KAZAKH-JAPAN SYMPOSIUM ON ECOTECHNOLOGIES

Innovative Technologies in the Field of Rational Use of Natural Resources

Innovative Technologies towards a Sustainable Society

Astana, May 23, 2018

公益財団法人 本田財団
HONDA FOUNDATION

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For Publication

Science, technology, and economic development towards an industrial structure in harmony with the human and natural environments

The present report is an account of the speeches and remarks from the international symposium entitled "Innovative Technologies in the Field of Rational Use of Natural Resources/Innovative Technologies towards a Sustainable Society" held on May 23rd 2018 in Astana, Kazakhstan. The symposium was jointly organized by the Library of the First President of the Republic of Kazakhstan, an organization directly under the government of Kazakhstan, and the Honda Foundation. The Library of the First President of the Republic of Kazakhstan—Elbasy" was established in March 13, 2014 by a Presidential Decree to ensure the preservation of Nursultan Nazarbayev's personal library and personal archive, to study the history and development of Kazakhstan and to promote the President's ideas and initiatives at home and abroad.

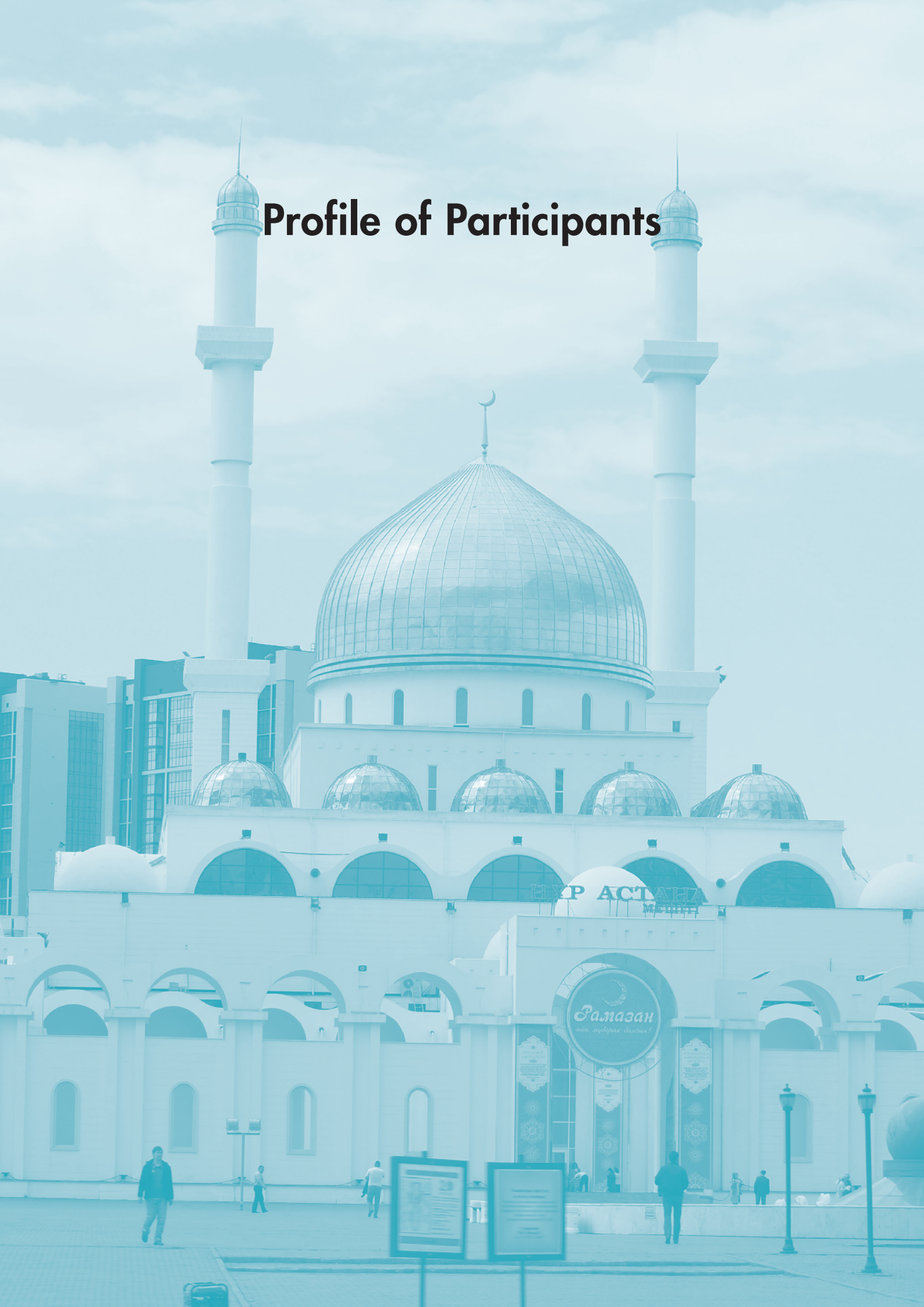
The goal of the symposium was to discuss how we should promote innovation to support the sustainable development of science and technology in harmony with the human and natural environments, focusing on the past lessons learned by Japan in its rapid economic development period and beyond. Speakers with varied expertise from diverse fields including academia, research institutes and industry and governmental organizations provided insightful observations and opinions to an audience with widely varying backgrounds. The symposium started with an overview of the Japanese experience in the Disruptive Changes in Science, Technology, Innovation and Policy Approach provided by the keynote speeches. Following that, the first session reviewed the innovative technologies for and legal aspects of the efficient use of natural resources (industrial policy and various reforms in the field of advanced technologies). The second session discussed success stories in the sphere of ecotechnology, looking at examples both in Japan and Kazakhstan. The third session looked into the future of advanced environmental technologies, with a focus on the introduction of technological innovation and human resources development that will transform the industrial structure. The final session wrapped-up the symposium, discussing how to harmonize science, technology and economic development with the human and natural environments.

This was our second symposium in Central Asia, and we hope that it has made a contribution to sharing the value of ecotechnology among the participants and strengthening the relationships between the region and Japan in the field of science and technology.

At the Honda Foundation, our founding prospectus states that our mission is to contribute to "creating a truly humane civilization." It is our fervent hope that the discussions and friendships cultivated through this symposium will contribute to the realization of a truly humane society of the future.

Masataka YAMAMOTO
Managing Director, The Honda Foundation

Profile of Participants



*The information is at the time of the Symposium unless otherwise noted.

Dr. Makhmud Kasymbekov

Head of the Chancellery of the President of the Republic of Kazakhstan – acting Director of the Library of the First President of the Republic of Kazakhstan – Elbasy, Doctor of Political Sciences, Professor

Education

1974 Graduated from Kazakh Pedagogical Institute named after Abai, Department of Mathematics
1985 Almaty Institute of National Economy, Department of Economic planning

Professional Career

1990 Head of the General Department of the Presidential Staff, Cabinet of Ministers of the Republic of Kazakhstan, Administration of the President
1996 Head of the Office of the President of the Republic of Kazakhstan

Dr. Amerkhan RAKHIMZHANOV

Deputy Director of the Library of the First President of the Republic of Kazakhstan-Elbasy, Doctor of Political Sciences, Professor

Education

1978-2000 Graduated from Semipalatinsk Pedagogical Institute, specialty "History and Social Studies"; Kazakh Institute of Finance and Economics, specialty "Economics and Management"
1995-1999 Internship in Japan for a public servant exchange project to study the education system, general administration and Japanese

Professional Career

2015 Executive Secretary of the Ministry of Education and Science
2017 Deputy Director of the public institution "Library of the First President of the Republic of Kazakhstan

H.E. Ichiro KAWABATA

Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Kazakhstan

Date of Birth: 17 December 1952

Education:

March 1976 Graduated from Sophia University in Tokyo, Faculty of Foreign Studies, Department of Russian Language and Studies
1977-79 Traineeship at Lomonosov Moscow State University

Professional Career:

April 1976 Entered Ministry of Foreign Affairs
January 1999 Region Coordinator, Central and Eastern Europe Division and Russian Division, European and Oceanian Affairs Bureau
February 1999 Senior Assistant Director, Russian Division, European and Oceanian Affairs Bureau
August 1999 First Secretary, Embassy of Japan in the United States of America
August 2000 First Secretary, then Counselor, Embassy of Japan in Russia

October 2005	Senior Foreign Policy Coordinator, Policy Coordinator Division, Foreign Policy Bureau
August 2006	Senior Coordinator, Russian Division, and Director, Russian Assistance Division, European Affairs Bureau
February 2009	Consul General, Consulate-General of Japan in St. Petersburg
September 2012	Director, Health and Welfare Division, Ministry of Foreign Affairs
Since April 2016	Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Kazakhstan (Presented the Credentials on October 10, 2016)
Marital status:	married, spouse Megumi Kawabata

Mr. Hiroto ISHIDA

President of the Honda Foundation (HOF)

Born: Sept. 16, 1941, Tokyo, Japan

Education:

1970	M.A. in Political Science at the University of Illinois
Mar. 1964	Faculty of Engineering, Department of Nuclear Engineering, The University of Tokyo (Univ. Tokyo)
Mar. 1960	Kanazawa University High School

Professional Career:

Apr. 2010	President Emeritus of Kanazawa Gakuin University
Jul. 2005	General Manager of National Museum of Emerging Science and Innovation
Apr. 2004	President of Kanazawa Gakuin University
Apr. 2003	Visiting Professor, Institute of Industrial Science, Univ. Tokyo
Nov. 1999–Feb. 2003	Ambassador of Japan to the Czech Republic
Jun. 1995–Jun. 1998	Vice Minister of Science & Technology Agency (STA)
Jul. 1994	Science Councilor, STA
Jun. 1991	Director General of the Nuclear Energy Bureau, STA
Jan. 1982–Apr. 1985	Counselor (Science), Embassy of Japan to the USA
Apr. 1964	Join STA

Public Services:
- President (2011), Director (2006) of Honda Foundation
- Chairman, Nuclear Safety Technology Center
- President, Maeda Ikutoku Foundation
- Chair of Association for Traditional Performing Arts of Japan
- Member of Management Council, National Graduate Institute for Policy Studies

Research Areas:
Science and Technology Policy, Nuclear Engineering

Books:
- Komatsu Children's Kabuki 'Meitouishikiri Hotokanoonmae' (2007, Jishosha Shinsho)
- From the Streets of Prague and Kanazawa (2008, Jishosha Shinsho)
- New Nabucco Story from Opera (2016, Hokkoku Shimbun)

Mr. Shigeo KATSU

President of Nazarbayev University

Shigeo Katsu is President of Nazarbayev University, a position he has held since December 2010. Prior to that, over the course of a 30-year career at the World Bank, Shigeo Katsu held various positions including leading financial sector reform support for China, Director for Côte d'voire, and Vice President for Europe and Central Asia.

After his retirement from the World Bank, he served for a few years on the US board of a youth-oriented international development NGO. Between 2011 and 2015 he was an Advisory Panel member of the ASEAN+3 Macro-Economic Research Office (AMRO). In addition to his responsibilities at the university he is a member of the National Commission on the Modernization of the Republic of Kazakhstan, and serves as advisor to international and bilateral development institutions.

In 2010/2011 he authored a chapter of "Asia, 2050: Realizing the Asian Century" by the Asian Development Bank, in 2014 he served as an editor for the book "Kazakhstan 2050—Towards a Modern Society for All" (2014), and in 2015/16 was involved in the book "Central Asia 2050—Unleashing the Region's Potential".

Mr. Bolat AKCHULAKOV

Vice-Minister of Energy of the Republic Kazakhstan

Education

1993 Kazakh State Academy of Management, Department of Accounting and Economic Cybernetics
1998 Education Center of the oil and gas industry, specialty "Subsoil Use Contract Evaluation" and "Economy of oil production"

Professional Career

2016 General Director of the Kazakhstan Association of Organizations of oil and gas and energy complex "KAZENERGY"
2017 Vice-Minister of Energy of the Republic Kazakhstan

Other positions

2009 Member of the Board of Directors "Kazatomprom", "KEGOC"
2016 President of the Asia-Pacific Federation of UNESCO Clubs

Dr. Michiharu NAKAMURA

Former president of the Japanese Agency for Science and Technology

Dr. Nakamura graduated from the University of Tokyo and joined Hitachi Central Research Laboratory in 1967, where he was engaged in compound semiconductors and optoelectronics research. He was a visiting Researcher at California Institute of Technology in 1972-73. He is entitled IEEE fellow, JSAP fellow, and IEICE fellow for his pioneering achievements in optoelectronics.

In 2004, he was appointed Executive Vice President and Executive Officer of Hitachi Ltd., and then assumed a position of Board of Director till September 2011. He was responsible for corporate technology development and new business

incubation.

In 2011, he assumed the office of the President of Japan Science and Technology Agency (JST), where policy-driven R&D funding is a major mission. Also, the dissemination of scientific information, science education for young generation, and science communication are among its current activities. He endeavored to achieve high-impact innovations based on advanced R&D. After completing four- year presidency, he has been serving as the Counsellor to the President of JST since October 2015.

He has been actively working on science, technology and innovation strategy. He served as Working Committee Chairman of Council on Competitiveness Japan (COCN) from 2008-2011 and pursued new industrial R&D initiatives under close collaboration with government and academia. He also served for Industrial R&D Committee of the Japan Business Federation, Tsukuba Global Innovation Promotion Agency, Industrial Committee for Supercomputing Promotion, and Nanotechnology Business Creation Initiative. He is a Distinguished Fellow of the Global Federation of Competitiveness Councils (GFCC).

He is currently serving as a member of the Advisory Board for Promotion of Science and Technology Diplomacy.

Mr. Ruslan BAIMISHEV

Director of Subsoil Use Department

Education
2006 "Femida" Law Academy, specialty lawyer
2012 Kazakh National Technical University, specialty "Geology and exploration of mineral deposits"

Professional Career
2013 Head of the Republican Center for Geological Information "Kazgeoinform"
2016 Director of Subsoil Use Department, Ministry of Investment and Development

Mr. Akira KOJIMA

Chairman of the international Committee of the Honda Foundation

Trustee and visiting Professor of GRIPS (National Graduate Institute for Policy Studies) and Councilor of JCER (Japan Center for Economic Research)

Year of Birth: 1942
Place of Birth: Yokohama, Japan
Education: 1965, Graduated from Waseda University (Econs)
1969-70, British Council Scholar at Manchester University (UK)

Other Present Positions and Activity:
Member of the Trilateral Commission
Board of Trustee of Japan Productivity Center
Chairman of WTC (World Trade Center) Tokyo
Vice Chairman of Japan-German Center (Berlin)
Councilor of Aspen Institute, Japan
Director of Honda Foundation (Chairman of International Committee)
Councilor of IIMA (Institute for International Monetary Affairs)
Director of IIPS (Institute for International Policy Studies)

Member of the Advisory Committee of JETRO (Japan External Trade Organization)
Visiting Professor of Ritsumeikan University (Graduate School of Management)

Professional Experiences:

1997-2000	Chief Editorialist and Senior Managing Director of NIKKEI (The Nihon Keizai Shimbun Newspaper)
1999-2008	Professor of Keio University (Graduate School of Department of Commerce)
2004-2008	Chairman of JCER (Japan Center for Economic Research)
2004-2007	Professor of Harbin Institute of Technology (China)
2002-2007	Advisory Committee member of Graduate School of Public Policy of Tokyo University (GRaSPP)

Publications:
A New Development Model for Japan: Selected Essays 2000-2008 (The Japan Journal Press, 2008)
Choices for Japan (NTT Press, 2008, Chinese language edition was published in 2010)

Dr. Altay ALIMGAZIN

Director of the Institute Energy Saving and Energy Efficient Technologies,
Professor of the Department of Heat Power Engineering, L.N. Gumilyov Eurasian National University, Doctor of Technical Sciences

Education

1980	Pavlodar Industrial Institute, specialty "Heat Power Engineering"
1982-1987	Moscow Power Engineering Institute, Graduate School of "Industrial power system"
2010	Almaty University of Energy and Communication, Doctor Course

Professional Career

2007	Associate Professor of the S. Seifullin Kazakh AgroTechnical University, Department of Heat Power Engineering
2012	Director of the Research Institute of Energy Saving and Energy Efficiency Technology, Professor of the L. N. Gumilyov Eurasian National University, Department of Heat Power Engineering

2 theses, 144 publications, 2 monographies, 2 copyright certificates, 5 innovative patents, 3 patents for a useful model of the Republic Kazakhstan, 1 International Patent Application (with Novosibirsk, Russia)

Dr. Taizo YAKUSHIJI

Research Counselor, Institute for International Policy Studies

Research Counselor and a board member, Nakasone Yasuhiro Peace Institute (the former Institute for International Policy Studies) (NPI)
Program Director, Japan Science and Technology Agency (JST)
Professor, Emeritus of Keio University

He was a Professor of Political Science at Keio University (1991-March 2010), formerly full –time Executive Member of the Council for Science and Technology Policy of the Cabinet Office and Vice President for Academic and International Affairs at Keio University. He was educated at Keio University (B.A. in Electrical Engineering), University of Tokyo (B.A. in History and Philosophy of Science) and the Massachusetts Institute of Technology (Ph.D. in Political Science). He was also a Fulbright Scholar and Ford Foundation Fellow (1970-75). He was Professor of Technology and International Relations at the Graduate Institute of Political Science at Saitama University and Visiting Senior Research Associate at both the Berkeley Roundtable on International Economy and the Department of Political Science of the University of California at Berkeley (1994-85). He was selected as one of the "1988 Young Leaders of Asia" by the US-Asia Institute in Washington, D.C and was at the Ushiba Memorial Foundation (1991-92) at the German Society for Foreign Affairs and the French Institute of International Relations.

Mr. Baurzhan SMAGULOV

Chairman of the Board of JSC "Institute of Electrical and Energy Saving Development (Kazakhenergoekspertiza)"

Education

2008 Karaganda State Technical University, specialty "Life Safety and Environmental protection"

Professional Career

2008 Head of Regional Territorial Department of Environmental Protection of Karaganda State

2016 Chairman of the Board of JSC "Institute of Electrical and Energy Saving Development" Ministry of Investment and Development

Dr. Akihiko TAMURA

Professor GRIPS, Ph.D

Akihiko (Aki) Tamura is currently a professor at the National Graduate Institute for Policy Studies (GRIPS) in Japan. He currently teachs World Trade Policy course and researchs on trade law and policy and global governance. His current extracurrcular activities include: Member of T20 Trade and Investment Taskforce, Advisor to Save The Children Japan, Member of Academic Board for International Energy Charter Beijing Research Centre, and Consulting Fellow for Research Institute of Economy, Trade and Industry (RIETI).

In the year 2016-2017, Aki was Deputy Director-General for Trade Policy at the Trade Policy Bureau and the Ministry of Economy, Trade and Industry (METI) in Japan. He was in charge of bilateral trade issues with China, Korea, Mongolia and Central Asian countries, such as China-Japan-Korea FTA negotiation and One Belt One Road (OBOR). He also served as Japan's chief negotiator for WTO Environmental Goods (EGA) negotiations.

From 2014 to 2016, he was Deputy Director-General for Rules and Regulations at the METI. He was in charge of strategizing next generational trade policy such as integrating international trade rules and regulations and CSR. From 2011 to 2014, Dr. Tamura was Managing Director for the Beijing Office of the Japan-China Economic Association, in charge of promoting Japan-China trade and investment cooperation as a leader of Japanese business community in Beijing.

From 2010 to 2011, Dr. Tamura was Director of FTAs with ASEAN and China/Korea at the METI. He worked on a possible launch of ASEAN plus 6 FTA negotiations, which turned out to be materialized as RCEP later. From 2009 to 2010, Dr. Tamura served as Councilor for APEC at the METI, serving as a primary officer of "APEC 2010" team, in charge of drafting and coordinating for the products including "The Yokohama Vision – Bogor and Beyond" and "Pathways toward FTAAP". From 2003 to 2006, Dr. Tamura was Legal Officer of Legal Division, World Trade Organization. From 1997 to 2000, Dr. Tamura was First Secretary to the Embassy of Japan in the United States.

Aki received his S.J.D in Comparative and International Law from The George Washington University Law School (2001). He got his LL.M. from Harvard Law School (1995) and his LL.B from University of Tokyo (1989). He speaks English, Japanese, and Chinese (Mandarin).

Dr. Zhumabay BAKENOV

Doctor of Engineering (Chemical Engineering, Tokyo Institute of Technology), Ph.D. in Chemistry (Physical Chemistry, Kazakh National Academy of Science),
Professor, School of Engineering, Nazarbayev University

Administrative duties (since 2011): Director of Center for Energy and Advanced Materials Science, National Laboratory Astana, Member of National Science Council of the Republic of Kazakhstan (2015–2017), Member of Academic (2011-2012) and Research Councils of Nazarbayev University (NU) (2011–2012, 2016), Chair – NU Equipment Committee (2014–2016), Member – Faculty Senate (2011-2013), Member - School of Engineering Teaching & Learning (2011–2012) and Research Committees (2011–present), Member of the Mayor Astana City Selection Committee for Innovative Business Projects; PI of National Targeted Technological Program of Kazakhstan, Ministry of Industry and New Technologies; Member of the State Commission for the Engineering Curriculum Development, Ministry of Education and Science of Kazakhstan; Member of Scientific and Technical Council of NURIS and National Laboratory Astana, Chair of School of Engineering Research Committee, Chair of International Conference (since 2013): "International Conference on Nanomaterials and Advanced Energy Storage Systems (INESS-2016)", Chair of Task Force NU-Pennsylvania State University.

Management experience: Director of Center for Energy and Advanced Materials Science of National Laboratory Astana, CEO of the Institute of Batteries LLC (the first start-up company at the NU Technopark established under the World Bank – the Government of Kazakhstan Commercialization Program), Vice-Dean (Research, Chemistry Faculty, Al-Farabi KazNU, 1996-1999), 25 years of advanced research laboratory and project management; Group Leader of the EU FP-7 Project in Kazakhstan, Recipient of British Council Grant, Principal Investigator of 10+ projects in last 5 years.

Mr. Nobuo TANAKA

Former Secretary General of the IEA (International Energy Agency)

Nobuo Tanaka is Chairman of The Sasakawa Peace Foundation. He has extensive national government and international experience in the fields of energy, trade and innovation. Executive Director of the International Energy Agency (IEA) from 2007 to 2011, Mr. Tanaka oversaw a seminal period in the Agency's work and direction. Under his leadership, the IEA initiated a collective release of oil stocks in June 2011, the third such collective action in the Agency's history, opening new scope and a new era for IEA emergency action. While IEA Executive Director, Mr. Tanaka was responsible for pioneering the concept of 'comprehensive energy security' while also expanding the Agency's focus on climate change, renewable energy and the transition to a low-carbon energy economy (with the 450 ppm scenario of the IEA's World Energy Outlook Äi0becoming the benchmark goal for global climate change mitigation). Mr. Tanaka led IEA work on fossil fuel subsidy reform, energy efficiency policy recommendations (adopted by the G8), low-carbon energy technology roadmaps, gas and electricity security, energy poverty and carbon capture and storage, among others. Notably, Mr. Tanaka also played a crucial and personal role in the strengthening of ties with major IEA non-Member energy players, including China, India, Russia, Brazil, Chile, Indonesia, Mexico and South Africa, and in IEA relations with business, including through the creation of the IEA Energy Business Council. Responsible for a great expansion of IEA engagement with other international fora, throughout his time as IEA Executive Director, Mr. Tanaka made numerous keynote speeches on global energy affairs and policy to summits of Heads of State and Ministers.

Mr. Tanaka began his career in 1973 in the Ministry of Economy, Trade and Industry (METI) in Tokyo, and has served in a number of high-ranking positions in METI, including Director-General of the Multilateral Trade System Department. In this capacity, he led many trade negotiations at the World Trade Organisation (WTO) and for bilateral Free Trade Agreements. Mr. Tanaka's career has also included a strong focus on energy. He was responsible for Japan's involvement with the IEA and the G7 Energy Ministers' Meeting during the second oil crisis of the late 1970s and early 1980s. He participated in establishing the comprehensive energy policy of Japan in the late 1980s, and oversaw the implementation of Japan's international nuclear energy policy and led negotiations of bilateral nuclear agreements. During the Kyoto COP3 negotiations, Mr. Tanaka worked for the Japanese government on formulating international strategy as well as co-ordinating domestic environment and energy policy. He was deeply engaged in a range of bilateral trade and economic issues with the US as Minister for Industry, Trade and Energy at the Embassy of Japan, Washington DC from 1998 to 2000, as well serving as the first secretary of the Embassy from 1982 to 1985.

With a strong background in international affairs, Mr. Tanaka has served as both Deputy Director and Director for Science, Technology and Industry (DSTI) of the Paris-based Organisation for Economic Co-operation and Development (OECD). During his time as Director from 2004 to 2007, he was responsible for the rollout of work on innovation, including innovation policy reviews of Member countries, collaboration with the OECD Economic Policy Directorate on the Innovation chapter of the landmark publication, "Going for Growth", and the role of innovation in intellectual property rights and biotechnology related regulations, among many others.

Mr. Tanaka, a Japanese national, has a degree in Economics from the University of Tokyo and an MBA from Case Western Reserve University, Cleveland, Ohio. He and his wife, Gloria, have two children.

Mr. Yerasyl AZIMBAYEV

Development Manager of LLP "EcoEnergy.kz"

Education
2013 Almaty University of Energy and Communication, Department of Electric Power Industry, Power Supply of Industrial Enterprises, specialty "Unconventional and renewable energy sources"

Professional Career
2018 LPP "GLB" Housebuilding plant, Electrical Engineer

Mr. Takashi MORIYA

Senior Chief Engineer, Automobile R&D Center, Honda R&D Co., Ltd.

Now	Honda Automobile R&D Center In charge of Fuel Cell Power-train development
2011-	Promoted Senior Chief Engineer
2009-	Honda Automobile R&D Center Operation Officer Fuel Cell Power-train development division
2006-	Honda Automobile R&D Center Senior Manager Fuel Cell Power-train development division
2001-	Honda Automobile R&D Center Fuel Cell Development Division Manager
1995-	Promoted Chief Engineer
1981-	Joined Honda Motor Co.,Ltd. Moved Automobile R&D Center Vehicle engine design division

Dr. Kuralai KARIBAYEVA

Director of Institute of Ecology and Sustainable Development, Candidate of Biological Science

Education

1974 Kazakh Pedagogical Institute, specialty "geography, biology"
1979 National Academy of Science
1996 Internship in International Institute of Development of Great Britain
2005 Internship in Canada by Administration of pasture and Environmental Protection

Professional Career

2014 Head of working group of regional project of UNEP. Global Environmental Foundation "Increasing of potential for implementation of Nagoya protocol in access and fair distribution of benefits in Eastern Europe and Central Asia"
2016 Director of Institute of Environment and Sustainable Development

3 monographs, 5 textbooks and manuals, 270 scientific article, popular sci-fi "Precious necklace of mountains", movie "From wild apple of Kazakhstan to the garden of 21 century"

Dr. Mitsunobu KANO

Professor of Okayama University, Doctor

Dr. Kano has experienced clinical medicine including gerontology, research in medical engineering and pharmaceutical sciences, and public services including academy activities and governmental commitments. The public services led him to efforts in developing education for general sciences, including implementation of achieving the United Nation's Sustainable Development Goals (SDGs) into university administration in Okayama University, where he works now. Dr. Kano graduated from and started research activity in University of Tokyo, did his clinical residency in St. Luke's International Hospital, and is now Professor and a Vice Executive Director in Okayama University. As the latter role he led the university to be awarded by the Japanese government for achieving the SDGs in 2017. Meanwhile he led to establish a new interdisciplinary graduate school focusing on the health care systems in the university including faculties from medical sciences, engineering, social sciences, and humanities, started in April 2018. Dr. Kano is in parallel the former Deputy Chair of the Young Academy Japan, and a former Executive Committee member of the Global Young Academy (GYA). He represented the GYA in the InterAcademy Partnership in 2016.

Dr. Zhumabek BAKHOV

Director of Scientific and Educational Center of Agroecological Research of the S. Seifullin Kazakh AgroTechnical University.

220 treatises, 8 innovative patents, 3 certificates of authorship, 4 monographies, 6 textbooks and manuals, 4 articles.

Dr. Hiroto Yasuura

Vice President and Professor of Kyushu University

Hiroto Yasuura is an Executive Vice President of Kyushu University. He is serving as Chief Information Officer (CIO) and Chief Information Security Officer (CISO) of Kyushu University.

Prof. Yasuura received the B.E., M.E. and Ph.D. degrees in computer science from Kyoto University, Kyoto, Japan, in 1976, 1978, and 1983 respectively. He was an associate professor in Kyoto University and moved to Kyushu University in 1991. Prof. Yasuura is the research director of Silicon-Sea-Belt Fukuoka from 2001, to build up a research-industry cluster on LSI design. More than 250 LSI design related companies are moved or established in Fukuoka area in the last 15 years. He is also one of founders of ISIT (Institute of Systems, Information Technologies and Nanotechnologies, established in 1995), which is founded by Fukuoka city for promoting ICT industry. From 2011, he is the director of Experimental Center for Social System Technologies in Fukuoka and also the director general of Fukuoka Asian Urban Research Center.

Prof. Yasuura is a Vice President of IEICE (Institute of Electronics, Information and Communication Engineers) and JMOOC (Japan Massive Online Open Course).

Dr. Kasym ZHUMADILOV

Head of the International Department of Nuclear Physics, New Materials and Technologies of the L. N. Gumilyov Eurasian National University, PhD, Professor

Education

1995	Tomsk Polytechnic University, Department of Physics and Technology (Russia)
1997	Course of Nuclear Safety of Equipment, IAEA, Madrid (Spain)
1998	Course of Environmental Sample Preparation and Measurement, IAEA, Vienna (Austria), Karlsruhe (Germany)
2003-2004	Researcher, Graduate School of Biomedical Science, Applied Biomedicine, Hiroshima University (Japan)
2004-2008	PhD, Graduate School of Biomedical Science, Applied Biomedicine, Hiroshima University (Japan)

Professional Career

2008-2011	Researcher, Assistant Professor of nuclear biophysical laboratory, Hiroshima University
2012	Associate Professor of Department of nuclear physics, new technology and materials, Department of Physics and Technologies, L. N. Gumilyov Eurasian National University, PhD, Professor
2015	Head of the International Department of nuclear physics, new materials and technologies of the L. N. Gumilyov Eurasian National University
2016	Associate Professor of the Department Theoretical and Experimental Physics of Nuclear Reactors, National Research Nuclear University, Moscow (Russia)

120 treatises, more than 30 international publications, which are in base of Web of Science, Thomson Reuters and Scopus.

Dr. Atsushi SUNAMI

Vice President, Professor, National Graduate Institute for Policy Studies
Major research fields: Science and Technology Policy, Public Policy Analysis

Professor Sunami holds BSFS from Georgetown University. He obtained MIA and PhD in Political Science from Columbia University. He is currently Professor, and Vice President at National Graduate Institute for Policy Studies, Japan. He is serving as Special Advisor, Cabinet Office responsible for Science and Technology and Innovation and President and Executive Director, the Ocean Policy Research Institute , the Sasakawa Peace Foundation. Before joining GRIPS, he was a Fellow at Research Institute of Economy, Trade and Industry established by the Ministry of Economy, Trade and Industry, Japan between 2001 and 2003. He also worked as a researcher in the Department of Policy Research at Nomura Research Institute, Ltd. from 1989 to 1991. He was a visiting researcher at Science Policy Research Unit, University y of Sussex, and Tsinghua University, China. He is also a member of the Advisory Board for the Promotion of Science and Technology Diplomacy in Ministry of Foreign Affairs of Japan, the Council for Science and Technology in Ministry of Education, Culture, Sports, Science and Technology and the Expert Panel on Basic Policy in Council for Science, Technology and Innovation of Cabinet office.

Mr. Tateo ARIMOTO

Professor, National Graduate Institute for Policy Studies (GRIPS) and Principal Fellow, Japan Science and Technology Agency (JST)

Tateo Arimoto is a Professor and Deputy Director, Science, Technology and Innovation Policy Research Center at the National Graduate Institute for Policy Studies (GRIPS) and also Principal Fellow at Japan Science and Technology Agency (JST).

He served as Director General of Science & Technology Policy Bureau of the Ministry of Education and Science and held the position of Executive Research Fellow at the Economic and Social Research Institute of the Cabinet office.
He has played an active role in public policy making and implementation in the area of science, technology and innovation in Japan and is a major promoter of science of STI policy with multidisciplinary approach.

He has been a co-chair person of the OECD study projects on scientific advice and research funding system. He is also a member of the program committee of the International Network for Government Science Advice (INGSA), and the special committee of Science Diplomacy at the Ministry of Foreign Affairs of Japan.

He has published several books and numerous papers and given many invited lectures in quality journals and international conferences such as OECD, INGSA, APEC, EU, WSF, STS Forum and AAAS; “Rebuilding Public Trust in Science for Policy Making” (by T. Arimoto and Y. Sato, Science, vol.337, pp1176-1177, 2012),“Building the Foundations for Scientific Advice in the International Context”(by T.Arimoto et al.,Science and Diplomacy, vol.3 No.3, September 2014), “UNESCO Science Report – Towards 2030”, Japan Chapter” (by Y. Sato, and T.Arimoto, November 2015),“Five years after Fukushima: scientific advice in Japan” (by Y.Sato and T.Arimoto, Palgrave Communications,2016).“Bridging science and government-Growing pains at the science-policy interface” (by T.Arimoto, Y.Sato and K.Matsuo, Angle Journal, 27 March 2017), “Science in a changing world” (by T.Arimoto, Physics World, Institute of Physics, IOP Publishing, March 2018)

Dr. Saltanat RAKHIMBEKOVA

Chairman of the Board of the Association of Legal Entities "Coalition for a Green Economy and Development of G-Global", Chairman of the Presidium of the Association of Legal Entities "International organization "EXPO & Women", Member of the Council on the transition to a green economy under the President of Republic Kazakhstan.

Professional Career
Managing director JSC "National Company "Astana EXPO-2017"
First Vice-President of the Association of Legal Entities "Civil Alliance of Kazakhstan"
Chairman of the Presidium of the Chamber of the Association of Legal Entities "National Chamber of the Housing and Utilities sector of Kazakhstan"

Dr. Bakhyt YESSEKINA

Member of the Board on the Transition to Green Economy under the President of the Republic Kazakhstan, Director of the Scientific Educational Center "Green Academy", Doctor of Economy Sciences, Professor

2009 Chancellor of the Academy of Public Administration under the President of the republic Kazakhstan
2014 Member of the Government Delegation by Partnership Program "Green Bridge" in Riga (Latvia)
2015 National Coordinator of the INDC Kazakhstan, Member of the Government Delegation of COP-21 in Paris.

Dr. Hirohisa UCHIDA

Professor, Department of Nuclear Engineering, School of Engineering, Tokai University

President and CEO, KSP Inc., Japan
Japan Representative, Baden-Württemberg State Government, Germany
Honorary Member, German Society of Materials Science (DGM: Deutsche Gesellschaft fuer Materialkunde e.V.)
Fellow & Vice President, International Association for Hydrogen Energy (IAHE)
President, Asian Science Park Association (ASPA)

Born in 1949, Tokyo, Japan.

EDUCATION
1) Bachelor's degree in Applied Physics (73), Master's degree in Materials Science (75), Tokai University
2) Doctor's degree, Doktor rerum naturalium (D.Sc.), University of Stuttgart, Germany (Nov.77)

PROFESSIONAL EXPERIENCE
Sep.75-Mar.81: Research Assistant & Post-Doctoral Fellow, Max-Planck-Institute (MPI) for Metals Research, Stuttgart, Germany
Apr.81-Mar.18: Assistant Professor (81), Associate Professor (84), Professor (90), School of Engineering, Tokai University (TU)
3) Oct.90-Mar.94: Leader of "UCHIDA Super-Magnetic Materials Project", Kanagawa Academy of Science & Technology (KAST), Kanagawa, Japan
4) Apr.97-Mar.03: Executive Director, Division of Research Administration (University-Industry-Government Collaboration, Intellectual Property), TU
5) Apr.00-Mar.02: Member, University-Industry-Government Collaboration Committee of UNESCO
6) Apr.01-Mar.03: Executive Director, Future Science & Technology Joint Research Center (Promotion of R&D, Incubation, Venture Support), TU

7) May/Nov-Dec.02: Invited Guest Professor, University of Paris/CNRS, Orsay, France.
8) Apr.03-Mar.09: Dean, School of Engineering, TU
9) Oct.03-Mar.08: Dean, School of Information & Design, TU
10) May06-May12: Member of Board of Trustees, TU Educational System (TES)
11) May06-May14: Member of Board of Councilors, TU Educational systems (TES)
11) Oct.07-Mar.09: Vice-Chancellor, TU
12) Apr.09-Mar.11: Executive Director, Tokai Institute of Global Education and Research (TIGER)
13) Jul.09-Jun.17: Chairman, Matsumae International Foundation (MIF)
14) Aug.11-Mar.13: Counselor of Governor, Kanagawa Prefecture, Japan
15) Jun.13-present: President & Chief Executive Officer (CEO), KSP Inc.
16) Jun.14-present: President & Executive Board Member, Asian Science Park Association (ASPA)
17) Apr.16-Mar.18: Research Staff, Strategic Peace and International Affairs Research Institute of TU (SPIRIT)
18) Feb.18-present: Japan Representative, Baden-Württemberg State Government, Germany

MAIN RESEARCH THEMES (past and present)
1) Rare Earths-Hydrogen Systems
2) Surface Processes of Gases/Ions on Metal Surfaces
3) Ni-MH Rechargeable Battery with the first demonstration over 1000 charge-discharge cycles, reported by newspapers June 1988
A long-term operation and demonstration of a Solar-Hydrogen Storage System since 1985
Creation of new magnetic materials in the project "UCHIDA Super Magnetic Materials", Kanagawa Academy Science and Technology (KAST) (1990-1994): (1) Nitro-Magnet and Phase Diagram of the Sm2Fe17-N System (The world first report); (2) Rare Earths Based Giant-Magneto-strictive (GMS) Thin Films (Patented)
Application of GMS Thin Films to Space Technology (Japan's NASDA Project)
Application of Metal Hydride Freezer Systems to cultivate Hydrogen Strawberry and Fish Breeding (Japan's METI Project)
Formation of Nano-Structured Hydrogen Storage Alloy (Patented), resulting in a national project "Renewable Energy Storage by Hydrogen using Nano-Structured FeTi Alloy, Ministry of the Environment, Japan (2017-present)
Surface modifications of hydrogen storage alloys by treatments of Fluorination, Alkaline, and Ion Beam Irradiation
Eco-technology, Energy Policy, Human Security in connection with SDGs (Sustainable Development Goals)

JOB-RELATED PROJECTS
The establishment of Shonan Fund for university-industry cooperation with Shonan Credit Union Bank and NIF-SMBC Ventures (1999-2009)
Member and Vice Editor, UNESCO University-Industry-Government Committee and preparation of manual : University-Industry Cooperation: How to make it?, ISBN 86-81449-13-3(2000-01)
Project Leader, The world first application of waste heat and metal hydride to agriculture (Hydrogen Strawberry) and fish breeding (2001-2013) as Cool Earth Project of METI and City of Saijo, Ehime Prefecture, Japan)
Project Leader, Establishment of Tokai University Airline Pilot Training Course with University of North-Dakota, All Nippon Airways (ANA), Ministry of Education (MEXT), and Ministry of Land, Infrastructure and Transportation (MLIT), Japan (2005)
Leader, Standardization of measurement and assessment methods of properties of hydrogen storage alloys (JIS=Japanese Industry Standard) (METI) (2007)
Project Leader, The world first participation as a university in the Le Man 24H Race in France (2009)
Leader, Implementation of the Asian Nuclear Personnel Training Course (MEXT, METI) (2013-16)
Chair, Evaluation Committees of NEDO for Infrastructure Development of Hydrogen Storage Materials (2007, 2012).
Research Project Advisor and Evaluation Committee Member, JST (Japan Science and Technology Agency) (present)
Promotion of University-Led Ventures "START Project", JST. (2014-16)
Evaluator and Advisor for Research Projects of JST (Japan Science & Technology Agency), and NEDO (New Energy and Industrial Technology Development Organization) (present)

ACADEMIC ACHIEVEMENT & PUBLICATIONS
Academic Papers: 292 for Materials Science, Science & Technology, Education, Human Security,
Eco-Technology, Energy Policy.
Books, Translation and Editors: 20.
Columns to Newspapers and Journals: 194.
Interviews, Comments on TV and radio: 62.
Invited Lectures: 75 of 235 presentations at international meetings
Invited Lectures at Gordon Research Conference 1989, 1997 for Hydrogen Storage Alloys

AWARDS & RECOGNITIONS
The Minister of Education, Japan, for the R&D of a Solar-Vehicle (1992)
The Japan Rare Earth Society for Excellent Study on Rare Earth Metals and Intermetallics (1997)
International Association for Hydrogen Energy (IAHE) for Excellent Scientific Achievement in the World Hydrogen Movement (1998)
Autonomy Merits Award of Saijo City for the marked contribution by advice and cooperation to the city's policy and advancement, Ehime Prefecture (2004)
IAHE & UNIDO for Excellent Scientific Achievement in Hydrogen Energy (2005, 2007).
IAHE Fellow for Active and Excellent Contributions to Academic and International Society in the field of Hydrogen Energy

(2014)
Honorary Member, Deutsche Gesellschaft fuer Materialkunde (DGM=German Society of Materials Science) (2015)

MAIN SOCIAL APPOINTMENTS:
1) Advisor and Chairman of Evaluation Committees, Japan Science and Technology Corporation (JST), and New Energy and Industrial Technology Development Organization (NEDO), Japan
2) Honorary Editor, JOURNAL OF ALLOYS AND COMPOUNDS, Elsevier
3) Editorial Executive Board Member, INTERNATIONAL JOURNAL OF HYDROGEN ENERGY (IJHE), Elsevier
4) Councilor, Hydrogen Energy System Society (HESS), Japan
5) Advisor, Hydrogen Division of the Japan Institute of Energy (JIE)
6) Board Member, Japan Rare Earth Society, Japan
7) Board Member, HONDA Foundation (HOF), Japan
8) Columnist, Science & Technology division, NIKKEI Newspaper, Japan
9) International Advisor, Hydrogen & Fuel Cell Project, South Africa (HySA)
10) International Advisory Board Member, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia
11) President, Society of Advanced Science & Shonan Association for Synergic Collaboration among University, Industry and Government (SAS), Japan
12) Board Member, German Baden-Wuerttemberg Freundeskreis (BWF), Tokyo, Japan
13) Advisor, Counselor and Member of Kanagawa Prefectural Governmental Committees for General Policy Planning, Governmental Projects for Smart Energy, Next-Generation Vehicles, Science & Technology Policy, Intellectual Property Right.

