be selected by thermal power and energy intensive sectors. The future extraction costs of fossil fuels are assumed to follow Rogner (1997). The detailed modeling structure is explained by Masui et al. (2011). Our data sources are the GTAP 6 for economic data (Dimaranan, 2006), the EDGAR v4.0 for GHG emissions (European Commission, 2009), the energy balance table of IEA for energy quantity (IEA, 2009a and 2009a,2009b), and the FAOSTAT for land use (FAO, 2009).

The final goals of climate policies are to change people's actions and to give an incentive to introduce new technologies such as energy-saving and renewable technologies. It is well known that the assumptions of availability of technologies and potential supply of renewable energies affect the result of climate change policy assessment.

There are two channels of emission reduction in our CGE model. The first is the improvement of energy intensity, which is usually represented by the coefficient improvement of energy input to output over time, the so-called autonomous energy efficiency improvement (AEEI). In most studies using the top-down model, these coefficients are specified without adequate information about actual technological progress. However, in this study we use technology information derived from the results of a bottom-up type technological selection model (AIM/Enduse [Global]) to specify energy efficiency coefficients as follows.

$$Output_{i,t} = F\left(Labor_{i,t}, Capital_{i,t}, Materials_{i,t}, EE_{i,t} \cdot Energy_{i,t}\right)$$

$$EE_{i,t} = EE_{i,t-1} \cdot eei_{i,t}$$

$$eei_{i,t} = \left[\frac{Energy_{i,t}/Output_{i,t}}{Energy_{i,t-1}/Output_{i,t-1}}\right]$$

$F(.)$ is the production function in a CGE model. The energy input depends on $EE_{i,t}$, the coefficient of energy input in sector i in period t. Coefficient $eei_{i,t}$ stands for the rate of energy efficiency improvement. The AIM/Enduse [Global] model can provide the information

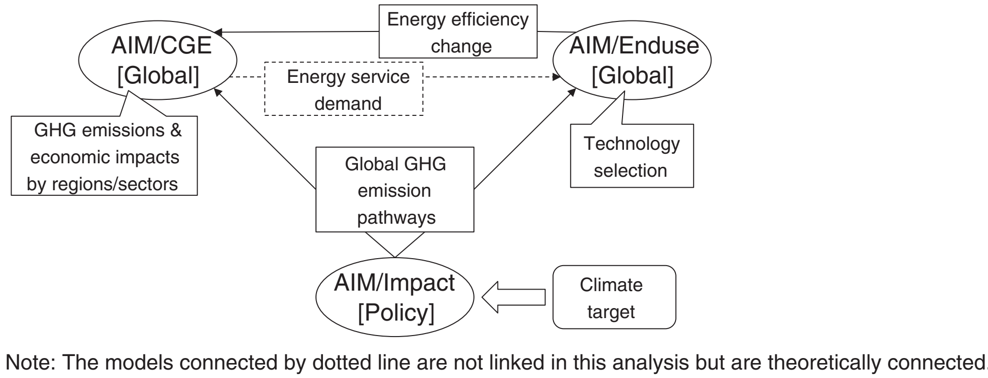

Fig. 1. Relationship between AIM/CGE [Global], AIM/Enduse [Global] and AIM/Impact [Policy] models.

Table 1
Regions and sectors in the AIM/CGE [Global].

Regional code	Regional definition	SRES region[a]	Sectoral code	Sectoral definition
AUS	Australia	OECD90	*Energy sectors*	
NZL	New Zealand	OECD90	COA	Coal
JPN	Japan	OECD90	OIL	Crude oil
KOR	Korea	Asia	GAS	Natural gas
CAN	Canada	OECD90	P_C	Petroleum and coal products
USA	United States of America	OECD90	GDT	Gas manufacture and distribution
MEX	Mexico	LAM	ELY[b]	Electricity
XE15	15 Western EU countries	OECD90	*Non-energy sectors*	
RUS	Russia	REF	AGR	Agriculture
XE10	10 Eastern EU countries	REF	LVK	Livestock
XRE	Rest of Europe	REF	FRS	Forestry
CHN	China and Hong Kong	Asia	FSH	Fishery
XRA	Rest of Asia-pacific	Asia	EIS	Energy intensive industries
IDN	Indonesia	Asia	OMN	Other mineral mining
THA	Thailand	Asia	M_M	Metals and manufacture
XSE	Rest of Southeast Asia	Asia	FOD	Food processing
IND	India	Asia	OMF	Other manufacture
XSA	Rest of South Asia	Asia	CNS	Construction
ARG	Argentina	LAM	TRT	Transportation
BRA	Brazil	LAM	CMN	Communication
XLM	Rest of Latin America	LAM	WTR	Water
XME	Middle East	LAM	OSG	Governmental services
ZAF	South Africa	LAM	SER	Other services
XAF	Rest of Africa	LAM		

[a] The definition of SRES region is as follows; OECD90: OECD as of 1990, REF: economically reformed countries, Asia: developing countries in Asia, and LAM: Latin America, Africa and Middle East.
[b] In electricity generation, the following sub sectors have been considered; coal-fired, oil products-fired, gas-fired, nuclear, hydro, biomass, waste, geothermal, solar, wind, and other renewables. Among the advanced technologies, IGCC and thermal power plant with CCS are available.

for *eei*, which reflects the average technology to be introduced over the simulation period (Morita et al., 1994).

