Keynote Speech

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Transformation for a Sustainable Future

Their Imperial Highnesses the Crown Prince and Crown Princess, Chairman Saito, distinguished guests, ladies and gentlemen, it is my great honor to be able to attend this meeting and to speak in front of such a distinguished audience. The title of my lecture is "Transformation for a Sustainable Future." This is in line with the conference title, "Advancing from Rio+20 toward a Sustainable Future: Economic Revitalization and Contribution to the International Society through Green Economy."

During the last 100 years – I should say, during the 20th century – we witnessed an enormous increase in the population. It went from 1.5 billion to 6 billion, increasing by four times, and per capita consumption also went up by a factor of two. The consequences are that human consumption on earth increased by a factor of eight during the 20th century, and we suddenly find that for the first time in human history, the earth has become overloaded. Our planet used to be an infinite place, but when the consumption of the population increased, it became finite, and we are now changing the earth's system in a precarious way.

If you look at some of the changes we are facing today, I think there is no doubt that many of you would say, "global warming." It has been shown that the average temperature gradually rose from 1800 to 2000. But the important thing is that, although scientists say that this temperature increase is dangerous, when people hear that the temperature will rise by two degrees centigrade by the middle of the 21st century – and maybe four degrees by its end – most of them will not take it too seriously. The reason for this is quite simple. You wake up in the morning, and by lunchtime the temperature will have gone up maybe three or four degrees. Across the seasons, the temperature could change from minus 40 degrees in the winter to plus 40 degrees in the summer – an 80-degree difference. Many people ask why scientists are so stingy, why they always talk about the two degrees. Of course, you can turn around and say, the human body is at 36.5 degrees. If our temperature were to rise by two degrees, to 38.5, we would all be sick. The human body cannot take an increase of two degrees very easily. The earth's system is quite similar in this regard.

The next slide will show you an even better example. This is called burning embers. The vertical axis is the temperature and the preindustrial era is right here, -0.6 degrees from the current temperature. When the temperature goes up, the white color becomes yellow, orange, and then red. This situation will become more and more serious. If you look at the temperature here at 0 degrees, and then at the risk of extreme weather events, it is clear that we are already in a yellowish area, almost leaning toward orange. As you can see, things are already very serious.

On the other hand, if you look at the risk of large-scale discontinuity, even though the temperature went up by two degrees from that of the preindustrial era, the color is still white. This means that the

transition into discontinuity is still slow. In IPCC 2007, we came to this conclusion and said that we should try to maintain a temperature of two degrees above that of the preindustrial era and a carbon dioxide level of about 450 ppm. We now have a level of 400ppm going up at the rate of two ppm per year. It will only take another 25 years to increase the temperature by another two degrees. In 2009, Smith et al. published a paper in the *Proceedings of the National Academy of Sciences*, which asserted that things are much more serious. If you look at the risks and the events, the situation as represented on the chart has not just become yellow, it is already very dark yellow, and if you look at the risk of another two-degree increase, we have a chance of going into discontinuity. That is really serious.

Also in 2009, Rockstrom et al. said, "Well, if you look at the earth and assume that there is a boundary – of course the boundary could be imaginary – and sunshine radiates on the surface of the earth through biospheric activity, it will create a cycle matrix." When consumption and production exceed certain amounts, the environment will deteriorate. This shows that climate change is already exceeding this boundary. Biodiversity loss and the nitrogen cycle have both exceeded the boundary by that point. At that time, atmospheric aerosol loading was not shown to be an important form of chemical pollution, but these two problems have been increasing rapidly during the last five or ten years. If you notice this, you will agree with what *National Geographic* has said: right now the world consumes 1.5 times the earth's resources. This means that sunshine can recycle and clean up the earth's waste, but we are cutting down forests, depleting the fishery stocks, and overloading the earth; thus, the earth is sinking.

If you take this problem seriously, then you'll immediately understand that it indicates that the earth is overdeveloped. If that is the case, then the concept of developed countries helping developing countries to become developed does not seem to be right. I believe that if the earth itself is overdeveloped, many of its countries are far too overdeveloped. If we all live like Americans, it will require 5.4 times the earth's resources. If we all behave like the Japanese, we will need three Earths to satisfy our needs. Thus, when we discuss "developing countries" or "developed countries," and when we talk about sustainable development and our needs, we really need to examine these issues quite carefully.

All of humanity on earth should recognize the fact that the world is overdeveloped and our very survival is at risk. This is the reality at the present time. But people in Africa do not agree with this. They say, "Professor Lee, don't say that, we are miserable, we need to develop." We understand their need to develop, but if they were to follow in the footsteps of the West – to use automobiles and consume large amounts of fossil fuel – then there would be no future. Their development has to be very different. We have to find a different way to develop.

Of course, environmental changes will also have impacts on Japan's vulnerable cities regarding matters such as food, water, changes in price and availability, and extreme weather events, as we've seen during the last couple of days. Events like the traditions of cherry blossom viewing might begin a little later, which will indicate a critical stage in the change of our climate. Eventually, people will not have the chance to drink wine under the cherry trees.

