

DSM Sustainability Forum Vol. 1

9 March, 2017 at Iino Hall, Tokyo, Japan

Business Opportunities with “Paris Agreement”

The Agreement's Impact on the Chemical Industry

Opening Remarks

Yuji Nakahara, President of DSM Japan

Keynote Speech

Dimitri de Vreeze, Member of the Managing Board, Royal DSM
/ Board Member of the European Chemical Industry Council (CEFIC)

Special Presentation

Dr. Yukari Takamura, Professor at the Graduate School
of Environmental Studies, Nagoya University

Guest Presentation

Mr. Yutaka Shoda, Councillor, Minister's Secretariat, Ministry of Environment

Guest Presentation

Mr. Futoshi Nasuno, Manager of the Environment Policy Division,
Industrial Science and Technology Policy and Environment Bureau,
Ministry of Economy, Trade and Industry

Keynote Speech

Jeff Turner, Vice President, DSM Sustainability

Panel Discussions

Moderator

Mr. Takejiro Sueyoshi, Special Advisor, United Nations Environment Programme
Finance Initiative

Panelists

Mr. Kiyoshi Matsuda, Advisor at the Public Policy & Relation Office,
Mitsubishi Chemical Holdings Corporation

Mr. Hiroshi Watanabe, Director General, Japan Chemical Industry Association

Mr. Andrew Staples, Southeast Asia Director, Economist Corporate Network

Dimitri de Vreeze, Member of the Managing Board, Royal DSM

/ Board Member of the European Chemical Industry Council

Closing Remarks

H.E. Aart Jacobi, Ambassador of the Kingdom of the Netherlands in Japan

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OPENING REMARKS



Yuji Nakahara
President of DSM Japan

As you already know, the Paris Agreement became effective last year, and currently, rulemaking for the agreement is being pursued in the midst of various arguments. In that sense, it is not an exaggeration to say that a framework of how the international community will be involved with the climate change problem this year 2017. In addition, the momentum of active involvement by the government and industry in response to such movements is also growing.

The chemical industry, which has actively worked on responsible care and supported environmentally preferable products and services in various industries, should see the world trend toward working on problems on a global scale, beginning at the Paris Agreement, as a golden opportunity. This is because as the arguments on climate change advance and the whole world moves on to sustainability, the value of technology for achieving that will be raised and converted to competitive strength.

DSM intends to further pursue the development and provision of useful solutions through open innovations by tackling this problem in cooperation with Japanese companies that have high-level technological capabilities.

Why does DSM stick to innovations this way? The answer is that we have the following definition: "R&D is a work of transforming money into wisdom, and innovation is a work of transforming wisdom into business." We are convinced that long-term challenges such as the climate change problem can be truly solved only with a mechanism called business.

Looking back, the 1973 Oil Crisis occurred when I was still a student. The crude oil price at that time had been three dollars per barrel. However, the six Gulf countries announced they would raise it to five dollars, causing the whole world to fall into chaos. Currently, the crude oil price is 50 dollars per barrel. Despite that, the world is turning fine. This is only because many scientific technologies and technological innovations have been created in approximately 40 years making the use of energy more efficient. This way, the human society has the ability to certainly overcome difficulties with strong willpower thanks to the progress of science and technology.

This forum is attended by companies representing various industries, government agencies, academic professionals, and those who are working on this topic on the respective front lines, as well as the speakers and guests on the podium. A total of approximately 150 people from approximately 97 organizations participated in the forum. I would like to express my sincere thanks to you all.

Today's forum focuses on climate change and sustainability, and is intended to discuss how to pursue the global sustainability while taking advantage of technical capabilities and innovations, and how to perceive this as business opportunity. I strongly hope that this forum will help revitalize arguments on climate change, and be instrumental in creating innovations that can change the world in collaboration with you.

It's too late to be pessimistic. (Now is the time to take action.)

Dimitri de Vreeze

Member of the Managing Board, Royal DSM / Board Member of the European Chemical Industry Council



Business is critical for the effectiveness of the Paris Agreement.

In present days, a situation where one third of food is disposed of and one third of irrigation water is lost on the earth has continued. It is said that if this pace was maintained, ten earths would be needed to cover resources necessary for humans in the year 2050.

In the meantime, do you know that the earth provides many opportunities to us? For example, if a 15 hour portion of solar light pouring onto the ground is all captured as energy, it will cover the amount of energy that humans use in one year. In addition, the markets related to climate change have the potential to grow to a scale comparable to a second China in ten years. Moreover, to achieve the objectives of the Paris Agreement: a 2-degree goal and net-zero CO₂ emissions, by 2100, presence of business is essential. In this sense, it is significant that many of the shareholders of global companies attach importance to this issue in these days. Furthermore, currently a trend in which private sectors actively demand the disclosure of information on carbon risks is also being formed.