The second channel of emission reduction is to consider improvement of the carbon intensity such as introduction and expansion of CCS and renewable energy. Generally speaking, these new technologies are too expensive to be used in the base case. Once the energy price goes up due to carbon pricing, these new technologies become worth the cost. This makes it possible to consider the shift to different technologies, such as from the conventional coal and oil fired plants to solar and wind power plants. This model includes the potential supply and costs of both renewable energy and the introduction of CCS, and among these technologies, both for existing and advanced technologies, the cheapest technology will be selected. With regard to solar and the wind energy cost potential we use the estimation by Masui et al. (2010). For hydro power potential, we use the economic potential estimated by World Energy Council (2010), and with regard to bioenergy potential we do not introduce the competition for land with the agricultural sector in each region. Besides their economic costs and potential, we will have to take into account institutional problems, and other barriers to introduce them. In this model, setting the speed of diffusion of each renewable energy represents these other obstructions. The assumptions of potential and bounds on the supply of renewable energies are based on the sources of literature such as IEA (2010). In some scenarios, these upper bounds are changed in order to introduce more renewable energies. The relaxation of bounds reflects removal of some of the barriers to renewable energies due to the higher marginal cost of CO_2 emission reduction in case of no availability of nuclear energy and CCS options.

3. Scenarios and simulation results

In order to assess the role of technologies under the climate targets, we define the future scenarios as follows.

(1) Reference scenario
(2) Climate target scenarios
(3) Climate target scenarios with technology constraints

Table 2 shows all assumptions on technologies for all simulation scenarios. The simulation in all the scenarios starts from 2001 and runs up to 2100. In the climate target scenarios a common carbon price is assumed across the regions. This implies that one global carbon market exists and the marginal cost of GHG emission reduction in each region is the same.

3.1. Reference scenario

The AIM/CGE [Global] reference scenario is constructed based on the World Population Prospects (UN, 2008) and the GDP pathway drawn from historical information provided by the World Bank (2009) from 2001 to 2005, and post-2005 projections of the modified SRES B2 scenario (Nakicenovich and Swart, 2000). The energy efficiency improvements of different sectors and regions are taken from the results of AIM/Enduse [Global] (Akashi et al., 2012–this issue).

Fig. 2 shows the characteristics of the reference scenario. China and India are assumed to achieve high economic growth. Their GDPs are assumed to increase by about five times in 2050 and about 10 times in 2100 as compared to the 2010 level. The share of GDP

Table 2
Simulation scenario.

Scenario	Nuclear	CCS	Additional renewable energy supply		
			Low	Mid	High
(1) Reference	√	√			
(2) Climate target	√	√			
(3) Climate target w/o nuclear		√			
		√	√		
		√		√	
		√			√
(3) Climate target w/o CCS	√				
	√		√		
	√			√	
	√				√

Note: The models connected by dotted line are not linked in this analysis but are theoretically connected.