Dr. Kazuko MATSUMOTO

Senior Director, R&D, Vision Development Co., Ltd.

Birth Date
October 27, 1949

Education
B.S., Department of Chemistry, The University of Tokyo 1972
M.S., Department of Chemistry, The University of Tokyo 1974
Ph.D., Department of Chemistry, The University of Tokyo 1977

Academic Career
Visiting Scholar, Sophia University, Japan, 2013–present
Professor, Department of Chemistry, Waseda University, Japan, 1989–2006
Associate Professor, Department of Chemistry, Waseda University, Japan, 1984–1989
Research Associate, Department of Chemistry, University of Tokyo, Japan, 1977–1984
IUPAC (International Union of Pure and Applied Chemistry) Vice President, 2006
Visiting Professor, Institute for Molecular Science, Japan, 1990–1992
Visiting Scholar, Massachusetts Institute of Technology, USA, 1993
Adjunct Professor, Institute of Molecular Science, Japan, 1998–2001
Invited Professor, Department of Chemistry, Nagoya University, Japan, 2004–2006
Visiting Professor at more than 10 national universities and Governmental Research Institute of Japan

Japanese Government Members and Advisors
The Member of The Council of Science and Technology Policy (Cabinet Office of Japanese Government), 2002–2005
In addition, advisory members of several meetings for Ministries of Industry and Science.

Career in Industry
Technical Advisor, Tokyo Chemical Industry, Co., Ltd. 2007–2010
Senior Director, Vision Development. Co., Ltd. 2011–present

Members of Foundations
Director, Honda foundation, 2012-present
Director, Japan-Turkmenistan Association for Science & Technology Cooperation 2014–present

Honors
Japan Society for Analytical Chemistry Award for Young Researchers, 1984
Japan Chemical Society Division Award, 1990
Ichimura Award, 2000
Japan Society for Analytical Chemistry Award, 2005

Members of Academic Societies
Japan Chemical Society
American Chemical Society
Royal Chemistry Society
Japan Analytical Chemistry Society
Society for Japan Coordination Chemistry
Japan Rare Earth Society

Advisory Board Members for International Scientific Journals
Bulletin of the Chemical Society of Japan, 2000–2006
European Journal of Inorganic Chemistry, 2000–2006
Journal of Organometallic Chemistry, 2002–2006
Journal of Biological Inorganic Chemistry, 2001–2006
Inorganic Chimica Acta, 2000–2010

Research Interests
Inorganic Chemistry, Metal Coordination Chemistry, Material Science (Nanodiamond), Biotechnology and Imaging Using Lanthanide Luminescence

1. Nanodiamond IT, Electro Devices, and Automobiles: Development of new nanocarbon materials by incorporation of surface-modified nanodiamonds with superhardness, high refractivity, high dispersion, and low friction coefficient into polymers, films, alloys, rubbers, and many others.
2. Luminescent Materials Composed of Nanodiamond and Lanthanide for Bionanotechnology and Bioimaging.
3. Luminescent Lanthanide Compounds for Time-Resolved Imaging.

Research Publications
More than 230 papers in major scientific journals

Opening Remarks

Dr. Mahmud B. KASYMBEKOV
Head of the Chancellery of the President of the Republic of Kazakhstan – acting Director of the Library of the First President of the Republic of Kazakhstan – Elbasy, Doctor of Political Sciences, Professor

Dr. Amerkhan RAKHIMZHANOV
Deputy Director of the Library of the First President of the Republic of Kazakhstan-Elbasy, Doctor of Political Sciences, Professor

Mr. Anarbek KARASHEV
Executive Secretary of the Ministry of Foreign Affairs of the Republic of Kazakhstan

Mr. Ichiro KAWABATA
Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Kazakhstan

Mr. Hiroto ISHIDA
President of the Honda Foundation (HOF)

Mr. Shigeo KATSU
President of Nazarbayev University

Dr. Mahmud B. KASYMBEKOV

Head of the Chancellery of the President of the Republic of Kazakhstan – acting Director of the Library of the First President of the Republic of Kazakhstan – Elbasy, Doctor of Political Sciences, Professor

Opening Remarks

I welcome the participants and distinguished guests of the International Symposium "Innovative Technologies in the Field of Rational Use of Natural Resources"!

Rational use of natural resources and protection of the environment is one of the most important problems of modern society in the era of development of scientific and technological progress, accompanied by an active impact on nature. The modern world is on the eve of the next cardinal change in the economic and technical paradigm.

World experience convincingly proves to us that innovative technologies represent one of the most important and effective tools contributing to the development of modern production and economic potential of the country. The areas of consumption of environmentally friendly energy sources and the use of renewable energy sources are significantly expanding.

Important energy policies in Kazakhstan today are energy efficiency and energy saving. The introduction of energy-saving technologies is a serious condition for ensuring the energy security of our country. In this regard, the experience of foreign countries, including the experience of Japan, where in recent decades there have been significant changes in favor of knowledge-based and resource-saving activities is indicative for Kazakhstan.

Japan as an economic power in the modern world in the multi-vector policy of Kazakhstan occupies an important place and represents an example of a state successfully moving towards a model of sustainable development, combining the interests of economy and ecology. Green technologies and environmental innovations are important tools for Japan to achieve the goals of the country's environmental policy.

In this regard, the analysis of the experience of Japan can be in demand for Kazakhstan.

Dear participants of the international symposium!

Today's meeting represents a dialogue platform of the scientific and expert community of Kazakhstan and Japan, which will allow us to draw the attention of the scientific world and the public to the problems of ecology, conservation of natural resources and the formation of a unified environmentally-oriented state policy in the field of environmental protection.

On the agenda of the symposium are issues of a global level concerning the role of innovative technologies in the field of rational use of natural resources.

I hope that productive discussions on the margins of the international symposium will contribute to the elaboration of contours of further cooperation on the rational use of natural resources.

I am confident that the Kazakhstan-Japan Symposium will make a definite contribution to the strengthening of bilateral relations between our countries.

I wish you fruitful work and all the best!

Dr. Amerkhan RAKHIMZHANOV

Deputy Director of the Library of the First President of the Republic of Kazakhstan-Elbasy, Doctor of Political Sciences, Professor

Opening Remarks

Dear guests and participants of the International Symposium "Innovative Technologies in the Field of Rational Use of Natural Resources"!

We are happy to welcome all participants of the International Symposium to the Nazarbayev Center, a solid delegation from Japan, extraordinary and plenipotentiary ambassadors, representatives of diplomatic missions, expert and scientific community.

Ladies and Gentlemen,

It gives me great pleasure to welcome you here today. Thank you for coming and taking part at the conference. I hope you will have a good impression of it.

Allow me to express special gratitude for supporting the idea of holding the symposium and actively participating in the preparation and holding of the symposium to the Honda Foundation and personally to the President of the Honda Foundation, Mr. Hiroto Ishida!

Minasan, ohayo gozaimasu, Astana ni yokoso.

shinpojiumu ni go sanka itadaki, arigatōgozaimasu.

Shinpojiumu no seika ga seikō shi, yakudatsu koto o negatte imasu.

We express special gratitude to the Embassy of Japan in the Republic of Kazakhstan and personally to Mr. Ichiro Kawabata, the Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Kazakhstan for his support in the preparation and holding of our symposium!

Let me express my sincere gratitude to our guests - scientists and researchers from Japan. Thank you for responding to our invitation, we are glad to see you at the Library of the First President of the Republic of Kazakhstan-Elbasy.

The international symposium on the importance of applying innovative technologies in the field of rational use of natural resources is undoubtedly a significant and relevant event for drawing the attention of the scientific world and the public to environmental problems, preserving natural resources and forming a unified environmentally-oriented state policy in the field of environmental protection.

The idea of a "green economy" began to be realized one of the first in the post-Soviet space precisely in Kazakhstan. More than a decade ago, on September 25, 2007, the President of the Republic of Kazakhstan, Nursultan Nazarbayev, proposed to develop a global energy and ecological strategy at the 62nd session of the UN General Assembly and discuss it at the UN World Summit on Sustainable Development in 2012.

In 2011, at the UN session, Nursultan Nazarbayev put forward a partnership program "Green Bridge", designed to strengthen the "green" economic growth in the region. In 2012, this program was approved at the UN World Summit on Sustainable Development "Rio + 20" as an interregional mechanism for the transition to a "green" economy, open to the participation of all parties. In 2016, Kazakhstan became a party to the Paris Agreement. The country pledged to reduce emissions by 15% by 2020 and by 25% in another 10 years. At the same time, the share of renewable energy sources in the economy should be 50% by 2050. It is expected that the program by 2050 will provide additional GDP growth of Kazakhstan by 3%, and will also create more than 500 thousand new jobs.

In 2017, Kazakhstan hosted the international exhibition "EXPO-2017: Energy of the Future", which became the basis for the systematic development of the "green" economy in the country. The theme

of the World Expo - "Energy of the Future" - made it possible to attract the best world energy saving technologies, new developments and technologies for using existing alternative energy sources. During the construction of the exhibition complex EXPO-2017 energy-saving technologies were used. Buildings of the exhibition complex were certified according to international eco-standards BREEM.

The topic of alternative energy sources has become one of the main ones at the Astana Economic Forum-2018, an annual dialogue platform for finding effective solutions in the fight against the main economic and social challenges of our time. The forum brings together world leaders, international experts, scientists, political and public figures, representatives of various financial institutions and the business community, and on its scale has no analogues throughout the Eurasian space.

A presentation of the International Center for Green Technologies and Investment Projects was held in the fields of the Astana Economic Forum, which will begin its work in June 2018 in the city of Astana. In the work of the Center, the content related to the green economy, energy efficiency and low-carbon technologies will be of particular importance. All the activities of the Center will contribute to the fulfillment of the commitments undertaken by the Republic of Kazakhstan within the framework of the Paris Climate Agreement.

In the near future such centers are to be opened in the regional centers of the country. The executive bodies plan to actively cooperate with business representatives and with their help to implement the best innovative projects.

Strengthening economic, environmental, energy, demographic and other global challenges means for most modern states an absolute priority in public policy measures aimed at increasing the efficiency of the use of natural resources in all segments of the economy. Such a key attitude towards innovative development of the economy is also relevant for Kazakhstan.

At the same time, in the course of the ongoing development of the scientific and technological revolution, the necessary technical prerequisites are created to ensure a new nature of the attitude to nature, the harmonization of production and natural processes into a single system regulated by man.

The new approach is not so much an abstract concern for nature as in the so-called "green growth" (green growth) - saving natural resources that contributes to sustainable economic development of states, which can be achieved through the use of science-intensive innovative technologies.

Therefore, it is no coincidence that today we have gathered to discuss the use of innovative technologies in the field of rational use of natural resources.

At the plenary session and 3 panel sessions, the issues of industrial structure transformation, various reforms in the field of advanced technologies, successful examples of Kazakhstan and Japan in the field of rational use of natural resources in environmental technology practice, future technologies for sustainable society, as well as human resource development for transformation of the structure of industry.

We, the organizers, are pleased with the high professional and scientific level of the Symposium participants. We are proud to note the participation in the work of the symposium of representatives of leading Kazakhstan and Japanese research, production, research and educational circles: the International Committee of the Honda Foundation, Honda Research and Development (R & D), the Higher School of Political Science of the National University of Japan, Tokaj, Kyushu, Okayama, Institute for International Policy, International Energy Agency, Nazarbayev University, Academy of Public Administration under the President of the Republic Kazakhstan, L. Gumilyov Eurasian National University., S. Seifullin Kazakh Agrotechnical University., Turan-Astana University, Kazakh University of Economics, Finance and International Trade, Eurasian Humanitarian Institute, Institute for the Development of Electric Power and Energy Saving (Kazakhenergiekspertiza), Institute of Ecology and Sustainable Development, Coalition for a Green Economy and development of G-Global », LLP «EcoEnergy.kz », Scientific and educational center« Green Academy ».

I am sure that today's symposium will give a new impetus to the development of innovative technologies of "ecological orientation" and to solve the problems of rational use of natural resources, socio-political and scientific problems, will allow us to outline concrete ways of developing "green technologies", unite the efforts of our countries' scientists in development and conservation natural resources in the world.

I wish the participants of the symposium successful work!

Mr. Anarbek KARASHEV

Executive Secretary of the Ministry of Foreign Affairs of the Republic of Kazakhstan

Opening Remarks

Good morning. Dear ladies and gentlemen and to your excellency, on behalf of the ministry of foreign affairs, I would like to greet all of the participants of today's forum. We are grateful for providing platform for holding these activities. For successful adaptation, the head of the state set new possibilities for industrial 4.0 in order to transform Kazakhstan along with the new developed world.

Let's talk about the main factor in the national economy. We would like to emphasize the development of manufacturing and recycling sector and also use of application of digital technologies and also other industry's information technologies for the effective use of natural resources. The world is on the threshold of the fourth industrial revolution which is close to mankind, we have new possibilities, epoch of abundance. We need new quality of development and global trends prove to us that we shall have the wide vision if we talk about the industrial vision. We have new possibilities and challenges. We need to review the resource potential of the country.

On the first agenda, if we talk about the transition to the green economy we shall address issues of energy saving issues and functioning of institutional development in the international center of development of green technologies. We have created this center--established this center in Astana. It will be engaged in promotion of technologies of the best practices, development of business investments, and also international corporations will send the framework of the partnership of green breach. We can talk about the participants of the conference. Also, we provide big prospects...have...which will be constructed based on the initial cluster. This is a breach for transition to the international--enter into the international markets.

It also starts out--this is a chance possibility for Kazakhstan to be one of the best generators in all the fields. Nazarbayev University was established based on the private institute where together, jointly with the executive committee we have some corporation based on the program energy technology system. On the whole, we shall emphasize that the world of the 21st century continues to study the natural resources and it will be some place for the development of the global economy of our country and we shall have new vision on management of natural resources. According to the words of the head of the state, if we talk about the transition or the green economy, we talk about the development of alternatives and renewables.

This is a special prospect for our country. Taken into account there--the fact that we are addressing the issues of natural resources, agriculture and you know that for us it's very important to have foreign international experience. For attracting foreign experts for development and limitations of elements of innovation ecosystem. Not by chance, the topic of today's symposium was the topic of recent event, economic forum as you know. And I wish you good luck in holding the event, fruitful and interesting discussions. Thank you for your attention. Wish you good luck in today's event.

Thank you very much for your greeting, for your welcoming speech. Next speech I would like to give to extraordinary plenipotentiary ambassador.

Mr. Ichiro KAWABATA

Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Kazakhstan

Opening Remarks

On the occasion of the 150th anniversary of modernization reforms of Japan

Dear Excellencies, distinguished guests, ladies and gentlemen.

I'd like to express my sincere congratulation on holding the international symposium "Innovative technologies in the field of rational use of natural resources", organized by the Honda Foundation and the Library of the First President of the Republic of Kazakhstan - the Leader of Nation.

Now I will start with the story of Mr. Soichiro HONDA, the founder of the Honda Foundation and, as known, one of the most proud by Japanese citizen with his outstanding talent and tireless efforts. After training at a small automobile repair factory following graduation from mandatory education, Mr. Honda started up a company with only 20 employees, where he started research and manufacturing motorcycles and, in a short time, developed to a world-famous large company in the automobile industry. The Honda Foundation, which inherited Mr. Honda's mission "Creating a Truly Humane Civilization", this time focused on Kazakhstan and decided to hold the international symposium, in order to discuss on various problems of modern society by using interdisciplinary and civilizational approaches, and to find eco-technological solution to these problems. I expect that the activities of the Honda Foundation will contribute to promote the development of cooperation and friendship between Japan and Kazakhstan.

Holding this symposium in the capital of Kazakhstan shows deep relationship between Japan and Astana, which marks the 20th anniversary this year. On this occasion, I'd like to express my heartfelt congratulations.

As you may know, the capital had been constructed and developed on the ground plan by a famous Japanese architect Mr. Kisho Kurokawa with basic concepts of 'symbiosis and metabolism'. According to Mr. Kurokawa, a new capital should be as a living organism. It means, the new city should embody metabolism, greenery of Astana and a view to Ishim River, and should be developed as cluster blocks. Besides that, as constructed as a newly-opened Land of Akmola city, Astana should be a symbol of symbiosis, where those conflicts are mutually combined and recognized each other, such as old and new, traditions and modernity, high technology and natural energy, and where the future coexists with the past and the present. Furthermore, you may be noted that parks in Astana are connected with each other through green landscape, while the parks in the West are separated from each other. This is based on Mr. Kurokawa's idea, according to which, even space connection of 5 cm wide should be remained green for habitation and movement of small animals and microorganisms, in order to create coexistence of people and nature. The concept of symbiosis indicates that heterogeneous things do not exclude, rather accept each other, as for instance, in Kazakhstan 130 ethnic groups and 18 religions live peacefully in one country. This is one of the ideas that reflect the reality of Kazakhstan developing towards common goals. In this sense, Astana is the appropriate city as the capital of Kazakhstan both in name and reality. Over the Last 20 years the population of the capital has been increased more than 3.5 (three and a half) times and the area has been expanded by three times, and Astana became beautiful and comfortable city with a million of people, where skyscrapers and unique and modern buildings are lined up. The capital aims to further development within new urban planning. Future development of Astana will be a barometer of development of Kazakhstan. Moreover, since

the capital had been developed on the idea of the Japanese architect, the Government of Japan provided economic assistance in reconstruction of the international airport and water supply and sanitation service in the city as well. Thus, Astana has strong ties with Japan.

For achieving the concrete strategic goal to enter into top 30 developed countries of the world by 2050, Kazakhstan pushes its political, economic and social reforms, carries out projects for establishing a national identity, and plays a leading role in Central Asia within the framework of international cooperation. Two years of my mission in Kazakhstan have passed, and I still feel deep impression constantly by people of Kazakhstan who always strive forward, promote reforms, and make efforts to increase international trust. The people of Kazakhstan are keen to learn modern technologies, and at the same time make efforts to restore, preserve and inherit their own history, traditions and culture. As for the Japanese during the modernization period, they were also struggled with adopting from the West while coexist traditional culture. In this sense, the feelings of both nations are similar.

This year we commemorate the 150th anniversary of Meiji Restoration, when Japan started reforms on establishing a modern state system to overcome feudalism. In 1868 the era of samurais ended after over 700 years and the Meiji Government was launched. The year 1868 symbolizes the opening of the new era. Japan studied enthusiastically the latest Western systems in various fields, such as politics, military, economics, science and technologies, education and culture. For instance, in early 1870s the leaders of the new Government headed by the foreign minister at that time visited the European countries and the USA. The delegation negotiated on diplomatic relations with each country; and learned from these countries the surrounded situation, latest information and technologies that influenced on establishment of a renewed state. As a result, a new cabinet system, modern constitution, and Constitutional assembly parliament were established, industries developed, and thus, Japan successfully joined the modern states in the world.

On the other hand, among intellectuals of that time, it was discussed a lot how to preserve Japanese unique history, culture and tradition while developing the country by means of adopting advanced foreign technologies and systems. Even now you may be heard both positive and negative historical assessments and studies on Meiji reforms which were carried out in turbulent international situation. However, today, I would like to emphasize its positive aspects.

The Meiji restoration had greatly changed the lives of people by adoption of advanced western technologies and culture, following the reforms in a wide range of fields, including economy, transport, education, culture and ideology. Having an increase of the number of students studying abroad, it became popular to take advantage of the knowledge learned in foreign countries. In parallel, contribution to establishment of modern society by more than 500 foreigners is also worth noting, who came to Japan at that time and advised the Japanese Government. Consequently, technological innovation and industrialization were brought and became a foundation of contemporary automobile industry and IT technologies, which are Japan's most proud of today. Ordinary citizens learned about western democracy via political novels written in the Meiji era. The new legal system built in Japan was based on the Western system and customized to suitable format to Japanese society.

Japan succeeded to become a country, where modernization is harmonized with preserved own traditions, unique culture and civilization. Having adopted the best systems from all over the world, Japan reminded own culture deeply rooted in Japanese society respected. Here we can observe the idea of symbiosis.

Soon, the Meiji Restoration influenced on Asian countries, including Kazakhstan too. As far as I know, "Alash" party established in 1917 was aimed to create the country on the model of Japan. In December 1917, establishment of the Autonomous Government of Alash-Orda was declared. 300 representatives from all over Kazakhstan were gathered, and under the chairmanship of Mr. Alikhan Bokeykhanov, Government leaderships and regional representatives were elected. It was a tragedy part of the history that some Alash-related intelligentuals were convicted as spies of Japan or other countries, and were executed by firing squads. Nevertheless, it is worth noting that, intelligentsia of Kazakhstan showed great interest to the country, which located in the same Asia and rapidly developed in various fields in only few decades after opening eyes to the world, -the country is Japan. I would like to point out this positive influence of Meiji Restoration on foreign countries including Kazakhstan.

One more thing I'd like to mention is sharing the achievement at civilized societies and the prospect for the future, which we, human beings, have done among international society. The first international EXPO held in London in 1851 played a role as a

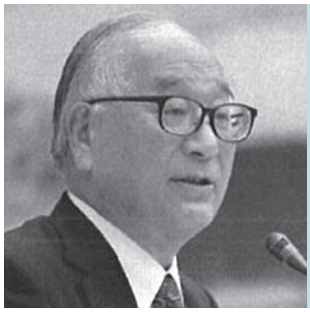
platform for each participated country to appeal achievement of civilization and industry, as well as to share their knowledge and experiences. In 2017, Astana EXPO was held successfully under the theme "Future energy", in which 115 countries and 22 international organizations participated. At the "Astana EXPO-2017," views to be considered and challenges to be solved on eternal and rational use of energy were presented. We should follow up the achievements of the Astana EXPO- 2017 in various forms. I'd like to add that Japan has announced a candidacy for the "Osaka-Kansai EXPO-2025" with the theme "Designing future society for our lives".

Now, let me introduce Japan's national project "Society 5.0" shortly. Human beings have experienced hunting society, agricultural society, industrial society and information society. In this regard, Japan outlines future society as "Society 5.0", where innovative technologies such as IT, robotics, and big data will be used for the well-being of our life and society. Thus the society will aim for balancing between economic developments and solving social problems, such as aging society and the gap between rich and poor. Besides, the world faces global challenges such as environmental problems, climate change, energy, healthcare, medical service, and food shortage. Taking this into account, Japan is ready to contribute to achieving the UN Sustainable Development Goals, SDGs, through realization of an idea of the future society. I am convinced that the EXPO 2025 in Osaka should be an opportunity to share new values and visions with many people from the different parts of the world.

Again, let me remind you about symbiosis, which is an eternal theme of old and new. Today Kazakhstan promotes several reforms, such as "Five institutional reforms", "100 concrete steps for implementing five institutional reforms", "The third modernization", "The fourth industrial revolution", and "The five social initiatives" and others. At the same time, "Spiritual Modernization - Rukhani Zhangyru" program is under implementation actively, which forms contemporary citizens of Kazakhstan and is considered as a spiritual foundation in order to implement mentioned reforms successfully and effectively. I think, it is the "Rukhani-Zhangyru" program that presents the idea of symbiosis for new Kazakhstan. I wish success of these reforms.

At the symposium today the important themes will be discussed, such as harmony of economic development and culture, or technological innovation and environmental protection. These issues are exactly what Japan and Kazakhstan have faced and will coordinately make efforts further.

Last year Japan and Kazakhstan celebrated the 25th anniversary of diplomatic relations, and close cooperative relations between both countries have already existed in the various fields. I'd like to emphasize this importance as new global challenges arise in the future, and Japan and Kazakhstan, located in the east and west of Asia, can continue to make efforts to expand the areas of further cooperation by intellectual exchange and various discussions. I wish all you to have open and substantial exchange of views today, which will contribute to comprehensive cooperation between Japan and Kazakhstan, as well as the regional and international community.



Mr. Hiroto ISHIDA

President of the Honda Foundation (HOF)

Opening Remarks

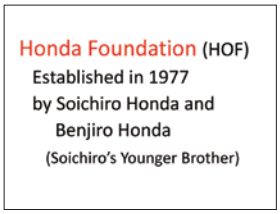
Introduction of Honda Foundation and the concept of "Ecotecnology"

Dear guests, ladies and gentlemen! I am honored to explain about activities of the Honda foundation.

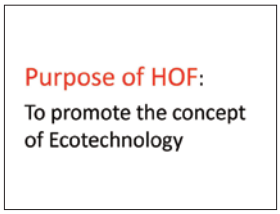
The first of all, I would like to say my gratitude for the invitation to this beautiful capital city Astana. I am glad to be here right now. My name is Hiroto Ishida. I am the president of Honda foundation.

This photo shows that Soichiro Honda's dream came true. He is very famous in the automobile industry. When he was a little boy, he flew on an airplane. It inspired him to be successful in the future. He dreamed about the airplane and realized his own dream. Honda Aircraft Company, Honda Jet in the USA. And they are becoming number one in this industry of small airplanes.

He was selected as a member of the Japan Automobile Manufacturers Association. He was in the Japan Automobile Hall of the fame. He worried about the mass use of cars because it is becoming a reason for road accidents, air pollution.



He and his brother organized a foundation by their own fund. Honda Foundation was established in 1977. The concept of this Foundation is the promotion of ecotechnology. The concept of ecotechnology is not just for profit. Technologies must be used in harmony with the environment and society. This wide and exclusive idea, he did a lot to promote this idea in our country.



He discussed about it with a lot of people worldwide.

First, I would like to talk about sustainable development in our countries and in the world. Secondly, about the utilization of energy efficiency. Thirdly, about technology for our bright future. We discussed with our colleges from Kazakhstan.

SDGs

Sustainable Development Goals

UN and many countries are making efforts for these 17 goals.

Activities of HOF

1. To host International Symposia
2. To present the Honda Prize (since 1980)
3. To present Y-E-S Award (since 2006)
4. To host Colloquia, etc.

I would like to explain about the idea of our Foundation. The main aim is sustainable development goals. Those problems are discussed in many countries. This program was initiated by UN. As for our activities of the foundation, we have four sections. The first is to host international symposia. Second is the Honda Prize. And Y-E-S Awards to young engineers and scientists. Last is to host Colloquia in our country.

International Symposia

- In Europe and North America, recently in Asian Countries
- To discuss various issues by gathering wisdom, aiming at promotion of Ecotechnology

We had International Symposia in Europe and North America. Recently we had symposia in Asia too. We had in Indonesia, Saudi Arabia, and this time here in Astana.

This photo is from the Symposium held in Indonesia in 2012.

Honda Prize:

- Started in 1980
- To reward prominent scientists and technologists on the contribution in light of Ecotechnology
- Up to 2015: 38 persons received

The second is the Honda Prize. We started this program in 1980. We give an award for the achievement, contribution and promotion of ecotechnologies. 38 persons were awarded this Prize.

This is from one of the award ceremonies. This is an award ceremony in 2015. This is an anniversary symposium that was held with the participation of many past Honda Prize laureates.

Y-E-S Award

- Honda Young Engineer and Scientist's Award
- Grants to young students
- To support future scientific leaders in Vietnam, India, Cambodia, Laos and Myanmar.

Honda Young Engineers and Scientist's Award. This is an explanation of why it is called Y-E-S. Not only young researchers, even university students have a chance. This is an award ceremony in 2017, in Vietnam.

And this is in Laos in the same year.

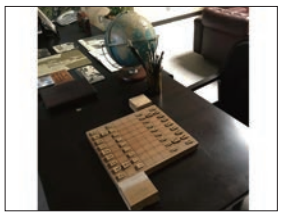
Colloquia:

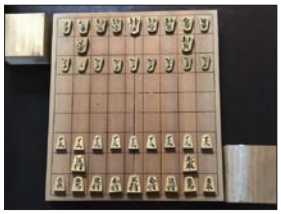
- To invite guest lecturers quarterly for intellectual exchange of various opinions on Ecotenology

Seminars and colloquia. We have colloquia every three months in Japan.

Soichiro Honda

- He had very fine human touch with various episodes.
- He was fond of playing Shogi (Japanese Chess).





Soichiro Honda passed away. He had a very fine human touch. He dealt with various issues. He loved Japanese chess shogi. This is chess desk. The cheapest kind of Japanese chess. It looks like this. It is not expensive. He loved this cheap kind. He always played, when he had a chance.

Painting

- He loved painting.
- Next picture is White Mt. Fuji painted by Soichiro Honda.

He also loved painting, drawing. I am not sure he was a talented artist, but it was his hobby. This is Mt. Fuji by him. He was born in the village near the Mt. Fuji. Many Japanese people draw Mt. Fuji.

Mt. Fuji

- Many Japanese Artists painted Mt. Fuji.
- Red Fuji by Hokusai Katsushika (1760~1849) is very famous.

The most famous picture was painted by Hokusai Katsushika. He is a legendary artist at 18-19 century. This is a well-known picture. It is red Mt. Fuji. This is black Mt. Fuji. This is an image of thunder and lightning. This is "the great wave." This painting has influenced many Western artists. Soichiro did not paint a "red" or a "black" mountain. He painted a "white" mountain. When I was young, it was difficult to see the Mt. Fuji from the center of Tokyo. We tried to do everything possible to clean the air with the technology. We have introduced a variety of methods for cleaning the air. Now this mountain is visible from anywhere in the city.

Environmental Efforts

- Now Mt. Fuji can be seen clearly from Tokyo just as Era of Hokusai by reducing air pollution by the environmental efforts.

Hope of HOF

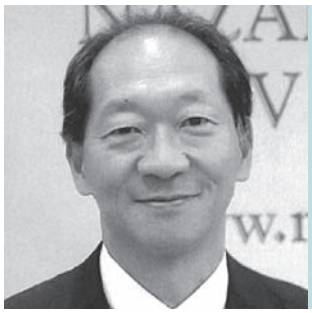
- HOF has made efforts for the success of today's symposium, and hopes that Ecotechnology will bring about and keep clean air, clean water, clean soil and clean globe.

We hope today's symposium will be successful. We can exchange our experience and be friends with our colleagues from Kazakhstan and create a better world for the next generation.

Thank you

HOF

Our Earth must be clean. Our Foundation is trying to do best for it. Thank you very much.



Mr. Shigeo KATSU

President of Nazarbayev University

Opening Remarks

Qurmetti Amerkhan Muratpekuly, Anarbek Bakhtygazyuly, Ichiro Kawabata elshi myrza, Hiroto Ishida myrza! Qurmetti hanymdar men myrzalar!

Symposiumga hoch keldinizder! Men bugingi symposiumnyn satti otetinine senimdimin! Barshanyzga sattilik tileimin!

Good morning, Ladies and Gentlemen!

It is my great pleasure and honor to welcome all of you to the Symposium this morning and thank you for your participation. The theme of today's discussion is "Innovative Technologies Towards Natural Resource Efficient Society."

We all know that at every stage and age, we are always going to face the world ever more volatile, more unpredictable, more complex, and more ambiguous, so called VLICA world.

This is even more pronounced as we now move forward in the age where technological breakthroughs and scientific discoveries are accelerating. When we have heard things such as over the last three years alone more information has been gathered than in all the history before. This gives us a sense of acceleration taking place. In this disruption that will be caused by technology change, it is vitally important that whole societies are well prepared in keeping up with this VUCA inspired world. I think Kazakhstan, under the guidance of President Nazarbayev has systematically mapped out the way forward.

In 2012 President Nazarbayev stated the vision of 2050 and challenged the nation to join the top 30 most developed nations by 2050. He was not only talking about joining top 30 in terms Of per capita income, but rather in terms of quality of life. And this is one part of why we also have symposium today.

Then, President Nazarbayev moved on and in 2015 launched the five institutional reforms, 100 steps, and the national plan. But importantly there, the foundations in a way were laid and set out for modernization of science, education, health, and social sectors as well, as the part of the vision 2050. So, it was clearly spelled out that Kazakhstan should aspire to and attain the standards of the OECD by around 2020.

Then, we had the implementation of EXPO-2017 last year as you all know with the theme of 'Energy of the Future' and transition to green economy.

Furthermore, the challenge of fourth industrial revolution that President Nazarbayev indicated in his Message to the People of Kazakhstan in 2018. In parallel, he also called particularly young generation, young people of Kazakhstan to take part in modernization of history the Ruhani zhangyru (Рухани жаныру) spirit that should take us forward. He then also pushed government to move forward and declare and put together Kazakhstan 2025 which will be focused on digital Kazakhstan.

We then heard further that it would be very important again to bring in and provide enabling framework and environment for the young people of Kazakhstan to express themselves and in order to create part of this enabling environment he talked about and declared five social initiatives including more scholarships for young people more especially in science, technology and engineering and math areas but also social living conditions such as dorms and last but not least we've now seen that also comes together in President's vision that was presented last week at the Astana economic forum where he talked about the five key global challenges and big trends of digitalization, energy revolution, demographic changes, and of course urbanization and last but not least how all of these affect labor markets and work places of the future.

So, we are actually seen a very carefully crafted

progression and concept of how Kazakhstan should really take part in the world that is rapidly changing, VUCA world, and how Kazakhstan can try to hold its own and compete.

As part of it therefore, education and research is going to play a key role. This is why in the President's mind and as his sort of brain child Nazarbayev University was also created and opened its doors in 2010.

Nazarbayev University was meant to be a disruptive. In order to do so, President Nazarbayev created some key enabling conditions for this disruption. We are operating under specific legal system which the first time in Post-Soviet space confers to an academic institution full academic freedom and institutional autonomy. So, these are huge privileges and of course our obligation therefore is try to share our experiences with the rest of higher education system.

President Nazarbayev also ensured by giving the University ample resources that we are able to attract top talent both students and as well as faculty. In terms of faculty, close to 60 countries are represented in our professorship.

But I would like to talk about talented student. For instance, I would like to share with you that last year our university team won the gold prize in the international student competition called IGEM, which is the famous international student competition on synthetic biology organized by MIT (Massachusetts Institute of Technology) on annual basis. Out of 300 teams, our team, Kazakhstani young students won the gold prize.

Similarly, our students for the first time participated in Eco-Marathon organized by Shell in Singapore, on stimulating the young engineers as to how far a drop of oil can take them in terms of distance. Our team did not immediately win, but for the first time it entered the competition and places 13th out of 30 teams.

Just to indicate that young Kazakhstanis are talented, they are motivated, and I think they have all that takes to really become a part of scientific and research community.

This we all need for Kazakhstan to succeed. But I have a sense of urging everybody here who has a voice and who can communicate to the government and decision makers, that for Kazakhstan to fulfill its vision of joining the top 30 countries, to ensure the transition to green economy, to build a society that is digitalized, a society that is really making use of and discovers the technological breakthrough, there is no other way and there are no shortcut, and therefore Kazakhstan needs to continue to invest in science and research. Unfortunately, today Kazakhstan's annual research development expenditures as a share of GDP are, at this point, only 1/15th of the average of OECD countries. So at this level, it's simply not possible even if the young people are talented and motivated, it simply will not be enough for Kazakhstan to compete.

Compete for talent and attract top international talent as well. So, I call on everybody here to help us to call on government to help push Kazakhstan forward by setting clear goals and commitments to increase research and development. So, that Kazakhstan can hold in its own. I am very optimistic that it will happen. I think the institutional infrastructure of universities and science institutions is being built. We have at Nazarbayev University a clear mandate to make sure that our privileges and the situation that we find ourselves is really shared with the rest of higher education system. Therefore, what we want is also to make sure that the country is going to endow research community with the resources that it needs and should design so.

Thank you very much!

Introductory Session

Mr. Bolat AKCHULAKOV
Vice-Minister of Energy of the Republic Kazakhstan

Dr. Michiharu NAKAMURA
Former president of the Japanese Agency for Science and Technology

Mr. Ruslan BAIMISHEV
Director of Subsoil Use Department

Mr. Bolat AKCHULAKOV

Vice-Minister of Energy of the Republic Kazakhstan

Introductory Session

Ladies and gentlemen, participants of the Symposium!

On behalf of the Ministry of Energy of the Republic of Kazakhstan, I would like to express my gratitude for the invitation and organization of the International Symposium: "Innovative technologies in the field of rational use of natural resources".

As you know, one of the priorities identified by the Head of State in the Message "New Opportunities for Development in the Conditions of the Fourth Industrial Revolution" is the further development of the resource potential of Kazakhstan through - 1) increasing the share of renewable energy in the country, 2) increasing the demand for energy efficiency and energy efficiency of enterprises, as well as environmental friendliness and efficiency of their work, 3) modern utilization and recycling of solid waste, 4) stimulating business in investing in "green" technologies.

Kazakhstan has set a goal to achieve a 10% share of RES in the total generation of electricity by 2030, and by 2050 we plan that half of the electricity consumption will be from environmentally friendly alternative and renewable energy sources. There are 55 renewable energy sources in Kazakhstan with a total capacity of 340 MW (hydroelectric power stations - 170, wind power plants - 110, solar power stations - 60). In 2017, they produced about 1.1 billion kW / h of "green" energy. In 2018, we intend to introduce another 120 MW of renewable energy.

The target indicator till 2020 is planned to be achieved through the implementation of the concluded projects of investors for the purchase of electricity renewable energy at another 53 sites.

In the long term, we attribute the decline in the cost of RES to the introduction of the auction mechanism, which will allow, on the one hand, to make the selection of projects and investors transparent and understandable, on the other hand, to rely on more efficient technologies and projects that minimize the impact on tariffs of end users from the introduction of renewable energy facilities.