Many people feel uneasy about the attitude of the new administration of the United States. However, in industrial circles, a basic trend of supporting initiatives toward a low-carbon society is noticeable. For example, in November 2016, investors running business in the United States and companies included in the Fortune 500 submitted an open letter requesting compliance with and driving of the Paris Agreement to the government before the new administration was inaugurated. DSM was one of them. Considering that these companies have approximately 1.8 million employees in total, operate their businesses in 44 countries, and earn sales of over 1 trillion dollars, their influence is immeasurable.

Huge business opportunities arising from climate change

Fig. 1 shows the Sustainable Development Goals (SDGs), which the United Nations leads. The SDGs encompass various business opportunities related to climate change.



Fig. 1: Sustainable Development Goals

According to a report, the business opportunities that will arise in relation to sustainable development are estimated to account for approximately 12 trillion dollars. Moreover, the report also suggest that this will create approximately 380 million jobs, which account for more than 10% of the total working population in 2030. The created jobs are said to include 220 million in Asia, which is expected to serve as the central region of such business opportunities. Needless to say, this 12 trillion dollar market can be realized only with collaboration between academic circles, government and business, and it will be essential to build such collaboration.

Building a good partnership toward the realization of a low-carbon society

In these circumstances, DSM places focus on three sustainable growth areas, which are “nutrition,” “climate change and renewable energy” and “provision of sustainable materials.”

Our company’s motto: “Bright Science. Brighter Living.TM” is not merely a message. It aims at providing solutions for Brighter Living by making specific efforts. “ECO+” which is intended to provide better environmental technology than existing solutions, and “People+” intended to provide products contributing to people’s life such as working conditions and health, are a part of the motto.

Ironically, our company started with coal mining as a regular vocation. However, since its foundation, our company has expanded its business into other fields such as feedstuff, foods and bio materials through various reforms while always looking into the future. “DSM” originally stood for “Dutch State Mines.” But, currently we recognize it as an abbreviation of “Do Something Meaningful.” And, the company intends to continue to seek further business expansion while keeping in mind the realization of a sustainable society in a global sweeping trend of climate change.

Rapa Nui (Easter Island), which had once built an advanced civilization, headed down the path of destruction as its citizens used up limited resources (such as trees). Thomas Jefferson said: “I like the dreams of the future better than the history of the past.” However, it is certain that we can learn something from the past. The tragedy of Rapa Nui is also a very powerful message to modern people. The purpose of our gathering here today is to build a partnership intended to realize a low-carbon society assuredly and constructively while sharing, learning and discussing such lessons and new insights and recognitions.

It’s too late to be pessimistic. Now is the time to take action together.

The Paris Agreement and its Impact on Business

～Business starting to move toward zero emissions～



Dr. Yukari Takamura

Professor at the Graduate School of Environmental Studies, Nagoya University

The direction of decarbonization has become clearer

The prime feature of the Paris Agreement is in the fact that long-term goals and a vision, that is to say, a direction in which the international society should aim at achieving social and economic decarbonization to cope with the problem of global warming, was clearly specified. The Paris Agreement stipulates that the global response should be strengthened against the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature rise even further to 1.5 degrees Celsius. The Agreement also aims at achieving reduction while balancing between man-induced emissions and absorption of greenhouse gases, or net-zero or zero emissions of greenhouse gases including CO₂, in order to achieve a temperature rise target (hereafter “2 degrees Celsius target”) by 2100. These long-term goals and vision serve as guidelines for national greenhouse gas reduction targets, and represent the directions of business, investment and innovation. The idea of “stranded assets,” which has recently attracted attention, also comes from these long-term goals.

It has become clear that there is an upper limit to the amount of CO₂ that we can be emit in the future

A Fifth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) presented a finding that the relationship between the cumulative emissions of CO₂ and the rise of the global average temperature was almost linear. The total CO₂ emissions in the past can be estimated. Therefore, if a target for limiting the temperature rise to a certain degree Celsius is set, a rough quotation of the permissible CO₂ emissions in the future will come in sight. This will also offer a suggestion on the risks of currently operated businesses and investments and their future shapes.