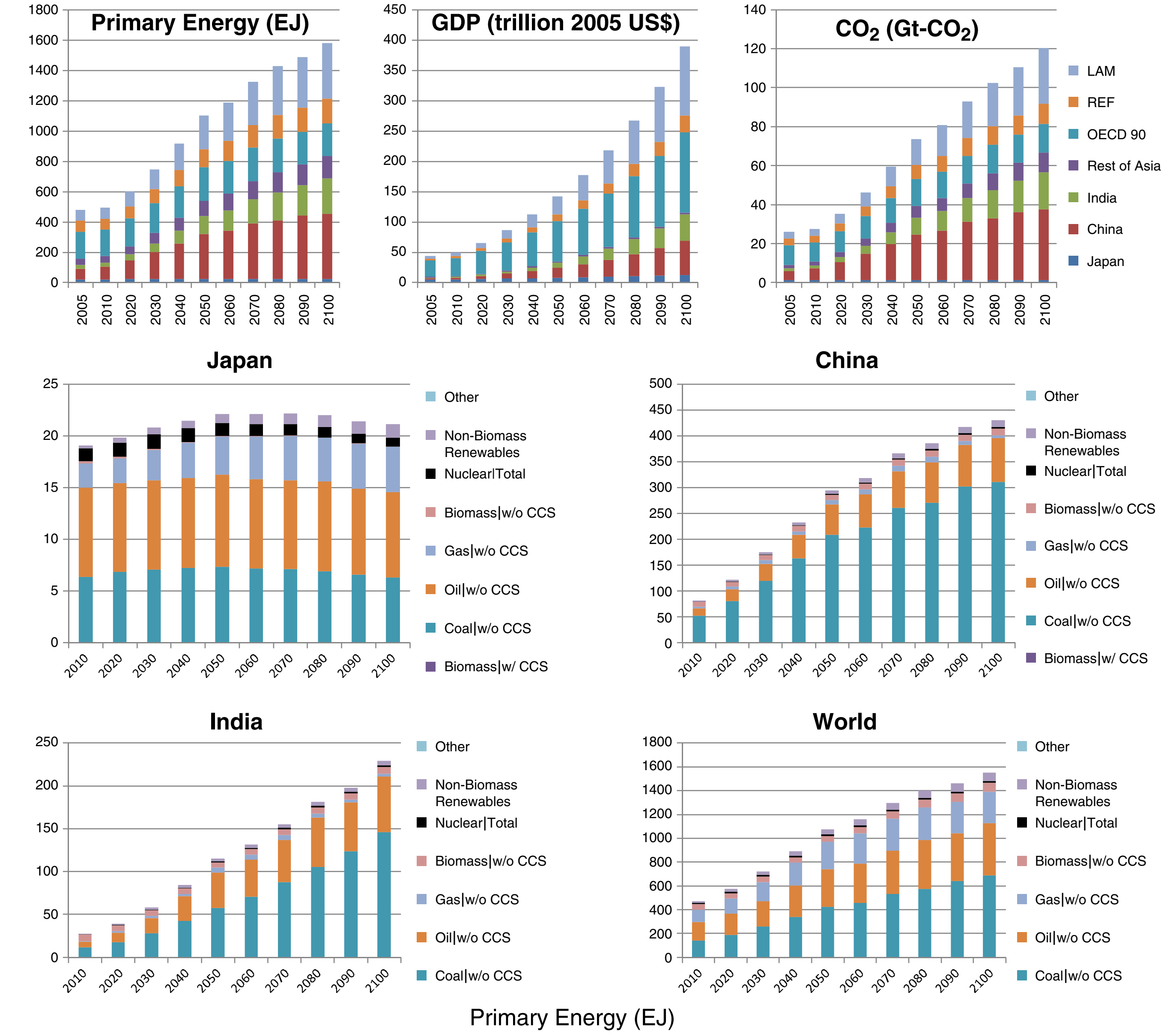

Fig. 2. Activities in reference scenario.

of China and India together in the world is 21% in 2050 and 29% in 2100. Their high economic growth is sustained by strong demand for coal and oil. The total primary energy demand in China and India in 2100 is assumed to increase by less than 10 times the current level. As a result, the share of CO_2 emissions from the two countries is 43% in 2050 and 45% in 2100. This means that their CO_2 emission per unit of output remains significantly higher than other countries.

The GDP growth rate of Japan is about 1% by 2030 and less than 1% after 2030. However, the Japanese economy continues to depend on fossil fuels and nuclear energy in this century. The primary energy supply increases by three times the 2005 level by the end of this century worldwide. The global primary energy becomes 2.2 times as much as 2010 level in 2050 and 3.2 times in 2100. On the other hand, China's primary energy supply becomes 3.5 3.6 times as much as 2010 level of China in 2050 and 5.3 times in 2100. India shows more rapid growth of primary energy supply. In 2100 it becomes 8.4 times that of the current level.

In the world, the fossil fuel supply, especially coal supply, will increase continuously during the 21st century, because of its lower cost. In China and India, similar trends are observed. In India, not only coal but also oil demand will increase rapidly, because of high economic growth rate. On the other hand, in Japan, the gas supply will increase during the 21st century, because gas fired power plants are assumed to be dominant.

3.2. Climate target scenarios

In climate target scenarios, the radiative forcing in 2100 is set to be 3.7 W/m^2. Instead of imposing the target of radiative forcing directly, we use the global GHG emission path constraints derived from AIM/Impact [Policy]. The regional CO_2 emission paths are shown in Fig. 3. In this simulation, it is assumed that the emission pathways to meet 3.7 W/m^2 are common although the available technologies are different.