If we were to go on like this, I can imagine that within the next 50 years our children, our grandchildren, and their children may not forgive us for destroying the earth and their future. I can imagine them at Rio+70, the older generation sitting at the podium, the younger one saying, "When you had a chance to do something about the earth, you didn't. Now, we cannot survive." Thus, in a sense, our only choice is to transform the way we develop.

How can we transform the way we develop? There are several points that might be important. The first is global responses to global problems. The Rio+20, which I attended and at which I gave a speech on behalf of scientific community, was a very big disappointment. We accomplished something, but it was a disappointment. Why? Because we are facing enormous global problems, but the responses are not global. Many nation states did not come up with positive conclusions.

I remember nine years ago, when STS was inaugurated, chairman and founder Koji Omi said a very interesting thing in his inaugural speech. He said, "Today's problems are global and cannot be solved by any single country or scientist alone. Boundaries between nations are merely lines on a map. Nature makes no such distinction." That was what Chairman Omi said. This year we celebrated STS's 10th anniversary and found that the spirit---*We are in one community*---is very strong. We had 1000 people come from all over the world; policymakers, businesspeople, scholars, scientists, and engineers all came and discussed many important issues.

Within this big job last year, a very important global scientific program was initiated to attempt to solve some of our sustainability problems. As I said, Omi-san talked about global responses to global problems. We also know that we have to go back to nature; go back to sunshine; in a sense, go back to 300 years ago, after the industrial revolution, when we somehow detached and dissociated ourselves from sunshine and nature. We also have to live better for less. That's the only form of energy efficiency. I think it will involve new values and philosophical views of human life. We have to control the population explosion or the population will keep on increasing. If we reach 9.6 billion by 2050, as the UNDP has estimated, the production of virtual products will probably decrease because of extreme weather. We want to solve these problems and we need to improve equality around the world. If only 1% of the population owns 40% of its assets, many people will not feel that we own this planet together. This is a very important point. The big job that I referred to earlier is an important global scientific program called "Future Earth."

Future Earth is a 10-year research program on global sustainability. It was initiated last year, around the time of Rio+20, by an alliance of eight members. The ICSU, of which I am currently president, is one of the most important organizations pushing this program. I will say a little bit about the ICSU. It was formed in 1931 after the First World War. At that time, scientists, scientific communities, and scholars all felt that we should work together globally to solve global problems.

The ICSU is currently the largest global science organization, with over 120 national members representing 140 countries. But more importantly, this organization started as a union: the "International Council of Scientific Union." It has 31 affiliated scientific unions, including the International Council of Pure and Applied Chemistry, Pure and Applied Physics, Material

Sciences, and most recently the International Sociological Association. It has a secretariat in Paris and regional offices in Africa, Asia, Latin America, and the Caribbean. The ICSU's mission is to strengthen international science for the benefit of society.

The ICSU is working together with the International Social Science Council in three UN organizations – UNEP, UNESCO, and UNU – and two funding agencies – the International Group of Funding Agencies for Global Change Research and the Belmont Forum. It is also a funding agency for environmental research. I am sure Japan is involved in both of these WMOs as an observer.

Future Earth has the following objectives: to provide the knowledge required for scientists to face the risks posed by global environmental change and to seize opportunities in the transition to global sustainability. This is a very different kind of scientific program. In the past, scientists have provided some solutions, but have not connected their actions. This organization therefore tries to connect knowledge to action. This is quite important, as Future Earth will try to solve real problems: feeding communities within sustainable planetary boundaries, protecting nature's services and biodiversity, transitioning to low-carbon societies, and adapting to a warmer and increasingly urban world. In Asia, we know that we have to solve a slightly different set of problems: how to grow; how to improve human well-being within planetary boundaries; how to manage urbanization and reduce pollution; and how to be less vulnerable and more resilient in the face of a changing climate and extreme weather.

Future Earth has three research themes and I will briefly mention what they involve. The first theme is called "*Dynamic Planet*." We know that we have an ego through observation, including human activities, and we should set up the collection of data, analysis, and models, and make predictions. We need to understand the current status and what the trends are. Things are moving and we are paying special attention to critical zones like Polar Regions, coastal areas, and tropical forests.

The second research theme is "*Global Development*." We have to pay attention to the stewardship of resources, clean air, materials, mining, biodiversity, ecosystem services, climate change, fisheries, equitable access, food security, water availability, and a healthy environment.

The third theme is "*Transformation toward Sustainability*." This is really important. Scientists, for the first time, are trying to engage in social transformation, so we have to examine the transformation process of economies, megacities, development options, innovations, and ideas. We have to look at emerging technology and assessment of policies, as well as global and regional governance, international law, and regional enforcement. This is certainly a very ambitious program. They have already organized a Science Committee within the alliance by now. In fact, I think one of the committee members is here – Professor Yasunari Tetsuzo-Sensei – and the committees are working very hard to promote scientific programs. The Engagement Committee has been formed and a permanent Executive Secretariat have attracted interest, such that many countries want to host the permanent secretariat. The Governing Council has also been organized. We are now in the first year of Future Earth.