The first auction bidding for the selection of projects for the construction of RES begin today. During the two auction sessions (in spring and autumn), 1 GW of renewable energy will be put up. Auction winners will be able to receive a 15-year guaranteed off-take contract for the purchase of electricity with a single purchaser of RES - a settlement and financial center.

n 2015, emissions of carbon dioxide in the power industry from the level of 2012 decreased by 9.3%. These results were achieved due to the fact that in 2012-2015 the basis for a modern energy saving system was created: a regulatory legal basis was established, the National Institute for Energy Conservation Development - JSC "Kazakhenergyexpertiza" was established, according to the experience of Japan a key element of the energy saving system was created - the State Energy Registry (SER).

The State Energy Registry includes the largest consumers of energy resources, which are obliged to ensure an annual reduction in the volume of energy consumption. It is now more than 5 thousand organizations.

For reference: among them 2,737 public institutions, accounting for 2% of total SER consumption; 1617 subjects of the quasi-public sector - 37%; 779 business enterprises with a 61% share of consumption.

The total energy consumption by the subjects of the State Energy Registry in 2016 amounted to 49 million tons of equivalent fuel (TEU), which is 38% of the total energy consumption of the country (taking into account the population) and about half of total consumption by legal entities. (For reference: The

domestic consumption of the country by the end of 2016 is 128.8 million TEU)

According to the Committee on Statistics of the Ministry of National Economy, the energy intensity of GDP in 2016 was reduced by 17.6% from 2008. At the same time, the energy intensity of the country's GDP still remains high in the world rating. Thus, according to the International Energy Agency, in 2017 the average world energy intensity of GDP was 0.18 tons of oil equivalent (toe), in OECD countries - 0.11 toe, and in Kazakhstan - 0.42 toe. One of the reasons for this is a significant share of energy-intensive industries, such as mining and metallurgy, which consume about 67% of the electricity produced.

For reference: According to the IEA analysis of 143 countries, the Republic of Kazakhstan occupies 114th place in terms of GDP energy consumption.

In this regard, in the medium term, in order to further reduce the GDP energy consumption, it is necessary in the most energy-consuming sectors of the economy to strengthen control over the implementation of measures to reduce energy consumption.

In order to reduce the emission of harmful pollutants into the atmosphere, measures were taken to denitrate and desulphurize exhaust gases and dust. At the end of 2017, from 25 coal-fired power plants, 13 were introduced to the second generation of ash collecting devices with a degree of coal dust capture of more than 99% and the installation of electrostatic precipitators at 6 TPPs, which allowed to reduce the emission of particulate matter by 70-80% and suppression of sulfur oxides by 10%.

This year jointly with the energy producing organizations a plan is being developed for the long-term phased implementation of measures to reduce emissions at TPPs, and also the requirements to the quality of the fuel to be sold from K-2 to K-5 levels from the first half of 2018, which will lead to a significant reduction in emissions in air from motor transport.

In the field of waste management, a regulatory legal framework was established to define requirements for secondary raw materials, separate collection, processing and disposal of waste.

In 2016, extended obligations of manufacturers (EOM) for cars and their components were introduced, in 2017 - for electrical equipment and packaging, accounting for about 50% of municipal waste. Over a two-year period of implementation of the EOM (2016-2017), more than 130,000 tons of waste were collected and processed.

In the sphere of waste management, the following achievements for the year 2017 are available:

- the share of recycled and recycled waste products was 31%, solid waste (SW) - 9%, while from 2015, this indicator increased by 1.3 times for industrial waste, 5 times for SW. It is planned to increase the share of industrial waste processing to 32% in 2018, and to 11% of SW;

- 69% of the country's population is provided with waste collection and collection services;

- the share of polygons that meet environmental requirements and sanitary standards is 16%.

The head of state in his Address pointed to the need to stimulate business to invest in "green technologies". The Ministry, in order to meet this mandate, together with government agencies and public organizations, began work on developing proposals for state support for green technologies, green projects and green financing, which will be included in the draft Concept of the new Environmental Code. The analysis showed that clear criteria for the definition of green technologies and green projects should be worked out, as well as measures of direct and indirect support of business entities introducing technologies to their production processes that allow minimizing the negative impact on the environment and rational use of natural resources.

In this connection the International Center for the Development of Green Technologies and Investment Projects which will form a register of "green" technologies, will be a catalyst for the introduction and development of clean innovation technologies, to seek out foreign partners for their transfer and implementation of projects in Kazakhstan, to cooperate with the countries of Central Asia, with international organizations to improve the mechanisms for the introduction of best available technologies (BAT).

Dear participants!

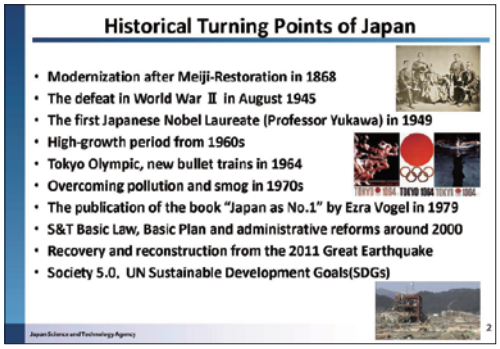
AS you can see, joint actions have allowed us to achieve certain results in the field of environmental protection. At the same time, the Head of State set us certain tasks, the solution of which should contribute to the sustainable development of our state. I hope that today's symposium will allow us to work out constructive proposals for introducing innovative technologies for the economic development of the country and improving the welfare of our people. In conclusion, I would like to wish all participants fruitful work.

Thank you for attention!

Dr. Michiharu NAKAMURA

Former president of the Japanese Agency for Science and Technology

Introductory Session



It is an honor to join this International Symposium in Astana. I would like to thank the Honda Foundation for inviting me to give an introductory talk.

The aspiration of today's world is to realize a sustainable and resilient society. Indeed it is the main theme of the SDGs, adopted in the 2015 General Assembly of the United Nations. Japan too is pursuing a human-centered society named Society 5.0, which is in direct line with the SDGs. Science, technology and innovation (STI for short) plays a key role in the sustainable development of the world. It is STI that makes possible the "decoupling" of economic growth and environmental damage, enabling inclusive development in which no one is left behind. In my talk, I would like to present an overview of Japan's STI-related activities, and touch on Japan-Kazakhstan collaboration in STI.

Let me first reflect on turning points in Japan's history. Japan's modernization began after the 1868 Meiji-Restoration through the opening of the country, reformation of the social system and promotion of industrial policy.

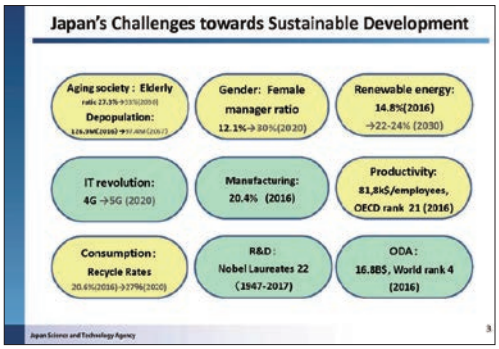
After World War II, reconstruction of completely damaged industry with a priority production system was an urgent agenda alongside forming a new democracy. Reconstruction of heavy and chemical industries was of high priority, soon followed by the emerging electronics and computer industries.

In 1949, Professor Yukawa of Kyoto University was awarded the Nobel Prize in Physics for his theoretical prediction of mesons particles. This event encouraged society, in particular the youth, by giving hope for Japan's future contribution to science.

A period of high growth began in the 1960s. Professor Ezra Vogel of Harvard University published a book entitled "Japan as No.1" in 1979 and referred to Japan's economic growth as an Asian Miracle, but obviously overestimated Japan's power. This rapid growth also came with its own costs, including serious pollution and smog in the 1970s.

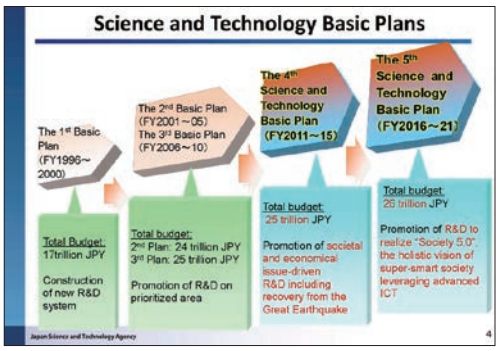
From the 1990s we started a new journey towards sustainable development. The 2011 Great Earthquake and Fukushima Nuclear Plant accident reminded us

of how important science and technology are, and how poorly we are prepared for such big disasters. Establishing a resilient society is a core theme of today's STI policy in Japan.



Today Japan has a hyper-aging society with depopulation. Under such conditions, can we really enhance competitiveness and attain well-being for our citizens? It is an unprecedented challenge that many developed countries will eventually face. As clear from the recent SDGs Index Study and other indicators Japan must solve its gender issues, accelerate renewable energy generation, enhance productivity per capita, and put more effort into recycling.

We believe STI is our key instrument to solve these issues. Importantly, we are implementing a plan-do-check-analysis cycle for national STI policy.



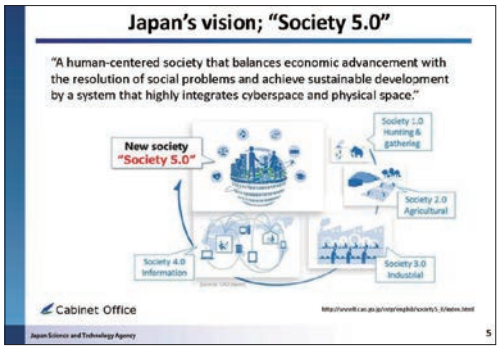
Every five years, Japan executes an S&T Basic Plan that leads national STI strategy under the Council for STI in the Cabinet Office. The Chairman of the Council is the Prime Minister.

In the first Plan, R&D system reform such as university and industry collaboration was one of the discussion points.

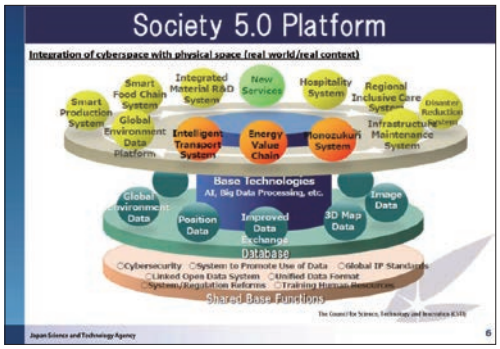
In the 2nd and 3rd Plans, promotion of priority regions such as nanotechnology, biotechnology and ICT were pursued for Japan to be a frontrunner in the world.

In the 4th Plan an issue-driven approach was emphasized to achieve innovations.

In the 5th Plan, the target is super-smart Society 5.0 leveraging advanced ICT. It requires us to break silo cultures of multi-ministerial activities. Facilitating PPP to mobilize academic and industrial capacities in national STI policy is also pursued.



Society 5.0 aims to achieve a human-centered society that balances economic advancement with the resolution of social problems, the decoupling of growth and environmental issues and achieve sustainable development by a system that highly integrates cyberspace and physical space. As I previously mentioned, Society 5.0 is in line with the SDGs' vision of universal and inclusive development.



Society 5.0 aims at a knowledge-based society empowered by advanced ICT. To make it a reality, we aim to build an STI platform. The platform incorporates systems and services such as energy value chain, intelligent transformation system, smart manufacturing system, and others. Shared base technologies are also incorporated such as AI, big data processing together with nanotechnology, biotechnology and others. Base functions are security, standardization, IPR, financing, capacity building and others. A new feature of the platform is data base and data analysis. It is based on our perspective that data and data analysis are cutting-edge STI tools that can contribute to achieving Society 5.0.

In this platform, deliberation on how to minimize negative impacts of STI related to ethics, security and

man-machine interfaces must also be included.

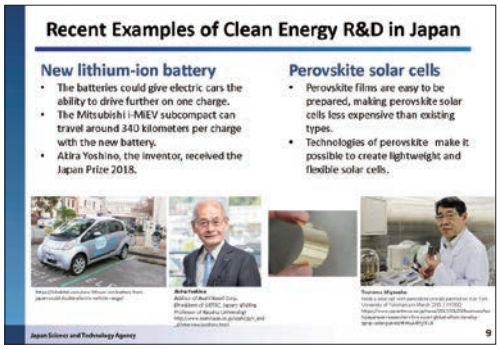
Let me introduce some of our practices. This is our road map for clean energy development. Japan's R&D on clean energy has three pillars:

The first pillar is a clean energy global network to facilitate access to global clean energy. Energy carrier systems using hydrogen gas or ammonia gas are under development.

The second pillar is accelerating the expansion of renewable energy with a target of 22-24% share by 2030. Local production and consumption are emphasized.

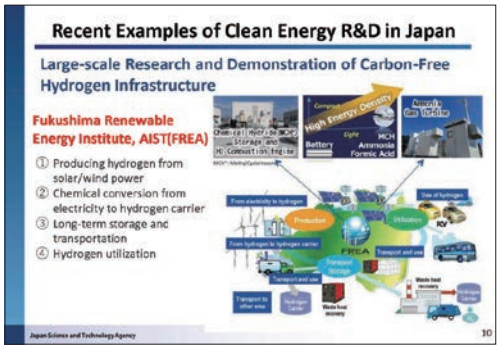
The third pillar is energy saving by using advanced ICT, efficient power electronics, new structural materials and others. Behavioral changes in people's power consumption are also addressed.

Local community is an active player in sustainable and resilient development in the context of local vitalization. This year, Shimokawa-city located in northern Hokkaido island with population 3,500 was awarded the first Japan SDGs Prize by Prime Minister Shinzo Abe for successfully realizing a low-carbon community: leveraging local and indigenous technologies, nurturing its forestry and forest research industries, enhancing local production and local consumption of low-carbon energy, and promoting hyper-aging society initiatives.



Advanced battery technology development is a theme Japan has been pursuing extensively over decades. Akira Yoshino, one of the inventors of the Li-ion battery, received the Japan Prize 2018 for his pioneering work in the 1980s. Perovskite solar cells invented by Professor Miyasaka are easy to prepare, and future possibilities include the creation of lightweight and flexible solar panels. Efficiency and reliability are improving year by year and they will eventually find big markets.

It takes time to implement new battery technology in society. We think consistent and continued efforts are necessary in national policy.



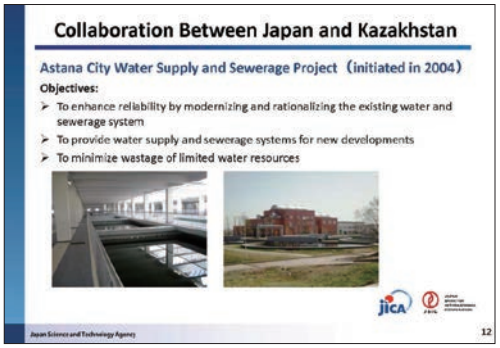
Another focus is hydrogen-based clean energy. Fukushima Renewable Energy Institute of AIST (National Institute of Advanced Industrial S&T) was established after the Fukushima Nuclear Plant Disaster as part of a carbon-free hydrogen R&D Infrastructure. Main R&D is on producing hydrogen from solar/wind power, chemical conversion from electricity to hydrogen, long-term storage and transportation and hydrogen utilization.

President Nursultan Nazarbayev visited Japan (Nov. 2016) and:

- Noted the close partnership in the field of international security, including the issues of nuclear disarmament and non-proliferation.
- Agreed to continue active political dialogue, ensure security of the region, facilitate trade, economic, cultural and humanitarian cooperation.

Minister of Economy, Trade and Industry Mr. Seko visited the Republic of Kazakhstan (Jul. 2017) and:

- Confirmed the expansion of Japan-Kazakhstan cooperation not only in the field of resources and energy but also in non-resource related fields and agreed on further enhancement of the Japan-Kazakhstan cooperative relationship.

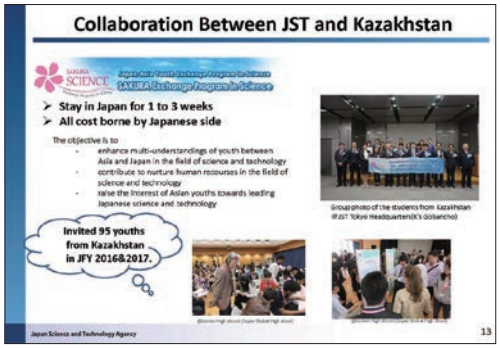


The loan agreement between JBIC and the Government of Kazakhstan for the Astana City Water Supply and Sewerage Project (the Project) was signed in July 2003 and the Project was initiated in 2004.

Objectives:

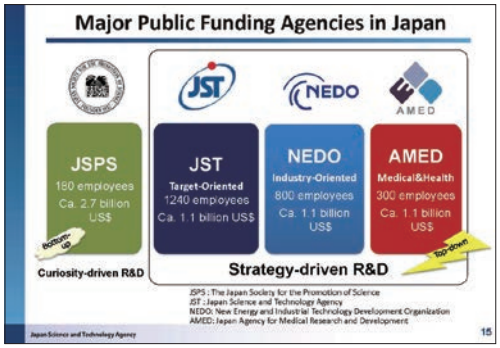
- To enhance reliability by modernizing and rationalizing the existing water and sewerage system
- To provide water supply and sewerage systems for new developments
- To minimize wastage of limited water resources

In parallel to collaboration on such hard infrastructure, collaboration on soft infrastructure is important as well.



The Japan Science and Technology Agency runs the Sakura Science Program in which JST invites thousands of young people to stay 1-3 weeks in Japan to experience Japan's R&D culture and establish a network. JST invites thousands of youths from Asian countries. In JFY 2016 & 2017 we invited 95 youths from Kazakhstan. We thank Kazakhstan for sending us the selected students.

SATREPS is an international joint research program implemented through collaboration of Official Development Assistance (ODA) and JST funding.



I would like to mention that not only JST but also other funding agencies as shown here are actively working on international collaboration. All of us wish to enhance collaboration with the Kazakh R&D community.

In Japan, Dr. Teruo Kishi was appointed as the Science and Technology Advisor to the Minister of Foreign Affairs two years ago. He chairs the Advisory Board for Promotion of Science and Technology Diplomacy and last year made a recommendation to facilitate global collaboration to achieve the SDGs. It has four pillars:

- Change through Innovation: Global Future Creation through Society 5.0.
- Grasp and Solve: Solution Enabled by Global Data.
- Link across Sectors, Unite across the Globe.
- Foster Human Resources for "STI for SDGs."

In closing, we would like to share our aspirations for a future human-centered society and explore close collaboration between Kazakhstan and Japan in STI for the SDGs.

Thank for your kind attention.

Mr. Ruslan BAIMISHEV

Director of Subsoil Use Department

Introductory Session

Dear participants of the international symposium. On behalf of the Ministry of Investments and Development of the Republic of Kazakhstan, I would like to greet all of you on this symposium, and thank you for the opportunity. We are aimed at digitalization and limitation of digital technology. In recent years, major global companies have been turning to digitalization and introducing innovation technologies, in particular, such global companies as Barrick Gold (Canada), Norilsk Nickel (Russia), Chelopech mines (Bulgaria), Matsa (Spain). In the Republic of Kazakhstan, JSC "AK Altynalmas", one of the top five gold mining companies, produces more than four tons per year and 1,700 people are working in the company and about 100 units of mining equipment are involved.

This is about rational use of natural resources. The technical progress makes constant adjustments to market demand. For example, for electric vehicle engines and smartphone, we have some demand for rare metals. The exportation of these metals is possible if companies have enough reserves. We shall save on the investments for geological investigation. The task of the government is to stimulate the demand not depending on the economical situation. In this regard, we can adapt some reforms in these fields which are aimed at implementation of international standards of new technologies and creations of favorable conditions for investors.

We carry out successive reforms in these areas, aimed at the implementation of international standards, technology, as well as the creation of comfortable capacity for investors. Another stage of these reforms will be the implementation of the Code based on the best advanced practices. We talk about the methods of governmental administration, support of investments. With the framework of this Code, the geological information will be available in the online mode at the lowest price.

You know that we have some Code on operations and use of ores and resources. In order to retain the quantity—we have the problem of illegal market in Kazakhstan to reach several thousands tons per year. In this regard, the Code introduces a new type of subsoil use for Kazakhstan on precious metal mining.

Along with that, the main trend is digitalization. Nowadays, full robotization is coming in the next 10 years. The Kazakhstan Industry Development Institute, a subordinate organization of the Ministry of Investment and Development of the Republic of Kazakhstan, together with foreign partners, is developing a set of measures for the technological re-equipment of the manufacturing industry and the mining sector until 2025, which includes elements of the Fourth Industrial Revolution. And this will be not only a trial, it is a possibility for the further development of Kazakhstan.

Thank you very much for your attention.

Keynote Speech

Mr. Akira KOJIMA
Chairman of the international Committee of the Honda Foundation

Mr. Akira KOJIMA

Chairman of the international Committee of the Honda Foundation

Keynote Speech

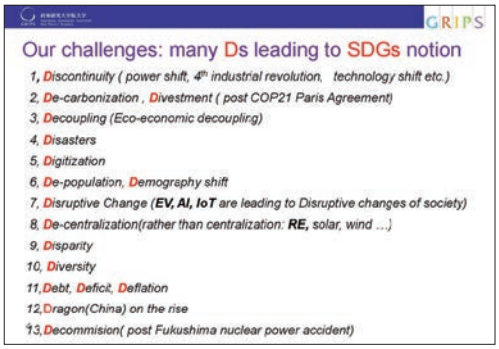
Disruptive Changes in Science, Technology, Innovation and Policy Approach: Coping with Challenges for Green and Prosperous World

Thank you very much. It is a great honor for me to give a presentation at a symposium for very important people today. As you already know, the main point is breakthrough changes in science and technology.

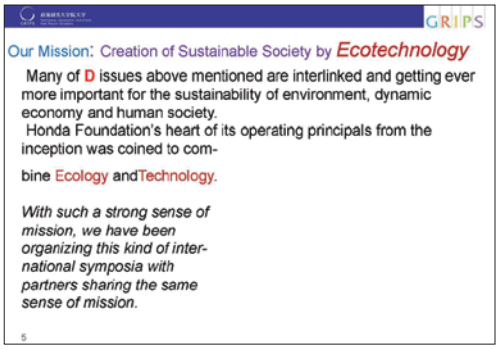
Your country has a powerful basis, I mean the event in Astana in 2017. EXPO 2017, countries have shown their strong will, desire and commitment to the transition to a greener and more sustainable economic development. Before getting on important issue, I will try to make some notes.

Today we are on a historic crossroad. 150 years ago there was a Japanese Meiji restoration, the beginning of Japan's modernization. 50 years ago, Club of Rome was established and we began to talk about programs at the international level. 45 years ago, we had oil crisis. People began to talk about "peak oil." And 40 years ago - there was a Chinese reform, an open up policy. 30 years ago there was an intergovernmental committee on climate change. 20 years ago, Russian financial default and the Japanese financial crisis, as a result the global international financial crisis has begun. And of course, 10 years ago, the establishment of Astana as the capital, and the crisis of the Lehmann Brothers happened. You know that the stories then have created some coincidences. For example, on October 25, 1917, there was the Russian October Revolution. Exactly on the same day, October 25, 100 years later in 2017, Chinese Xi Jinping perpetuated his name became as Mao Zedong.

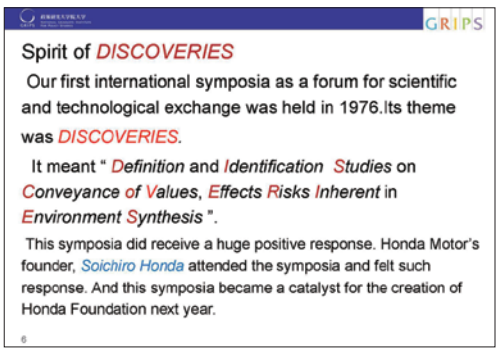
In 1991, when the Soviet Union had implosion, your country became independent and there were reforms as well. In the same year, there was a collapse of the Japanese "bubble" economy. We will talk about a breakthrough, about the prosperity of the economy.



I found there are many "D" questions, in English "D". These are our challenges that we face, which need a certain attention. The first is a discontinuity, if we are talking about the fourth industrial revolution, the transition, the change of technology, the change of governance, also decarburization, degradation, natural disasters. And also digitalization, digitizing. The sixth point is depopulation, a decrease in population.

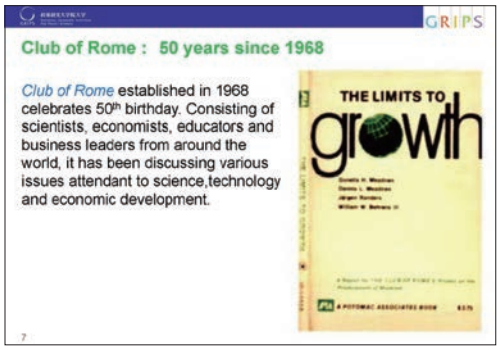


These are some demographic changes, and also fundamental technological changes, like the Internet, electric vehicles, which lead to a breakthrough change in society. We also have a challenge toward decentralization. Solar energy and wind energy are supported by decentralization.



Inconsistency or inequality that is associated with programs, or diversity, this is another part. Also, questions about debt, deflation, deficit and dragon, like China, which is on the rise. And of course, disarmament. In Japan, in Fukushima, an accident occurred at a nuclear power facility. We are now facing the problem of decommissioning.

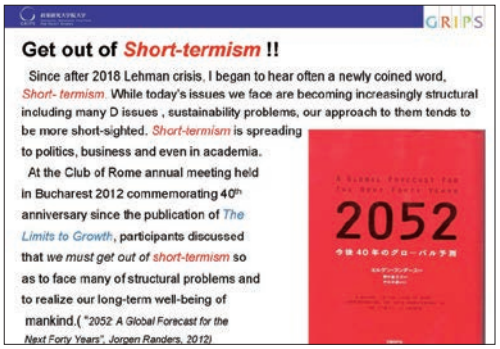
As you know, we must make breakthrough efforts in order to cope with problems and challenges.



In the Club of Rome was established in 1968. When the 50th anniversary was celebrated, it was attended by scientists, economists, and business sector representatives from around the world. We talked about the Club of Rome's warning about sustainability.

"The Limits to Growth" report was published in 2002 by the Club of Rome, which warns that unless we quickly respond. We will face such problems as destruction of the environment, the exhaustion of natural resources, or the crisis in food.

The report cries out for the argument of zero growth. The following year, in 1973 the oil crisis occurred. And Japan registered negative economic growth, which happened for the first time in post war history. After this oil crisis, the Club of Rome began to get more attention. It turns out that the message of this book, the content is still valid nowadays.



Since the crisis of Lehmann in 2008, I began to hear often about the new certain term, in English "short-termism". This is a policy of obtaining short-term benefits or short-term results. Short-termism is spreading to politics and businesses.

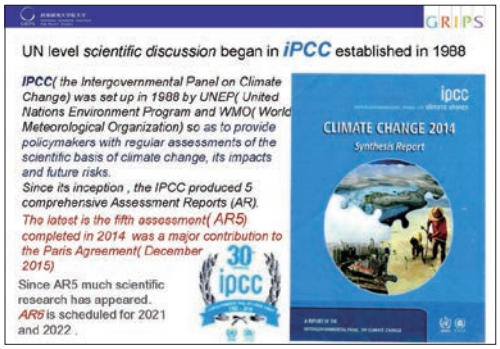
And in 2012, this popular / famous report was strongly mentioned again at this annual meeting of the Club of Rome in Bucharest. And at this meeting, participants stressed that we must get rid of this short-term benefits orientation and should face as many structured problems as possible.

The following new report, which is associated with the Club of Rome in this anniversary year, analyzes capitalism, a policy of short-term gains, a population, the destruction of the planet. They emphasize in this report.

Our social system requires more than just improvement.

In 2012, according to the UN Global Compact, more than 1,000 research managers echoed that for the future success, sustainability is very important. For example, an insurance company cannot provide us with all guarantees unless we can manage climate change and natural disasters.

We are talking about natural forest, some technologies, etc. Our time is limited.

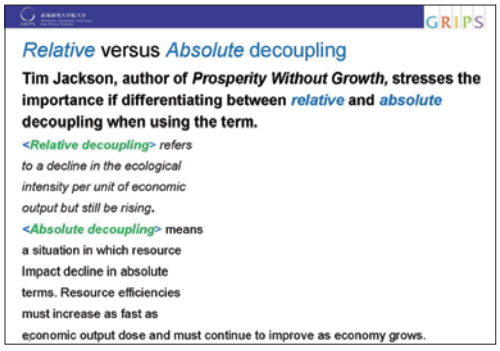


If we are talking about decarboning or elimination, as you know, it becomes a significant use ... in the context of economic production and environmental quality, refers to the ability of an economy to grow without any environmental pressure.

In 2011, an international resource committee led by the UN environmental program UNEP informed and warned that by 2050 the human race will absorb 40 billion tons of minerals, ore, fossil fuels, biomass per year until countries begin to decarbonate, to eliminate.

In 2012, this commission published the second report "Decoupling 2", which emphasizes the existing technological capabilities to accelerate the decarbonation process in elimination.

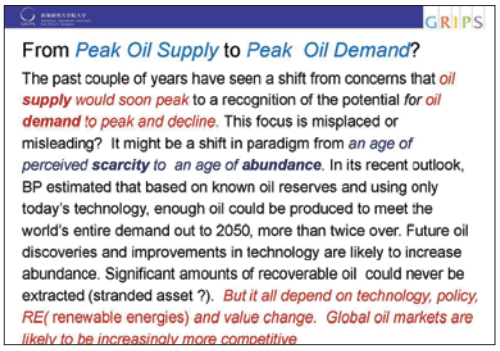
There are a lot of discussions about decoupling.



Tim Jackson, he is the author of a book or report on prosperity without growth, emphasizes its importance in distinguishing relative and absolute decoupling. We are talking about absolute decoupling. And now we are on the path of a new concept - this is a divestment, or a withdrawal of investment, and stranded assets.

Divestment is the departure or exit of an investment from an enterprise's business with carbon density.

During 2015, according to the Paris conference, the number of institutions, funds, universities, public pension funds, large financial companies expressed their decision and desire to make divestment amounting to 0.4 billion. If we are talking about carbon-intensive materials, such as coal, they are considered as stranded assets. It may be different opinions or discussions, or a huge change in the process of recognition.

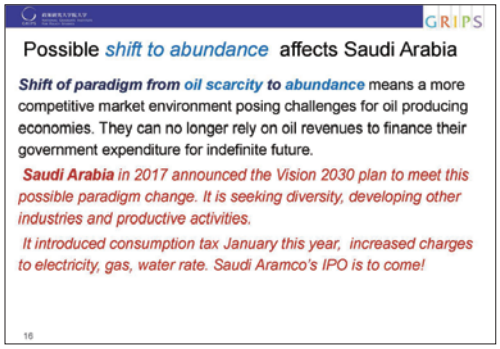


An interesting discussion about the peak oil supply and peak oil demand.

Over the past couple of years, there has been a shift from the problem or concern about oil supply, which soon became such a peak of recognition to the potential for peak oil growth, or some deviation of indicators. As you know, there are 15 paradigms where we can discuss either abundance or lack of something ...

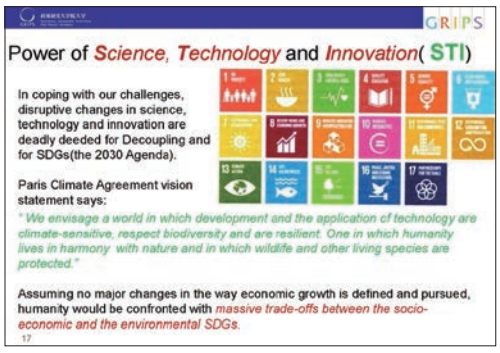
As you know, in some past prospects, BP "British Petroleum" estimated on the basis of well-known oil reserves and the use of current technologies if enough oil is produced to meet the overall demand by 2050.

In order to increase this level of abundance and significant amounts of this recoverable oil that have never been recovered, this is a blocked asset when there are so many discussions that all these issues may depend on political choice and on certain changes. As you know, the global oil market is likely to increase, to get more competitive. And the possible transition to abundance is affected by a certain change.



In 2017, Saudi Arabia announced the "plan 2030", where the development and usage of other industries were considered, and as you know, where the increase of IPO level was considered.

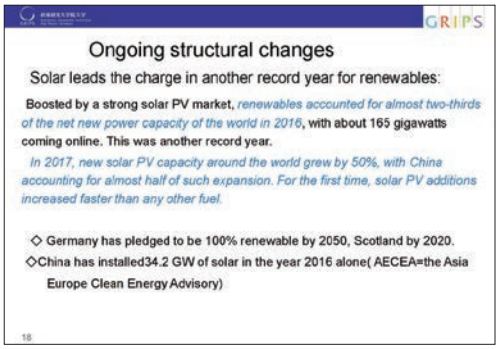
Here importance of science, technology and AI innovation is required.



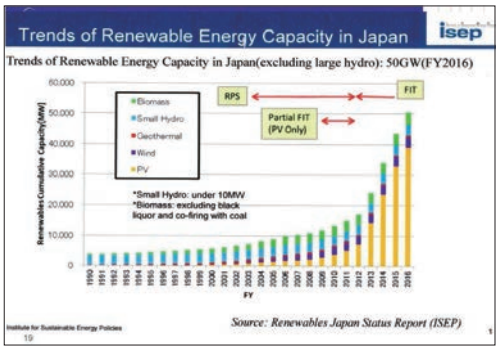
The solution of these challenges depends on science, technology and innovation. They are necessary for decarbonizing for SDG for the goal of sustainable development.

The Paris climate agreement says that we envisage a world in which diversity takes place. This biodiversity is reliable, and one of which is to be in harmony with nature and with the wild world, the animal world.

So, I want to go to the changes that have already occurred.



A change, in some way associated with economic growth, which is determined.

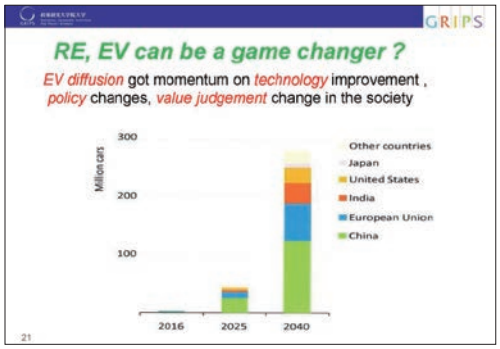


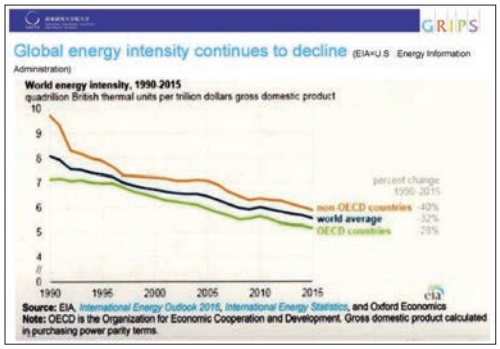
The market of renewable resources is developing very quickly.

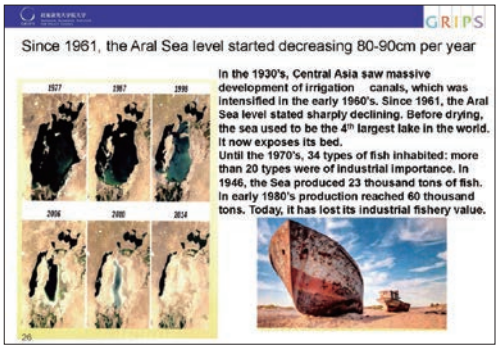
You all know about new solar panels. They actually increased by 50% in China.

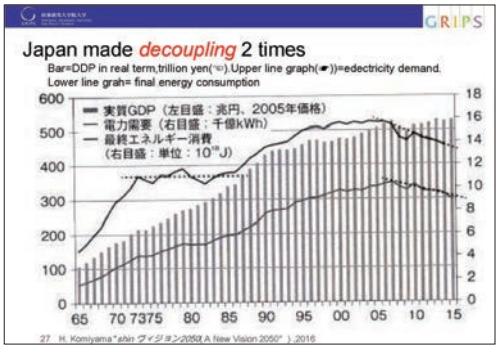
As you know, an increase of 100% in Europe, let's say in Germany ... in Scotland by 2020 ... in general, there is an increase in a particular year in different countries.

Percentage is getting higher. If we talk about the Beijing auto show, it is worth considerable attention. This is about the market of electric vehicles. This is what happens with solar panels in China.



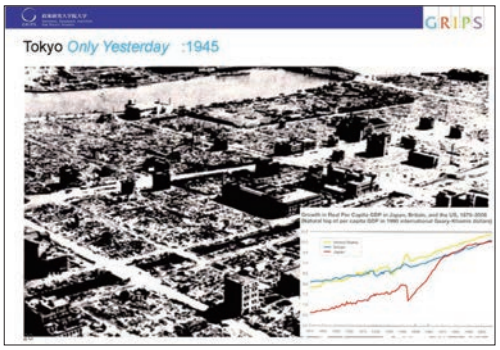






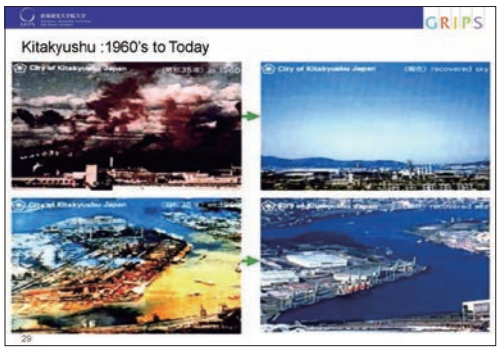
Japan has done decarbonizing twice already.

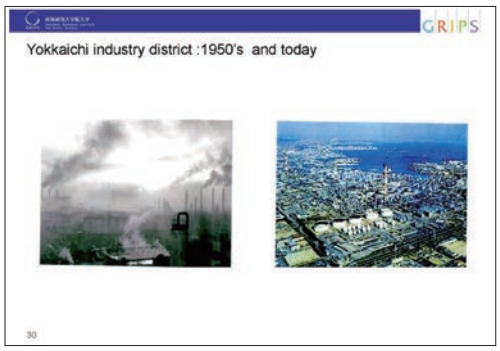
In 1973, as you know, GDP had dropped a little. But after this crisis, the economy rose a little, let's say, the level of the economy had grown, and then certain deviations had appeared.



This is a picture of Tokyo, please ... but after this event you can see a sharp drop of GDP.

Kitakyushu, once under terrible environmental degradation, looks beautiful today.

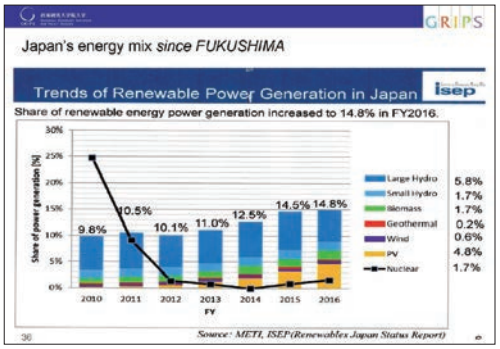




This is the industrial area of Yokkaichi, you can see how this place looks like now and then.

This is not Mumbai, pay attention, this is not Beijing, this is Tokyo in the 1960s.

Mount Fuji is more than 100 km away from Tokyo, but this mountain can be observed from Tokyo.

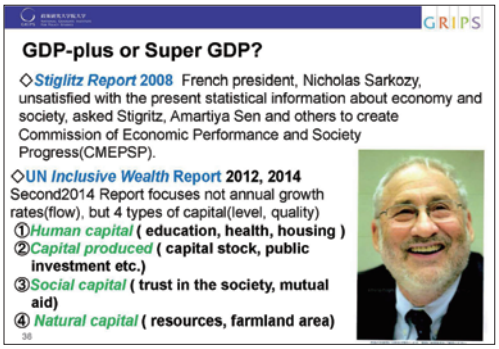


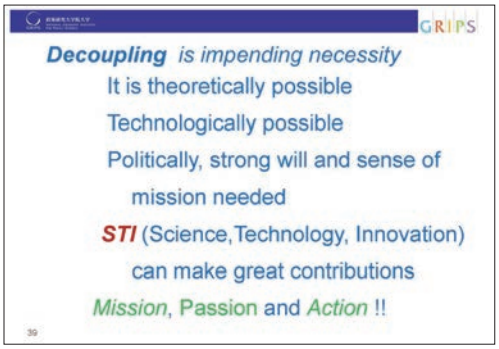
Recently, you can see such types of buildings decorated by bresh green. This is also associated with a green economy.