As shown in Fig. 4, the carbon price in 2050 for 3.7 W/m^2 is 39 US $2005/t$CO_2$. In 2100, this price goes up to 2382 US$2005/t$CO_2$. The high carbon price induces a shift from carbon intensive energy to less carbon intensive energy. The high energy costs arising from the carbon price promote the introduction of CCS, and the CO_2 emissions become negative in the rest of Asia after 2070 with the introduction of biomass-based CCS technologies.

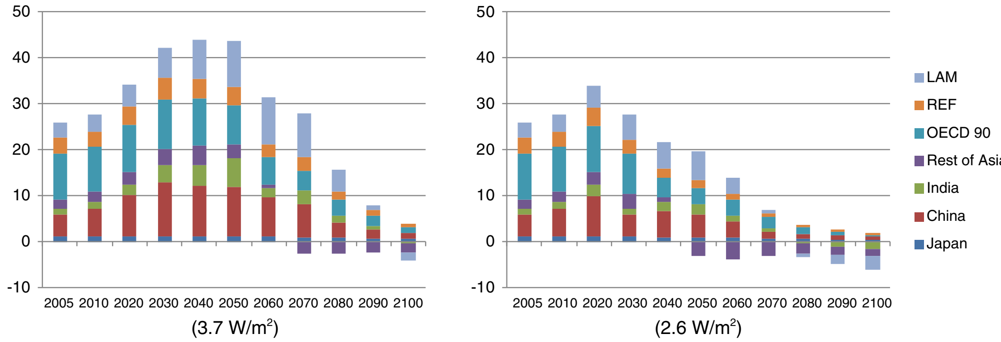

Fig. 3. Global CO_2 emissions in climate target scenarios.

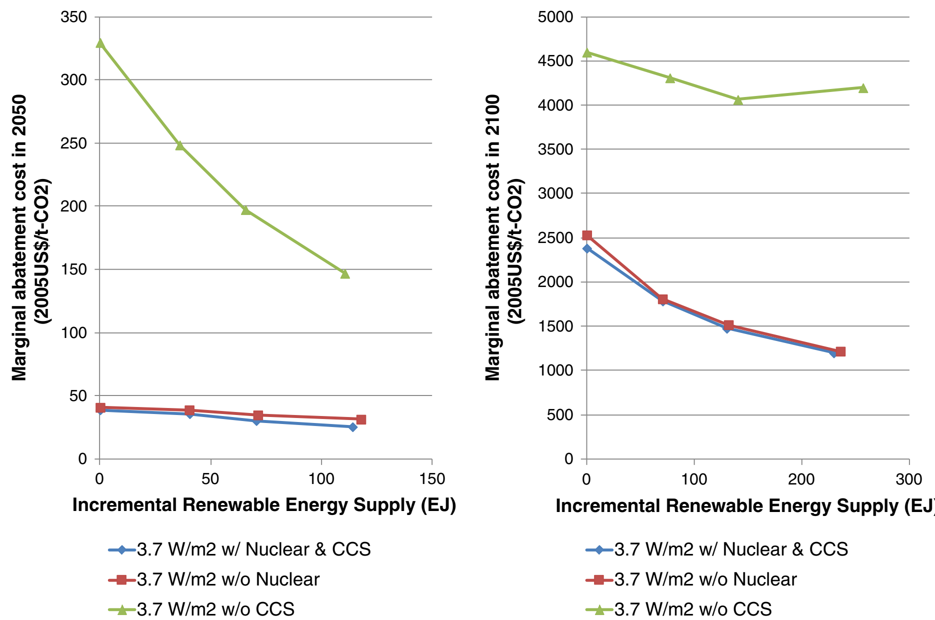

Fig. 4. Marginal abatement costs and incremental renewable energy in 3.7 W/m^2 scenarios in 2050 (left) and in 2100 (right).

Fig. 5 shows the regional share of nuclear, renewable energy and energy input to the power plant with CCS in the climate target scenario. The deployment of nuclear energy, renewable energy and power plants with CCS is different between regions. In 2010 mainly the developed countries have installed nuclear power plants. Nuclear energy would support the economic growth of China and India in the later simulation period. Therefore, Japan, China, India and other OECD countries would be affected more than other regions in the case that the nuclear energy becomes unavailable. On the other hand, CCS is installed in the other OECD90 in 2050 with their higher emission reduction costs. In 2100, CCS is widely installed across the regions. Therefore, almost all regions would be affected by the unavailability of CCS. Renewable energy as well as CCS is supplied in most regions after 2050.

China and India continue to consume coal with CCS which becomes available due to a strong demand for energy and a rising carbon price. On the other hand, Japan reduces coal consumption and increases gas consumption. The different responses of energy systems to the emission reduction are caused by the different relationships between magnitudes of demands for energy resource, energy endowment and energy-using costs. In the reference scenario, coal is assumed to be the cheapest and most easily-available all over the world through the 21st century. Economic growth in China and India basically depends on cheap coal in the reference scenario. At the same time the rapid economic growth in India increases the domestic coal price, and the coal demand is switched to the oil including unconventional oil especially after 2060.