Fig. 1 shows estimated amounts of carbon that can be emitted in the future on the assumption that the respective temperature targets shown in circles can be achieved with a probability of 50%, and of 80%. Of the two outer circles, the second outermost circle represents the amount of carbon that is emitted if fossil fuel assets in which private companies

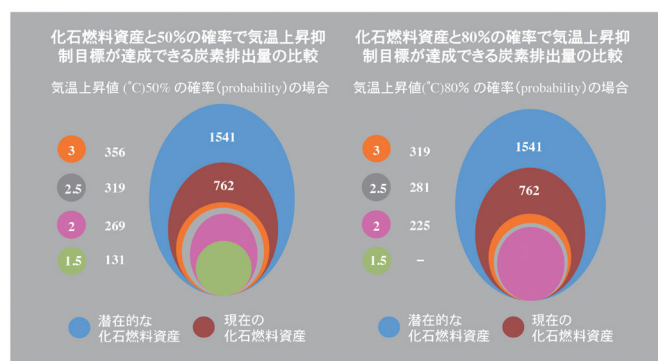


Fig. 1: Stranded assets

invest are burned, while the first outermost circle represents the amount of carbon that is emitted if fossil fuels in which private companies have not invested, but may invest in the future, are burned.

As shown in this figure, if fossil fuels private companies have invested in were burned, even control to a 3 degrees Celsius temperature rise would not be achieved. If the 2 degrees Celsius target is to be achieved, not all the fossil fuel assets private companies have invested in cannot be burned, and those assets that cannot be burned would remain as “stranded assets,” posing a risk of inability to recover the investments. As described, setting a long-term goal would clarify the risks that a fossil fuel project and its investment may pose, and the future direction of business and investments. The long-term goals of the Paris Agreement are very important also in a sense that they represent business and investment risks and opportunities.

Climate change poses risks and provides business opportunities

Currently, movements toward the achievement of the Paris Agreement’s long-term goals, decarbonization of society and economy, and zero emissions are led by businesses and local governments, rather than national governments. Urban cities, local communities and companies have launched collaborations and coalitions intended for net-zero greenhouse gas emission and a resilient and sustainable society. A typical example is “WE MEAN BUSINESS,” in which the world’s leading companies numbering over 500 as of the end of 2016 participate. Centering on these initiatives, activities such as implementation of emission reduction targets (consistent with the 2 degrees Celsius target) and carbon pricing based on scientific findings, and use of only renewable energy for the electricity consumed at companies, are being accelerated. Such movements are also backed by worldwide and rapid advancement of trends in which investors urge companies to disclose information on business risks and opportunities associated with climate change.

Partly because businesses are clearly moving toward substantial reduction with the aim of achieving zero emission, shift to energy-saving approaches and renewable energy is steadily advancing on a global scale. While the world economy has maintained a growth of 3% or more, the global emissions of energy-derived carbon dioxide have stayed flat or slightly decreased from 2014 to 2016.

However, international organizations and think tanks see it essential to further drive shift to energy saving approaches and renewable energy in order to achieve the long-term goals of the Paris Agreement. From a different angle, this means that that market will expand on a global scale in the future. For businesses, climate change is a risk, but at the same time, provides an opportunity for the generation of a market and investment associated with a substantial social shift. I hope that you actively discuss how we should take advantage of this.

Role of the market toward a decarbonized society



Mr. Yutaka Shoda

Deputy Director-General, Ministry of Environment

Achieving simultaneous solution to climate change and economic challenge

According to the Intergovernmental Panel on Climate Change (IPCC), to limit the temperature rise to 2 degrees Celsius with a probability of 66% or more, it is necessary to limit the cumulative CO₂ emissions in the world to approximately 3 trillion tons. However, we humans have already emitted approximately 5 trillion tons of CO₂. So, the remaining cumulative emissions are only approximately 1 trillion tons.

The global annual CO₂ emissions in 2014 were 32.2 billion tons. If we continued emissions at this pace, the emissions would reach 1 trillion tons in only about 30 years. To achieve both economic growth and substantial CO₂ reductions, it is necessary to systematically aim at a decarbonized society while minimizing the cumulative emissions (see Fig. 1). We are now entering an age where we must consider achieving simultaneous solution to the climate change problem and the economic challenge.

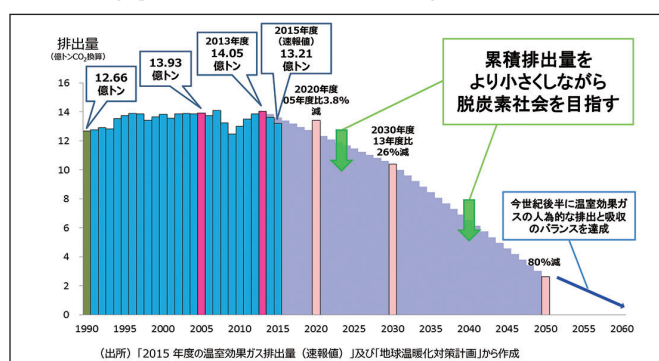


Fig. 1: Toward a decarbonized society

Measures against climate change are a “promising market”

The main assumption of the past economic growth has been CO₂ emissions commensurate with it in a sense. However, to achieve sustainable economic growth in a situation where the amount of CO₂ that we can emit is 1 trillion tons, it is essential to increase the added value per carbon input = “carbon productivity,” which means generating an additional value with less CO₂ emissions, or a smaller carbon input, in other words. For that purpose, it will also be important to pursue a structure designed to earn profits on quality, not on quantity, by making efforts to reduce carbon input such as adoption of renewable energy or pursuit of an energy saving approach, and adding a high value to properties and services.