Although we are only in the first year, the Science Committee is already working on fast-track initiatives. We would like to see many governments provide a small amount of funding – $125,000, which can have a big impact – and we will have products that integrate many disciplines designed within two or three years with the help of policymakers. In this area, Japanese scientists are really playing the leading role in Asia. This is quite impressive, but things are moving. We want to mobilize lots of people engaged in small programs and make connections with the government and different disciplines.

I should now return to the more serious problem and address what Japan can do about it. Japan can certainly play an important role. Most importantly, Japan can create a visionary path towards sustainability. For the achievement of global sustainability, Asia is going to be the most important area because of its population, activities, environmental problems, and dynamics.

For Future Earth to go well, Future Asia has to go well also, and that depends on how Asia moves. I really think no other country other than Japan can push forward Future Asia. In a sense, Japan could lead the entire activity of global transformation for sustainability – an action that will earn Japan respect from people around the world. I say this because Japan has incredibly rich traditions and wisdom, not just scientific efficiency. We need to learn from these Japanese traditions and wisdom, particularly the ancient wisdom of managing water. Your Imperial Highness has mentioned this important subject several times. Japan really has done very well. It was interesting, I was in Sri Lanka, and found out that 2000 years ago Sri Lanka also had a very good water management system. In Asia, it was certainly a very advanced water management system for quite a long time.

More importantly, Japan has excellent science and technology capabilities. If you look at energy efficiency, Japan's is extremely high. If you look at the tons of carbon dioxide for every one million GDP, Japan's is the lowest. If you look at the energy generation, Japan is the most efficient country regarding appliances. I bought a refrigerator made in Japan that only uses 50 watts. It's a very smart refrigerator; if you leave it open too long, it will warn you. Your computer will monitor how much energy you are using during the day. Japan certainly has enormous capabilities in science and technology.

Also, Japanese scientists are working together with Asian scientists on the Asian monsoon issue. This relates to tectonic plate formation, and because rain provides so much rice production in this area, it is really quite important. This research is supported by APN and carried out at the Research Institute for Humanity and Nature, in which Professor Yasunari is engaged. The Asian monsoon climate system underpins the ecosystem services on which the livelihood and wellbeing of billions of people depend. Japan is also the only country that earnestly looks at global environment and disaster risk and tries to work together with other countries. This is the Asian monsoon region, rice paddy fields in monsoon areas, and well-utilized alluvial basins and plains formed as a part of the tectonic zone. When I have attended meetings in Asia related to sustainability research, I have always been extremely impressed by what Japanese scientists have been doing, working together with scientists from other countries.

Recently, people have been worrying about PM2.5 and looking at new issues with aerosol. Pollution by sulfate aerosol has become very serious and you can see that it does not respect national boundaries. These issues are coming from China to Japan, and really all are affected. Yonemoto-Sensei (Shohei Yonemoto, visiting professor of the University of Tokyo) did mention that PM2.5 will be "*nicchu gaiko no kouki de aru*." There are chances for China and Japan to carry out some diplomatic relations.

In organizing for the Future Asia, the Japan Science Council has put enormous effort into getting university groups and research institutions such as RIHN, IGES, and NIES to form Future Earth national committees. These also include policymakers, MEXT, METI, MOE, and stakeholders – businesses, agriculture, media, and medical caregivers – who are trying to form a Future Earth Japan Foundation or a Future Earth Japan Society, as well as a Future Earth Japan Secretariat. But I sincerely hope that it will not be a Japan secretariat, but a global secretariat. As I said, Asia is very important and Japan can really take on a leadership role. I want to pay respect to how the Japan Science Council, including President Onishi and Vice-President Kasuga, has been working on this.

Last week at the STS conference, Prime Minister Abe mentioned that Japan's economy must be made more robust and its international profile more prominent. Of course, global environmental change has severely threatened all economies and in order to achieve that goal, we have to pay a lot of attention to global environmental problems.

It was interesting, about 20 years ago when I was visiting Japan, a young man came to see me and said, "Professor Lee, Japan has become economically rich and successful, but how come the world still doesn't respect us?" I said, "That's not quite true. Japan is quite well respected but perhaps not at the level that young people would like." I mentioned to him that in 1962, when I went to the United States as a student from Southeast Asia, from a country that was repressive, corrupt, and very poor, we were seeking something that was not just wealth. We went to the States because we liked what Lincoln said in the Gettysburg Address in 1863: "All men are created equal." and a "government of the people, by the people, for the people." This idealism was really what drove many of the people who went to the States and it is going to be important in the future as well.

Future Earth will depend on Future Asia, and Japan is best suited to take on a leadership role both within Asia and globally. I am sure that if Future Earth is mobilized and Japan takes on leadership, we can transform all of human society to a sustainable society – not just so-called developing countries, but developed countries too. We will have to find a new kind of development and Japanese society will have to transform. I am quite confident that Japan is a country that can take the lead and accomplish these goals, and I am looking forward to seeing this leadership. Then, 20 years from now, if I were to meet that young student again, he would instead say, "Professor Lee, Japan is revered globally today because when it was necessary your generation stepped up to become leaders and in doing so, transformed human society." I hope it is apparent that the only choice is to continue transforming.