3.3. Climate target scenarios with technology constraints

In the climate target scenario discussed in the previous section, the nuclear energy, CCS and renewable energy technologies contribute to reduce GHG emissions significantly. To analyze the importance of these technologies, we simulate the following two technology constraint scenarios in which the 3.7 W/m^2 target is achieved under certain technology constraints; 'without nuclear' case and 'without CCS' case.[1]

[1] The Asian Modeling Exercise obligates modelers to simulate both 3.7 W/m^2 NTE and 2.6 W/m^2 OS. However, to meet the 2.6 W/m^2 radiative forcing limit, AIM/Impact [Policy] represents that net CO_2 emissions should be negative at the end of this century. This means that CCS is inevitable because any other reduction options in the atmosphere such as the reforestation and the stratospheric aerosol geoengineering are not endogenously determined in the present model. In order to develop the 2.6 W/m^2 OS without negative emissions, the GHG emissions at the beginning of the 21st century must be reduced more. On the other hand, for the AIM/Enduse [Global] which provides the energy efficiency parameters to the AIM/CGE [Global], the marginal abatement cost increases very drastically. Because of inconsistency between the results of the two models, we focus only on the 3.7 W/m^2 radiative forcing to evaluate the policy scenario under which CCS is not available. However, it should be emphasized that CCS plays an important role in achieving the 2.6 W/m^2 target.

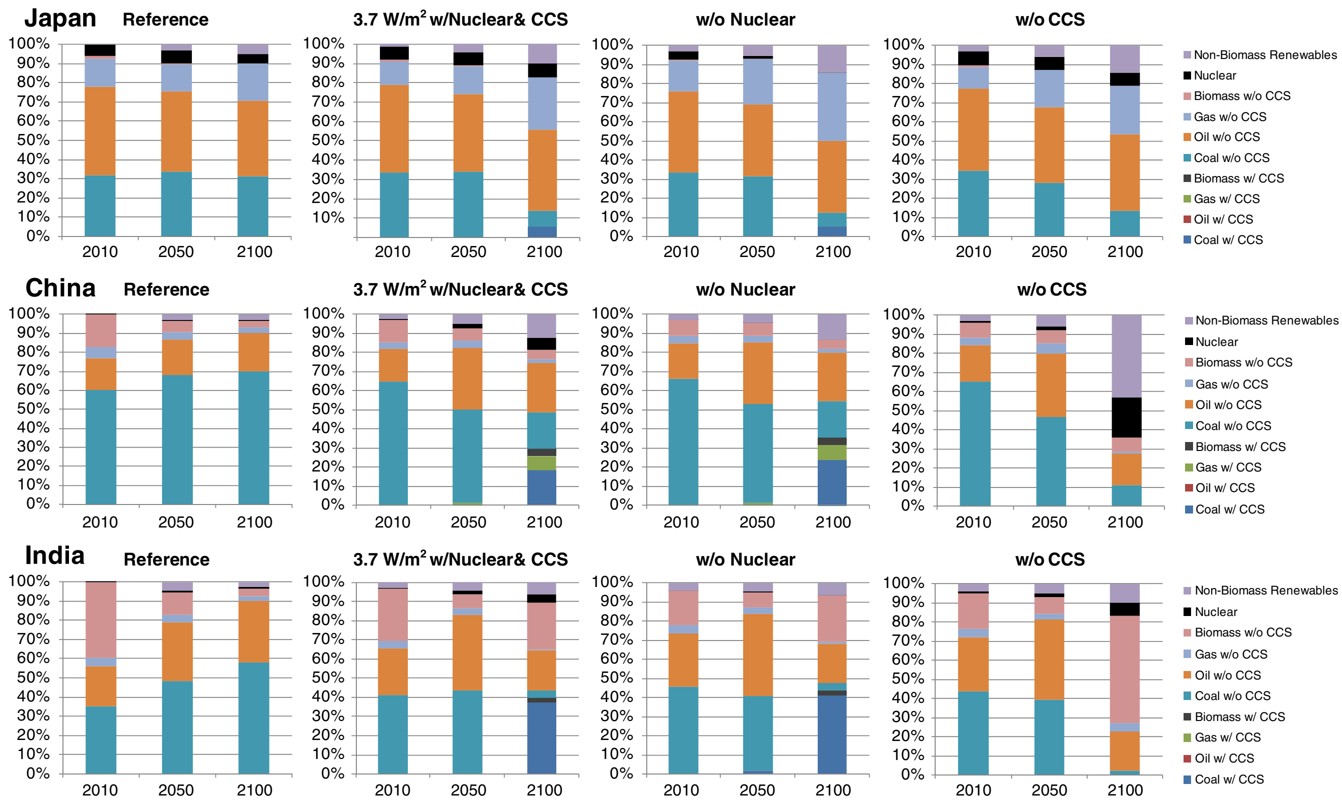

Fig. 5. Share of primary energy source in the climate target scenario (3.7 W/m^2).