Naturally, it will be necessary to create a new market where companies and individuals can actively make investment or consumption with a certain level of prospect. In that sense, under circumstances where the global trend toward decarbonization, which got into action around the time of enforcement of the Paris Agreement, has become solid, climate change countermeasures, which are said to require continued investment in the future, can be regarded as a

promising market with large room of growth.

In fact, IEA estimates that decarbonization in the power sector in accordance with the 2 degrees Celsius target scenario will require additional investment of approximately 9 trillion dollars in a period from 2016 to 2050, and achievement of energy-saving in three sectors, building, industry and transport, will require additional investment of approximately 3 trillion dollars in the same period. In addition, efforts for climate change countermeasures are expected to produce effects of generating demand for new properties and services by inducing innovations over a long period, such as development of innovative reduction technologies.

Rapidly introduced carbon pricing

One of the points for that is carbon pricing, such as carbon taxes, which are imposed according to CO₂ emissions, and an emissions trading system. According to the World Bank, 40 countries and 24 local governments have introduced, or are considering introduction of, the carbon pricing scheme in some form. These circumstances suggest that the carbon pricing scheme is already internationally recognized as a cost-efficient method of substantially reducing long-term CO₂ emissions.

In addition to this, recently many companies implement internal carbon pricing, in which a company voluntarily prices carbon, as an approach for managing their climate change risks and opportunities.

According to a survey that organizations including CDP (Carbon Disclosure Project) conducted in cooperation, the number of companies that replied they have adopted internal carbon pricing or plan to adopt it within two years was 1,249 worldwide, a 23% increase from 2015.

Finding the ideal form of economy adapting to changes in world rules

Decarbonization is a big business opportunity. World companies have started to move toward that opportunity, and a competition on the market has already begun. Japan must vitalize economy while making the most of the market force and make a correct investment decision in doing so. Carbon pricing is an effective tool for that.

For example, if the emission of CO₂ becomes costly due to carbon pricing, the prices of low carbon products and services will be proportionally decreased, and boost to the demand for them is expected. In addition, on the supply side, development of low carbon technologies that takes into account such changes in demand and investment in assets with less CO₂ emissions will advance, leading to the promotion of innovations as a result.

There are various opinions from various standpoints on climate change countermeasures including carbon pricing. Seeing that major world rules have obviously changed due to the Paris Agreement, Japanese companies also need to sensitively adapt to this, and seek to find a new form of economy. The Ministry of the Environment is willing to firmly support these movements.

Climate change countermeasures that take into account the Paris Agreement ～Expectations for business～

Mr. Futoshi Nasuno

Manager of the Environment Policy Division, Industrial Science and Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry

It would be difficult to achieve the 2 degrees Celsius target if we maintained the status quo

With the enforcement of the Paris Agreement, many countries are working to formulate long-term strategies for the achievement of the 2 degrees Celsius target. In a “Plan for Global Warming Countermeasures” of Japan, its long-term target is aimed at reducing greenhouse gas emissions by 80% by 2050.

Currently, 87.2% of the greenhouse gases in Japan are energy-derived carbon dioxide. Therefore, energy policies will account for the majority of the global warming countermeasures. In addition, approximately 40% of the energy-derived carbon dioxide is emitted from the power sector. Therefore, our country should first aim at achieving zero emission in this sector. However, given the 80% reduction centering on greenhouse gas emissions of 1.41 billion tons in fiscal 2013, the target value will be 0.28 billion tons, or 0.25 billion tons in comparison to 1990. Given that the CO₂ emissions in the industrial sector alone in fiscal 2013 were 0.36 billion tons, considerable reduction will be required. Moreover, the industrial sector contains areas where generation of CO₂ is inevitable, such as the steelmaking process in the steel industry and the refining process for petroleum.

To achieve the 2 degrees Celsius target with the present technological level in these harsh conditions, it will also be necessary to eye substantial expansion of nuclear power stations and introduction of CCS at thermal power generation. However, if such expansion or introduction was implemented, it would likely pose a large burden on the environment and safety in another way. It will be necessary to develop or introduce other innovative technologies after all.