GDP is a leading indicator of the economy, and GDP can be a misleading indicator.

Because we are faced with the basics, challenges and problems that GDP, let's say, is the king of economic indicators in a particular area.

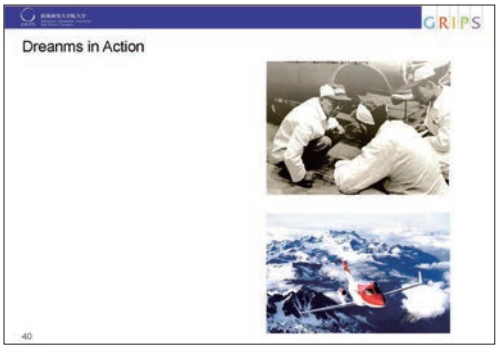
If we are talking about the economy, if we are talking about prices, if we are talking about GNP, if we compare, then we can say that GDP, GNP and state products in the future will be considered as a very important indicator.



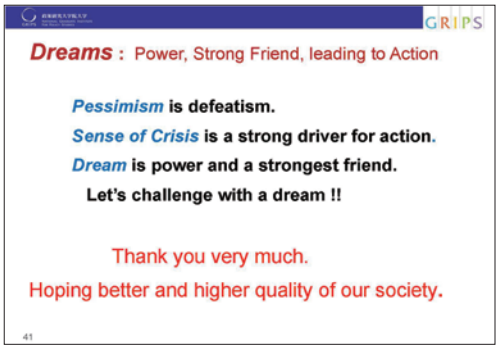


But also the quality of education, as you know, if we are talking about public investment, trust in society, if we are talking about human capital and resources

Decarbonizing is an imminent necessity, which is possible theoretically and technologically, and it is a powerful will and desire with a certain necessary mission ... in this case science, technology and innovation can allow us to make a certain contribution



This gentleman is a founder of the Honda Foundation. He kept his dream! Dream gave him power.



Here we do not need pessimism. What is need is a sense of crisis, which can be a powerful mover for action.

And of course, let's consider challenges to our dream. Thank you very much for your attention.

Session 1

Innovative technologies and legal aspects for the efficient use of natural resources

Transformation of industrial structure: industrial policy, various reforms in the field of advanced technologies

Dr. Altay ALIMGAZIN

Director of the Institute Energy Saving and Energy Efficient Technologies,
Professor of the Department of Heat Power Engineering, L.N. Gumilyov Eurasian National University, Doctor of Technical Sciences

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Dr. Akihiko TAMURA

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Director of the Research Institute of Energy Saving and Energy Efficiency Technology, Professor of the L.N. Gumilyov Eurasian National University, Department of Heat Power Engineering, Doctor of Technical Science

Session 1

Innovative technologies and legal aspects for the efficient use of natural resources

Transformation of industrial structure: industrial policy, various reforms in the field of advanced technologies

APPLICATION OF ENERGY-SAVING HEAT PUMP TECHNOLOGIES USING NON-TRADITIONAL AND RENEWABLE ENERGY SOURCES FOR ENERGY SUPPLY OF OBJECTS IN THE REPUBLIC OF KAZAKHSTAN

The strategy of developing renewable energy sources and reducing the impact on the environment contributes to the accelerated transition of Kazakhstan to a "green" economy.

During the XI Astana Economic Forum, the theme of the "green" economy and climate change took a special place. The Plenary session of the forum was made by the 8th UN Secretary General Ban Ki-Moon, who noted that Kazakhstan is becoming one of the world leaders of green economy initiatives!

The long-term approach to the qualitative implementation of the principles of the "green" economy in the regions of Kazakhstan is that the protection of the environment should not be an obstacle, but a symbol of technological and economic development.

The International Center for Green Technologies and Investment Projects, created on the initiative of the President of the country N.Nazarbayev on the basis of the heritage of the International Exhibition EXPO-2017 held last year, is a continuation of the "Green Bridge" partnership program, which is intended to strengthen "green" economic growth in the region.

In 2010, Kazakhstan announced voluntary commitments to reduce greenhouse gas emissions by 15% by 2020 compared to 1990 and by 25% by 2050. As a priority area for mitigating the impact on climate change, the urban sector (centralized heating, buildings, waste, transport) has been allocated with the possible reduction of annual greenhouse gas emissions of about 30% of all possible reduction of greenhouse gas emissions in Kazakhstan

Heat pump technology with the use of non-traditional and renewable energy sources (Alternatives & Renewables), represents the introduction of a new, energy-saving, highly efficient and environmentally friendly way of simultaneously obtaining heat and cold.

Figure 1.2 shows the different types of heat pumps (HP) produced and used in the Republic of Kazakhstan for the heat and cold supply of various facilities.

Fig.1,2 - Heat pumps of various capacities

Market for adoption of heat pump technology in the Republic of Kazakhstan

- objects of the budgetary sphere and housing and

communal services (objects of education, public health, culture and sports, the Ministry of Internal Affairs, the Ministry of Defense, NSC, administrative buildings and facilities, etc.);

- industrial enterprises (power engineering, ferrous and non-ferrous metallurgy, petrochemical industry, machine building, etc.)

In the Republic of Kazakhstan there are 37 thermal power plants, a number of state district power stations, 3 oil refineries, ferrous and non-ferrous metallurgy plants, machine building, etc.

In the technical water supply systems of enterprises, large heat losses amount to 50-55% of the primary energy of the fuel burnt.

- agro-industrial complex;
- objects of small and medium business;
- Cottage house-building.

The direction of energy saving, connected with the utilization of low-temperature thermal waste (5-45° C) of industrial processes (waste water of the circulating water supply systems of CHPP, GRES -Hydroelectric Power Station, metallurgical plants, petrochemicals and etc., waste water sewage treatment plants in major cities) in order to reduce harmful emissions into the atmosphere and simultaneous reception of heat of higher parameters

Regulatory and legislative framework for the introduction of heat pump technology in the Republic of Kazakhstan

- The Law of the Republic of Kazakhstan "Supporting the Use of Renewable Energy Sources" (No. 165-IV of July 4, 2009);
- The Law of the Republic of Kazakhstan "Energy Saving and Energy Efficiency Enhancement" (No. 541 of January 13, 2012);
- The State Program of the Republic of Kazakhstan "Energy Saving-2020"
- normative documents "Guidelines for the use of heat pumps using non-traditional renewable energy sources and secondary energy resources" (November 2009)

State support for the use of heat pumps (HP) in China

1. Privileges in the areas of electricity prices, tax compensation for initial investment, costs for resources, etc.
2. The use of heat pump technology is listed in the "Law on Regenerative Energy Resources", "Guidelines for the Development of Regeneration Energy Resources."
3. State Committee for Development and Reform, Ministry of Science and Technology, Ministry of Land Resources, Ministry of Finance of China published a number of preferential measures to support the development of warmth of groundwater and ground, the spread of geothermal pump technology.
4. The Office of Technical Consultancy under the State Council conducts a survey and study of the use of groundwater heat, ground to provide a rationale for the development of preferential measures of state support.
5. This technology was transferred by the Ministry of Construction in terms of the main energy saving facilities in China during 2015-2020.

Examples of the implementation of projects with HP at CHPP in China

At the municipal heat and power plant in Yangin (China) in 2010, six Shuangliang HPs were installed with a capacity of 30 MW each (Fig. 3.4). They utilize the thermal energy of the cooling towers (temperature 30-40° C), and produce hot water with the parameters 70-90° C for additional heat supply of the whole district of the city, utilizing the heat previously drained by the cooling towers. Similar projects have been implemented at a number of other facilities: the district power plant in Yangkwang City, Shentu City, Shenyang City.

The adoption of HP at Yangzhin CHPP allowed annually:

- additionally sell heat energy for more than $ 5 million (and the tariffs for heat energy in this city are lower than in Kazakhstan and Russia);
- save 500,000 tons of water (it does not evaporate in cooling towers);
- save 49,300 tons of coal;
- reduce CO 2 emissions by 98 600 tons;
- reduce emissions of nitrogen oxide by 730 tons.

The payback time for the adoption of the HPS and the use of low-temperature waste heat for heating the plant was less than 2 years.


Fig. 3,4 – A general view of the station and the installed heat pumps Shuangliang

The efficiency of heat pumps in the Republic of Kazakhstan will be higher than in most other countries, due to:

- severe climatic conditions (up to -45 C);
- a long heating period, reaching from 200 to 250 days a year

In the implementation of these technologies, instead of the existing systems of autonomous power supply (coal boiler houses, boiler houses with liquid fuel, electric boilers), the following will be obtained:

- a 2-4-fold decrease in budget funds allocated for heat supply with traditional boiler houses;
- complete absence of emissions into the atmosphere;
- short payback period of projects (2-5 years)

Below are the results of scientific and practical works on the use of heat pumps (HP) with various sources of low-potential heat (heat of soil, groundwater, heat of sewage of sewage treatment plants of cities, heat of water of cycles of circulating water supply) conducted in the Republic of Kazakhstan from 1999 to 2018 to improve the efficiency of heat supply to budgetary and public utilities, industry, etc., in a number of climatic regions of the Republic of Kazakhstan.

For a number of years scientists of the Scientific Research Institute "Energy Saving and Energy Efficient Technologies" of L.N. Gumilyov ENU have been working on the development of schemes and technologies for the use of HP with the use of waste heat of the circulating water supply systems of industrial enterprises (CHPP, metallurgical plants, oil refineries, etc.) to improve the efficiency of the heat and power equipment of these enterprises.

Developed as much as possible to the operation in the harsh climatic conditions of Kazakhstan and Russia (up to -45° C) and the scheme for the use of a new generation of HP with the use of low-grade heat of water from turbine condensers as a source of low-potential heat, it is planned to adopt in most cities where there are CHPP plants regions of the country, to improve the efficiency of heat and power equipment of stations which in general, will give the state significant savings in budget funds, reduce greenhouse gas emissions in the atmosphere and improve the ecological situation

In the Republic of Kazakhstan since 1999, work has begun on the use of HP for use:

- Heat of waste water from industrial enterprises (JSC Kaz-zinc, JSC Ekibastuz GRES-2, JSC ArcelorMittal Temirtau, JSC CHPP-2 Astana, PCHPP JSC SevKazEnergo, LLP AES Ust-Kamenogorsk TPP, AES Sogrinskaya TPP LLP, KSP Steel LLP, Aksu Ferroalloy Plant TNK KazHrom LLP);
- both treated and untreated wastewater from sewerage treatment facilities (STF) in a number of cities in the country (Astana, Pavlodar, Shymkent, Petropavlovsk, etc.).

Proposed solution

The use of energy-saving heat pump technologies in stationary and block-modular assembly (BMA) at industrial enterprises using low-grade heat of water from the service water system (SWS) with temperature from + 250C to + 450C, directed instead of cooling towers (cooling ponds, rivers) to the evaporators of BMA (Fig. 5,6).


Fig.5,6 - Stationary and modular arrangement of heat pumps

Advantages of the proposed technology

- Unique patented technology and multistage applications of the HP, adapted and tested in the harsh climatic conditions of Kazakhstan (up to -45 C);
- The lower market price of our products in comparison with the analogues:
- The cost of proposed HP (up to 2 MW) -about 220 thousand $ / Gcal;
- The market price of foreign manufacturers (Germany, Sweden, etc.) - 300-400tys. $ / Gcal;
- the presence of intellectual property;
- guarantee and service maintenance of Kazakhstan specialists.

Some examples of the use of HP in the Republic of Kazakhstan (Fig. 7-10)

Fig 7-8 - The use of stationary heat pump units at the objects of Kurchatov, Akmola region

Fig 9-10 - application of BMA at facilities of East Kazakhstan region, Almaty

Figures 11-12 show the first industrial heat pump HT-3000 (heat capacity 3.7 Gcal), the first in the Republic of Kazakhstan, launched jointly with CJSC "Energia" (Russia) at JSC "Kazzinc" in December 1999 (Ust-Kamenogorsk)

Fig. 11-12 - General view of the industrial heat pump HT-3000

Experience of operation of the HT-3000 industrial heat pump (HP) on JSC "Kazzinc"

It was installed in 1999 in the heat-power department of the power plant of the enterprise.

HP is used for heating of initial water for a chemical water purification station and recycling of circulating water.

Capital costs - 27.7 million tenge (1 $ = 122 tenge)

Average cost of heat energy - 198 tg / Gcal

The payback time of capital costs is 2.5 year

The average annual output of heat energy is 8800 Gcal.

The productive capacity of TH is equivalent to 4.5 tons of steam per hour

Conversion efficiency - 6

Use of waste heat of circulating water of CHPP-2 in Astana.

Promising is a pilot project using waste heat of circulating water of JSC "CHPP-2" (Fig. 12-13) for own needs, as well as for heat supply of various facilities of the capital city.

Parameters of wastewater going to the cooling towers of JSC "CHPP-2":

- temperature of 25-40 C;

- volume up to 35 000 m^3 / hour;

- volume up to 32 000 m^3/h (new fan cooling towers)

Fig.12-13 - general views of atmospheric and fan cooling towers of the station.

The proposed scheme for the use of HP at JSC "CHPP-2" in Astana

Fig.14 - The proposed scheme for the introduction of HP at the station, developed by the specialists of the Research Institute "Energy Saving and Energy Efficient Technologies" (ESEET) ENU named after L.N. Gumilyov.

Scientists of the Scientific and Research Institute "ESEET" jointly with the specialists of LLP Scientific and Technical Center "KazEcoTherm" within 2013-2016 developed the scientific and practical basis for the application of heat pump technologies with the use of NRTI for power supply to a number of facilities of the International Specialized Exhibition EXPO-2017, including the "Energy Research Center" with the use of technology "Green heating".


Fig.15-16 - Objects EXPO -2017 "Energy Research Center" and Pavilion "Nur-Alem"

Use of technologies "green heating" with use of HP for increase in energy efficiency of the data-processing center (DPC)

The proposed system of "green heating" includes non-traditional heating systems with the use of energy-saving heat pump technologies for heat and cooling of the infrastructure facilities of the EXPO-2017. When IT servers work, a large amount of heat is released which is removed from the data center by means of air conditioning systems and is irretrievably lost in the environment. At the same time, the efficiency of heat energy return is practically zero.

Exhibition stand for heat pump technologies in Pavilion "Nur-Alem" EXPO-2017

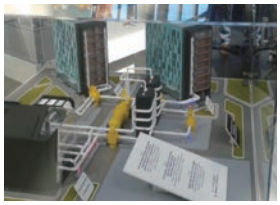
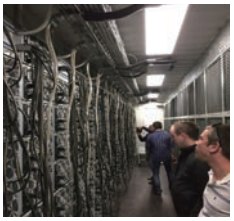



Fig.17-18 - Project on HP of L.N. Gumilyov ENU in the Pavilion "Nur-Alem"

Prospects for using hp for cooling IT equipment (data centers, mining farms)

In the Finnish city of Mäntsälä (finnish Mäntsälä), the Data Center of Yandex will be used for heating residential houses. Servers of the Finnish data center (DPC) "Yandex" will help to heat the city of Mäntsälä. In the process of extracting crypto currency, the heat released will be used for heating purposes.

On the recommendation of the Minister of Energy K. Bozumbaev, ENU named after L.N. Gumilyov started joint work on the application of heat pump technologies for cooling of IT equipment, several meetings were held with the energy director of one of the largest companies - one of the main producers of equipment for mining in Russia.




In Fig. 19-20 - General view of mining equipment for crypto currency mining

The concept of the project "Green Heating" at LLP "KSP Steel" (Pavlodar)

In the period of 2017-2020 scientists and specialists of "ESEET" of the University on the grant program for the implementation of the results of scientific and technical activities (RSTA), funded by JSC "Science Fund", carried out a set of works on the introduction of a pilot BMTU with a thermal capacity of 0.405 Gcal/hour in the pipe production of LLP "KSP Steel". The company annually spends 3.4-4 billion tenge for the purchase of heat (46 Gcal/h) and electricity from the CHPP-3 in Pavlodar.

Energy-saving potential: Circulating water with a consumption of 28 000 m^3 / h and a volume of thermal energy 280-450 Gcal / h,

Technical solution: the use of recycled water as a source of heat for the HP.

Installation and launch of heat pump technology for heat generation and cooling of circulating water from 45 To 25 Seconds.

Result: saving of thermal and electric energy received from the heat and power plant-3 in Pavlodar.

The economic effect of the introduction of HP for hot water in the rolling production of LLP " KSP Steel»

Cost of annual operating costs, thousand tenge/year

- CHPP-3 in Pavlodar - 72,180;
- heat pumps - 13,160;

The cost of 1 Gcal /h, tenge/ Gcal (VAT)

- from CHPP-3 in Pavlodar - 3 313,8;
- heat pumps - 751.14

Conclusion: the cost of own heat pump heat will be 4.4 less than the cost of purchased heat from CHPP -3

Commercialization strategy for the use of HP in the enterprise

- L. N. Gumilyov ENU signed an agreement of intent with LLP "KSP STEEL" (2017-2020 years);
- identify specific plant, where it is planned the adoption of new technology 2 Gcal/h at stage 1 (pipe-rolling production - PRP), received all the original data and schema;
- the source of low-potential heat for HP-3 was determined; the cooling towers of the PRP with a return water volume of 3000 m3/h;
- implementation of the project on further application of HP in PRP to cover the full heat load on the heat supply of the workshop (10 Gcal/ hour) - 2019-2020;
- creation of a joint venture production on the basis of LLP "KSP STEEL" (2019-2020)
- construction of a greenhouse complex (2 ha) on the territory of the enterprise;
- use of HP for heating cottage town (500 pieces)

Analysis of the possibility of using heat pump technologies using alternative energy sources at the Aksu Ferroalloys Plant (AFP) LLP "TNK Kazkhrom".

In the spring of 2018, in coordination with the AFP management, the first stage of research on the use of HP at this enterprise was started with the use of low - grade heat of the plant's recycling water supply system for heat and cold supply of its own facilities.

The implementation of the project:

- application of green technologies using alternative and renewable energy sources and reduction of environmental impact at the regional level;
- the use of low-potential waste heat of the water recycling system (WRS) of AFP to improve the efficiency of the plant's technological equipment, a significant reduction in greenhouse gas emissions.

Characteristics of the water recycling system of AFP

Saving potential

Low-grade heat source for heat pumps:

- 2 atmospheric cooling towers and 1 fan cooling tower of the enterprise;
- volume of circulating water: 17,000 m3 / hour
- temperature regime of the cooling towers:

Input temperature = from 260C to 350C, Output temperature = 190C

Heating system load of the entire site of AFP, Gcal / h: 43

Maximum load on hot water supply, Gcal / h-19,783 (winter); 13,303

The maximum number of low-grade heat Qnpi discharged currently, the water recycling system using cooling tower of PRP:

- winter-Qnpi =17 000 * (260C - 20) = 17*106*6 = 102 Gcal / hour;
- summer-Qnpi= 17 000 * (320C - 20) = 17*106*12 = 204 Gcal / hour.

The payback period of the proposed project will be 1,46 year.

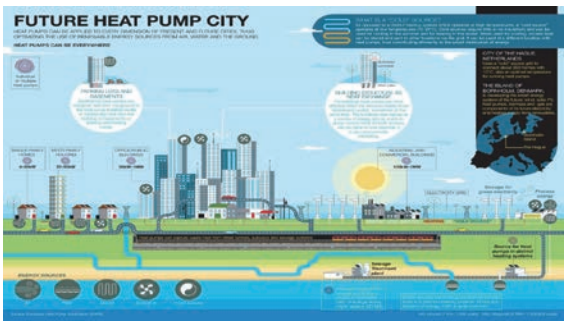
Summary

The introduction of new energy-saving heat pump systems of heat supply using non-traditional and renewable energy sources makes it possible:

- significant reduction of organic fuel consumption, which will significantly reduce the effect of adverse environmental impact from the combustion of various fuels;
- improving the efficiency of heat and cooling systems of buildings and structures;
- reducing the greenhouse effect.

In 2018-2020, it is planned to widely use heat pump technologies in various areas of the country for the objects of the public sector, housing and communal services, industrial enterprises and objects of the agro-industrial complex of the country, etc., according to the implementation of the State energy saving program for the period up to 2020, as well as the relevant Regional energy saving plans.

Cities of the future are inextricably linked with heat pump technologies



Dr. Taizo YAKUSHIJI

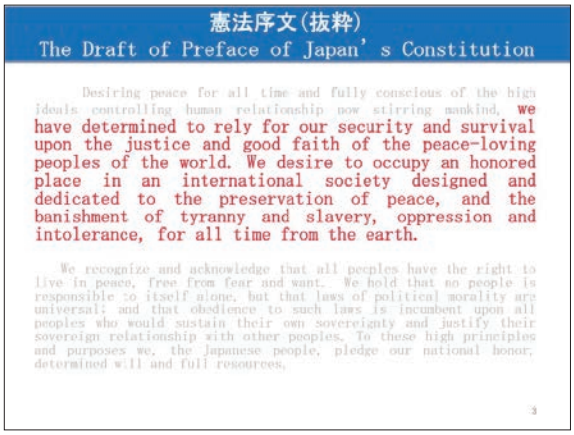
Research Counselor, Institute for International Policy Studies.

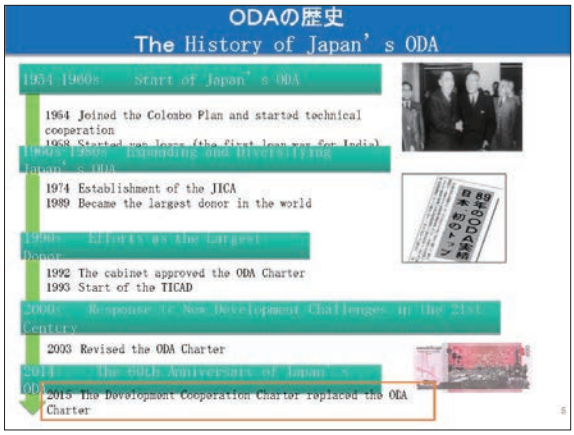
Session 1

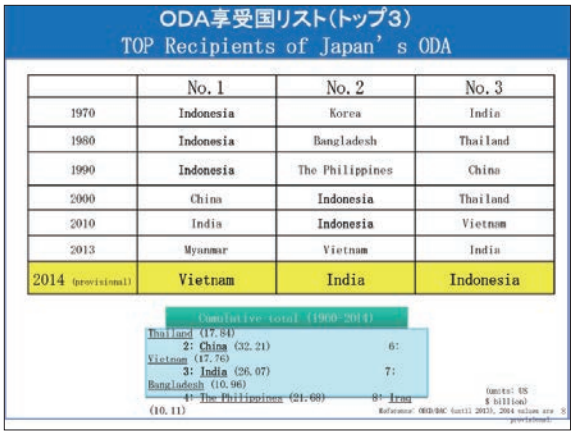
Innovative technologies and legal aspects for the efficient use of natural resources

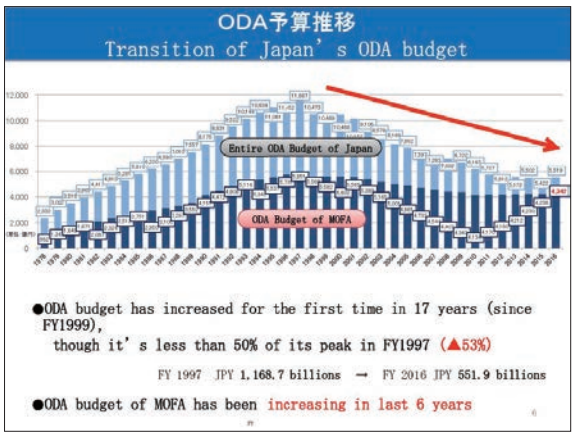
Transformation of industrial structure: industrial policy, various reforms in the field of advanced technologies

Japan's New ODA Charter & SciTech Diplomacy

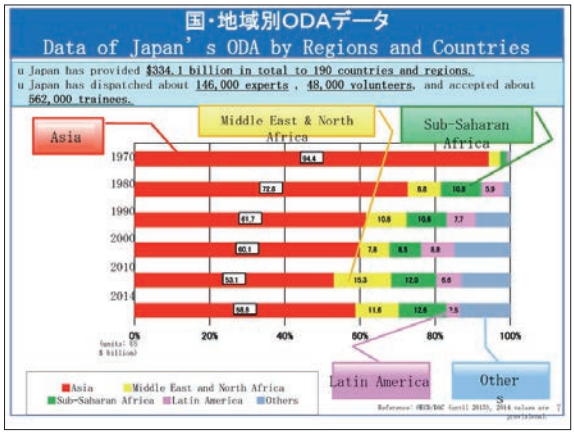



ODAの歴史
The History of Japan's ODA
1954 Joined the Colombo Plan and started technical cooperation
1974 Establishment of the JICA
1989 Became the largest donor in the world
1992 The cabinet approved the ODA Charter
1993 Start of the TICAD
2003 Revised the ODA Charter
2015 The Development Cooperation Charter replaced the ODA Charter

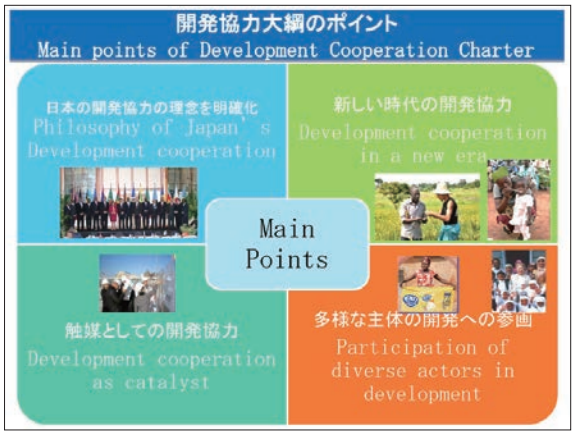

ODA享受国リスト(トップ3)
TOP Recipients of Japan's ODA
No. 1 No. 2 No. 3
1970 Indonesia Korea India
1980 Indonesia Bangladesh Thailand
1990 Indonesia The Philippines China
2000 China Indonesia Thailand
2010 India Indonesia Vietnam
2013 Myanmar Vietnam India
2014 (provisional) Vietnam India Indonesia
Cumulative total (1960-2014)
Thailand (17.84)
2: China (32.21)
Vietnam (17.76)
3: India (26.07)
Bangladesh (10.96)
4: The Philippines (21.68)
(10.11)

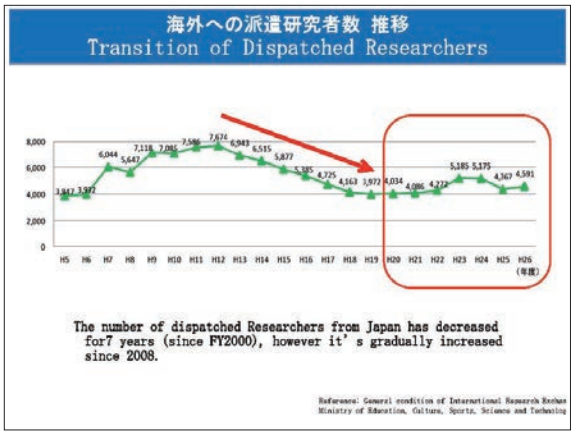

ODA予算推移
Transition of Japan's ODA budget
Entire ODA Budget of Japan
ODA Budget of MOFA
●ODA budget has increased for the first time in 17 years (since FY1999), though it's less than 50% of its peak in FY1997 (▲53%)
FY 1997 JPY 1,168.7 billions → FY 2016 JPY 551.9 billions
●ODA budget of MOFA has been increasing in last 6 years


日本の戦後外交とODA
Japan's Postwar Diplomacy & ODA
非軍事的協力による国際の平和・安定への貢献
Contribution to the peace & stability through cooperation for non-military purposes
日本にとって良好な外交環境の形成促進
Promotion to building a favorable environment for Japan's diplomacy
1) Economy (Market, Investment, etc.)
2) Security
3) Soft power
EAST ASIAN MIRACLE


国・地域別ODAデータ
Data of Japan's ODA by Regions and Countries
u Japan has provided $334.1 billion in total to 190 countries and regions.
u Japan has dispatched about 146,000 experts, 48,000 volunteers, and accepted about 562,000 trainees.
Asia
Middle East & North Africa
Sub-Saharan Africa
Latin America
Other
1970
1980
1990
2000
2010
2014
0% 20% 40% 60% 80% 100%
Asia
Middle East and North Africa
Sub-Saharan Africa
Latin America
Others


Decision on New Official Development Assistance Charter
Cabinet Decision for comprising fundamental Japanese policies on aid
◆ Japan's ODA Charter decided by the Cabinet in 1992
◆ Revised in 2003 has been the foundation of Japan's ODA policy.
1. ODAが対峙する開発課題の多様化、複雑化、広範化
Development challenges are more diverse, complex, and widespread
2. 途上国の開発にとってのODA以外の資金・活動の役割増大
Increasing role of funds and activities other than ODA for development
developing countries
3. グローバル化 Globalization
The government of Japan revises the ODA Charter and hereby establishes the Development Cooperation Charter


開発協力大綱のポイント
Main points of Development Cooperation Charter
日本の開発協力の理念を明確化
Philosophy of Japan's Development cooperation
新しい時代の開発協力
Development cooperation in a new era
Main Points
触媒としての開発協力
Development cooperation as catalyst
多様な主体の開発への参画
Participation of diverse actors in development

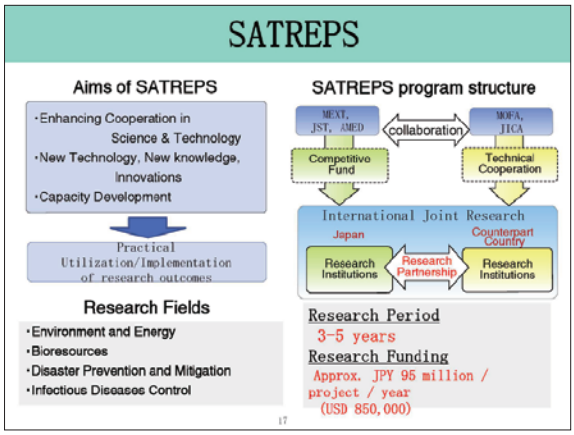

海外への派遣研究者数 推移
Transition of Dispatched Researchers
The number of dispatched Researchers from Japan has decreased for7 years (since FY2000), however it's gradually increased since 2008.

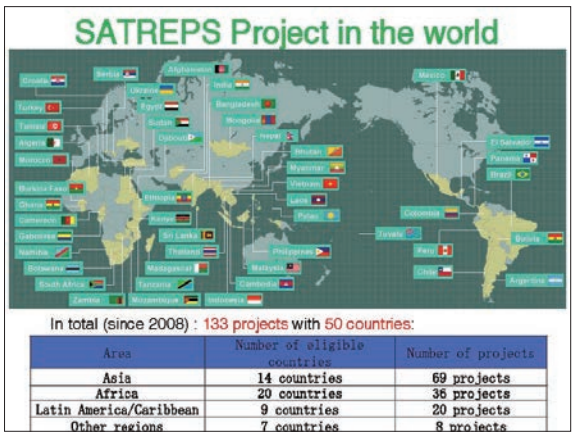

重点政策
Priority Issues
'質の高い成長'とそれを通じた貧困撲滅
'Quality Growth' & Poverty eradication through such growth
Quality Growth = Inclusiveness, Resilience, Sustainability
Sharing 'Universal Values' and realizing a peaceful and secure society
地球規模課題への取り組みを通じた持続可能で強靭な国際社会の構築
Building a sustainable and resilient international community through efforts to address global challenges
Japan will seek to contribute to building a sustainable and resilient international community


SATREPS発足経緯
Creation of SATREPS
Created by the strong policy directive from the Council for Science and Technology Policy (CSTP) chaired by the Prime Minister
SYNERGY
Utilization of S&T for diplomatic purposes
Utilization of diplomacy for the further development of S&T
" To link S&T with foreign policy for mutual development"
"Strengthening S&T cooperation with developing countries for resolving the global issues" "in the areas of the environment and energy, disaster prevention … and infectious diseases"
From "Toward the Reinforcement of S&T Diplomacy" (by Council for Science and Technology Policy; May 19, 2008)


SciTech Diplomacy & SATREPS


SATREPS
About SATREPS
SATREPS: Science and Technology Research Partnership for Sustainable Development
SATREPS_Program
SATREPS
Science and Technology Research Partnership for Sustainable Development
To enhance science and technology in Japan and among developing countries
To promote international joint research partnerships aimed at resolving global issues
0:56 / 12:52
YouTube
http://www.jst.go.jp/global/eng


SATREPS
Aims of SATREPS
·Enhancing Cooperation in Science & Technology
·New Technology, New knowledge, Innovations
·Capacity Development
Practical Utilization/Implementation of research outcomes
Research Fields
·Environment and Energy
·Bioresources
·Disaster Prevention and Mitigation
·Infectious Diseases Control
SATREPS program structure
MEXT, JST, AMED
collaboration
MOFA, JICA
Competitive Fund
Technical Cooperation
International Joint Research
Japan
Counterpart Country
Research Institutions
Research Partnership
Research Institutions
Research Period
3-5 years
Research Funding
Approx. JPY 95 million / project / year
(USD 850,000)
17


SATREPS Project in the world
In total (since 2008) : 133 projects with 50 countries:
Area | Number of eligible countries | Number of projects
Asia | 14 countries | 69 projects
Africa | 20 countries | 36 projects
Latin America/Caribbean | 9 countries | 20 projects
Other regions | 7 countries | 8 projects


SATREPS
For the Earth, For the Next Generation
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
Thank you for your attention !
http://www.jst.go.jp/global/eng
19

Mr. Baurzhan SMAGULOV

Chairman of the Board of JSC "Institute of Electrical and Energy Saving Development (Kazakhenergoekspertiza)"

Session 1

Innovative technologies and legal aspects for the efficient use of natural resources

Transformation of industrial structure: industrial policy, various reforms in the field of advanced technologies

Dear participants of the Symposium!

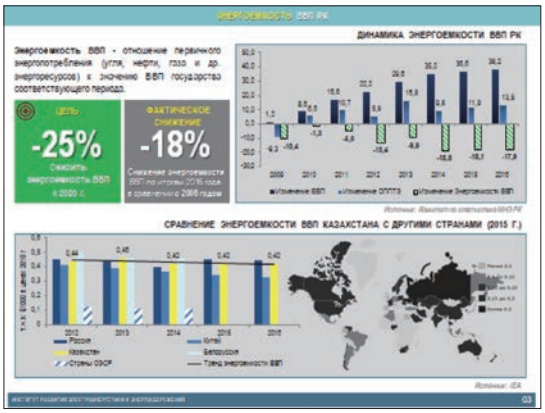
Let me welcome you to the international Symposium and wish you all fruitful work!

I would like to start my presentation with a little idea of the global trends of the near future.

According to international experts, such as the International Energy Agency, Bloomberg and others, the population will increase to 9.6 billion people by 2050, 70% of the population will live in cities, the digitalization of economic indicators will increase to 44 Zeta bytes, the volume of trade relations will double.

This global trend is leading to an increase in demand for energy resources. As we see on the slide, global demand for primary energy for both traditional and renewable energy generation is expected to increase by 1/3 by 2030.

In this regard, energy efficiency plays a major role, being the main trend of the world economy, which includes all aspects of sustainable development, technological modernization and growth of the green economy.



One of the key indicators characterizing the sustainability of the development of the energy sector and energy efficiency is GDP energy intensity. GDP energy intensity is calculated as the ratio of primary energy consumption (coal, oil, gas and other energy resources) to the GDP of the state of the corresponding period

The Strategic Development Plan of the Republic of Kazakhstan sets specific goals for reducing GDP energy intensity by at least 25% by 2025 by 50% by 2050.

The diagram on the slide shows the energy intensity of the GDP of the Republic of Kazakhstan in 2012 - 2016 in 2010 prices, as well as this indicator of the countries of the Customs Union, China and OECD countries.

The Republic of Kazakhstan has a very high energy

intensity of GDP in comparison with these indicators of the OECD countries.

This indicator of the Republic of Kazakhstan is reduced from 2012 to 2016, the average rate of decline in this period was about 8%, and the actual decrease in GDP energy intensity by the end of 2016 was 18%.

The basis of the modern energy saving system was created in 2012-2015.

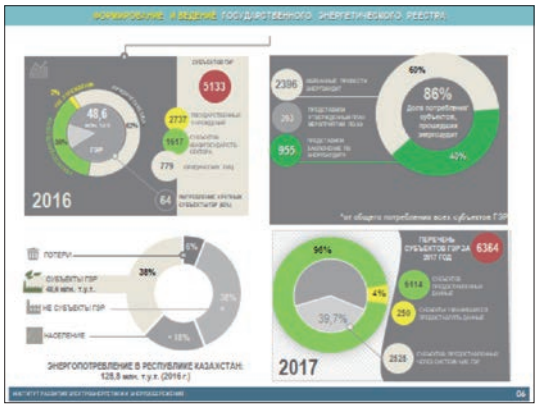
A complete legal framework has been formed, including

- a fundamentally new Law on Energy Saving;
- within the framework of the Law, 34 NRAs, the regulatory provisions of the Law, have been adopted;
- in the framework of the Code of Administrative Offenses of the Republic of Kazakhstan, state control was established on 8 articles;
- regional and sectoral energy conservation plans have been developed;
- the National Institute for Energy Efficiency Development - JSC “Kazakhenergosexpertiza”;
- Based on the experience of Japan, a key mechanism of the energy saving system was created - the State Energy Registry.

To date, work will be introduced to amend and supplement the Law on Energy Saving.

Now, briefly about the Institute for the Development of Electricity and Energy Saving and the main functions of the Institute:

- formation and maintenance of the State Energy Register (SER) and Energy Efficiency Map;
- analysis of energy audit findings, evaluation of energy saving and energy efficiency measures;
- implementation of the project in conjunction with the World Bank “Improving Energy Efficiency in Kazakhstan”.



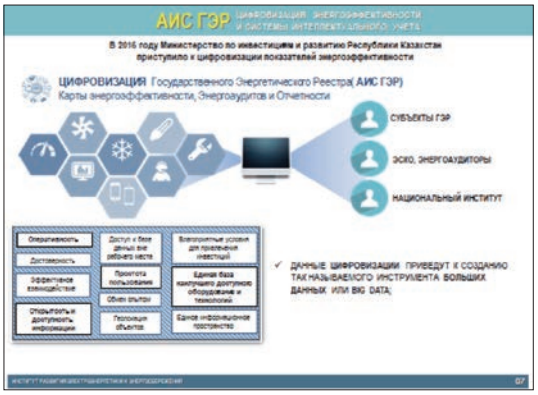
One of the main mechanisms for the operation of the new legislative framework is the creation from the experience of Japan, of the State Energy Registry, the subjects of which are individual entrepreneurs and legal entities that consume energy resources in a volume equivalent to 1500 and more tons of equivalent fuel (hereinafter referred to as tu.t.) in year, as well as state institutions, subjects of the quasi-public sector and natural monopolies, consuming energy resources in a volume equivalent to 100 tons or more.

Within the framework of the SER, there are obligations to conduct energy audits by SER subjects, except for state institutions, to reduce the

consumption of energy resources, to implement action plans, etc. In 2016, energy consumption by GER subjects amounted to 48 million tfoe or 38% of the total energy consumption of the Republic of Kazakhstan. To date, the list of SER subjects consists of 6364 subjects of GER - industrial enterprises, government institutions, and subjects of the quasi-public sector.