3.3.1. Without nuclear case

In this case, new nuclear power plant installations are not allowed after 2010. Supply of nuclear energy shrinks as the existing nuclear power plants are decommissioned gradually over the simulation period.

Even though nuclear energy phases out, the target of 3.7 W/m^2 of radiative forcing is achievable. The marginal abatement cost required to meet the 3.7 W/m^2 target increases slightly when no additional nuclear energy can be introduced in the future (Fig. 4). In this case, CCS becomes available to a greater extent than in the climate target scenarios due to the higher mitigation cost (Fig. 5). If the bounds on renewable energy supply are not changed, fossil fuels with CCS technology increase as alternative to nuclear energy. GDPs of China and India increase but slow down after 2060 because in the climate target scenarios these countries depended on nuclear energy for their economic growth (Fig. 6). In this case, the energy intensity becomes more efficient and CO_2 intensity becomes worse in China, India and Japan, because of the phase out of nuclear technology compared to the climate target scenarios. It implies that more energy efficient technologies are selected and that the industrial structure shifts toward energy-saving instead of the introduction of nuclear energy.

In the 'without nuclear' case an increase in the renewable energy supply can reduce the marginal abatement cost as shown in Fig. 4. It is observed that higher supply of renewable energy can also mitigate the impact on industrial structure and fuel substitution. From this result, it can be suggested that increased renewable energy supply can mitigate the economic damages that are likely to occur in the 'without nuclear' case.

3.3.2. Without CCS case

In this case, CCS is not installed during the 21st century. In the 'without CCS' case the economic impact is significantly larger than in the 'without nuclear' case. The marginal abatement costs in this case are much higher (Fig. 4). In the later periods of simulation, China and India use more nuclear energy than in the early periods (Fig. 5). However their economic growth relies mainly on fossil fuels and the share of nuclear energy is still small as compared to the consumptions of fossil fuels with CCS in those countries. Therefore CCS has a larger impact on the marginal abatement cost than nuclear energy. Higher marginal abatement costs reduce fossil fuel use in China and India. However, Japan continues to maintain a strong demand for fossil fuels.

The absence of CCS cannot be compensated even if renewable energy supply is promoted, unlike in the 'without nuclear' case where the marginal abatement cost can be reduced than the case of 3.7 W/m^2 target with nuclear energy if the renewable energy supply increases (Fig. 4). This is because the global economy depends on CCS more than nuclear energy in order to achieve the targets of constrained emissions in our model. Only a few countries are assumed to introduce nuclear power plants whereas CCS is assumed to be available in all regions.[2]

3.3.3. Assessment of CCS and nuclear technologies toward the low carbon society

Fig. 5 also shows the energy composite in 2100 of 'without nuclear' and 'without CCS' cases under the 3.7 W/m^2 NTE. The regional responses of energy systems to the unavailability of technologies are different between China, India and Japan. China depends strongly on coal with and without CCS in both the climate target scenario and the climate target without nuclear energy, but it depends on renewable energy in the 'without CCS' case. India also depends on CCS, however, biomass energy supply increases in the 'without CCS' case. On the other hand Japan, which does not possess rich resources

[2] As the introduction of nuclear power plants is driven by rapid economic growth and potentially large electricity demands, and is managed from the viewpoint of nuclear nonproliferation, we assume it to be limited to developed countries and some emerging countries.