Problems with carbon pricing

There are various means for global warming countermeasures. Carbon pricing is mentioned sometimes as one of those means. The types of carbon pricing that governments adopt are divided into carbon taxes and emissions trading.

The carbon tax corresponds to a Global Warming Tax (hereafter “Warming Tax”) of Japan, and the tax rate is 289 yen/t-CO₂. In the meantime, in analyzing the carbon price of fossil fuels, it is also necessary to consider the energy taxes and the price of energy itself in addition to the carbon price. In terms of the relationship between the carbon price and the CO₂ emissions in Japan, no correlation between changes of the carbon price and the CO₂ emissions is observed, and its impact on the CO₂ emissions will be small in the short term. This seems to be due to factors such as the energy supply demand structure and the inevitable CO₂ emissions in the industrial sector, and suggests that it is difficult to simply reduce the whole emissions by manipulating the carbon price, and it is necessary to take measures that take into account the characteristics of the respective sectors.

Concerning the emission trading, the present state of an EU-ETS, which has already been adopted in EU, suggests that it has the following problems: the

credit price is unstable as affected by movements of companies and external environments, and it tends to fall as time elapses. In the EU-ETS, emission quotas are given as credits to the covered companies. However, if the credit price falls, the credit that the company records as an asset will serve as latent loss, which may cause the company to become insolvent.

Furthermore, there is another problem, which is carbon leakage (portion emitted outside the area). If no incentive is found in the credit, a production activity outside the area can also be an option for a company. This could end up with an increase in the CO₂ emissions on a worldwide scale as a result. In fact, carbon leakage of 600 to 800 million tons per year has occurred in EU.

However, some companies are starting to voluntarily set a carbon price related to business management in order to quantitatively grasp its impact on their present or future business activities and strategically make decisions based on the idea that their response to climate change would turn into a business cost or opportunity. Such voluntary pricing of carbon is called “internal carbon pricing.” Companies’ reflecting the optimal price in their business strategies in the form of internal carbon pricing could be one of the risk management methods.

Thus, carbon taxes and emissions trading still have room for improvement, so careful consideration will be needed.

Having a broad perspective for “contribution,” instead of sticking to the acquisition of a foreign credit

Then, what direction should be taken in pursuing long-term global warming countermeasures? The Ministry of Economy, Trade and Industry has proposed a “game change,” in which to shift to “carbon neutral with international contribution,” “carbon neutral with a global value chain” and “carbon neutral with innovation,” in a “Platform for Long-term Measures against Global Warming,” which has been discussed as its policy. These proposals are all intended to encourage the start of a positive “game,” in which to determine how much contribution international technological collaborations and economic cooperation, and products, technologies and innovations that companies deliver have made to global warming countermeasures, instead of sticking only to domestic emission reduction, including foreign credit.

Based on such an idea, a large number of companies have already estimated emission reduction effects in product lifecycles. For example, it is estimated that by using low-carbon products and services that the chemical industry delivers, a CO₂ emission reduction of 120 million tons can be expected in 2020. Considering that the CO₂ emissions in the chemical industry in fiscal 2015 were 70 million tons, its contribution can be regarded as considerable. Instead of sticking only to near-term CO₂ emission reduction, shouldn’t we think about and discuss what kind of contribution the industrial circles can make for global warming countermeasures, in order to advance such efforts and lead to the development of business?

Future-proofing business in the transition to a low-carbon economy

Jeff Turner

Vice President, Sustainability at Royal DSM



Achieving a low-carbon society with a multifaceted approach

Behind DSM's response to the climate change problem and its focus on achievement of a low-carbon society, we as a company have a social responsibility for building a better future first. As the same time, this problem also serves as a best business opportunity. If there is a big business opportunity said to represent 12 trillion or 13.5 trillion dollars, any company should naturally go for this.

As its specific approach for realizing a low-carbon society, our company first aims at reducing our carbon footprint. To be more specific, our company has set a target of reducing GHG emissions by 40 to 45% from 2008 by 2025 through introduction of renewable energy and implementation of carbon pricing. In addition, we consider it essential to take an approach of building partnership by actively seeking exchanges with business communities, learned societies, governments and NGOs in order to solve problems such as the climate change problem. Today's forum is also part of such approach of our company.

And what we as a company can regard as our main approach is our response to climate change problems in the respective countries, or in other words a business approach of providing products, services and innovations necessary for the transition to a low-carbon economy.