In 2016, energy consumption by SER subjects amounted to 48 million tce. or 38% of the total energy consumption of the Republic of Kazakhstan.

In Kazakhstan, the activities of the SER provided an opportunity to achieve a forecast of reducing the energy intensity of GDP, the creation and creation of a single register of energy consumers with the possibility of annually monitoring the reduction or increase in consumption of each entity, the introduction of advanced energy-saving technologies by entities through the energy audit procedure and the implementation of energy conservation plans.



In 2016, the Ministry for investment and development of the Republic of Kazakhstan started digitalization of energy efficiency indicators, namely, within the framework of a joint project of the world Bank, work on the creation of a digital platform for the collection, processing and analysis of data of the state energy registry entities began.

For the first time, it was possible to digitize historical data on energy consumption, fuel resources of SER subjects.

A database on energy consumption of GER subjects was created, starting from 2012 to 2016.

Approbation of the Automated Information System of the SER was started this year, which made it possible to increase the efficiency of the formation and maintenance of the SER in the country due to the optimization and interaction of the registry participants - if previously the information was collected from the subjects and processed manually by the SER operator, then, with the help of AIS SER, fill in the information and upload it to the portal using EDS.

The head of state in the national plan “100 concrete steps to implement the five institutional reforms” step 59 set the task of attracting strategic investors into the sphere of energy saving through the internationally recognized mechanism of energy service agreements.

One of the mechanisms for achieving this goal is the creation of an Energy Efficiency Card.

For reference:

The energy efficiency map is a single republican list of energy saving and energy efficiency projects, indicating the sources of financing, schedules and action plans for their implementation)

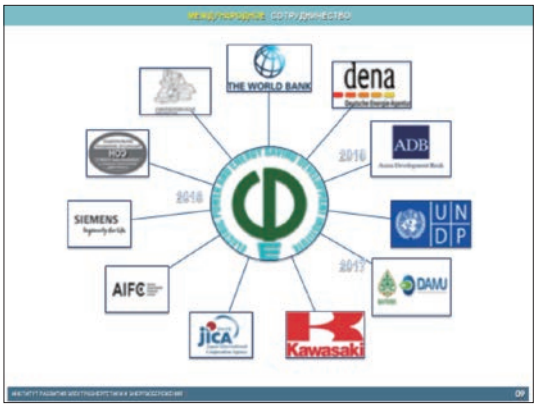
Within the framework of the Energy Efficiency Card, the Institute accepted 112 applications for the total amount of investments of about 68.4 billion tenge, 40 projects in the field of energy saving and energy efficiency were realized or implemented for a total of KZT 7.8 billion, expected savings of 960.75 million tenge per year.

Following the results of 2016-2017 the following results were achieved:

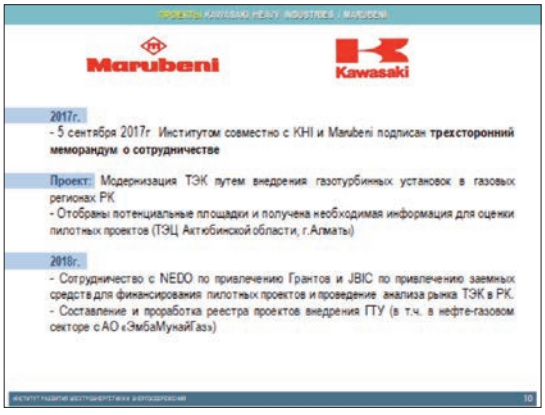
- 40 Projects in the Energy Efficiency Map, including 8 PPP / ESCO projects;
- Advisory support of PPP projects in the sphere of energy saving (3);
- Advisory assistance (35) to investors in PPP projects by providing services and information on projects in a single center;
- Projects on modernization of street lighting and lighting of educational institutions in Mangistau and

Karaganda regions were initiated;

- Upgraded 38.9 thousand points of street lighting;
- Standard service contracts have been developed for the implementation of PPP projects in the field of energy conservation;
- A database on street lighting was created;
- Extended PPP forms have been adapted for energy saving and energy efficiency projects;
- A technical assistance project was implemented to increase the capacity and competence of the Institute in the field of PPP, this project was financed by the Asian Development Bank in the amount of 500,000 euros.



In order to attract international experience and investments, the Institute has established cooperation with such organizations as DENA, ADB, UNDP, JICA, Kawasaki, Siemens.



Since last year, cooperation with a strategic investor, Kawasaki and Marubeni, has begun, as of September 5, 2017. a tripartite memorandum was signed. The project is aimed at the modernization of small CHPPs and boiler houses by introducing gas turbine units in the gas regions of Kazakhstan.

To date, potential pilot projects for the introduction of gas turbines at the Aktobe district thermal power plant, Almaty city, as well as in the oil and gas sector with EmbaMunaiGas JSC, are being developed in particular.

In addition, negotiations are under way with NEDO to attract grants, and with JBIC to raise borrowed funds to finance pilot projects and to conduct analysis of the fuel and energy complex in Kazakhstan.

THANK YOU FOR ATTENTION!

Dr. Akihiko TAMURA

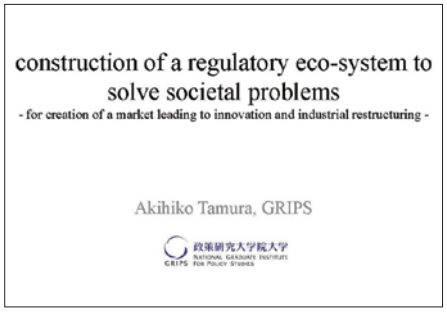
Professor GRIPS, Ph.D

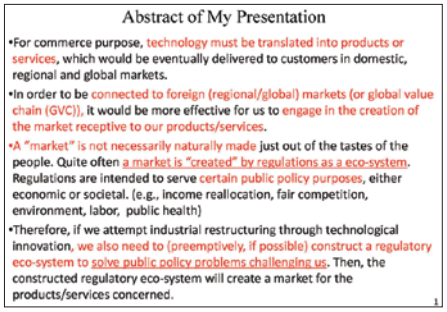
Session 1

Innovative technologies and legal aspects for the efficient use of natural resources

Transformation of industrial structure: industrial policy, various reforms in the field of advanced technologies

Construction of a regulatory eco-system to solve societal problems – for creation of a market leading to innovation and industrial restructuring –





Distinguished leaders, distinguished guests, ladies and gentlemen, I was going to say good morning, but already it's 12:45 in the afternoon. I'm neither a scientist nor energy expert, I'm just an international business lawyer, I used to work for the government of Japan as a trade negotiator. I was requested by the organizer of this symposium to speak a little bit about the transformation of industrial structure, particularly in the context of corporate strategy. So building upon my a little bit unique background which is international business lawyer. I would like to make some humble intervention, then I chose this topic which is a little bit lengthy but in a nutshell I'd like to talk about construction of a regulatory system.

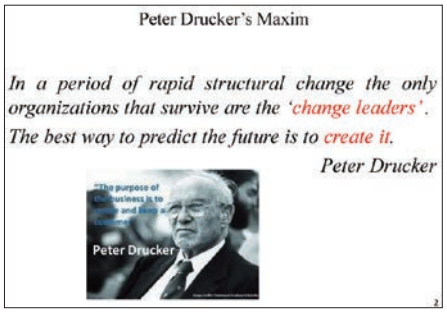
My punchline is that too technology or innovation has to be carried out in tandem with creation of market. You don't create market, you have to create so-called regulatory ecosystem because market is not in a vacuum, market is something, substance. That substance is sometimes derived from nature, but some of the ecosystems are derived from man-made regulations, and man-made regulations has purpose, regulation has a purpose to soothe public policy. So, in order to generate market, in order to carry out fruitful R&D process simultaneously, we have to be engaged in being a little bit concerned about the kind of rulemaking to address public policy issues. That is the punchline I'm going to address.

This is just full of letters. I mean, I was sitting over there so I understand how--how much you suffered from reading this kind of piece of paper and also I'd like to fill the gap a little bit. This first page is all I want to say. It's my presentation, but I'd like to fill the

gap blank a little bit. As I said, my punchline is that technology is just technology, it has to be applied. It has to be used for a certain purpose, otherwise it's going to be useless. Particularly in order to carry out kind of sustainable, not sustainability meaning the sustainability of development, but kind of a continuous process of our R&D. It has to be for instance, financed. In order for the R&D process to be financed, it has to be considered about how usually the technology is going to be translated into the market of something. market of something means use the products or services.

In order to bring the product or service into the market, we have to be concerned about what kind of customer we are targeting at. Customers do not live in vacuum, customers live in certain environments, certain circumstances, certain market circumstances. And as I said, market is not the vacuum, market is Colored by several ingredients one is nature, the other is man-made. As I said--I already said that point. Man made ingredient market is regulation. And regulation is a purpose to serve for some kind of public policy ranging from, like I said, some economic or public policy such as income reallocation, or fair competition. This kind of thing are very typical in economical public policy issues. Also we have to bear in mind that there are tons of public policies which is environment, labor, public health. These are public policy issues to be addressed through implementation and enforcement on regulations. Therefore, you are then to carry out very meaningful R&D processing. We also have to be proactively engaged in the regulatory ecosystem building process as well.

So this is what I would suggest and also if we are just concerned about our domestic market, regulatory ecosystem--only domestic regulatory ecosystem is what we should be concerned about. But, I guess that Kazakhstan as well as Japan also is not the largest country in the world, we have to always be concerned about how much we face our global market. So therefore as Japanese industry we have to be always engaged in the regulatory ecosystem, building in the global scale. So it means that we always have to be concerned about what the global public policy issues are.



Peter Drucker, the very famous business folk leader, he said that kind of similar thing but in a more sophisticated manner, he said that in the period of rapid structural change, the only organizations that survive our so-called change leaders. And also he said that the best way to prepare for the future, is to create the future, not just to be passive. In order to survive for certain periods of time, we have to create. This is the best way to survive an uncertain period of time. To create. So in order to survive uncertain periods of time, we have to be engaged in the creation of econmerty, ecosystem. This is the best way to survive and this is the best way to make fully use of the technology we have.

Then better way to address public policy and also carry out the fruitful R&D is not only addressing the current public policy issue, but also we should address the future public policy issues. So means that let us take a look at the future public policy which is for instance, we call risks. There are tons of reports in the public policy community which talk about the global risks. This is one of the very typical reports which has been--which is issued annually. This report is the so-called global risks report, the latest version is 2018. This report is issued every year, every January they issued from the global economic forum. The latest one is 9 28 version. You can tell easily that some stars, a lot of stars in total 30, 30 global risks. Green one is environment, blue one is economics, and orange one is political, and red one is societal, and the purple one is technological risks. And this is based upon the so-called global risk perception survey which had been conducted from 1972

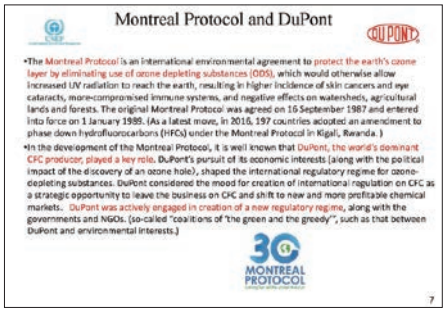
1980--1918, and then asked around 800 leaders how they assess the likelihood of 30 individual risks in the scale of from 1 to 5.

And also, they asked them to assess certain risks in terms of impact as well, and you can tell that the right hand side is the ones who more kind of, the risks with more likelihood. And upper side is the area where the risks are more important. And you can easily tell that the place as far as 19--2018 version is concerned most riskiest, most--risks with the most impact and with the most likelihood are sustainable ones, environmental ones.

Actually, this is the recent trend...I'll skip this. And this is the chronology of this survey, recent couple of years, mostly the risks--the high risks are about sustainable ones, used to be dominated by more economical one, but lately everybody thinks that the most risky--the risks are in terms of impact and in terms of likelihood are sustainable, environmental.

So therefore, bearing in mind that this kind of risk, we have to be engaged in the regulatory ecosystem building exercise and it has been already exercised on the regulatory ecosystem building on the sustainable issue, everybody talks about the SDG, I also have no choice but to touch upon this document as well, but everybody talked about this document already, so I'm not getting into the detail of this one, and also SDG is just a goal, it's not the regulation, but I guess this is good manifestation of kind of the so-called zeitgeist, I mean the spirit of this time. So I guess that I think that this SDG will serve as a very good foundation for the regulatory ecosystem building exercise from now on.

And particularly we have to emphasize that this SDG emphasize the importance of engagement by not only the government, but also private sectors as well. They always promote the idea of multi-stakeholder so therefore I think business or corporate has also a very critical role to realize SDG. And I was requested to talk a little bit about the corporate strategy, I'd like to touch upon the strategy done by corporate.



First example is Dupont. As you know is like to talk about the Dupont in context of the so-called Montreal protocol on the elimination of the use of ODS. Some of you may have heard that the Dupont strategy which encourage the deduction of this protocol, even though Dupont used to be the biggest, dominant CFC producer. So it means that Dupont, they're supposed to be hard hit by the deduction of this model--

protocol. Nevertheless, Dupont is more proactively engaged in the process of mating this protocol by synchronizing this rule with their strategy to come up with new alternative product.

So this kind of theory is the one I would try to promote. And also the other thing is that so called global GAP. Some of you may have heard about this, but because in particular I know this in large. There was some event of the global GAP in Astana, Kazakhstan, so therefore some of you may have noticed about this thing. This global GAP is kind of a standard and certification system mechanism on the food agriculture and processed fruit. And they try to make sure that growers of agriculture product into follow the kind of rules in these kind of things. The food safety, traceability and the environmental consciousness something like that. So this kind of system generated, created market in sustainable food through the regulatory ecosystem building exercise.

Finally I'd like to, this is the last page in sorry about that, but this is the last page. I noticed that Kazakhstan had a lot of window through points that you'd be able to engage in that ecosystem building. I just only picked that for only the relatively three economical windows, there got may have more but I know that Kazakhstan is quite active player in diplomacy, but even limited to trade and investment. You have several windows you can utilize to be engaged in the regulatory ecosystem building exercise. First one is WTO, you were exceeded to the WTO in recent years, can you try that? And also you were an active member of the EEU, Eurasian Economic Union. And also the last one is that guests of Kazakhstan is quite critical of location in terms of where you are, so called the "Belt and Road" initiative. The Belt and Road initiative has been promoted by China as you know, it's not missile, it's a trade agreement. It's more kind of infrastructure development initiative, but I guess it seems like this initiative has more Implications than just infrastructure, so the buyer engaged in the building upon building this kind of initiative. I guess that Kazakhstan and maybe Japan in the future will be able to be engaged in the regulatory ecosystem in Eurasia and in the global community. I'll stop here, thank you very much. If you have any questions or comments I'll take that thanks.

Session 2

Success stories in the field of natural resources management in the practice of environmental technologies.

Japan and Kazakhstan success stories and facing new challenges

Dr. Zhumabay BAKENOV
Doctor of Engineering (Chemical Engineering, Tokyo Institute of Technology), Ph.D. in
Chemistry (Physical Chemistry, Kazakh National Academy of Science), Professor, School of Engineering, Nazarbayev University

Mr. Nobuo TANAKA
Former Secretary General of the IEA (International Energy Agency)

Mr. Yerasyl AZIMBAYEV
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Mr. Takashi MORIYA
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Professor, School of Engineering, Nazarbayev University

Session 2

Success stories in the field of natural resources management in the practice of environmental technologies.

Japan and Kazakhstan success stories and facing new challenges

Application of Sulfur in Batteries

Rational use of mineral resources and its deep processing resulting in high value-added product is a crucial approach towards sustainable development.

In this talk I would like to focus on a specific product of our industry – sulfur. Sulfur in Kazakhstan is produced as a by-product of Oil&Gas industry, and currently Kazakhstan has large deposits of sulfur in the oil produced regions on its West part (Fig. 1). Sulfur itself is a neutral and stable compound. However, influenced by the environmental factors, it transforms into its toxic and harmful compounds. This might cause serious ecological and health problems.

Fig. 1. Sulfur deposits in oil production sides.

Sulfur – waste or an excellent material to store energy?

Sulfur from oil refining processes is mostly used to produce sulfuric acid which is used in various areas of chemical and fertilizer industry. Along with this sulfur is a potential raw material to produce high-tech materials, for example, battery materials.

Rechargeable batteries play critical role in modern society and provide reliable energy sources for various applications from portable electronics and medical devices to transport. Lithium-ion batteries (LIBs) lead this market. However, current LIBs have low capacity and expensive. In my laboratories at Institute of Batteries (our startup company funded by the World Bank and the Government of Kazakhstan) and Nazarbayev University, we develop new sulfur based cathode materials for LIBs which may increase several times the capacity of batteries. Due to this advantage, lithium-sulfur batteries (Li/S) will allow to remarkably increase autonomous operation time of various devices from one charge. Fig. 2 illustrates this promising feature of Li/S batteries.

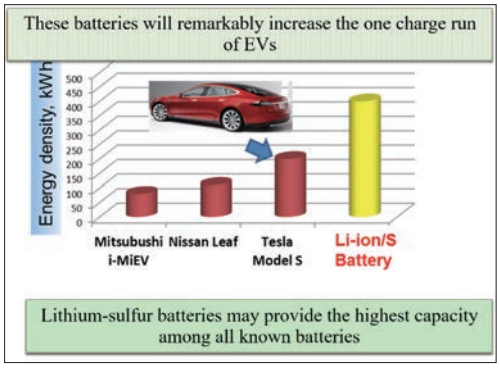


Fig. 2 Potential of use of Li/S batteries for electric transport applications.

We have developed new sulfur composite cathode material which demonstrated excellent performance in various geometry and size of batteries (Fig. 3), a long cycle life, high capacity and stable cycling. The battery successfully passed various safety tests, which confirmed its safety and secured operation. The batteries were tested in laboratory scale and showed excellent performance:

Coin cell batteries – 2000+ cycles with ~80% capacity retention;

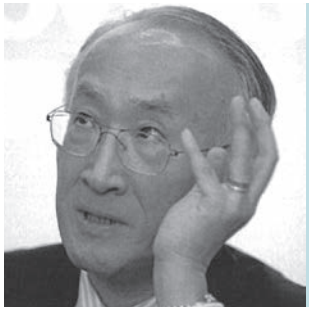
Pouch cells of 5 Ah capacity – 500 cycles with ~80% capacity retention.

Fig. 3 High performance lithium-sulfur batteries with new cathode material assembled at Institute of Batteries and Nazarbayev University.

Currently, we continue developing this battery technology along with other battery systems such as lithium-ion aqueous batteries (absolutely safe batteries for renewable energy storage), thin film microbatteries and other types. These works are done in cooperation with leading laboratories in Japan, Korea, UK, China, EU and USA.

Acknowledgements

This work was supported by Institute of Batteries LLP, Nazarbayev University, the research grants from the World Bank and the Government of the Republic of Kazakhstan.



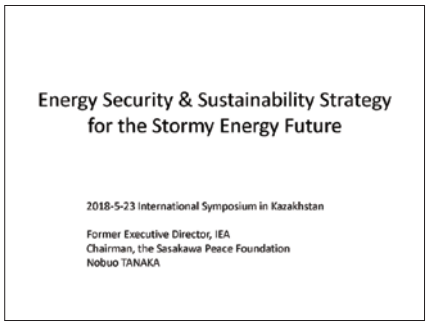
Mr. Nobuo TANAKA

Former Secretary General of the IEA (International Energy Agency)

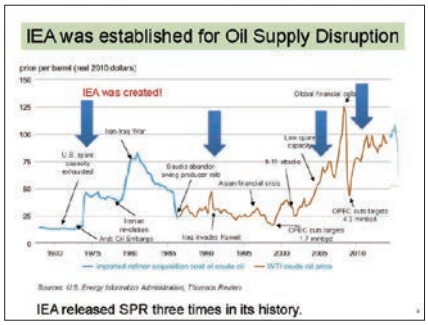
Session 2

Success stories in the field of natural resources management in the practice of environmental technologies.

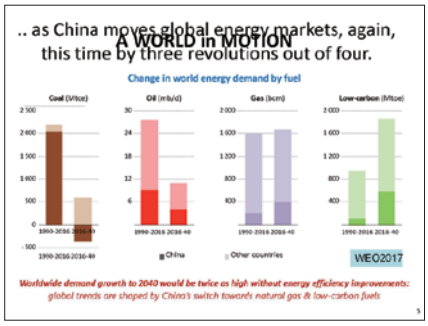
Japan and Kazakhstan success stories and facing new challenges



Thank you. Thank you very much for introducing me and I'm delighted to come and talk about the energy security issues which I was the head of the International Energy Agency in Paris. I'll make a global story about where we stand about energy issues and how Kazakhstan or how China, how United States, how Japan can cope with very serious change which is happening now in the energy sector.

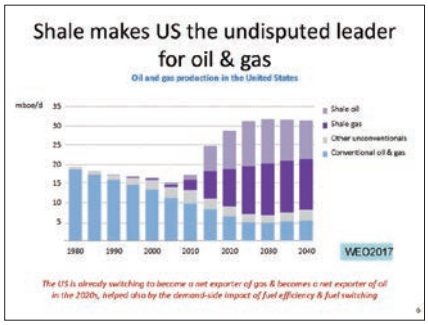


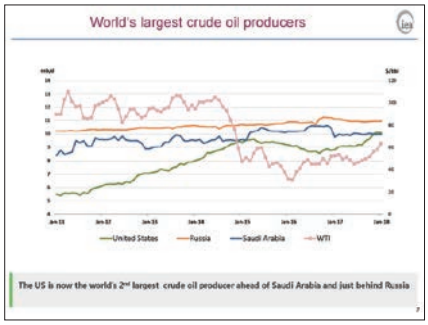
This is the oil price from 1970's, IEA was created in 1974 when the first oil crisis happened. An oil crisis caused huge economic turmoil in many countries and especially the consumer countries. Consumer countries arrived together to create IEA to prepare for the emergency. Having a strategic stockpile of oil for 90 days, they released it three times in history. Most recently in 2011, when I was the head of the IEA the Libyan crisis, we released the strategic stockpile of oil.



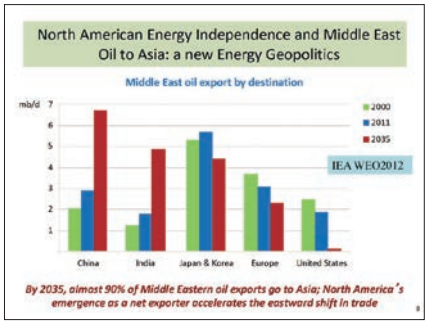
This graph shows the very interesting in 2007, date oil price ranked as high as 147 dollars per barrel. That was a historical high--highest place. The reason for this peak height was China. China made a huge consumption growth in structure of oil supply which can never be supplied that level, that's the cause of the hike of the price happened in 2008. It collapsed because of the Lehman shock, but this is--cause of IEA is creating every year that one energy outlook and show you what's the most recent changes. This year's--last year, excuse me, the last year's November, they made another study and said there were 4 revolutions in the world energy market.

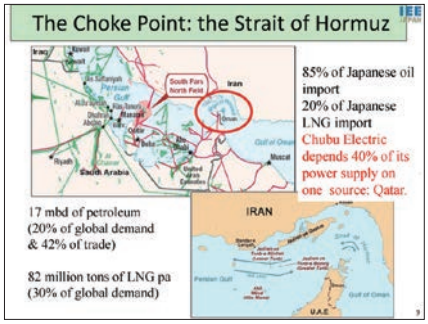
First is the shale oil and shale gas revolution in North America. Everybody knows about shale, and that have huge kinds of power to the United States. President Trump is using it for his political advantage and using his power or geopolitical power in the Middle East, everybody knows it.



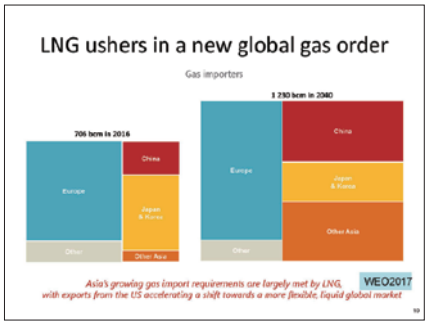


But second revolution is the solar revolution. The solar photovoltaic will be the cheapest source of energy in the near future for many countries. This surprised me a lot. This is really the first time that IEA declares solar will be the cheapest source. The oil, gas, and nuclear; how could other energy sources can compete with solar is a really important question for everybody.

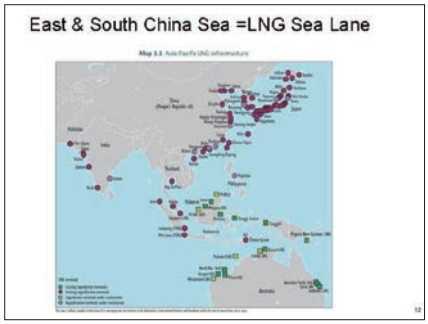




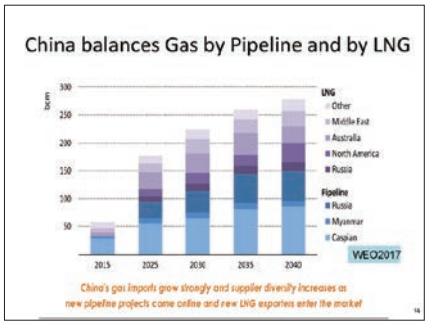
Third revolution is China's green revolution. I've visited China many times in December or November this year and the sky was totally blue, nobody is wearing masks, so China changed dramatically from the dirty coal to gas and more renewables. This caused a big change for everybody.

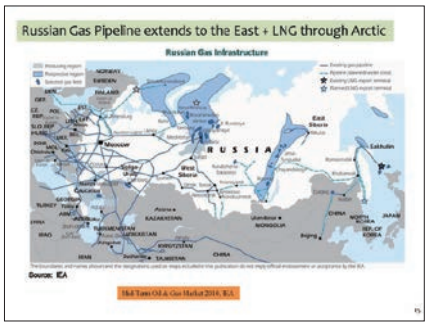


The last one is electrification. Energy is coming through electricity. Not burning, but through the electricity using sustainable, clean source and supply the digitization of service sector, electric vehicles, batteries, AI. Three out of four revolutions are happening in China. And this shows that first--until the recent, from 1992 to 2016, China used coal and oil to make economic growth, but now China is changing to the green source like gas and renewable to make a big shift geo-political paradigm shift of Chinese policy to a sustainable green future. This cause everybody a big change of their policies, Energy security and sustainability. That is a message of the IEA's world energy outlook.

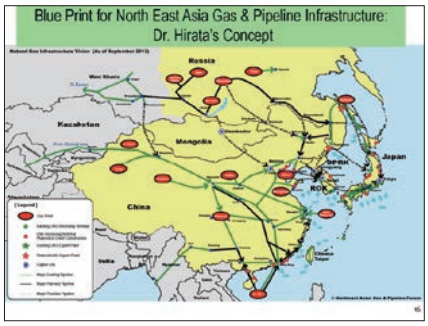


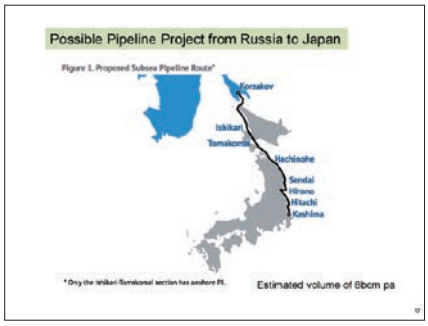
This is American shale gas, shale oil; yes, energy dominance is what Mr. Trump is always saying and making out of the Middle East because the US will no longer need oil from Middle East. This is the production level of three largest oil producers in the world. Namely the United States, Saudi Arabia, and Russia. This shows that Saudi--and pink is the price level, this shows well that Saudi Arabia is the price changer or swing supplier and adjusting the production level, but now the rule passed to united states thanks to the very abundant and cheap shale oil.

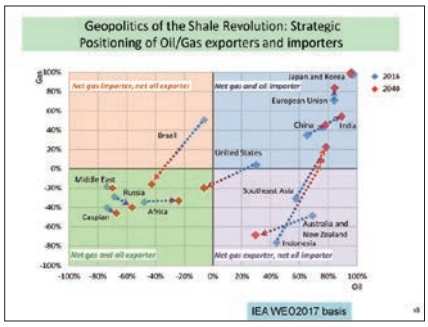


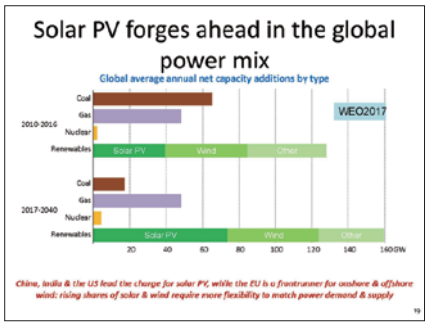


Next, this shows clearly where the Middle East oil goes now and in the future. The red is 2035 or 40 and clearly shows that China and India needs the middle east oil and 90% of the Middle East oil will go to Asia and United States will no longer need oil from the Middle East. This gives a very strategic advantage to the United States. That shows why United States, Mr. Trump withdrew from the Iranian nuclear deal or moving the embassy from Tel Aviv to Jerusalem. Of course, very serious issue now is how Iran reacted to that and how Saudi will react to that. I am very concerned that something wrong could happen in the Persian gulf in the near future.

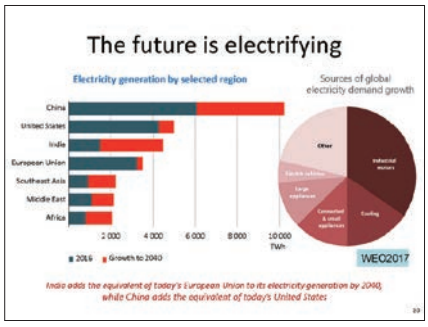


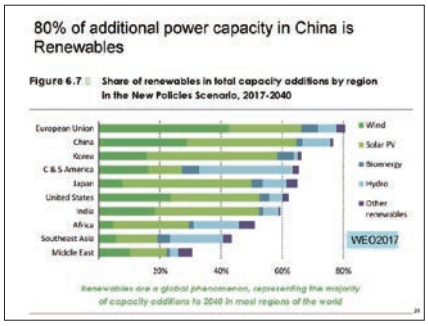




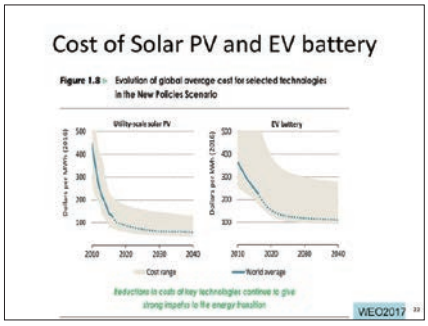


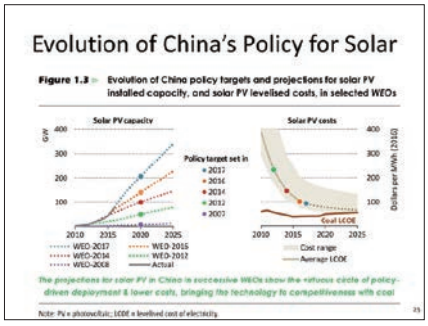
This is gas. Now the big user let's see, is Japan and Korea. But in the future, China will be and China will be a dominant player in the energy. That is in the future of the gas. Also, it is true that China needs gas and lots of energy means South China sea or Indian Ocean will be very substantial risk for the supply chain. So seafaring protection is a very important geopolitical issue for the consuming country like China, India, Asian countries, and japan. This shows a map of where the important facilities of LNG and exporting facilities of LNG.





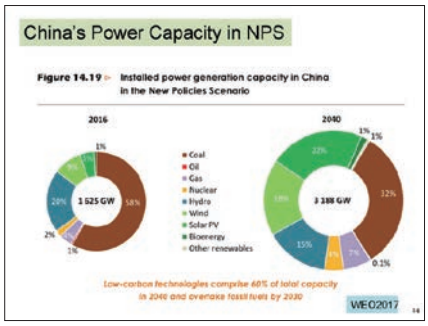
Yes it's clear that South China sea is a critical interest of China, but for other consuming countries too. This is the Chinese geopolitical strategy of using pipelines. Kazakhstan exports oil to China by pipeline and also it is the route of getting gas from Turkmenistan to China. So China thinks that pipeline is much safer than sea lanes. So they are thinking is using almost half and half, or more pipelines than LNG to get the gas because gas is more important source on energy in the future rather than coal, rather than oil so the gas trade will decide the geopolitics in the future.

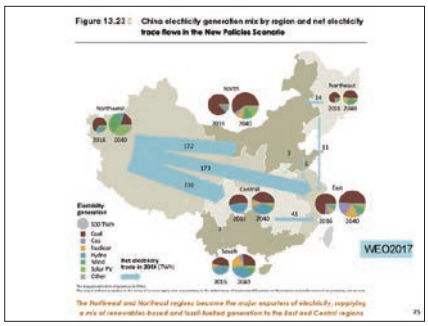




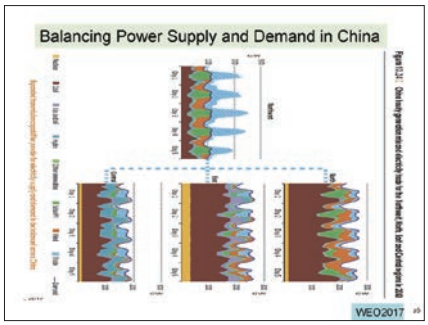
Russia moves from west to east using the Eastern Siberian gas pipeline. To gain the arctic sea lane of LNG from the above would be geopolitical interest of Russia. Gas pipeline could be built involving Japan or Korea, but this is a concept which Japanese professor built, but only reality came to China. Unfortunately Japan is not connected to the pipeline Network in Asia and that creates a geopolitical risk for Japan. Of course Kazakhstan is--could be connected to this kind of model. Yes the One belt, One Road of china is certainly an important issue and geopolitical issue for

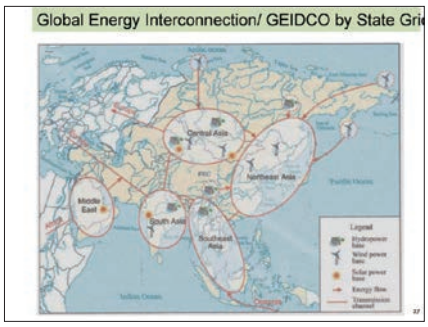
surrounding neighboring countries.



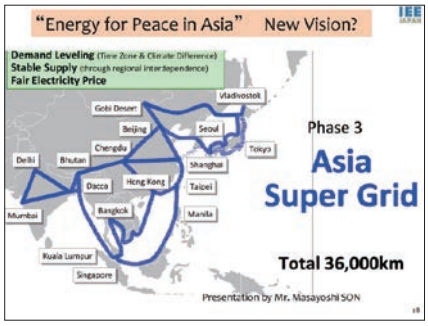


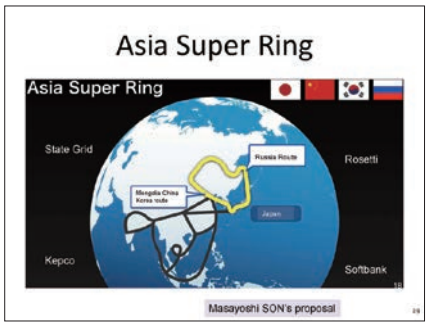
This shows the vertical line is Import dependency on gas for countries. Horizontal line is Import dependency of oil. So blue countries are both imports of oil and gas, green is both exporters of oil and gas. For example China imports about 60% of oil, but will go to 80% of oil imported. Gas about 30% but would be 40% in the future. So China is getting more vulnerable to imports in the future. Japan and Korea is already 100% import of both gas and oil. We can never be worse so we are stuck in the right and top corner. United States moves totally different direction moving currently import of gas, but future exporter--already exporter of gas and will soon be exporters of oil. So, as consuming countries, US is very different positioning, so US can be free to take risk in the Middle East. And this is a huge geopolitical issue for other consuming countries. Sadly, we have to depend more to the conventional gas from Russia, Africa, and Caspian countries including you. Middle East will be very unstable with Mr. Trump's policies, so we have to move away from Middle East and heavily dependent on these other conventional players. This is the geopolitical gain we will see very soon about gas and oil, but we have to remember as IEA said, what's will grow most will be solar, wind, and other renewable energies in the power sector. so we cannot be complacent with fossil fuels. You have to think about the future is renewable how you can use your money into investing to the renewables would be the issue. This is the future of electricity, India and China will grow very fast. With sustainable energy source for industrial sectors cooling or appliances and electric vehicles. Sustainable electricity and electrification is the Chinese geopolitical energy security strategy. And this shows how much of the portion of the new power generation comes from renewable; in many countries, it would be renewable.



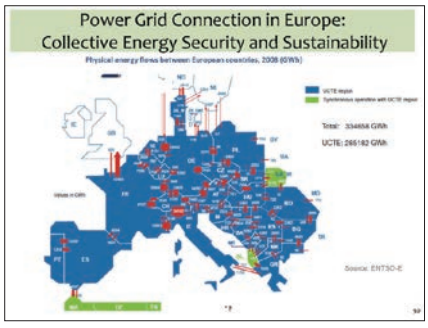


In China, more than 80--closely 80% of new electricity will be renewable in the future. And this shows how fast the cost of solar and cost of batteries is coming down. My previous speaker talks about electric batteries, this is a very important technology for the future and the cost is coming down. This is a Chinese case; in China, the cost of solar will be lower than coal in the future. Even coal is less competitive. In China is thinking about using lots of renewable energy in west and north sectors through connecting the grid lines to the more consuming regions to the south and east. And by doing so, this chart is upside down, but using this interconnection of the countries, volatility of renewable can be compensated. This is the Chinese grid strategy and connecting its to other countries is the state grid's idea of global energy interconnection.This is the One Belt, One Road electricity version of China.

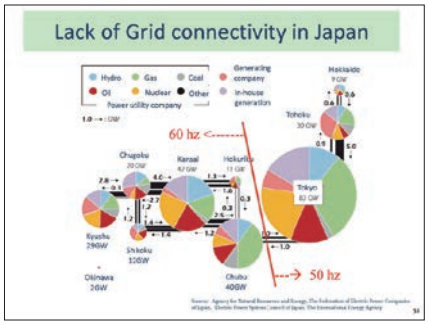


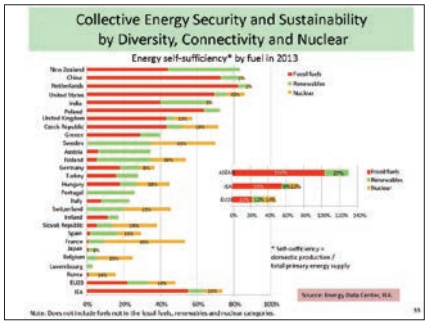


Certainly Kazakhstan is the next door, are you going to connect the grid line to China? Is Japan going to connect are grid line to China? This is our strategic position but there's no other way. None of the Japanese--CEO of Softbank, Mr. Masayoshi Son is saying Asia's super grid can be built, the cost of renewable is getting so cheap, this kind of grid connectivity makes good sense. Is it enhancing the energy security of 1 country or not? this is a very interesting question. Russia is also supporting this kind of grid connectivity, President Putin also endorsed this Asian super ring of four Asian countries-- companies.



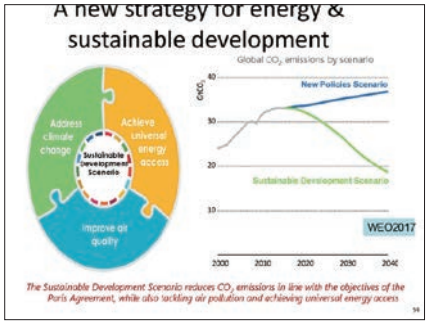
Europe is already connected to each other by grid lines and pipelines. By doing so, Europe reduces the risk of resource supply shortage and enhancing sustainability making Germany an easy use of the renewables, volatile renewables, and at the same time reducing nuclear power. This kind of geopolitical, geographical positioning of Germany make it very good idea of sustainability and security. I think this is the idea of collective energy security. Collective means countries get together in constant security and sustainability. Japan, Kazakhstan, or any country cannot increase sustainability and security by yourself--by oneself, you have to work together with our neighbors to enhance security and sustainability. This is the lesson of European Union. Yes, they are expanding to Africa.