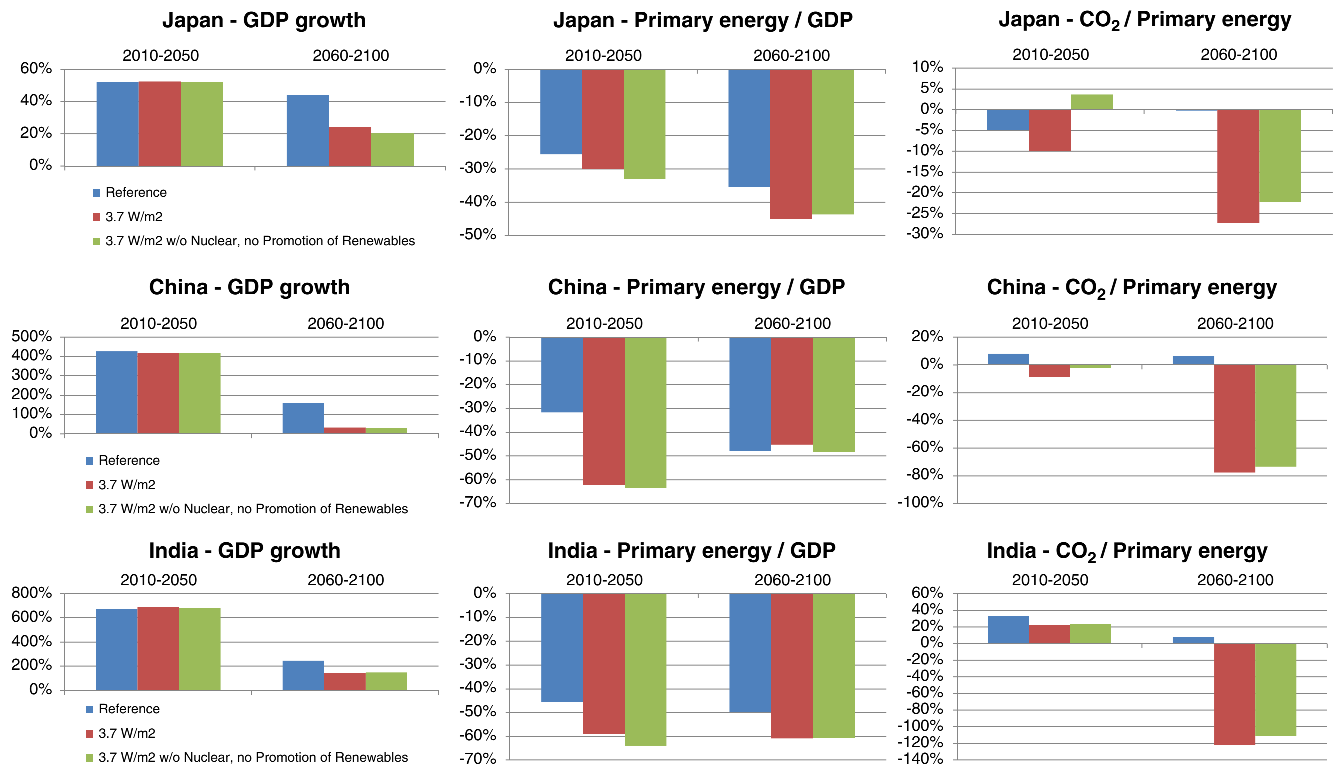

Fig. 6. GDP growth rate (%) and improvement rate (%) of energy intensity and carbon intensity in the 'without nuclear' case.

and CCS potential, does not depend on CCS even in the climate target scenario and it increases coal and renewable energy in the 'without CCS' case. Regional CO_2 emissions changed across the scenarios with the constant global level of emissions (Fig. 7). In the 'without CCS' case CO_2 emissions in China and India declined compared to those in the climate target scenario and the climate target w/o nuclear scenario because they increase biomass, renewable energy and nuclear energy. Japan's CO_2 emissions are increased more when the CCS is not available due to the increasing use of coal.

Fig. 4 shows the marginal abatement cost response to the additional renewable energy supply due to the promotion policy in the technology constraint scenarios. The curves are generally downward-sloping.