Enormous social contribution that our Brighter Living Solution makes

Our company provides products and solutions that will contribute to the climate change problem and sustainability, as we collectively call them as a "Brighter Living Solution," to the market. To confirm the outcome of its concept and purpose, we measure the social impacts of these products and solutions as needed, and they each have a high reputation. In addition, the growth rate of the Brighter Living Solution is very high as compared with other product portfolios. In other words, products and solutions with a high level of contribution to sustainability not only make social contribution, but are superior in terms of both management and business. Let me take two examples. The first one is "CleanCow," which is an enzyme that substantially reduces methane emitted from livestock burp, as a "nutrition" solution. GHGs include CO₂, chlorofluorocarbon and methane. As a matter of fact, as far as the greenhouse effect itself, not the amount, is concerned, that of methane is overwhelmingly higher than CO₂. And, livestock burp accounts for approximately 25% of the methane emissions. DSM took particular note of this from early on, and succeeded in developing "CleanCow." It is estimated that if the whole industry shifts to feedstuff using this enzyme, the GHG emissions can be reduced by 2 to 3% of the total amount (Fig. 1).

The second example is related to "material." "Niaga" is a 100% recyclable carpet. Previously, every carpet required multiple materials for a structural reason. Niaga consists only of polyester. This is because we succeeded in developing a technology that enables provision of various forms or functions to polyester through variations of processing. If the whole carpet is made of polyester, a product of the same quantity can be recycled from a carpet of the same quantity. In addition, due to a single material, the energy required for the production can be reduced by 95%. Furthermore, looking at the amount of waste worldwide, carpets represent the second largest amount after paper diapers. If waste carpets can be recycled, the contribution to the environment would be immeasurable.

Enabling a low carbon economy: CleanCow

- **Societal challenge**
 - Livestock are responsible for methane emission, a GHG that causes global warming.
- **DSM solution**
 - CleanCow is a feed additive solution under development for reducing the environmental impact of milk and beef production and with the potential to improve performance, like increased milk yield, increased body weight gain or better feed efficiency.
- **Eco+**
 - **Impact on the environment:** Reduces methane emissions by at least 25-30% in vivo.

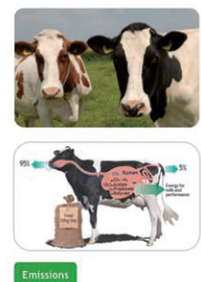


Fig. 1: Synergistic effect of internal carbon pricing

Huge business opportunities arising from climate change

As described earlier, DSM implements internal carbon pricing at 50 Euros per ton in CO₂ terms. In addition to reducing emissions, this also leads to raising awareness about energy within the company, and encouraging the ability to catch business risks and opportunities related to climate change. And, the internal carbon pricing at DSM approach has produced a favorable circulation in which the development of products with high contribution to sustainability is accelerated as a result.

With the climate change problem being tackled this way, carbon pricing has the potential of making a change in business. Additionally, more than 1,200 companies have introduced or plan to introduce this internal carbon pricing approach. Some of these companies seek business operation by adopting the approach as a business strategy, not a mere means to reduce their emissions. If the flow of carbon pricing introduction by the government cannot be avoided in the future, we strongly recommend that the company should pursue the introduction of voluntary carbon pricing, and build a structure for the introduction.



DSM Sustainability Forum

The Impending "Paris Agreement" and Business Opportunities

The Agreement's Impact on the Chemical Industry and its Conversion to Competitive Strength

Panel Discussions

Moderator



Mr. Takejiro Sueyoshi
Special Advisor, United Nations Environment
Programme Finance Initiative

Panelists



Mr. Kiyoshi Matsuda
Advisor at the Policies and Public Relations Office,
Mitsubishi Chemical Holdings Corporation



Mr. Hiroshi Watanabe
Director General, Japan Chemical Industry
Association



Mr. Andrew Staples
Southeast Asia Director, Economist Corporate
Network



Dimitri de Vreeze
Member of the Managing Board, Royal DSM /
Board Member of the European Chemical Industry
Council

Sueyoshi At present, many countries are trying hard to tackle the climate change problem. First of all, let me ask you what the chemical industry should do in order to keep up with these global trends?

Watanabe It is without saying that the industry should increase the energy efficiency to minimize the CO₂ emissions. But, we must also note that this is a global environment issue, and so, it is important to think how we should make use of the chemical industry's technologies and know-how on a global scale in order to create a sustainable society. For example, I think the industry is required to provide technical support to countries and regions where environment-responsive technologies are on the way to development, and build a sustainable relationship by forming a win-win relation, instead of making a unilateral contribution. In particular, Asia is a very important region for our country. So, the Japan Chemical Industry Association is conducting a "Responsible Care Integrated Program (RCIP)," which contains educational support related to chemical control and security and disaster preparedness, in ASEAN countries.