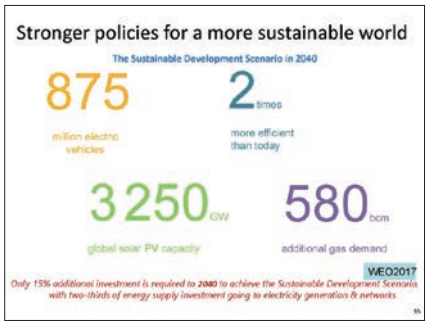




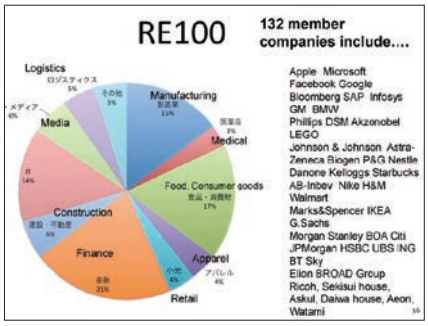
This is Japan, the Japanese problem is more domestic. Our grid lines are not connected west and east, their connectivities are very weak that is the reason why after the Fukushima accident with the nuclear power plants, TEPCO lost whole the nuclear capability, but western part of japan did have

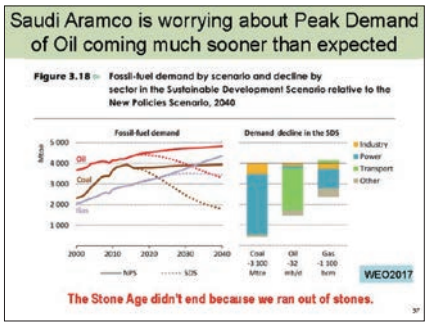
enough excess capability of power generation, but cannot transmit the power to the east because the shortage of connectivity between the east and west, so blackouts happened in the east. If Russian power is connected already to the eastern part or Korean part, we could have avoided this kind of blackout. So the risk of Japan's supply security is in the country but not out of the country so this lesson clearly shows that we have to think carefully, but at the same time, bluntly that what we have to do to make the difference in the future.

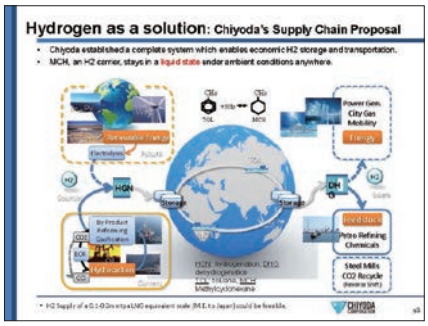


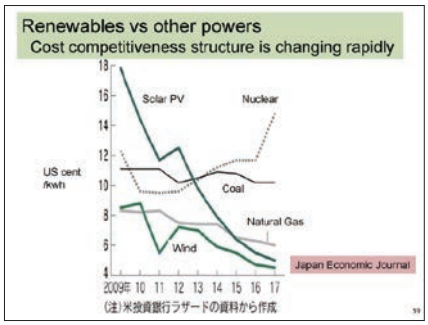


This graph shows energy self-sufficiency rates by countries top to down, there are net exporters above them. They are more than hundred percent self-sufficiency rates of countries but if you see this where the fossil fuel (red) and renewable (green) are not enough. Sometimes nuclear (yellow) is a supplementary source. The problem with the nuclear, I will explain, is that commercial nuclear power will no longer be competitive in the future against solar. That is going to be a very serious problem, sustainability issues everybody--Tamura-san said sustainability risk are increasing. Yes, we need huge amounts of electric vehicle batteries in the future to achieve less than one degree or less than 2 degrees Celsius scenario. But, there are many companies in the world who is trying to be sustainable renewable energy 100% These are the companies who try to use only renewables in the future: Apple, Microsoft, Facebook, Google, GM, BMW, Phillips you name it. Big corporations are forcing the supply chain companies also to be renewable 100%



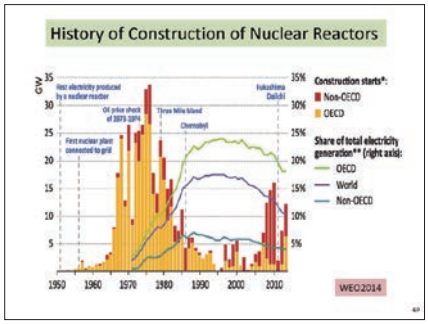


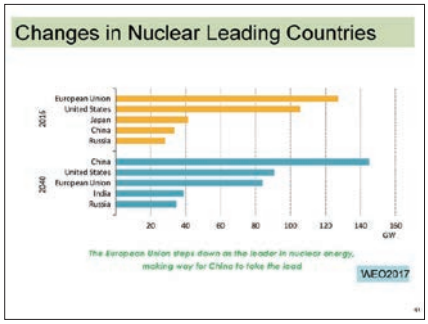


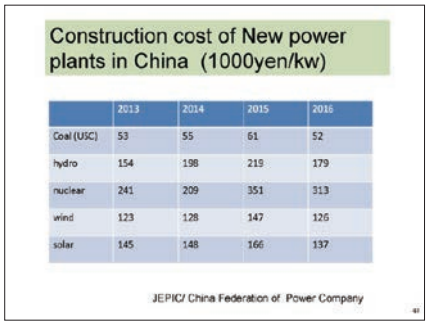


And this change from the demand side is probably very, very forceful. Chinese companies will be supplied with renewables by photovoltaic and wind through the grid connection. Of course China will continue to use coal, but this is for the more rural parts. So this kind of change of strategic nature could happen from the user and from the global users...that we have to know, and financial market will force us to go this direction. I will stop here but Saudi Arabia is very much worried about this change. Peak demand of oil would come much earlier than expected, even before 2030. If that's the case, we have to prepare.

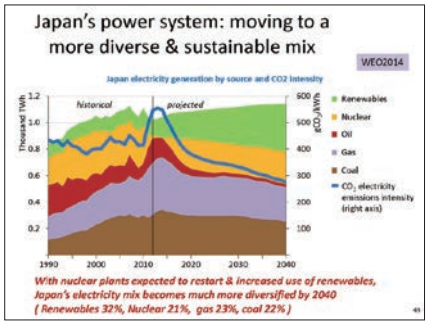
Using hydrogen is one idea, storing electricity or storing clean hydrogen from oil and gas with CCS is one good idea. Japanese participants will explain about hydrogen use, but hydrogen economy is one Japan thinks is probably helpful to sustainability, where the cost of renewables is getting so cheap.

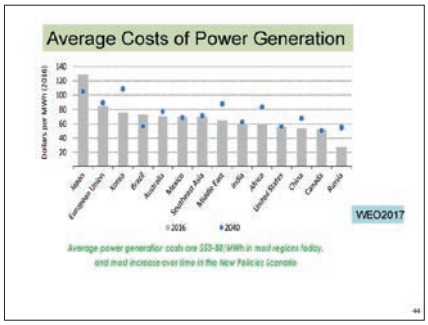


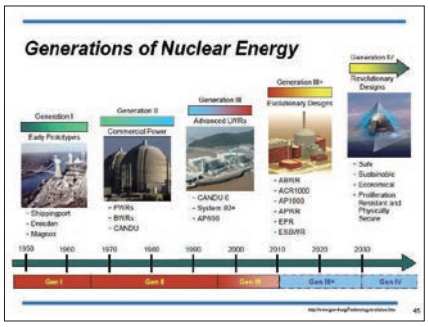




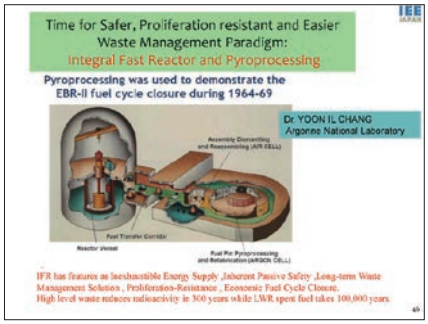
	2013	2014	2015	2016
Coal (USC)	53	55	61	52
hydro	154	198	219	179
nuclear	241	209	351	313
wind	123	128	147	126
solar	145	148	166	137

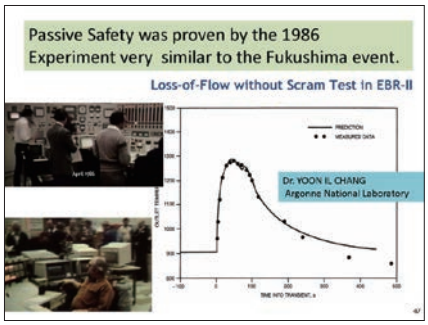


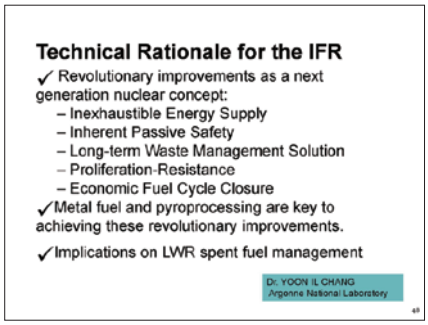


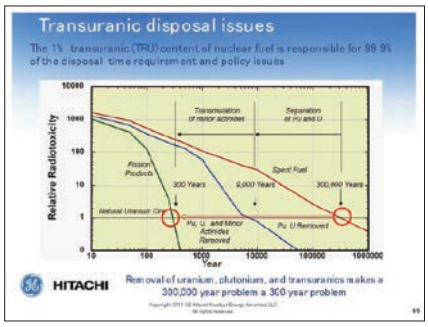


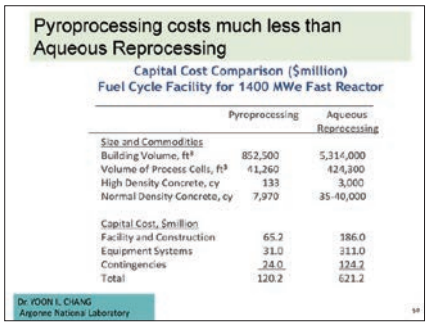
Just you can see the nuclear power is getting more and more expensive. Large light water reactors will no longer be competitive, so probably what we have to do is we have to go into the small modular reactor in the 4th generation. I don't want to get in too much, but this is one model American Integral fast reactor which can be utilized for the sustainable nuclear future. This is a real challenge for Japan after Fukushima, but here in Kazakhstan you are very rich in uranium source, but if there is no light-water reactor using uranium, you are in problem.

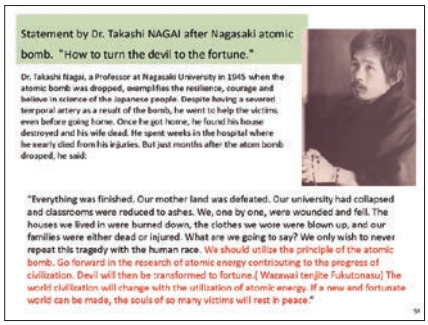












We have to think together what is the advance or what's the future of nuclear power? This is a common agenda for both countries. Thank you very much for your attention.

Mr. Yerasyl AZIMBAYEV

Development Manager of Development LLP "EcoEnergy.kz"

Session 2

Success stories in the field of natural resources management in the practice of environmental technologies.

Japan and Kazakhstan success stories and facing new challenges

2) We are an EPC company, namely we design, supply and construct SS, both electric and thermal, for the production of electricity, heating and hot water. Year of foundation is 2011; we have quite a lot of experience in this area. A well-established delivery system from Europe - in just 2 weeks. Coverage area of the supplied equipment is Kazakhstan, Russia, CIS countries. Engineering, procurement and construction

3) The list of services and products includes: Construction of solar electric and thermal stations from 1 MW. Network and Autonomous Solar power plants for houses and farms with a capacity of 500W or more. Solar water heaters for heating and hot water for private and industrial sectors (namely vacuum, tubular, flat).

4) VIDEO ECO. Installing the SS, you get energy savings of up to 90%. Independent hot water supply, seasonal heating and ecological clean methods of energy production. Wide range of products for any customer's choice. From budget options to high-quality products from European manufacturers. You can always count on doing any amount of work. From the installation of collectors on the roof of a private house to the implementation of large-scale regional projects. A reliable staff of qualified specialists will ensure high-quality performance of services. Development of projects and completion of facility on a turnkey basis. For many years of the company's activity, colossal experience and professional service have been formed.

5) SOFTWARE of SS allows such monitoring and management functions as == Visualization via the Internet and smartphones == Automatic alarm monitoring == Remote troubleshooting. **Moreover, monitoring is carried out not only for solar power plants**, but also for thermal power plants.

6) There are **3 fastening possibilities**, 1) on a flat roof with a special fastening of 45 degrees, 2) on a roof with a slope of 15 to 75 degrees, and 3) the option of integrating the collectors in the roof, thereby providing a beautiful and aesthetic appearance of the roof.

7) Our facilities where we have already installed the SS. Government House of the Republic of Kazakhstan, UNDP facilities, Nazarbayev University, Teplitsa in Astana and over one hundred private houses and enterprises of Kazakhstan.

8) - 9) These are pictures of completed projects

And if more detailed, I will give some examples, which I picked up

10) Government House of the Republic of Kazakhstan installation of solar water heaters for hot water

12 solar collectors 2 working stations 2 thermal tanks of 500 l. **The system provides hot water 6 floors of the Government House.**

11) Sports hall of Nazarbayev University. Solar water heating station with 30 collectors for hot water supply of athletes

12) The cottage village of Nazarbayev University

Solar water heating station installed 201 collectors at 67 cottages for teachers.

Each system includes 3 flat collectors, a pumping station and an indirect heating boiler of 300 liters.

13) In the village Zhanakorgan, Kyzylorda region were installed Autonomous solar power plant 4015 kW * h annual output

Accumulators AGM, 200 A / h Converter 24V, 2000W

Solar panels polycrystalline 260 W Solar controller 60A

14) East Kazakhstan Autonomous Solar Power Plant 5257 kW * h annual output

Solar panels for 3.5 kW Solar controller 5 kW

Inverter 5 kW Batteries 1600 Ah

15) The Greenhouse in Astana. Solar water heaters volume 600L (passive type)

16) UNDP facility, kindergarten in Akshi village, Almaty region

Solar water heating station Kingspan Thermomax HP400, with a capacity of 14.53 kW

17) We are the dealer and official partner of such Austrian companies as Fronius, GREENoneTEC, KiotoSolar, as well as Belgian companies Sunoptimo and CMIEnergy, Irish manufacturer Kingspan Solar and German firm Paw GmbH.

18) One of the unique types of solar stations is the OPTICUBE **Ready Modular Station**

A container with equipment is produced in Belgium and is supplied as a complete system and tested. A mounting frame and collectors produced in 1 day. This system provides a reduction in the total cost by 40% compared with the classical solar thermal plant. It does not require a large installation area, allows you to quickly relocate the system along with the supply object - for example, for mobile structures of construction and oil companies.

More details can be found on the next prepared material.

19) VIDEO Installation of the structure takes only 1 day and does not require a large area

20) In the future, we would like to build concentrated **SES in the southern region of Kazakhstan together with CMI Energy**

Its advantages are the high level of efficiency, which is achieved through the use of not just solar panels, and mirrors that reflect the sun's rays and sent to the catcher at the top of the tower, there is heated coolant to 530 °C, 130 bar, and then accumulate and generate energy using a steam turbine. Instead of water, salt is used, as it retains heat much more than water. Also, the temperature of salt heating to 530 ° is higher than that of oil, whose temperature should not exceed 400° for fire safety, which is also used in such CSP (CES) stations.

All the molten salt heated during the day is constantly poured into the heat storage, because of the high initial temperature, the heat can be stored up to 3-4 days even at night in the absence of The sun in the sky.

21) VIDEO

22) Solar Energy is perhaps the most natural and beautiful solution to meet our energy needs. This is the energy of the future!

We invite everyone to cooperation!

Thank you very much for your attention!

Mr. Takashi MORIYA

Senior Chief Engineer, Automobile R&D Center, Honda R&D Co., Ltd

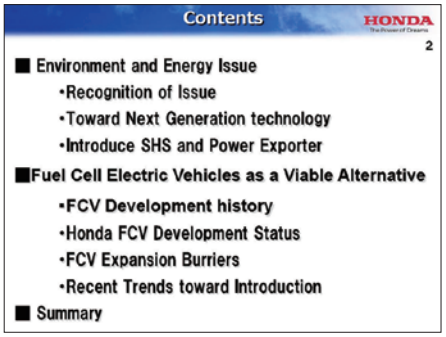
Session 2

Success stories in the field of natural resources management in the practice of environmental technologies.

Japan and Kazakhstan success stories and facing new challenges

I'm Takashi Moriya of Honda R&D.

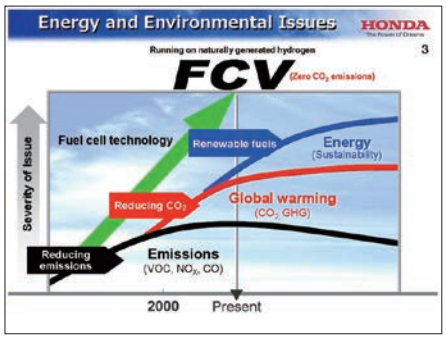
I explain Honda's Fuel Cell Vehicle development status and efforts for establish the hydrogen society.

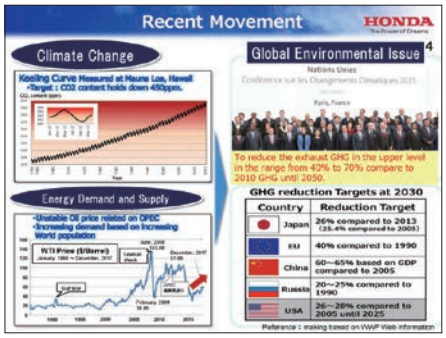


Today's contents are here. At first, I explain the environment and energy issue and efforts for hydrogen society of Honda. And then, I explain Fuel Cell Vehicle (FCV) development of Honda.

This slide is a conceptual image of the issues facing the automobile industry today.
Namely,
• Reduction of Harmful exhaust emissions
• Global warming related to CO_2 emissions
• And the energy issue

At Honda, we believe fuel cell technology to be a very promising solution for all three issues. Some could argue in favor of EVs, but we consider the FCV to be the ultimate answer.

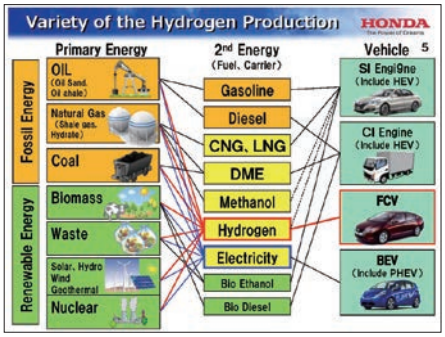




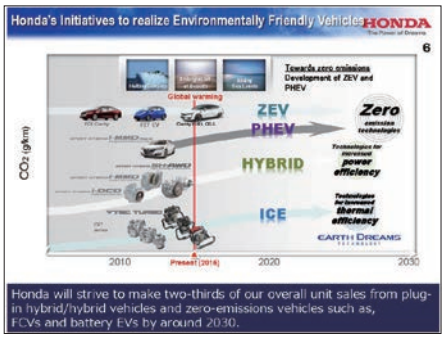
This slide explains the recent actual situation regarding the concerning issues. In order to achieve the target (less than 2 degree centigrade), CO_2 concentration must be kept less than 450ppm.

However Kieling curve has already indicated over 400ppm. In terms of Energy Issue,

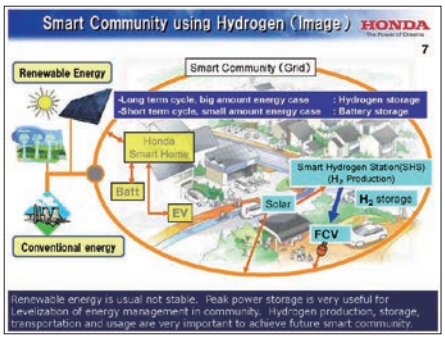
Oil price is not stable depending on various reasons. However future prediction is that price will increase, because of limited resources. December 2016, COP21 was held in Paris for discussion regarding the countermeasure of climate change. Participating countries have set their individual targets toward 2030.



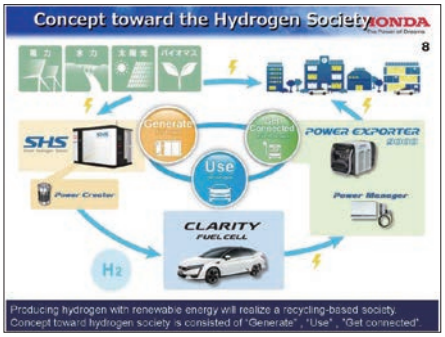
Hydrogen is 2nd energy career. And hydrogen produce from various primary energies. Hydrogen and Electricity have this feature.



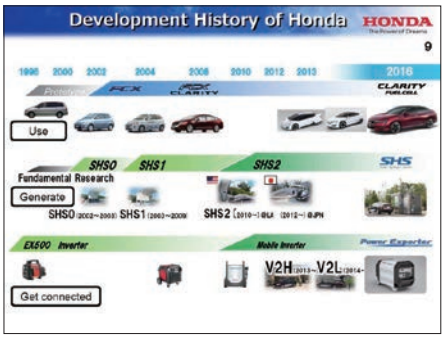
This is CO_2 reduction strategy of Honda. Near future, we must reduce the CO_2 in main market. At first we concentrate to improve the ICE efficiency. and increasing Hybrid Vehicle. Buying time for effort of these counter-measure, we must develop the PHEV and ZEV simultaneously in the future. And Honda will strive to make two-thirds of our overall unit sales from PHEV and ZEV by around 2030.



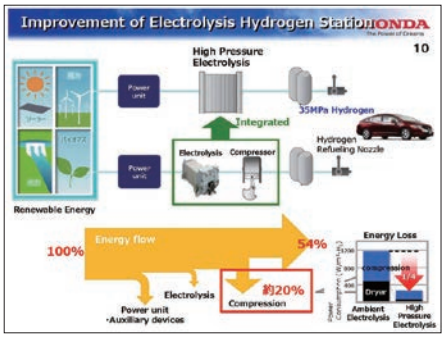
This is our Smart Community image including hydrogen. Hydrogen will be a buffer of electricity from renewable energy. Renewable energy is usual not stable. So peak power storage is very useful for leveling of energy management in community. Hydrogen generation, storage, transportation and usage are very important to achieve this smart community



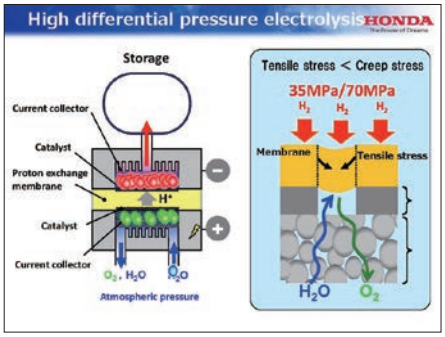
This is our concept toward the CO_2 free recirculation system based on renewable energies. Honda has been developing Smart Hydrogen Station called SHS for generating Hydrogen, FCV based on hydrogen fuel and mobile inverter for power output from FCV. We call this concept “Generate”, “Use” and “Get connected” toward the society.



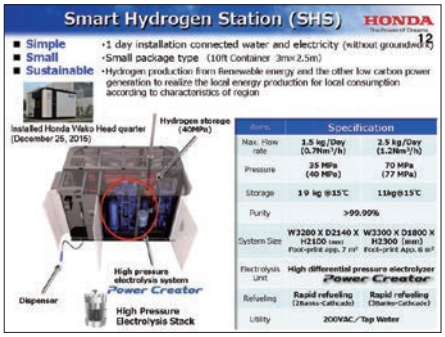
This is the development history of Honda. Vehicle development started from the end of 1980s. SHS has been developed from around 2000. From 2010, we developed high differential pressure electrolysis. And we developed the mobile invertor, we called Power Exporter, based on our power products R&D technology.



This is our development concept of SHS. Old version system needs the mechanical compressor for producing the high pressure hydrogen. We developed this high pressure electrolysis in order to reduce the compression loss.



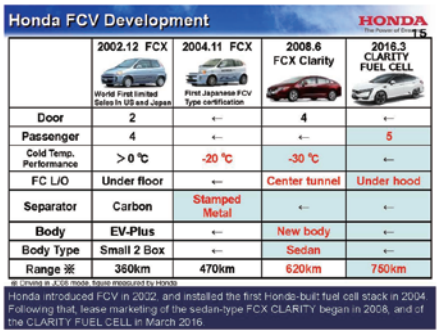
This slide explains the fundamental function of high pressure electrolysis. Water come in, applied electric power and this power is applied little bigger than needed electrolysis power. So this electrolysis has two functions. One is electrolysis and one is chemical pump. Honda found the new support method of membrane in order to protect weak thin membrane.



I introduce Smart Hydrogen Station (SHS) specification. S means Simple, Small and Sustainable. SHS can install only 1 day by connecting tap water and electricity. Package size is 10 ft container size. And hydrogen generation is not only solar but also the other carbon free power. High pressure electrolysis stack is called Power creator. Production capacity is only 1.5 kg/day. And back yard, hydrogen storage vessels are installed. And recently, Honda is developing 70 Mpa type SHS.

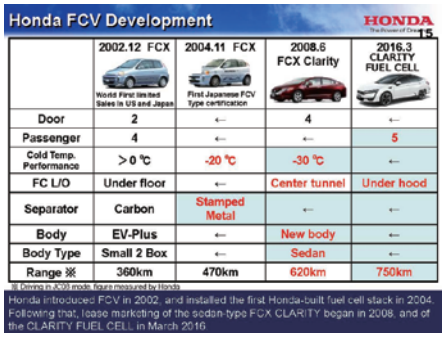
This slide explain the mobile inverter, named Power Exporter 9000. This inverter can provide 9kW ac power by connecting clarity. This ac power can save various use cases.

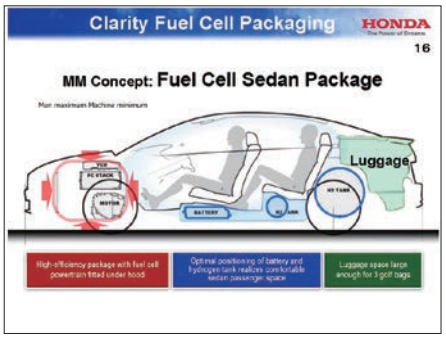
These pictures are demonstration activities using the Power Exporter. Vehicle to Home, Education, amusement and disaster case.



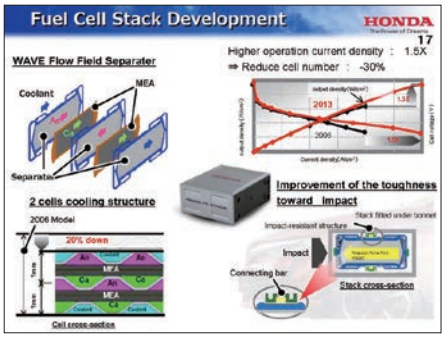
From now I explain Honda's vehicle development activities. Honda began research on fuel cell. At first, we concentrate improvement of fuel cell stacks. We began the first known lease marketing of a fuel cell vehicle in December 2, 2002,and installed the first Honda-built fuel cell stack in 2004

Following that, lease marketing of the sedan-type FCX CLARITY began in 2008, and of the CLARITY FUEL CELL in March 2016.

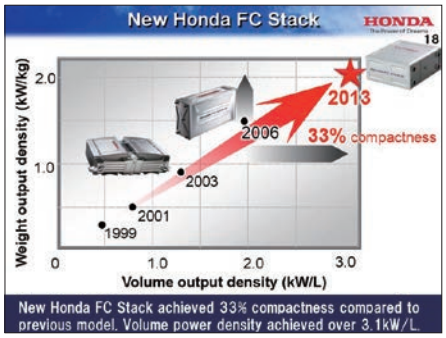




Honda has a basic vehicle design concept. We call the MM concept. MM means “Man-maximum and Machine-minimum”. Clarity Fuel Cell is designed based on this concept. High efficiency package with fuel cell powertrain fitted under hood. This concept will be able to expand the other type of vehicle in the future. Optimal positioning of battery and hydrogen tank realizes comfortable sedan passenger space.

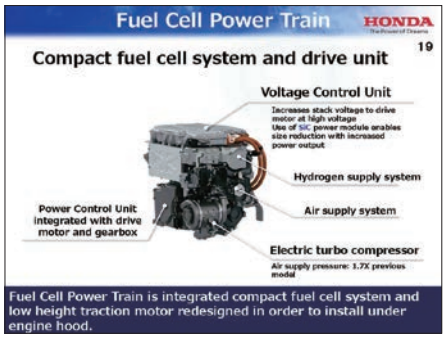


I explain the compactness technologies of Fuel Cell Stack. Honda’s cell structure is reduced one separator compared to conventional cell structure. We improve 1.5 higher operation current density compared to previous model. And we reduced the cell thickness 20%, so current cell thickness is 1mm. The other side, we must improve the toughness toward impact, because of front installation.This connecting bar improves 4 times higher toughness compared to previous structure.

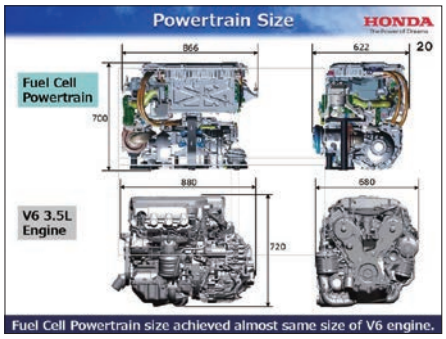


Volume output density of new stack achieved 3.1kW/L (World top class)

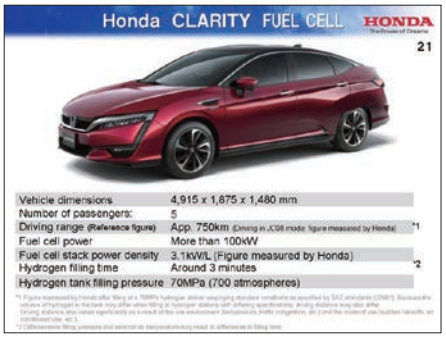
New stack compactness achieved 33% smaller than previous one.



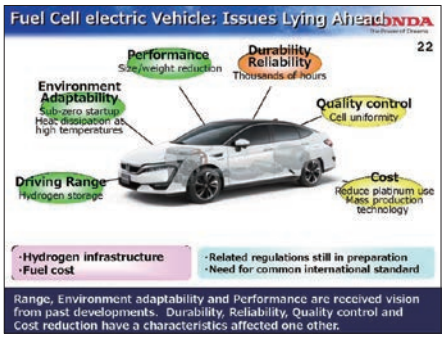
Fuel Cell Power Train is integrated between BOP, Voltage control unit and driving motor. Turbo compressor is used for increasing air pressure. Driving motor integrated power control unit is redesigned for decreasing the height. And voltage control unit installed SiC is located on the fuel cell stack.



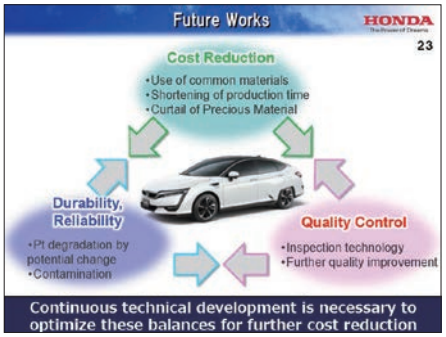
This is size comparison between fuel cell powertrain and V6 engine. Fuel cell powertrain achieve almost same size of V6 engine.



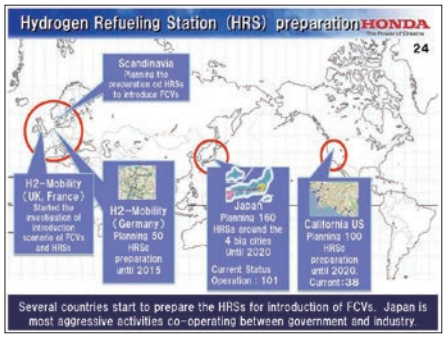
This is the main specification of clarity fuel cell. 5 adult passengers can seat comfortable by fuel cell power-train installation under hood. And approximately 750km driving range is achieved by 70MPa hydrogen storage. Of course, hydrogen filling time is around 3 minutes.



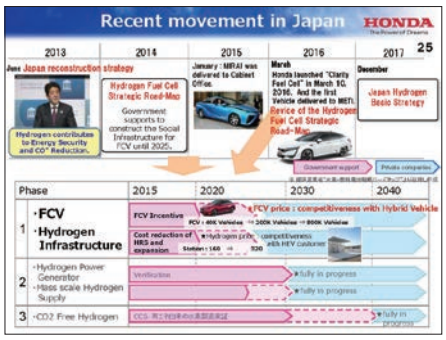
If we consider other crucial issues relating electric vehicle based on fuel cells, why we have achieved certain results, there are other questions, which are required, which are part of the whole by themselves. We need to connect electricity providers.



FCV still need to overcome many issues before they can be considered a commercially viable alternative. While we have achieved a certain level in these green items. And the other items are required extensive work continuously. Apart from the vehicle itself, we also need to involve energy suppliers in order to build the required refueling infrastructure.

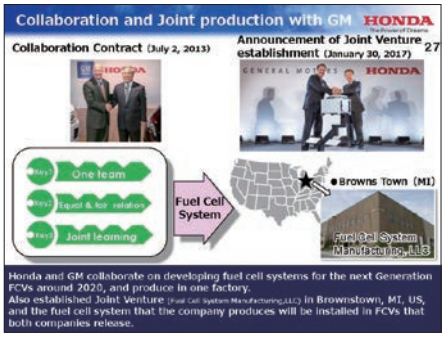


This is Hydrogen Refueling Station deployment situation all over the World. In US, only California state increases the Stations for preparing the infrastructure for FCV. And in Europa, many countries start the preparation of hydrogen stations. Germany established the company for Hydrogen station named H2-Mobility for acceleration of this activities. Japan is most aggressive activities for preparation. And established the similar company of H2-Mobility in March 2018. named JHyM. And current 101 stations are operating.

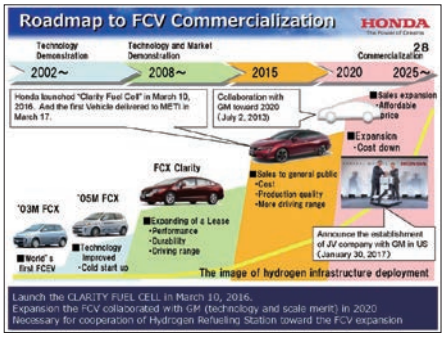


I like to explain recent activities in Japan. In 2013, Prime minister Abe announced the importance of hydrogen for energy security. And ministry of Economy, Trade and Industry (METI) issued the hydrogen and fuel cell road-map in 2014. And Japanese cabinet approved Japan Hydrogen Basic Strategy in December 2017. Numerical targets for FCV and Hydrogen Station are set in this road-map. And this road-map is indicates not only FCV targets, but also mass market introduction for base load contribution.

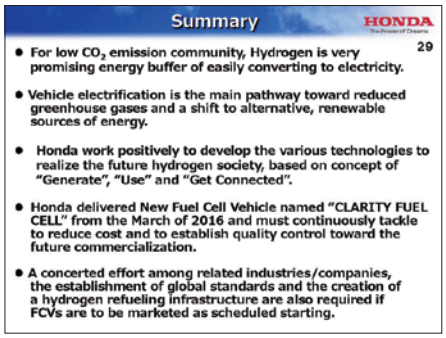
New "Hydrogen Council" launched in January/2017 at Davos. Collaboration and promotion of Hydrogen related activities among global industries are also important. And current participants are 38 companies. Depending on the Vision toward 2050, energy demand will be covered by CO_2 free hydrogen. CO_2 will be reduced to 6Gton,, economy of scale will reach $2.5 trillion and Job creation will be around 30million.



Honda and GM collaborate on developing fuel cell systems for the next Generation FCVs around 2020, and produce in one factory. Our development policies are one team, equal & fair relation and joint learning. These policies are very important for a successful collaboration.



Regarding the perspective of Fuel cell commercialization, we will be addressing cost reduction for FCV expansion. And also addressing realization of competitive hydrogen price as the expected business opportunity for the future.



This is summary. Hydrogen is very promising energy for low CO_2 emission community. Vehicle electrification is the main pathway toward the future. Honda works hard toward the hydrogen society based on concept of "Generate", "Use" and "Get connected". Honda continuously tackle to reduce cost and to establish the quality control. And in order to expand FCV, we need hydrogen station preparation and harmonization of Global standard.

This is our global environmental slogan. "BLUE SKIES FOR OUR CHILDREN" We believe this is very important message.

Thank you for your kind attention.

Session 3

Future technologies for a sustainable society

Human resource development for industrial structure transformation

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Candidate of Biological Science

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Professor of Okayama University, Doctor

Dr. Zhumabek BAKHOV
Director of Scientific and Educational Center of Agroecological
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Dr. Hiroto Yasuura
Vice President and Professor of Kyushu University

Dr. Kuralai KARIBAYEVA

Director of Institute of Ecology and Sustainable Development, Candidate of Biological Science

Session 3

Future technologies for a sustainable society

Human resource development for industrial structure transformation

GENETIC RESOURCES AND IMPLEMENTATION OF THE NAGOYA PROTOCOL IN KAZAKHSTAN

The Republic of Kazakhstan is located in the depths of the Eurasian mainland, in Central Asia. It occupies the central and southern latitudes of the temperate zone from 55026′ N up to 40059′ N and from 46005′ to 87003′ E. The length of the country's territory is 1600 km from north to south and 3000 km from west to east. It borders on Russia in the north and west, China on the east, Kyrgyzstan, Uzbekistan and Turkmenistan in the south. The population is 18 117 641 people.

In terms of the area of the territory (2.7 million km^2), the republic ranks 9th in the world and 2nd place among the CIS countries (after Russia). It is washed by two internal seas - Caspian and Aral. Most of the territory of Kazakhstan is occupied by deserts - 44% and semideserts - 14%. The steppe zone occupies 26%, forests - 4.6% [1]. The figure shows the map of the country's natural zoning.

Kazakhstan is insufficiently provided with rainfall, their quantity decreases from the North by the South. In a forest-steppe zone on average in a year 300-400 mm of rainfall drop out, in steppe their quantity decreases to 250 mm, in the desert - 100-200 mm. On the contrary their quantity increases in foothill and mountain areas from 400 to 1600 mm.

A variety of climatic conditions defines existence in the territory of Kazakhstan of a wide specific and

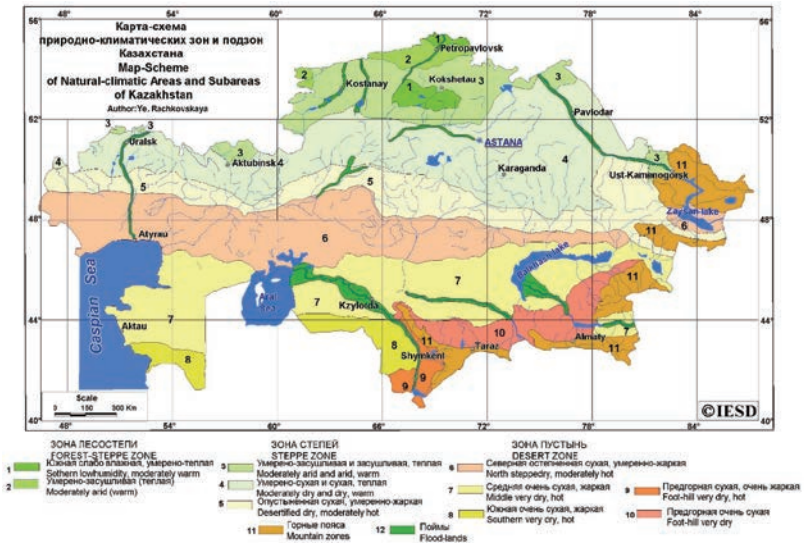

Fig. Map of Kazakhstan's natural zoning

intraspecific variety of a plant and animal life.