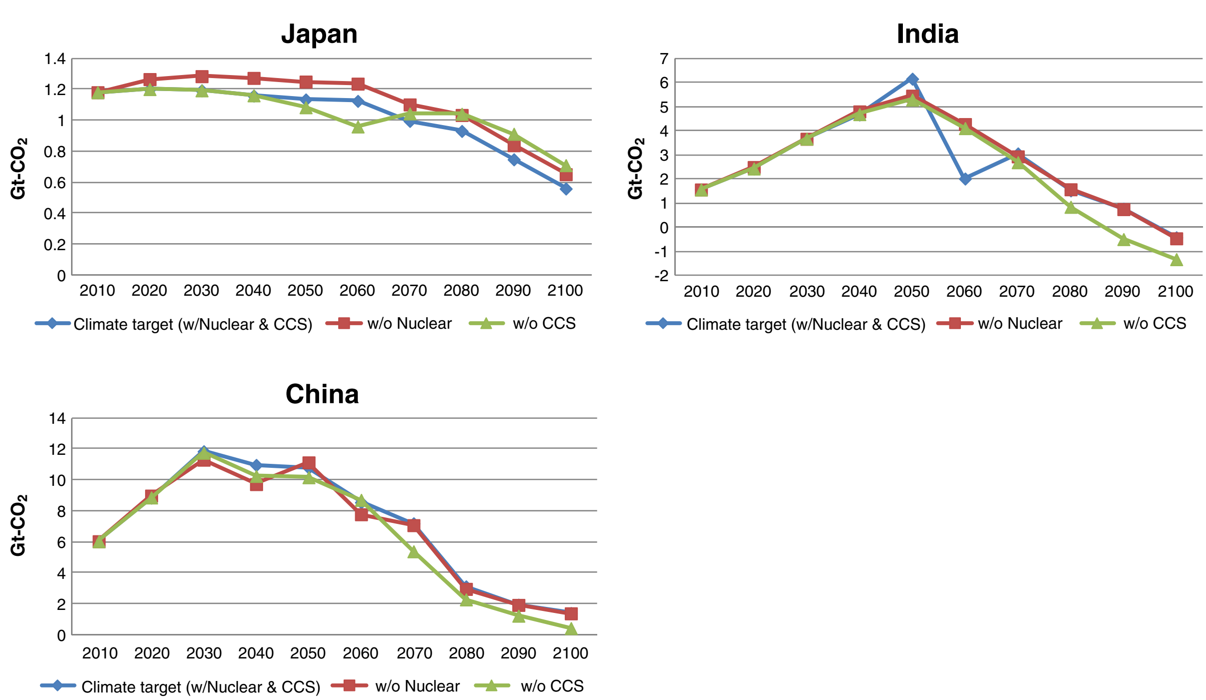

Fig. 7. Regional CO_2 emissions in climate target scenarios. Note: In this model, the CO_2 reduction by introducing biomass energy is not counted at the biomass energy demand but the biomass energy supply. When the biomass energy is exported, the CO_2 equivalent to the exported biomass energy is accounted as a negative emission for the exporter of the biomass energy.

The slopes of these curves reflect the relative scales of effect between the importance of technologies and incremental renewable energy supplies. In 'without nuclear' cases, the marginal abatement costs become more sensitive to the incremental renewable energy toward 2100. In 'without CCS' cases, on the other hand, marginal abatement costs do not respond in 2100 as compared to those in 2050. The dependency on CCS increases rapidly in later periods as shown in Fig. 5. The impact of the unavailability of CCS is too large to be compensated for by 30–90% of incremental renewable energy supply.

From the above results we find that increasing renewable supply might be effective to reduce carbon abatement cost especially when nuclear energy or CCS is not available in the 21st century. However, the impacts of the absence of nuclear energy and CCS are somewhat different across regions. The impact of absence of nuclear energy is greater in China, India and developed countries which are buyers of emission permits. However, developing countries like Latin America, Africa, Middle East and the rest of Asia supply emission permits at lower prices due to increased renewable energy supply, which has the effect of reducing the marginal abatement cost. The latter effect dominates the former in the relationship between nuclear power and renewable energy options.

On the other hand, the impact of the unavailability of CCS appears mainly in Latin America, Africa and Middle East which are sellers of emission permits. The supply price of emission permits pushes up marginal abatement cost as a whole. Although the increased renewable energy supply helps to produce emission permits, it is not sufficient in this case. It means that a significant amount of renewable energy supply is needed to compensate for the fossil fuels which become unavailable due to the absence of CCS.

4. Conclusion

In this study, we quantified the importance of carbon-saving technologies to climate change policy in order to picture the climate change strategies of China, India and Japan against a backdrop of uncertain availability of nuclear energy and CCS. We obtained two main findings from our analysis. The first is that the appropriate energy strategies against the uncertain technologies differ between regions. The response of energy systems to the lack of technologies is differentiated by the uneven deployments of nuclear energy, CCS potential and renewable energy potential, the resource endowments and the levels of economic development.

The second finding is that nuclear energy, CCS and renewable energy play important roles in reducing marginal abatement costs to meet the 3.7 W/m^2 target. Nuclear energy can be replaced by renewable energies if the speed of renewable energy deployment is increased, and this can reduce the cost of carbon mitigation. On the other hand, the impact of CCS unavailability on marginal abatement cost is significantly larger than that of nuclear because the economic growth of China and India relies on fossil fuels with CCS in the latter part of this century. The absence of CCS cannot be compensated for by the promotion of renewable energy.

In summary, it is possible to develop robust emission pathways even amid uncertainty about future technologies. This would necessitate strategies such as a significant enhancement of renewable energy supplies by removing barriers to their penetration, and promotion of particular fossil fuel alternatives based on region specific availabilities and costs.

In order to portray robust emission pathways, the global emission pathways and available technology options will have to be also reconsidered. Moreover, contribution of the demand side technologies to the robust emission pathways will be more important to the actual mitigation policies. For that purpose, the more concrete linkage between two types of models, AIM/CGE [Global] and AIM/Enduse [Global] will be necessary.

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