And I think that the Japanese chemical industry has strengths such as intimacy between the administrative section and the field personnel, and a trusting relationship with workers. I think that industrial organizations such as ours have an important role of visualizing the strengths of the Japanese-style management in some form, and spreading it as one of the truly sustainable management styles to the world.

Sueyoshi I think Mr. Watanabe's pointing out that we should share the strengths of the Japanese-style management with the rest of the world is very important. Mr. Dimitri, how do you see that?

Dimitri Indeed, if Japan's innovativeness, innovation, way of thinking and thoughts are fused with what we have, that would be a great advantage. DSM held the first of this forum series deliberately in Japan only because Japan is highly conscious of sustainability and climate change, and has the ability to bring solutions and innovation to them. I think Japan is in the only position to bring such innovation in Asia. I realized this through our partnerships with Japanese companies.

Instead of sticking only to near-term CO₂ emission reduction, shouldn't we think about and discuss what kind of contribution

the industrial circles can make for global warming countermeasures, in order to advance such efforts and lead to the development of business?

Sueyoshi Mr. Andrew is based in Singapore. How does Japan as a partner look in Japan? Also, please tell us about the future potentials of Asia, which is achieving a remarkable economic growth, from the viewpoint of a journalist.

Andrew Leaders of Southeast Asian countries see Japan's movements consciously. They model after Japan in terms of policies, technologies and innovations, and feel Japan as a reliable partner. I think this is a result of Japan's aggressive investment and partnership spanning many decades. Considering that recent economic growths in Asia, such as more than 7% in GDP in India, more than 6% in China, and 4.5% in ASEAN countries, it is without doubt that Asia will become an important region. Asia has a growth market. The demand for infrastructure will be raised, and energy demand will also be generated. For example, the Asian Development Bank has announced that infrastructure investments worth of 8 trillion dollars would be necessary in several years in the Asian region. Naturally, that would involve CO₂ emissions, which must be solved. But, it can be said that this can be regarded as an opportunity in an opposite way.

Sueyoshi The importance of contribution by the whole earth was mentioned earlier. But, I think that is true only if national strict global warming countermeasures are achieved. In that sense, Mr. Matsuda, please tell us about the efforts in Japan or in the whole chemical industry.

Matsuda First, low-carbonization mainly in the power sector will be the first important target by 2030. Many countries have various options such as shift to renewable energy or gases, so they will be able to achieve the target with relatively reasonable costs. But, after that, low-carbonization in industries representing large emissions following the power sector will be the target. So, the situation will change. Low-carbonization of industry means that low-carbonization of consumptions is implemented globally. In the case of Japan in particular, the energy efficiency is very high, and equipment investment has remained almost flat since the mid-1990s, so, the situation does not allow aggressive investment. To aim at achieving net-zero emission in these difficult circumstances, numerous new technologies will be needed. Although this may also be regarded as a business opportunity, it would take a long period to establish technologies, business models and policies for that. It will be necessary for companies to consider the issue with a long span of time.



Sueyoshi Some companies have already started committing not to emit CO₂ in the manufacturing process with the aim of net-zero emission. But, this may be very troubling for those in the chemical industry.

What kind of preparation do you think should be started now for that purpose?

Watanabe For example, Japan has a Containers and Packaging Recycling Law. As demonstrated in a case where useful hydrogen is extracted from waste plastics thanks to such a social system and Japanese technology, technological innovation of some form and a social system according to it will be required. One more thing that will be needed at that time will be the behaviors of citizens. The Containers and Packaging Recycling Law has operated well thanks to the fact that each household carefully separates waste. I think it is also important to determine how to encourage such behavior of each citizen. Unless we think of such factors, merely saying technology or industry will have its own limits.

Sueyoshi I feel that DSM thinks about various things in a very systematic way, or put briefly, it takes a well-organized approach. How do you think should DSM work on the matters that Mr. Watanabe talked about, from the standpoint of your company?

Dimitri I think that all depend on partnership after all. I think they can be achieved only with a multi-dimensional and comprehensive approach for that.

Also, there are several more aspects that must be taken into account. We frequently quote a "boiled frog" theory. You have two frogs, and put one in boiling water, and the other in cold water and gradually raise the water temperature. While the frog put in boiling water jumps up to get out immediately, the frog put in cold water dies in the end. The latter frog is accustomed to the gradually rising temperature, and cannot sense danger. It's the same with humans.



Once a person is accustomed to the environment, he or she cannot make a move unless the government or regulatory authority says something. Our company acts based on the thought that we must not be like that.

As for climate change, the COP conference gained consent of all member nations for the

first time ever at COP 21, and took a first step. To pass this on to the next generation by taking a second step and then a third step, we must not be in a state like that of the boiled frog.