Genetic resources of flora. The plant world is represented by 5,754 species of higher plants, about 5,000 species of fungi, 485 species of lichens, over 2000 species of algae, and about 500 species of bryophytes. In the modern flora of Kazakhstan, there are 68 species of tree species, 266 species of shrubs, 433 species of semifrutex, 2,598 species of perennial and 849 annual grasses. Kazakhstan has a high level of endemism of plant species - up to 14%. The list of rare and endangered species includes 387 plant species [2].

A special group consists of wild plant species that are related to agrobiodiversity and are of value for the development of agriculture and the export potential of the country. This is more than 210 species of wild plants that determine the genetic potential of 24 agricultural plants. Some of them, such as Asian wild apple (Malus sieversii) and common apricot (Armeniaca vulgaris) are the progenitors of agricultural varieties that are of global significance for mankind. Others are relatives, used in breeding or potentially significant for breeding work in the future.

In Kazakhstan, the northernmost areas of the ranges of these species are located, which causes the presence in their genetic structure of resistance to adverse environmental factors (winter hardiness, drought resistance, unpretentious to soil conditions) [3].

The southern and south-eastern regions of the Republic are included in the territories designated by N.I. Vavilov as the center of origin of three species of wheat Triticeae aestivum L., T. compactum Host, T.sphaerococcum Perc. In general wheat (Triticeae Dum.) Are represented by 6 main genera, including 57 species. In the south of Kazakhstan, the progenitor of the cultured barley Hordeum spontaneum L. grows. These species are a valuable raw material that extends the inevitably limited genetic base of modern varieties of wheat and barley [4].

In the country grows more than 120 species of wild relatives of carrots, portolac, asparagus, onions and garlic. The flora of the Zailiysky Alatau (Northern Tien Shan) is a constant source of introduction of medicinal plants into the culture (13 species from 9 genera).

Important for breeding purposes can be the types of technical (flax - Lipit spp., Soflor - Carthamnus spp., Indau - Eruca spp., Prunes, mustard - Brassica spp.) and forage (lucerne - Medicago spp., Etc.) plants. Their gene pool has a high degree of tolerance and adaptability to stressful environmental factors - drought, heat, low temperatures and soil salinity. In all there are about 70 species belonging to 29 genera.

Among the perennial forage grasses, alfalfa became the most well-known. Its gene pool in Kazakhstan belongs to one of the richest centers – Central Asian, which is considered the primary source of alfalfa.

The importance of genetic resources of these species cannot be overestimated, since many of them are included in the list of food and feed crops important for the food security of the planet (Annex 1 to the international Treaty of FAO on plant genetic resources for food and agriculture).

Great prospects has a wide species and genetic diversity of floral and ornamental plants. In particular, of the 36 species of wild tulips growing here (18 of them are rare), at least one third are the genetic basis for the famous Dutch collection of their cultural varieties.

Genetic resources of fauna. 835 species of vertebrates, of which 178 are mammals, 489 species of birds (396 of them nesting), reptiles - 49 species, amphibians - 12 species, fish and cyclostomes - 107 species, represent the fauna of Kazakhstan. The invertebrate fauna is about 100 thousand species, of which insects are not less than 50-60 thousand. 93 species of animals, including 34 species of mammals and 59 species of birds, are hunting objects. Over

the past 10 years, zoologists have described more than 500 new for science and over 1000 new invertebrate species for Kazakhstan. The list of rare and endangered species includes 224 species of wild animals [4].

The population of Kazakhstan for various purposes uses a variety of animals: maral, mink, sable, fox, etc. The breeding-genetic potential of the ermine, marmot-bobak, muskrat, otter is promising, the processes of domestication are rather successful.

On the territory of the Republic live a number of species of vertebrates, which are classified as wild ancestors of domestic animals. Among the mammals are the moufflon (Ovis orientalis), the mountain sheep (O. ammon), the wild boar (Sus scrofa), the koulan (Equus hemionus), the jackal (Canis aureus), the wolf (C. lupus), the spotted cat (Felis lybica) and a number of others. Among the birds are duck (Anatidae - ducks, geese) and chicken (Gallidae). At the same time, such species of wild ornithofauna as mallard (Anasplatyrhynchos), gray duck (A. strepera), quail (Coturnix coturnix), pheasant (Phasanius colchicus), gray goose (Anser anser) can become objects of selection and genetic studies.

There are quite large prospects for breeding popular hunting species on farms: Otis bustard, Tetrax and Chamydotis, pheasants (Phasasnius colchicus) and other chicken.

Aquafauna is represented by 11 acclimatized and 28 local species. As a genetic fishery resource, local species are of interest: nelma (Stenodus l. Nelma), whitefish (S. l. Leucivhthys), grayling (Thymalus arcticus), taimen (Huso taimen), pike (Esox lucius), Caspian roach (Rutilus rutilus caspius), kutum (R. frisii), tench (Tinca tinca), barbel brachycephalus and B. capito, marinka (Schizothorax spp.), Balkhash perch (Perca schrenki).

Of amphibians and reptiles are important as a genetic resource, the types of poisonous snakes: vipers steppe and ordinary, Viper, Copperhead snake (Vipera ursinu, V. berus, V. libethina and Arkistrodon halys), and the types used in the traditional Oriental medicine: Semirechje frog tooth (Ranodon sibiricus were), East boa (Eryx tataricus), etc., as well as a variety of arachnids.

In the collections of scientific organizations of the country, according to data for 2015, a significant number of strains of microorganisms are stored, in particular: The State Enterprise "Republican Collection of Microorganisms" contains more than 418 collection crops; in the scientific organizations of the agricultural profile, there are 190 strains of microorganisms and viruses, 21 lines of cell cultures of production and control strains, 120 isolators of various fungi; The Kazakh Institute of Veterinary Medicine stores over 300 cultures of microorganisms; The Kazakh Research Institute of Processing and Food Industry contains more than 40 cultures of lactic acid bacteria, 30 yeast cultures and 22 strains of mycelial fungi.

Genetic resources of agriculture. More than 1000 varieties and hybrids of agricultural crops are cultivated in the agricultural sector, of which about 20% of the Kazakhstani selection. More than 70 varieties of cereals, 68 varieties of fruit and berries, more than 60 varieties of vegetable-cabbage crops, 23 varieties of potatoes are bred and zoned. In general, within the framework of studies covering the period from 1996 to the present, a gene pool of agricultural crops has been collected, which includes about 75,000 samples [5].

The genetic fund of grapes in Kazakhstan is more than 500 varieties, collected from almost all the viticulture regions of the world, of which 28 varieties were excavated by scientists of Kazakhstan. The collection of fruit and berry species exceeds 3000 varieties, forms and hybrids [6].

In the livestock industry, 17 breeds of breeding cattle are used, of which only 1 breed is local aboriginal (Kazakh white-headed), 6 breeds were imported and acclimatized in the mid-20th century, 10 breeds were imported after 1995. About 13 thousand heads of breeding cattle from the USA, Australia, Canada, Russia, Austria, Ireland, the Czech Republic, Denmark, Ukraine, France were imported until 2015 [5].

The importance of genetic resources in agriculture cannot be overemphasized, as the sustainability of

the variety, breed, crop growth and productivity requires a constant infusion of genetic resources. Thus, according to the US Department of agriculture, new varieties of crops are stable on average up to five years, and for breeding new varieties usually require 8-11 years. Half of the U.S. harvest over the past 60 years is due to such genetic improvements (Fuglie et al.(1996).

To preserve the biodiversity of rare species, ecosystems, landscapes, a national network of specially protected natural areas has been created and is developing in the country. To date, it includes 10 state nature reserves, 12 national and 3 national nature reserves, 5 state nature reserves, 5 state botanical gardens, 3 state zoological gardens and 1 state dendrological park, 5 state protected areas, 50 state nature reserves, 26 state monuments of nature. The total area of specially protected natural areas is 24.4 million hectares or 8.9% of the country's area, including 7.0 million hectares or 2.5% of protected areas with a legal entity status [7].

Given the above, the Republic of Kazakhstan can act as a supplier and consumer of genetic resources.

In this regard, the initiative of the Secretariat of the UN Convention on Biodiversity on the signing of an additional international treaty, which is the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Application to the Convention on Biological Diversity (adopted on 29 October 2010 at The 10th Meeting of the Conference of the Parties in Nagoya, Japan), was supported by Kazakhstan. The Republic of Kazakhstan acceded to the Nagoya Protocol in accordance with the Decree of the President of the Republic of Kazakhstan of March 17, 2015 No. 1025. The initiative to accede to this Protocol belongs to the Ministry of Agriculture of the Republic of Kazakhstan and its department - the Committee for Forestry and Wildlife, which act as coordinators of the Convention and the Nagoya Protocol in the country. They also supported the UNDP / GEF global project "Strengthening Human Resources, Legal Frameworks and Institutional Capacities for the Implementation of the Nagoya Protocol," with the technical support of the UNDP Office in Kazakhstan to assist the Government of Kazakhstan in implementing the provisions of this Protocol in the country. The Institute of Ecology and Sustainable Development of the Republic has a direct executor of this project on a competitive basis and has considerable experience in implementing international projects in the field of biodiversity conservation. The project is designed for 3 years (2017-2019) and will be implemented in stages in accordance with approved work plans.

In Kazakhstan, there are certain legal bases that should facilitate the early implementation of the Nagoya Protocol on the territory of the country. More than 20 existing laws are, to one extent or another, relevant to access to national genetic resources. At the same time, there is no legislation on direct action regulating the circulation of genetic resources in the country. A number of norms of the Protocol will require amendments and additions to the current legislation.

At least 3 republican ministries (Ministry of Agriculture, Ministry of Education and Science, Ministry of Health) are engaged in regulation in this area in the areas within their competence. The main problem is the lack of the necessary coordination between them, which can make it difficult to formulate linear management links to ensure the functioning of the national clearing-house mechanism for access to genetic resources and traditional knowledge relevant to genetic resources and an equal sharing of benefits from their use.

Serious consideration will be required in the study, selection and documentation of traditional knowledge. This issue can include both the experience of using different types of biological resources, technologies for their processing, food production, and folk healing, folk art, associated with genetic resources, and others. With limited time and financial opportunities, it is advisable to limit this field of activity to a certain scope that is possible for implementation by this project.

Certain difficulties arise with the preparation of the community protocols and agreements on access to traditional knowledge envisaged by the Nagoya Protocol. Local communities in Kazakhstan are not subjects of legal relations and owners of traditional knowledge associated with genetic resources. Such entities may be individuals and legal entities: local residents, farmers, peasant farms, entrepreneurs living in villages and other settlements under the administration of the state administration. World experience of using traditional knowledge in the field of genetic resources of indigenous peoples in the country is not applicable, since indigenous peoples and communities in Kazakhstan are absent. In this regard, the process of studying, documenting and establishing a legal mechanism for accessing this knowledge, obtaining benefits from their use by the holders of this knowledge, will require more in-depth study.

The existing terminology on access to genetic resources and fair and equitable sharing of benefits (ABS) will also require clarification, and possibly

adaptation, to the conditions of post-Soviet countries. In particular, the terms in the field of access and distribution of benefits, traditional knowledge and their classification, etc. In the official glossary (the most recent glossary of key terms related to intellectual property, genetic resources, traditional knowledge and traditional cultural expressions prepared by the Secretariat of the Intergovernmental Committee for intellectual property, genetic resources, traditional knowledge and folklore in January 2018), definitions and terms used in national and regional laws and draft laws, multilateral treaties, other organizations and processes, and also in dictionaries. In addition, the definitions are based on the working documents of the IGC, other WIPO documents and documents of other WIPO programs. Nevertheless, the proposed definitions are not exhaustive and other terms and definitions existing in the field that are close to the understanding of particular peoples and communities can be used.

Importance was given to the promotion and encouragement of research that contributes to the conservation and sustainable use of biodiversity. The Government of Kazakhstan to support the development of science established the Science Financing Fund, approved a list of organizations of scientific and scientific and technical activities that are subjects of basic financing. 3-year state grants for research are allocated on a competitive basis, as well as for funding targeted programs, including the biodiversity area. At the same time, biodiversity issues associated with bringing awareness and studying genetic resources, creating collections and genetic banks, documenting them require long terms of execution and financing, equipping an appropriate base for research and storage of genetic material with modern equipment, which will require the development of a special state strategy and programs for the long term.

This global project provides for the development of model treaty provisions and other documents provided for by the Nagoya Protocol for access and benefit-sharing, and a bioethical code for researchers and users of traditional knowledge. A number of activities are planned to widely inform and train owners and potential users of genetic resources and traditional knowledge, managers, representatives of the non-governmental sector and business.

It is envisaged that the implementation of this project and, in general, the Nagoya Protocol in Kazakhstan will help to ensure:

- increase of legal protection of the gene pool, genetic resources of the national biodiversity;
- conservation and sustainable use of national genetic resources, increasing the contribution from their use to the economy of the country;
- development of national research on biodiversity, study of genetic resources and selection of new productive and effective varieties and breeds;
- Equitable participation of owners and users of genetic resources and traditional knowledge in obtaining benefits in the form of cash payments (license fees, duties, etc.) and non-monetary benefits from sharing research results, transferring technology, equipping laboratories and production facilities with scientific and technological equipment and techniques , information support, additional education, participation in joint publications and applications for patents, etc .;
- obtaining equitable access to genetic resources and the results of research works of other countries participating in the Nagoya Protocol.

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Dr. Mitsunobu KANO

Professor of Okayama University, Doctor

Session 3

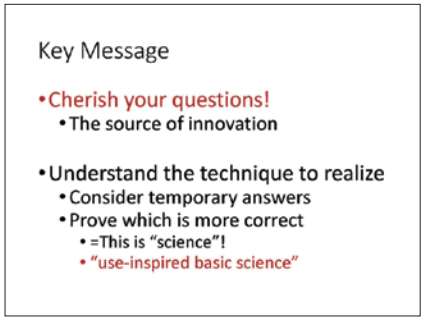
Future technologies for a sustainable society

Human resource development for industrial structure transformation

Express and implement your creativity in social challenges: by utilizing the scientific thinking

Thank you very much. I would like to express my sincere appreciation for your participation and also your endurance to be awake after the greatly delicious lunch. Today I wish to make my talk for all those who are struggling with issues and all those who are fostering younger people.

My key message as a headliner is: the importance of cherishing your questions. What is the meaning to have the diversity in human beings?

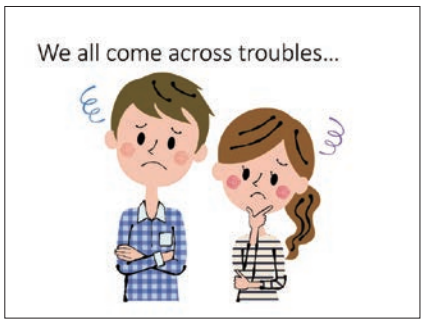


The previous speaker talked a lot about diversity.

I think that the reason why we need diversity as human beings is that the diversity is the source of the variety of ideas. Then how we can make the idea more accurate and also persuasive to other people?

To have more people collaborating with your idea: That's at least one purpose to utilize the scientific way of thinking. Science can be classified into three according to Pasteur's quadrant. In which the scientific activities are classified into three, from basic to applied science, and in addition, used-inspired basic research. The third category is the one that I'd like to emphasize in my talk today. Without this category of science, we cannot answer any of the issues regarding sustainability.

In this slide I utilized an illustration from a Japanese illustrator. We, Kazakhstan and Japanese people look similar and therefore I hope you may feel these illustrations very familiar.



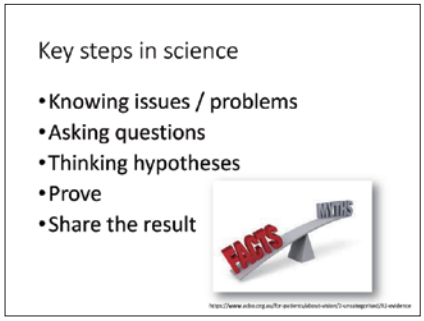
We are actually surrounded by a lot of trends not only sustainability issues, but also social issues as well,

maybe because our brain is structured to percept the world like that. Why we have that kind of troubles? What we can do? It would be better thinking of new ideas to overcome the troubles, not only complaining about them.

An addition from me, as a scientist, is that we need reasons for our new ideas. Without the reasons, one cannot be convinced about the argument of new ideas. New ideas without enough reasoning may be, sometimes, harmful for you. Imagine a gram of white powders, said to be effective for any diseases, even for terminal cancer. Would you take it, if you suffered from the disease?

Only powders which are proven effective scientifically are used as your medicine.

So here are the steps of scientific thinking. First of all, we need to know issues and problems and then asking questions. These are the steps which I asked you to cherish.

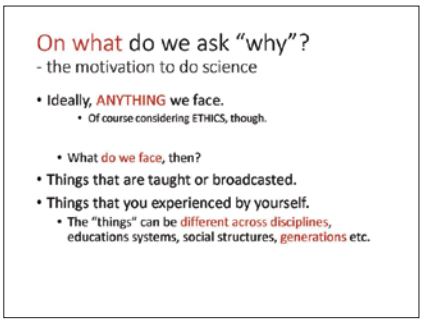


And then we may think about some temporal answers that are called "hypotheses". The next step is to prove one of them to be true.

So, the question is: "on what can we ask why?"

Well, the scientists may tend to ask questions in their own fields, so far. However, taking these sustainability related issues into account, what we need to know first should be the issues. Next comes to think questions out of the issues.

As an educator, I am also wondering whether we teach the kind of issues to the students. Well, in many cases, you may not teach so far.

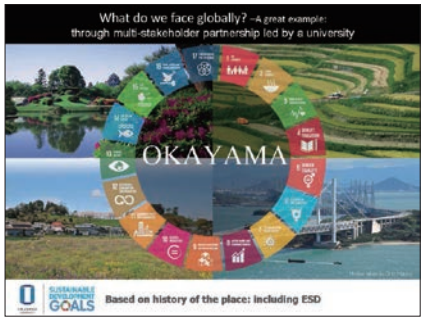


We tend to teach something already known. It is easier to teach what are already known than to teach things that we don't know how to deal with. If we teach the things we do not know how to deal with, the students may ask you what you think. In the case, you may not feel that you're a teacher anymore. But wait. Still, teachers know limits: issues you don't know how to deal with. This is an advantage to your students.

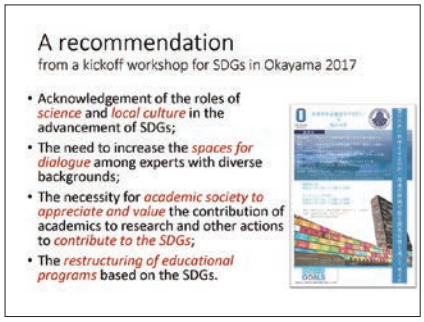
Here are some examples of what we do not know how to deal with so far. A great compilation of issues, called as the SDGs. In my university I'm promoting achieving the SDGs by answering these questions, as an institute.

This is really a challenge. It's never easy to involve today's ordinary scientists into this kind of activity because they are chasing different questions. However, the SDGs are the issues that we are facing

now. Therefore I hypothesize that we need to involve more people, not only faculties but also students, into solving these kinds of questions.



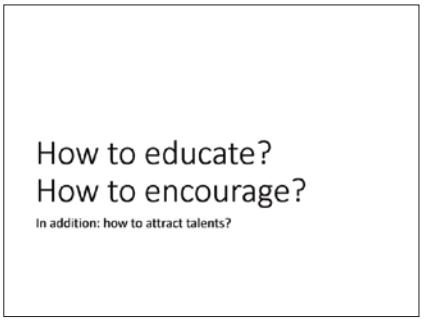
An advantage of my town to achieve the SDGs is that it is a place where the education for sustainable development (ESD) has been promoted already for 10 years. We started the initiative by holding a meeting on how we can deal with the SDGs in my university last year. An outcome of the meeting was a recommendation on the importance of having science and local culture to solve the SDGs, as well as a need of space for having dialogues of stakeholders across sectors toward achieving the SDGs.



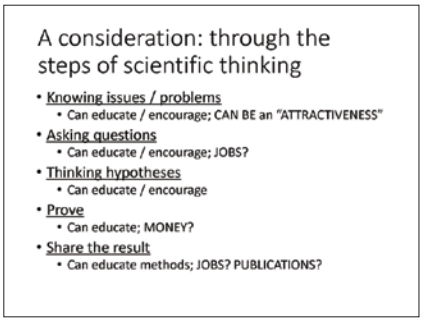
The academia may need to acknowledge the efforts towards the SDGs, in parallel to the current values in the sector. Of course, it is great if we could revisit how to educate through the SDGs. These were recommendations came out of the participants in the meeting.

How would you start today? Here are some examples from my university. Let me share one of the most prominent example in the light of achieving the SDGs.

An institute in my university has been gathering seeds of barleys for decades. Various biodiversity has been discovered in the collection of seeds. A seed was then found to be quite endurable with the high concentration of salt. The seed was tested in the area suffered from tsunami, including salt as sea water, in the severe earthquake in 2011. And it was proven to be successful to have crop! The story does not stop there. The crop was used to brew and commercialize a new label of beer. It is possible that people, who have been storing the various kinds of barley seeds, may not be so aware of that kind of meaning of the collection. But actually it resulted in a progress in the food security.



My next question is how to educate and how to encourage people involved. The question is extended toward how to allocate money to the people.



By going through the steps of scientific activity I mentioned earlier, I'd like to discuss about my question.

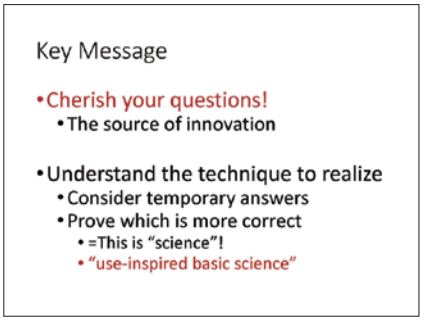
The first step: "knowing issues and problems". How can we educate it? How can we encourage people to know the issues?

An idea of mine for this step is that the issues around you can be an attractiveness to some kind of people who love to solve problems! If you have some fields which is full of issues and problems that you can challenge, consider to utilize them as a source of attractiveness. For all those who are from Kazakhstan in the audience, you may wonder how you can develop your country more. This challenge can be an attractive experience if you have a lot of issues that you needed to solve. And if you can be successful in that, you would become very influential in your country. You can attract talents from all over the world by this point of view.

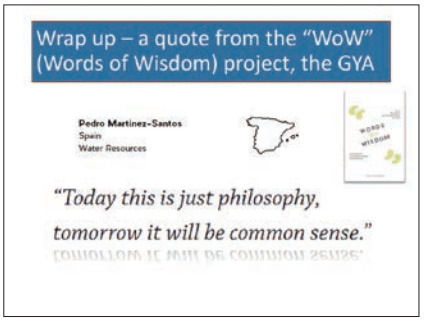
The next step is to "ask questions". How we can encourage people to ask questions? It is worth considering we are living in a social norm in Asia, or Eurasia, which may not encourage you to ask questions. We also tend to have people who only think of one hypothesis for their questions, but that's not good at least from scientific point of view. We need multiple hypotheses to reach a more suitable answer.

The proving step needs money. You may need experimental facilities or people to collaborate with you to gather data. If you have only limited amount of money, you need to choose some proving activities. How can we choose one? By what criteria? This is another set of pressing questions.

The step for sharing results, in other words publishing papers and presenting in meetings, is already done greatly. But actually in terms of publication, there may be still a lot of issues to overcome. These include whether a work can be published if the work treats something which is not popular now, or if the work may seem premature to the experts because it treats some issues no one know how to deal with. Would you be able to find a right place to publish your work? These concerns we may face when we may do research on some issues related to the SDGs.



I now wish to close my talk with repeating my messages again: "cherish your questions". Please make questions, please. Your questions should be quite independent from those by others. This is a meaning to keep our "biodiversity". Also, how we can deal with that question is the scientific way of thinking. Let's make progress together!



Lastly, I wish to quote a phrase from a booklet entitled "words of wisdom" by the Global Young Academy (GYA), in which I had been a member. The booklet is an outcome of a project gathering "gem" phrases from mentors of the GYA members. In it, there is a good phrase shown here: "today this is just philosophy, but tomorrow it will be common sense."

I love this. I'd like to convey this message to you too. Thank you very much.

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Session 3

Future technologies for a sustainable society

Human resource development for industrial structure transformation

Energy priorities of industrial technology development strategy

In the context of sustainable development, economic definitions related to environmental priorities are widespread: "green economy", "green growth", "low-carbon economy", etc. Within this concept, the interests of the economy, on the one hand, and nature conservation, on the other hand, should be balanced and should be guided by a long-term perspective.

At the same time, innovative growth and the growth of an energy-efficient "green economy" that takes an important place in ensuring global energy security are necessary.

The development of the "green economy" is a priority and for the Republic of Kazakhstan today the main priorities in this matter are determined. For the transition to a "green economy", we must not only effectively manage energy wealth today, but also form the basis of our energy future through the development of new technologies, the correct management of energy flows.

It is no secret that energy is central to all actions to achieve the goals of sustainable development. The challenge is to find ways to balance between the growing demand for energy and the impact of energy on the natural resource base in order to achieve sustainable development goals.

Energy is considered as not only a driving force of technologies for processing natural raw materials, but also the basis for solving environmental problems, as well as socio-economic problems. Factors of sustainable development are formed based on parallel economic, social and ecological measurements.

Now, both internationally and within the UN system, a view has emerged that energy is an essential component of sustainable development for creating environmentally friendly economies, for countering climate change and for addressing crisis situations in other directions.

Rational use of energy is the basis for sustainable energy development of industrial technologies, as well as natural, socio-cultural and socio-economic processes.

The development of technologies affects the development of energy in three ways.

First, it determines the ability of the world's energy sector to meet the world's demand for energy while respecting environmental constraints.

Second, the technological factor has a decisive influence on the energy structure, determining the cost ratio in various energy sectors, the possibility of using different types of energy for both final consumption and primary energy sources.

And third, technological development not only allows to meet the existing demand for energy, but also has the opposite effect on it, forming new qualitative features and quantitative levels of demand.

If we analyze the processes of energy conversion in natural processes, we see that any ecological system exists and develops by exchanging with the environment substance, energy, information. At the same time, all ecosystems are in a quasi-stationary

state of dynamic equilibrium with the environment. With external influences aimed at breaking this equilibrium, according to the Le Chatalier-Brown law, opposing forces get excited in systems.

Now, let us recall the patterns of the passage of matter in trophic chains. Producers convert carbon dioxide and water, under the influence of solar energy, in carbohydrates - organic substances, which accumulate it in the form of chemical energy. In the process of transport of this substance from one living organism to another, by means of consumers, gradual depletion of high-quality energy occurs. Decomposers - detritus, which decompose the organic waste of natural processes, replace the trophic chains. Thus, in the natural processes waste is formed, which is processed and included in natural cycles, the amount of natural losses in which is from 2 to 6 percent.

If we had done the same analysis with respect to, say, mineral raw materials with accumulated chemical energy, we would have obtained a roughly opposite picture. All this is connected, first of all, with the level of development of industrial technologies. Historically, the development of industrial technologies can be divided into three main stages.

The initial stage can be considered a long period from the first fire to the middle of the XIX century, during which people did not lack natural resources and did not think about the consequences of their activities. Gradually, with the emergence and development of technological production, deterioration of the quality of the natural environment began in the areas where industrial enterprises were located. Technological processes at this stage are completely open, production and consumption wastes enter the surrounding natural environment in unlimited quantities, and the violations of the ecological balance are of a local nature.

The second stage covers the middle of the XIX century and the end of the 80s, beginning of the 90s of the last century. During this period, mechanical and filtering devices were developed that limit the flow of pollutants into the atmosphere. Development of environmental protection technology. The designs of the devices providing purification of gases more than 99% and sewage more than 95% are known. As practice showed, these achievements did not lead to a radical improvement of the environment. This was due to the significant complication of industrial processes, as well as the additional application of considerable energy to the processes of cleaning and utilization of waste. At this stage, technological processes were still built as linear. They are characterized by limiting emissions by increasing the activity of filters without affecting the processes of waste generation. Protecting the atmosphere from emissions leads to the formation of toxic sewage, and the treatment of effluents - to soil contamination. The violation of ecological balance has regional, and sometimes global significance.

The third stage began with the 90s of the last century and its main purpose was the development of low-waste and resource-saving technologies, built in accordance with environmental requirements compatible with the natural environment. The general characteristic of this stage is the gradual restoration of the dynamic equilibrium of ecosystems through the transfer of industry to resource-saving technologies.

From this analysis it can be concluded that human activity, all anthropogenic processes, were aimed at the release and scattering of the associated energy of the natural environment, that is, they are the entropy generators, at a time when all processes in the biosphere are aimed at accumulating energy.

Proceeding from the foregoing, the following criteria can be singled out for the techno-resource and environmental efficiency of technological processes:

- Level of energy intensity
- Degree of use of raw materials (transformation into target products)
- Performance
- Degree of closed processes
- The level of harmful effects on components
- The environment

Also, the analysis allows to formulate the requirements for technological processes:

- Minimization the consumption of natural system resources;
- Isolation of resource flows within the system boundaries within 94-98%;
- Adaptation of technological processes (full nature of technology) to the resource base parameters (permissible technological capacity of the natural environment).

Assess the level of balance of natural-technical systems can be based on the thermodynamic analysis of the full nature of technological processes and the permissible technological capacity of the natural environment. We will return to these concepts because here it is necessary to note one more

problem. Assessment of pollution of the environment on the basis of regulatory legal documents is made by comparison with the sanitary and hygienic standards of MPC.

These standards have a strictly defined orientation to humans, and how does this ensure the safety of other representatives of the biota? Let us try, for example, to compare the permissible levels of air pollution with some pollutants for humans (maximum one-time MPC) and plants (table).

Table - Permissible levels of air pollutants by pollutants

Substance	Maximum One-Time MPC for human	MPC for plants	Multiplicity of excess
Sulfur oxides	0.5	0.02	25:1
Oxides of nitrogen	0.4	0.02	20:1
Ammonia	0.2	0.05	4:1
Benzene	1.0	0.20	5:1
	1.5	0.10	15:1

From the table we see that plants are more sensitive to pollution than humans. Therefore, rationing should reflect the stability of the whole ecosystem and for this, it is necessary to identify the most vulnerable species and their complexes from all three components of the biota (producers, consumers, decomposers).

MPC as a strictly sanitary-and-hygienic standard is developed for various natural environments (soil, water, air) and does not correlate in any way. Most importantly, standards based on MPC cannot correctly reflect the real environmental situation and are. Therefore, when it comes to assessing the technogenic load on the natural environment, additional criteria are needed that would allow us to assess the level of pollution of the natural environment on the basis of fundamental indicators.

In search for how to link environmental indicators with economic indicators, different attempts were made. And here the proposal of the French scientist R.Dajo about the introduction of a single "currency" for the analysis of any ecosystems, measured in calories, aroused special interest in scientific circles. In fact, this meant evaluating the value of natural resources not in monetary but in energy units.

The consequence of this was that scientists began to apply the methods of thermodynamic analysis, in particular its exergy method, in studies of the influence of technical objects on the state of the surrounding natural environment.

Based on the conclusions of such works and the results of our own research, we believe that the total nature of the anthropogenic core of natural-technical systems can be calculated as the amount of exergy for centripetal and centrifugal flows. Centrifugal flows determine the importance of anthropogenic load on the natural environment, and the reaction of the natural environment, manifested in the growth of entropy, is a function of this pressure. The magnitude of this loading can be calculated using exergy indexes: the total exergy attributed to a unit area or volume of the natural environment per unit time. As an indicator of the response of the natural environment, reflecting changes in the composition or state of biota components under the influence of anthropogenic load, one can consider the change in the entropy per unit volume of the medium.

In general, the resource saving and the way it is organized entirely depends on the level of selected industrial technologies and the characteristics of the devices. Resource saving is the main factor in ensuring dynamic equilibrium and stability of natural-technical systems. Therefore, the main tool for optimizing the functioning of natural-technical systems in conditions of intensive technological development first must be a technological process.

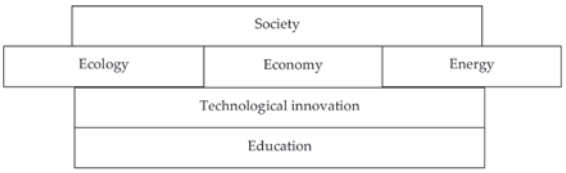
This provision in its essence can be qualified as the basic law of applied ecology, which determines:

- The place and responsibility of the technical sciences in the protection of the natural environment,
- The role of technological processes as a tool for resolving the contradictions between ecology and the economy.

Scientists of the Mexican oil Institute Ricardo Rivera and Roberto del Rio proposed a model that guarantees the continuous sustainable development of mankind in the future. It is based on the harmony and internal interrelations that exist within the Energy-Economy-Ecology-Education model. The essence of the so-called "4E" model = Energy-Economy-Ecology-Education) is that energy and ecology are related by the appropriate use of technological innovations (Figure 1).

In the proposed paradigm, the concept of energy symbolizes simultaneously effective, rational and ethical transformation of renewable and non-renewable energies; as well as the transformation of materials, which is intended for responsible, deliberate and indispensable industrial development not only of energy consumers, but also of the external environmental environment and society, of which industry is an indispensable element.

Figure 1. A new paradigm based on the model of sustainable development "4 E" (Energy-Economy-Ecology-Education)



This concept requires that the industrial system be analyzed not in isolation from the outside world surrounding it, but in harmony and interconnection with the entire surrounding world.

Speaking about the development of industrial technologies, we can say that these concepts have changed dramatically recently. Interactive models, which differ significantly from previous linear approaches, now determine the role of industrial developments, and take into account feedback effects between the different phases of the implementation of technological innovations.

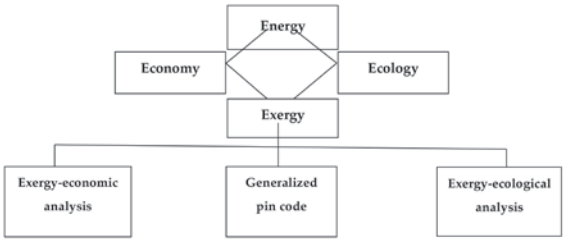
With regard to education, this concept should include not only the best formation of human resources, but also establish the ethics of energy use. At the same time education must remain the basis of all technological innovations.

In general, increasing the energy efficiency of industrial technologies is always regarded as one of the main scientific and technical tasks of managers, engineers and scientists.

Experience in the implementation of energy-saving programs in various industries shows that it is possible to receive up to 15% of savings from the activities of the first level, i.e. "saving energy," reducing losses, efficient operation of equipment, as well as increasing awareness of the need for energy conservation.

However, we need more economic and organizational measures of the 2nd and 3rd level, which require additional investments. We must be able to assess where and how energy reduces its value in industry, and find ways to avoid this. According to the second law of thermodynamics, energy has the property of decreasing its value. The interconnection of the triad "energy-economy-ecology" and the role of exergy in ordering this system you can see in Figure 2.

Figure 2 - The role of exergy in the ordering of the system "energy-economy-ecology"



In the face of the challenges of sustainable development, this has led to two significant changes in energy policy at the international level.

The first change concerns the need to consider not only the amount of energy when its consumption is optimized, but also its quality. This change was triggered by the energy crisis of the 1970s, when the energy-economy relationship was discovered and the first Energy Conservation Programs were created.

The second change relates to the need to stop the environmental deterioration caused by the increase in the consumption of fossil fuels while ensuring continued development. This change was initiated by the recognition of the energy-ecology bond.

In conclusion, we note that, in conditions of sustainable development, the technological strategy of industry can be supported by research and development in two main directions:

First, the technological development of methodologies through the inclusion of exergy analysis in existing tools for modeling, analysis and optimization in order to: conduct ex-economic and exergy-ecological research to establish the level of inefficient use of energy and determine their economic consequences and assess their environmental impact.

Second, the technological development of expanded exergy systems, such as: processes of heat pumps and systems of heat exchangers, and stations based on renewable energy sources, etc.

Annotation

The report examines the issues of rational energy use in industry, the priorities of technology development, taking into account the new requirements for the use of energy. A significant role of the correct distribution and management of energy resources in the development of the "green economy" was noted.

A special place in the report is allocated to the fact

that in improving the regulatory framework for environmental impact assessment it is advisable to rely on fundamental indicators such as “waste exergy”, “exergy loss”.

The model “Energy-Economy-Ecology-Education” is analyzed, aimed at the continuous sustainable development of mankind in the future based on the harmony and internal interrelationships of the system.

The technological strategy of the industry in the future can be supported by research and development in two areas, such as the technological development of methodologies by incorporating the exergy method of thermodynamic analysis into existing tools for modeling, analysis and optimization, technological development of expanded exergy systems.

Dr. Hiroto Yasuura

Vice President and Professor of Kyushu University

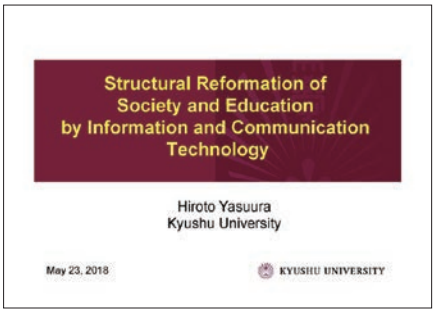
Session 3

Future technologies for a sustainable society

Human resource development for industrial structure transformation

Structural Reformation of Society and Education by Information and Communication Technology

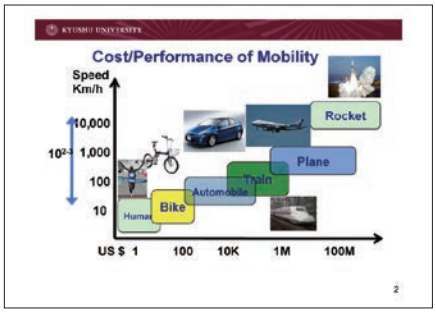
It is my great honor to be the last speaker of the symposium. And my thought—just the direction of our activities especially for education in university. Information technology is changing very, very quickly.

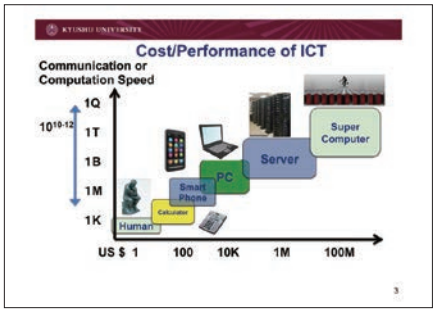


My background is computer science.

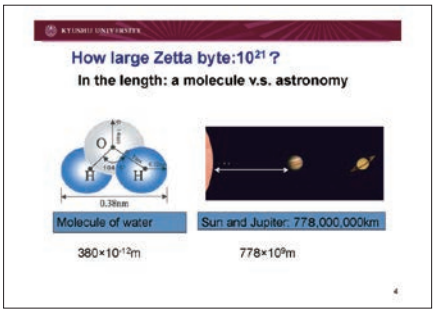
Progress of the information and the communication technology are being made and a super computer of 30 years ago is just in your pocket now.

The very rapid cost down of the devices and services has been occurred by the technology which has changed in your daily life.

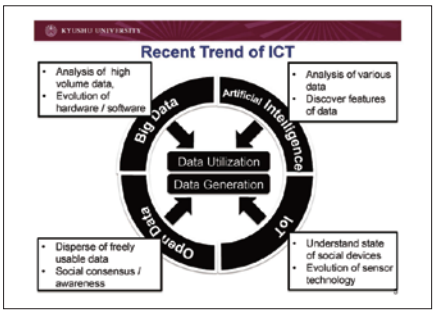




Compare with another technology, just compare with mobility technology. So we can walk just 4 km per hour, only having one bottle of water and if you pay the several hundred million US dollars, you can get an airplane. But the speed of the airplane is at most 1,000 km per hour. Only 250 times faster, but ICT field, if you pay hundred million times larger, you can get 10 to the 10th or 10 to the 12th power of performance. It's a crazy technology.