Sueyoshi Then, innovation, not a gradual change, will be needed for that purpose. What do you think about that?

Matsuda We must first aim at achieving net-zero emission. We are not without technology for that now. But, simply, those technologies are not cost competitive. Specifically speaking, the simplest one is CCS. If this was boosted at a breath, the companies implementing it would become losers in cost competition. There is another technology called CCU (Carbon Capture and Utilization), in which CO₂ is used as the raw material. This is an ultimate circulation of carbon, and several technical methods have already been proposed. But, they are not cost competitive yet. Not only will be the cost fluctuate, but also the equipment investment will be large. So, this needs to be solved. And, there is another approach, which is to cover everything with renewable resources. In fact, our company also provides such a product. But, even if a company only says “we made this with a renewable resource” to its customers, they would not purchase it. You must add a new function or value after all. I think such a way of thinking will become important.

Sueyoshi With the comments of both of you combined, it seems that to achieve a long-term target, a work of changing the roles of the economic model and the social model themselves will be needed in a sense. Mr. Staples, what do you think about this from the viewpoint of Economist journal?

Andrew First of all, we will need to tackle the problems in a comprehensive manner. We have the demand, and business, government, consumers, NGOs and others should firmly link to it. Off course, it will be necessary to use the market mechanism.

A cost will be generated there. So, if CO₂ is appropriately priced, I think it will be nicely utilized. To encourage technological innovation, it may be necessary to take something like a carrot-and-stick approach. Off course, a fund will be necessary. But, I think it is necessary to make investment under a more effective and efficient mechanism. So, we must have discussions carefully.

Sueyoshi Thank you. In closing, let me say a few words. First, I keenly feel that the chemical industry is faced with big challenges as well as high expectations. And, you worry a great deal while being torn between the destiny of consuming much energy and the greatness of products produced with it. I would like to point out that you are not the only ones who have the worry, but the whole society, whole economy and whole country share the same worry. That is why not only the chemical industry, but also many other stakeholders should be involved in the solving of the problems.

Also, we must note that the Paris Agreement has great importance after all. The agreement seemingly means balancing human-induced emissions with human-induced absorptions. But, it contains a profound implication of how we should change the world. I think that the way we understand this can mean the difference between winning and losing. I hope that the companies will make a correct decision while keeping these in mind. Our direction is important. I think that it has been determined already.

Now, let me conclude the panel discussions with a phrase that was shown in DSM's slide.

Let's create a better world together. Thank you very much for your attention.



CLOSING REMARKS



H.E. Aart Jacobi
Ambassador of the Kingdom of the Netherlands in Japan

I am greatly honored to be invited to make closing remarks at today's DSM Environmental Management Forum.

In the past ten years, I have had a number of opportunities to see DSM's activities in the Netherlands, Japan and China, and always felt that the company's commitment to the society and the environment is very model.

Let me take an example. Before being appointed as the ambassador to Japan, I had served as a Netherlands ambassador in China. During my tenure there, I visited a production facility for DSM's feedstuff for animals in the suburbs. This facility was recognized by the Chinese authorities as a good business facility for legal compliance, and made a significant contribution to the community. DSM provided feedstuff also to farms in the surrounding areas, and supplied tablet terminals to the farms in order facilitate their ordering for the feedstuff. This is not only positive for the business, but also guides the farmers to the digital age. I thought that was a great idea.

The topics of today's forum were global warming and climate change. Personally, I also have a very positive feeling toward the solution to these problems since the Paris Agreement.

As the speakers stated, the Paris Agreement is a symbol of commitment of almost all counties in the world to their efforts against climate change, and at the same time, lays out realistic goals. To achieve these, it is essential for governments, private sectors and academic circles to closely cooperate with each other. If discussions are made and information exchanges are repeated under such international cooperation, the activities will become more efficient and various inventive ideas may be generated. That must lead to preventing useless research and development and improving the quality of research and development, and accelerate the efforts.

As you know, the relationship between Japan and the Netherlands has continued for over 400 years since the Edo Era, and today various experts in both countries collaborate in innovative projects such as those for renewable energy and agricultural sophistication. Furthermore, over 450 Japanese companies operate in the Netherlands. Both countries are truly long-standing partners to each other. As the international society is about to confront the global warming problem, it can be said that now is the perfect opportunity for further vitalizing the cooperative ties between both countries.

For that reason, I think today's forum is very meaningful. And, I am convinced that you will obtain new ideas and knowledge through this forum, and this occasion will serve to provide a firm basis for the cooperative ties in the future.



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Business Opportunities with “Paris Agreement”

The Agreement’s Impact on the Chemical Industry

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