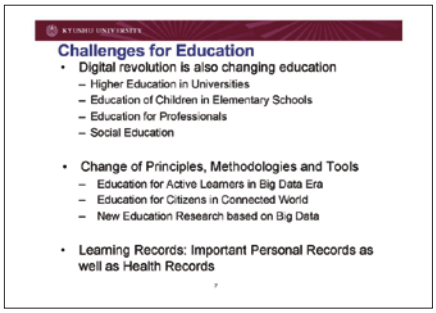
So first you should understand the how crazy technology ICT is. We use the big data. Every year we can generate one Zettabyte of data in the world. Zettabyte means 10 to the 21st. It's just a, in length, it's just the ratio of the diameter of the molecule of water and distance from sun to Jupiter.



So we are using the big data, AI, IoT, open data. To use these words are very easy, but you should understand how big power you are using. So ICT is the root of innovation now, so we should change education itself using ICT.

And another issue is university campus should be an experimental field for new technologies.

These are my message.

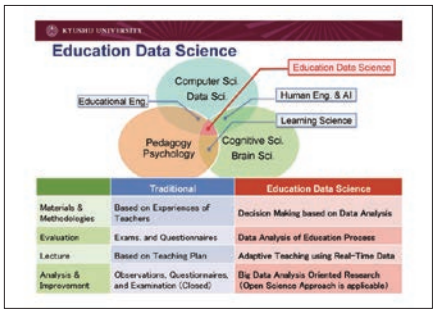


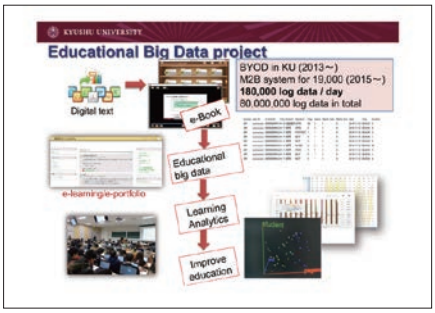
First one, how to change the education by ICT? We can check a little bit easily to change the education—higher education like university education. Maybe it will be introduced in the education for elementary schools and also for education for professionals like doctors, lawyers, or bureaucrats, and we can also use the technology for the social education.

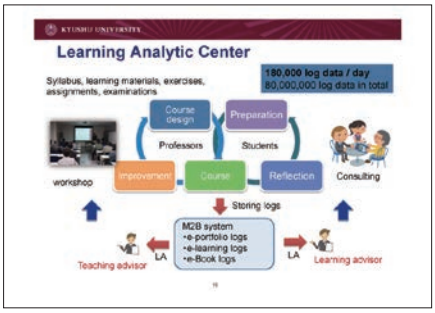
Now using the ICT, we are changing the principle and methodology. Education for big data era, that is one big issue. Students can easily get big data, even professor told this is a real data, they can get different big data through internet easily. And all citizens are connected to each other by SNS. So, we need new education research. And also learning record for yourself are very, very important as health care record.

So we are now attacking the new field of science named education data science. That is a combination of computer science and psychology and also cognitive science.

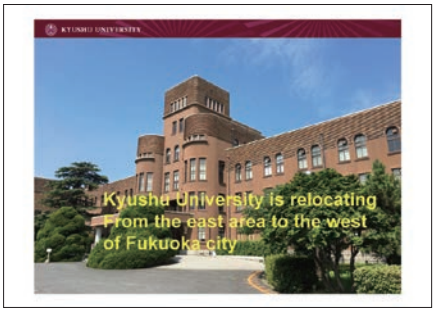
Combining these kinds of different areas, we should make a new science named education data science. For example, evaluation of a student, now we use the exam or questions like this, but we can use data analysis for the education process.







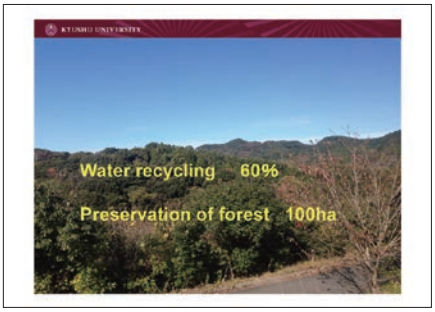
In Kyushu university, 5 years ago we started to BYOD, bring your own device for all students. So all students have their own PC and professors provide the text by e-textbook style so we can get the information which page, when students read and which part students mark and are learning. So we can get every day 180,000 logs of education process of all students.



And then using this big data, we can make technology of learning analytics. So analyzing the learning data, we can make new advices to students how to change their learning way, and also give advice for professors on their method of their teaching and their teaching materials.

And the second issue is using our campus as a test field for the new technologies. Kyushu universities is now relocated from eastern part of Fukuoka city, to the western part of the same city.

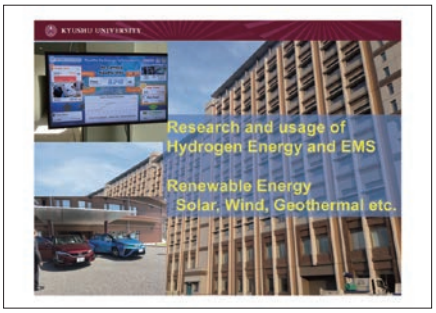
The new campus is very wide, 272 hectares, and we decided that this campus will be the model of smart urban development. Just like this city, Astana.



So first we started the ecological issue. We are recycling water, the university uses a big amount of water, but 40 to 50% water are recycling.

And we also decided 100 hectares out of the 272 hectares are natural preservation area, keeping the forest.

And second issue is the energy issue. Kyushu University is one of the largest research centers of hydrogen energy research. So we can combine the hydrogen energy and also energy management system. Of course, we just combined with the renewable energy, solar, wind and geothermal energies. And we also bought FCVs, one is Honda Clarity, and another one is Toyota Mirai. For using our FCVs and we also have the hydrogen gas station inside of the campus. And students can see what kind of power resources, energy resources now using in the campus on display monitors.

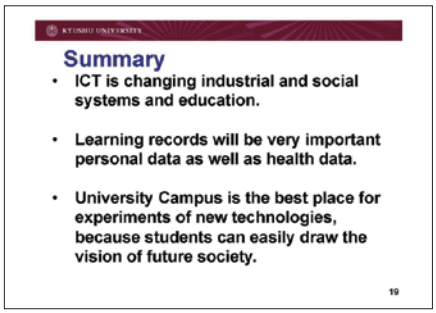


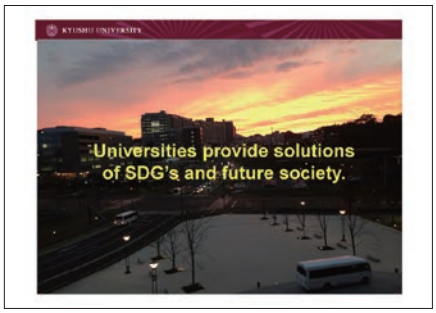
And we are also introducing the Smart card as a student ID card...of course teaching staff ID cards. So it can be used for room key, library, and e-Money, electric money and bus tickets, card controlled traffic gates, and many services for students. This is the issue of value and the right control on campus.

Inside of the campus is a private Zone, so I just talked with the police and to get permission that we can drive the automated driving cars inside of the campus. So Nissan and DeNA, a Japanese communication company just making several kinds of the new trial, are making experimental runs of automatic driving services.

We are using our new campus as an evolution for the technology and society test field.

As a summary of my talk, ICT is changing the industry and social system and education itself. Learning records will be very important personal data as well as health record, and the university campus is the best place for experiments of new technologies because students can easily draw the vision of future society.





Thank you very much for your attention and lastly, I will give you a message... “universities provide solutions of SDGs and future society. “

Thank you very much.

Wrap-Up Session

Science, technology, and economic development toward industrial structure harmonized with human and natural environment

Dr. Kasym ZHUMADILOV

Head of the International Department of Nuclear Physics, New Materials and Technologies of the L. N. Gumilyov Eurasian National University, PhD, Professor

Mr. Tateo ARIMOTO

Professor, National Graduate Institute for Policy Studies (GRIPS) and Principal Fellow, Japan Science and Technology Agency (JST)

Dr. Saltanat RAKHIMBEKOVA

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Wrap-Up Session

Science, technology, and economic development toward industrial structure harmonized with human and natural environment

The application of innovative technologies in the sphere of the use of natural resources

In the modern world, innovative technologies are developing exponentially. At the moment, there are assumptions about the innovative development of technologies for the next hundred years (1). At their core, the discussed modern innovative technologies have a trend towards achieving the needs of the modern world, both public and vital, directly affecting the individual in conditions of some uncertainty. Often, innovative technologies are associated with a huge number of problem areas and issues and directly with the subject of study and research. If we approach the very essence of the notion of modern innovative technologies, it is a novelty in the field of world technologies and solutions, both with a technical component and with regard to management processes including labor coordination, based on unique experience, recent scientific achievements and, of course, efficiency in the methodology. Innovative technologies are aimed at improving the quality of products and perfection of the production sector. The term innovative technologies implies not just something new or some unusual innovation, namely, that which is intended and has the ability and competence to drastically and seriously increase the effectiveness of any zone of responsibility. The introduction of innovative technologies entails the integrity of activities and organizational developments aimed directly at the development, production, operation and maintenance, and, if necessary, direct repair and restoration of the product or innovation with the most cost-effective work and, of course, nominal quantitative characteristics (1).

Natural resources are indispensable for the functioning of human societies and economies. They are the main source of most production processes and provide great energy for transport, light and heat throughout the world. Natural resources are distributed unevenly across countries and, therefore, are widely sold and can strongly influence the industry specialization of the country (2). Moreover, the management of natural resources has a huge impact on industrial development in the areas of resource production, as well as on global opportunities for the transition to sustainable development (3).

The main question is not whether the innovation and industry dynamics can be managed for development based on natural resources. It is based on the evolutionary approach to innovation and industry research that underpins this recent study to determine development based on natural resources as a process of structural change, when the expansion of the natural resource-based (NRB) sector is linked to the processes of innovation and enhancement competence within (from producers) and around (suppliers and users) and beyond (the redistribution of knowledge through diversification), the production of natural resources for ensuring long-term benefits for the national economy (3, 4).

The increase in the demand for energy has provided opportunities for increasing productivity and production through innovation. Large varieties of natural resources that are offered today for culinary and environmental purposes, expand the possibilities

of differentiation associated with natural resources and, as a result, innovation.

A significant change in recent decades has been the emergence of new technologies, such as biotechnology and nanotechnology, which increase the opportunities for differentiation and innovation in activities related to the natural resource-based industry. Natural resource producers include these new technologies in production, and this casts doubt on the notion of "low-tech" industries based on natural resources, and shapes and deepens links with other industries, creating new opportunities for diversification.

Multinational corporations increasingly use outsourcing of non-core functions at the local level and, through new forms of competition and resource nationalism, apply corporate social responsibility measures to increase transparency and interaction with local communities.

Innovative research and natural resources

Innovative research tends to work with the perception of the production of mechanisms for the development of industry. This is consistent with the views of early structuralists who had little opportunity for learning and innovation, as well as relationships in the relationship with the natural resource-based industry, which attributed the full development potential to production (3). It also agrees with historical catch-up research, which suggests that low-income countries have to imitate industrial routes that are being undertaken by high-income countries for development (3, 5).

Figure 1. Number of annual articles in research on innovative research in the field based on natural resources (NRBI), manufacturing (Manufacturing) and service (Service) industries (3).

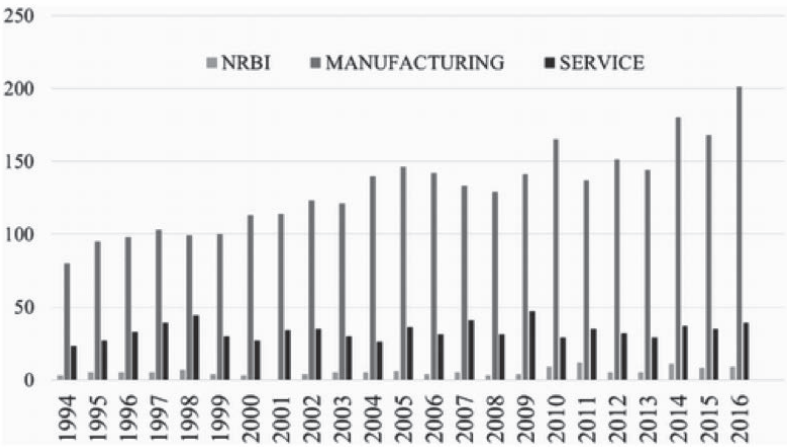

Figure 1 shows the growth dynamics of annual publications on innovative research. Most of the research belongs to the manufacturing sector, the smaller part belongs to innovative research in the field of natural resources. All this may be due to the rapid growth of scientific and technological progress in the manufacturing sector. But in general, growth is observed in all studies.

A limited set of key industries is central to industrial development in every era, it is understandable that researchers focus on the institutional and social mechanisms necessary to benefit from these industries. However, it is also clear that the dominance of such thinking, although extremely valuable, can create a blind spot on the path of innovation in an industry based on natural resources and theorize knowledge about innovation and development in relation to natural resources.

Dynamic perspective of development of natural resources

Following the evolutionary perspective of industrial development, one can not overemphasize the importance of adopting a dynamic view of natural resources. This view implies that natural resources are not static or absolutely finite, but rather expand and contract in response to changes in our overall knowledge base and our estimates of various resources (3, 6). In this regard, it is useful to distinguish between nature and natural resources. Nature is the theme of natural science and is connected with the physical universe.

Innovation and the importance of suppliers and users

First of all, it is well known that innovations do occur in an industry based on natural resources and we know that the properties of suppliers and professional users, and also how they interact with producers of natural resources and knowledge organizations, are crucial for innovation in an industry based on natural resources (3).

As one example of the introduction of innovative technologies: in South Africa, mining technology vendors have developed a low-radiation

imaging device, a full body for scanning miners for theft, for the diamond industry, which was later used in the medical industry and at airports (3 , 7).

Basic research, new scientific knowledge and new technological developments in several disciplines related to natural resources are crucial for innovation in the NRBI.

These are important problems for developing countries, which in many cases, because of the lack of development of their national innovation systems, are used to use foreign developed technologies and practices (3, 8).

Some of the strategies that have been important for development in countries that have grown on the basis of NRBI in the past may be relevant, but not all of them will include the immediate problems of the present. The management of natural resources and new industries arising from natural resources, such as biotechnology, requires new rules and institutions, which will require the development of the public sector's capacity to introduce rules and institutions that allow them to benefit from these sectors and protect the sustainability of these activities. Developing countries usually face problems in the development of such institutions (3).

In recent years, the mining industry has seen a significant increase in productivity through the introduction of innovative technologies and automation. The processes of extraction from crushing to mineral powder are automated. This is made possible by the integration of several operations into one intelligent steering system. This innovation is significantly increased due to the high capital intensity of the equipment. Innovations in the mining industry are characterized by creative adaptation of general-purpose technologies. These innovative processes are revealed in the links between mining companies and their suppliers and customers (3).

Conclusion

The interaction between the development of natural resources and innovation can lead to the creation of a new path in natural resources. From some evidence of the case, it was suggested that, due to local characteristics, new directions of innovations related to natural resources may appear. This can create important opportunities for innovation in developing countries that face huge barriers to entering existing industries dominated by developed countries that control not only technology but also institutions. It is necessary to continue research in this area to better understand whether there is an opportunity and what needs to be done to expand these opportunities. Management of natural resources and innovative technologies is of great importance for the desire of the world to move to more sustainable forms of production and consumption.

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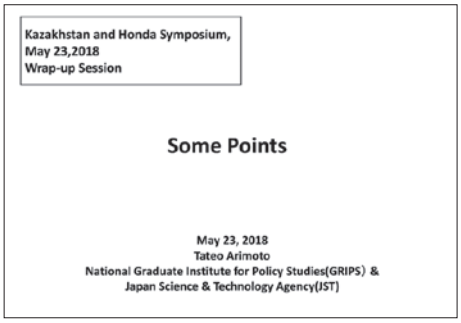
Mr. Tateo ARIMOTO

Professor, National Graduate Institute for Policy Studies (GRIPS) and Principal Fellow, Japan Science and Technology Agency (JST)

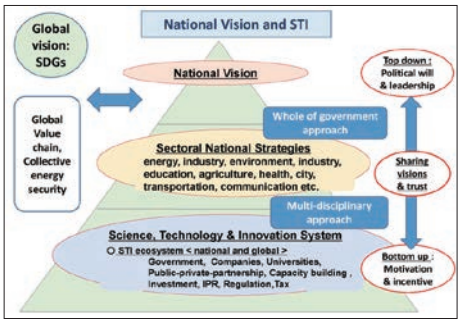
Wrap-Up Session

Science, technology, and economic development toward industrial structure harmonized with human and natural environment

Marketing, of course, is very different from cultures, so I'll show you the overall pictures. There are the Strategic Development Plan, Kazakhstan 2025, the SDGs global goals and the Japanese Society 5.0.



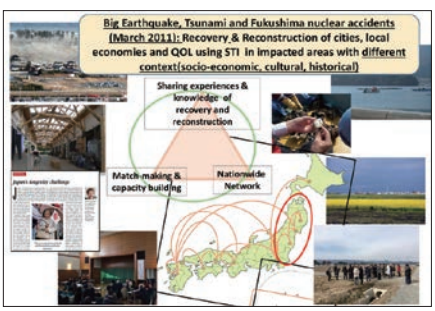
The National Vision. Today we focus on the energy policy, but energy policy is related to Sectoral National Strategies, but the whole government approach is also important. And science, technology and innovation systems are foundations. We need multi-disciplinary approach. We need not only physics and engineering science but also collaboration with the social science and humanities.



Left hand side is important. Beyond the boundaries of nation states, we are in the next generation of global vision SDGs. Global management and collective energy security. Right hand side, nation state system. Top-down is political will and leadership and also bottom-up is important.

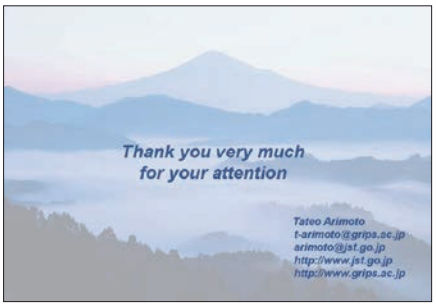
Between the top and the bottom. Technology, science, and education. We need shared vision and trust for the future. I point at this time that Japan can transform our society, industrial business models and activities by combination of social innovation and technological innovation.

Technological innovation and social innovation are very, very important. More than the public/private partnership and policies. Not only policies but also technology development are necessary. And finally capacity have been increased.



So another typical example Japanese history was seven years ago. The big earthquake, tsunami, and Fukushima nuclear accident happened. How to recover and reconstruct? Devastated and broken serious villages and local economies. The right hand side is fisheries industry and the agriculture industry, left hand side is housing.

Using science and technology, innovation technologies, and experiences, and expertise, this is important, different context, societal economic context, different culture historically different. Even within the Japanese mainland, impact daily, small village is divided in history.



Thank you.

Dr. Saltanat RAKHIMBEKOVA

Chairman of the Board of the Association of Legal Entities "Coalition for a Green Economy and Development of G-Global", Chairman of the Presidium of the Association of Legal Entities "International organization "EXPO & Women", Member of the Council on the transition to a green economy under the President of Republic Kazakhstan.

Wrap-Up Session

Science, technology, and economic development toward industrial structure harmonized with human and natural environment

Dear participants of our remarkable symposium. On this symposium, we saw that one of the leading countries is Japan who came here today together with the Kazakhstan party organized the symposium just one more time to emphasize the important trends.

We can see that in our countries we have adherence to the transition to the green economy. We have support of innovation green technologies so that our countries will be developed at the low carbon strategy in this region.

And on our session, we have demonstrated the leading scientific directions areas which are relevant for today. And that's why Dr. Bakenov, our speaker from Kazakhstan party, talked about the prospects of low carbon energy that the batteries actual for today as well.

And all these researchers are very important and Nazarbayev University works out with doctors, with students, with master students in the center as they work out these issues and it's very important when we say thank you to our speaker who showed us the achievements.

The second speaker was Mr. Azimbayev. He demonstrated how business realizes these green technologies.

And those pictures demonstration facilities subjects, we have information about it. How the reproduction of rice for panel PV is important and this is a prospect for implementation of this technology into our economy.

Both speakers, in my opinion, demonstrated the achievements of Kazakhstan party in this field. And I've not had to emphasize and to say thank you to the speaker from Japan, Mr. Takana who showed us researches of the international energy agency, how the world society—global society, achieved the results in prospect areas of technologies, and he came to the conclusion that one of the most prosperous prospects of technology is solar energy.

This is a huge dynamic on the reduction of price allows us to say that majority of our countries if you talk about the achievements of results, they can rely on these technologies.

Technologies in the field of renewables. And we shall stack on solar energies as well and it's great prospect.

Thank you very much.

Dr. Bakhyt YESSEKINA

Member of the Board on the Transition to Green Economy under the President of the Republic Kazakhstan, Director of the Scientific Educational Center "Green Academy", Doctor of Economy Sciences, Professor

Wrap-Up Session

Science, technology, and economic development toward industrial structure harmonized with human and natural environment

PARIS CLIMATE AGREEMENT AND KAZAKHSTAN

Paris Climate Agreement for the countries-participants of UNFCCC, including results of the COP-23 (figure 1) is a universal strategy in addressing issues of climate change and sustainability of the national economy.

Prospect of a new agreement for the economically weaker and vulnerable countries is related to the possibility of obtaining substantial financial support for adaptation to adverse effects and shocks of the elements, and for transition to low-carbon development through the reduction of greenhouse gas emissions, and the decarbonization of national economies. For most developed and wealthy countries, the agreement must allow optimizing their financial and technological role in the global effort. As for the less developed countries, but with a large carbon potential, such as China, Brazil, Turkey, the financial component of the agreement is secondary, since international assistance will be relatively small, or approximately the same, their assistance to the weaker states. These countries depend substantially on global trend on low-carbon development and to a large extent formed, especially China.

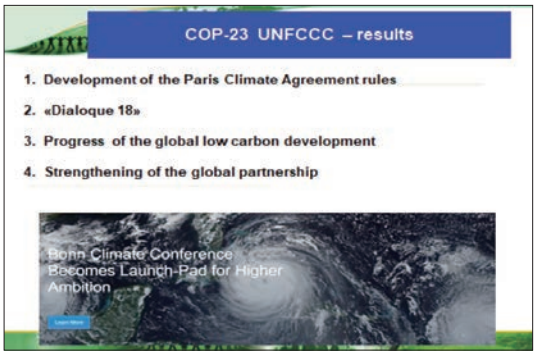


Figure 1

When speak about it comes to the countries of Eastern Europe, Caucasus and Central Asia (EECCA), the Transcaucasia countries Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan the Agreement should become a powerful factor of international support, Russia, Belarus and Kazakhstan to help participate in the global investment processes and encourage a deep modernization of the structure of the economy.

International experts identify at least three trends that the new agreement reinforces and enhances in the current process of preparation for ratification (figure 2). Firstly, the development planning of energy and economy, taking into account the probable changes in the years 2020-2040. In many cases, this leads to a wait-and-see position in the endorsement of international and national projects, while maintaining that the current situation would be cost effective.

Secondly, the "carbon price" that is being implemented or expected in the future (fees for emissions of greenhouse gases in one or another

stimulating or burdening form), which shifts the competitiveness of various projects and trade flows. This is demonstrated by the results of the bilateral meetings are the main emitters (China, US, EU and India).

Thirdly, a total trend on the choice of low-carbon solutions, if planning for 20-30 years of profitability, they are equal or not significantly more expensive than traditional. This is derived from the conclusion of the partnership and selection of investment options in almost all countries of the world, in public and private companies in all sectors of the economy.

Figure 2

As already noted, at COP21 each country presented their national commitments, which are a kind of a start to the policy of moving towards low carbon development and decarbonization of the economy. At the Paris Summit, the government delegation announced a contribution of Kazakhstan to hold the growth of global climate change - reducing greenhouse gas emissions to 2030 for 15% in 1990 level as an absolute and 25% conditional target. Kazakhstan's target to low carbon development were adopted by Order of the President of Kazakhstan N.Nazarbayev in November 2016.

To achieve these goals reducing greenhouse gas emissions the Government will have to undertake system work on deep modernization of the industrial sector and adaptation of all economic sectors, including energy, mining, agriculture and forestry, utilities, transportation, construction and other sectors, to already occurring climate change .

Without the implementation of pilot projects for the development of breakthrough low-carbon technologies in the next decade will be almost impossible to curb the rise in global average temperature by more than 20C. The world already has a wide set of successful technologies that enable economic growth while reducing emissions, improving environmental quality.

According to calculations conducted by international and national experts in the justification of INDC, Kazakhstan has sufficient potential for utilising new technologies in order to reduce emissions. Firstly, human capital is able-bodied, educated population (according to the latest UN report - 70% of the total). Secondly, developed scientific and technical potential, and thirdly, the country is actively developing alternative energy. The most effective technological solutions are: transition to a low-carbon or carbon-free fuels; decarbonization of electricity generation; the electrification of the economy and specific sectors (e.g. transport); improving the efficiency of production and consumption of energy; the technology of carbon capture and storage of carbon; the use of biofuels and other renewable energy sources. A special role is given to the task of maintaining and increasing absorption capacity of CO_2 in forestry and land use.

For an integrated analysis of the transition to low-carbon development, a scheme bellow was proposed, which represents a conceptual approach to selection of priority areas for the transition to a low carbon economy in Kazakhstan, as well as mechanisms for the implementation and support of the transition.

The potential of non-traditional renewable energy sources (RES) in Kazakhstan is $ 2 trillion. KWh/year. The power generation capacity exceeds consumption in the country and is about 337 billion KWh/year. At the same time, wind energy accounts for 322 billion kWh/year, solar energy - 4 billion kWh/year, small hydropower plants - 11 billion kWh/year. Technical potential of wind energy in Kazakhstan significantly exceeds the volume of consumption of fuel and energy resources of the country (figure 3).

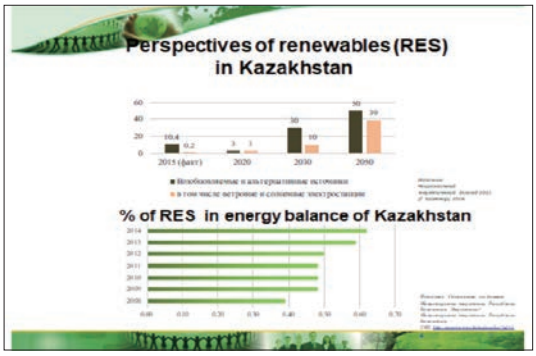


Figure 3

Implementation of projects for the development of RES will reduce the volume of construction of new generating capacities with coal power of about 200 MW, and, accordingly, to decrease in

future CO_2 emissions is not less than 1 million tons/ year. It should be noted that the main factor in the transition to a low carbon economy is to reduce consumption/burning fossil fuels containing carbon. Based on Analysis of expert predictions revealed that dependence on fossil fuels (especially under long-term contracts) will be significantly reduced, prices for oil, gas, and coal will be low and will not provide the payback on many energy projects, at the same time, the activity of companies that supply RES technologies will increase dramatically.

Thus, *the development of generation capacities based on renewable sources of energy* can be the most effective measure for reducing CO_2 emissions in the electricity sector. This is one of the most effective mechanisms of transition to "green" low-carbon economy in Kazakhstan.

The next priority is *to increase energy efficiency and conservation in all sectors of the national economy.* In this direction, it is necessary to improve energy-efficiency standards and their implementation, programs to subsidize businesses that install energy efficient and energy saving technologies. Prime step is the development of energy efficiency programs in industrial companies. Activities in this direction should include measures to improve the energy efficiency of buildings by electrification of the relevant processes and gasification the heating system, the transfer of vehicles from internal combustion engines to electric stimulation of the transition from private to public transport, etc. (figure 4).

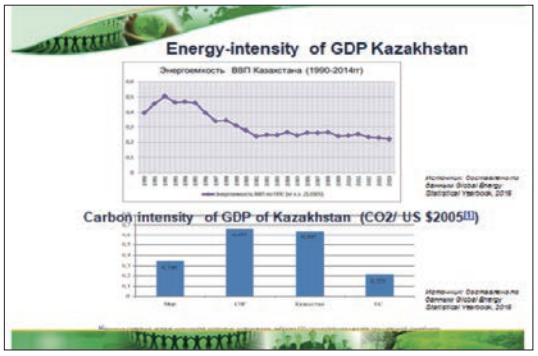


Figure 4

In order to achieve this goal, it is necessary to create conditions for the implementation and execution of the tasks and indicators of state programs to reduce energy and carbon intensity of industrial production. As figure 5 presented below enterprises of the all sectors must to start developing corporate strategies to reduce GHGs emissions and to take measures on modernization of existing production capacity.

Likewise, a great potential to reduce greenhouse gases in the atmosphere is forest fund of the country. Therefore, the basis of absorption of CO_2 the forest will allow the Republic an additional 10% on national contributions to emissions reduction (figure 5).

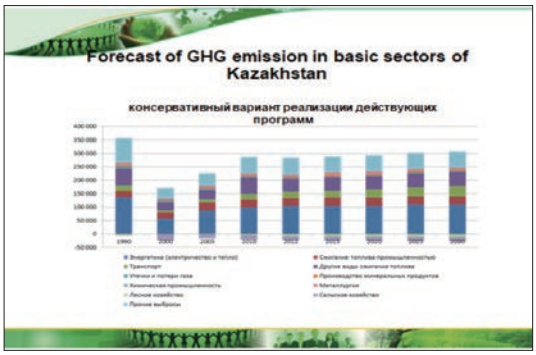


Figure 5

The instruments to stimulating of emission reduction of enterprises should be considered in the development of future low-carbon development strategy of the Republic of Kazakhstan in accordance with Paris Climate Agreement.

It is also necessary to develop relations and strengthen cooperation between international organizations such as Global Climate Fund, GEF, ADB which provides methodological and technical support.

Overall, transition to low-carbon development and decarbonization of the national economy of Kazakhstan proposes the adoption of drastic measures in the following areas:

- improvement of the institutional framework (adoption of measures and policies of adaptation of economic sectors to climate change; improvement of legislation in the sphere of regulation of emissions of greenhouse gases, etc.);
- energy efficiency and the introduction of new technologies (introduction of low carbon technologies in all sectors of the national economy, improving energy efficiency in buildings, transition to energy saving products, alternative fuels);
- development of renewable energy sources;
- capacity building (building skills of national experts and civil society in the field of low-carbon development, the development of cooperation with international organizations and global funds).

Sources:

1. Strategy of transition of the Republic of Kazakhstan to low carbon development in globalization, Institute of Economics, Green Academy, Astana, 2016-292c.
2. Implementation of the Green Bridge Partnership Program in terms of low carbon development transition.- Edition by Dr. Bakhyt Yessekina- 2017, 29 p.
3. https://cop23.unfccc

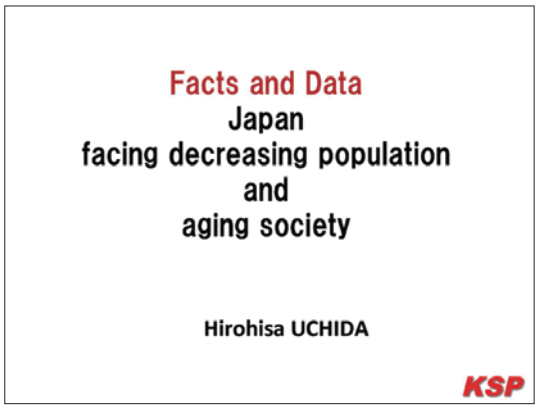
Dr. Hirohisa UCHIDA

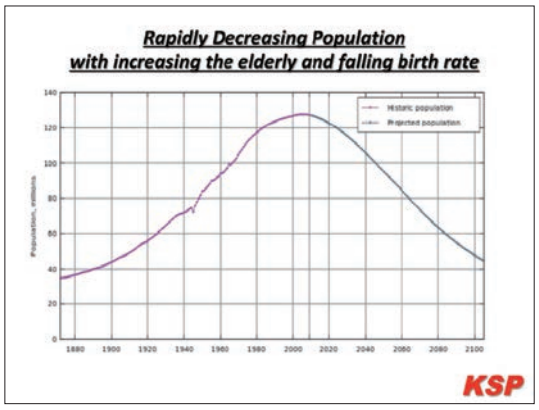
Professor, Department of Nuclear Engineering, School of Engineering, Tokai University

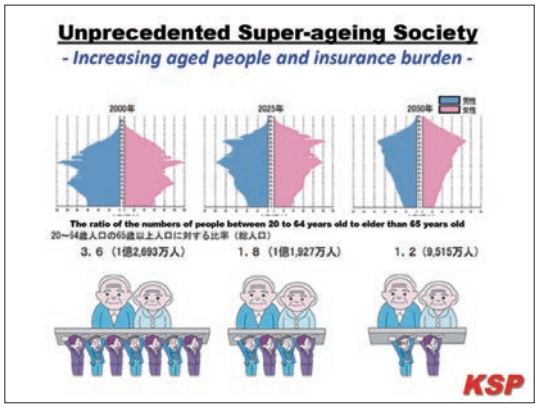
Wrap-Up Session

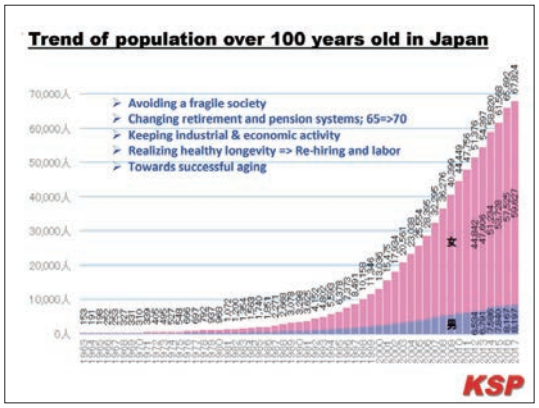
Science, technology, and economic development toward industrial structure harmonized with human and natural environment

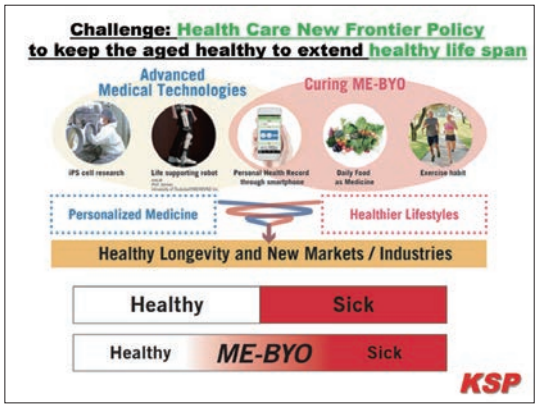
Thank you very much. I'll show you some interesting data. This is very important, I talked based on facts and data of Japan. Some things are very happy, but some things are very tragic.

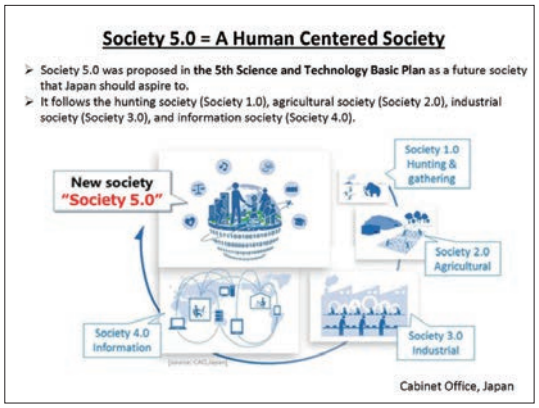












Society 5.0 = A Human Centered Society

- In society up to now, a priority has generally been placed on social, economic, and organizational systems with the result that gaps have arisen in products and services that individuals receive based on individual abilities and other reasons.
- In contrast, **Society 5.0 achieves advanced convergence between cyberspace and physical space**, enabling AI-based on big data and robots to perform or support as an agent the work and adjustments that humans have done up to now.
- This is a society centered on each and every person and not a future controlled and monitored by AI and robots.
- Achieving Society 5.0 with these attributes would enable not just Japan but the world as well to realize economic development while solving key social problems. It would also contribute to meeting the **Sustainable Development Goals (SDGs)** established by the United Nations.
- Japan aims to become the first country in the world to achieve **a human-centered society (Society 5.0)** in which anyone can enjoy a high quality of life full of vigor. It intends to accomplish this by incorporating advanced technologies in diverse industries and social activities and fostering innovation to create new value.

HONDA Foundation is aiming at

Human Environment Conscious Technology = ECO Technology

Cabinet Office, Japan

Closing Remarks

Dr. Kazuko MATSUMOTO
Senior Director, R&D, Vision Development Co., Ltd.

Dr. Amerkhan RAKHIMZHANOV
Deputy Director of the Library of the First President of the Republic of Kazakhstan-Elbasy, Doctor of Political Sciences, Professor

Dr. Kazuko MATSUMOTO

Senior Director, R&D, Vision Development Co., Ltd.

Closing Remarks

On behalf of Honda Foundation, I would like to take this opportunity to thank all the speakers for their valuable and stimulating talks in this symposium. I especially thank speakers of Kazakhstan, who kindly manage to attend this symposium in spite of their heavy duties in their offices. Their talks are so attractive and informative for us to understand the current situation of Kazakhstan in science, technology, industry development, energy, natural resources, and international exchange activities.

I also thank Vice president and people of Nazarbayev President Library, for their kind arrangement of the symposium, which is held in such a gorgeous grand hall.

Unfortunately Kazakhstan is not a close country to Japan geographically and in various human activities such as exchange of students, collaboration in scientific research, and industrial development. Japanese Prime Minister Shinzo Abe formally visited Kazakhstan in 2015, and Kazakhstan president Nazarbayev visited Japan in 2016. As these mutual visits show, more increased exchange and collaboration in science, technology, and development of human resource are expected in the near future between the two countries.

As a summary of today's symposium, I draw your attention to the following 4 items.

1. SDGs. SDGs are United Nation's goal to the welfare of the world. This goal needs balancing of economic growth and sustainability. Innovative technologies must be developed in order to realize SDGs.
2. Sustainable Energy and Natural Resource Technology. The technologies must be developed in accordance with suppression of climate change. In this regard, oil-producing country Kazakhstan and oil-importing country Japan seem to be in different positions. But we should find a way to continue exchange of information to advance better wellness of the two countries.
3. Legal Aspect and Management of Energy and Natural Resource. Management of these resources has to be considered seriously, in order to conserve precious resources and use them wisely.
4. Development of Human Resource by International Collaboration. As Japanese speaker Dr Taizo Yakushiji talked in the morning session, international collaboration in science and education is recently very much encouraged in Japan. I hope this symposium is an opportunity to let Kazakh people know about Japanese systems and organizations for such exchange of human resource.

Finally, I would like to name two Japanese people, who have been strongly influencing Kazakhstan.

One is the Japanese architect Kishou Kurokawa, whose planning and design of the new capitol city Astana won the international competition in 1998, and the city has been constructed according to his plan.

Second Japanese is the president of Nazarbayev University, Shigeo Katsu. It is a great honor that a Japanese person is selected as a president of the most prestigious University in Kazakhstan.

These two people have already committed so remarkably to Kazakhstan society, and I take this as a token that Japan is favorably and friendly welcomed by Kazakhstan.

Thank you very much for your kind hospitality.

Dr. Amerkhan RAKHIMZHANOV

Deputy Director of the Library of the First President of the Republic of Kazakhstan-Elbasy, Doctor of Political Sciences, Professor

Closing Remarks

Dear guests and participants of the International Symposium!

I am very pleased that the Library of the First President of the Republic of Kazakhstan-Elbasy hosted an event of such a high level in the building of the Nazarbayev Center.

Allow me once again to express special gratitude to the Honda Foundation and the Embassy of Japan in the Republic of Kazakhstan!

Everyone knows that the key element of the philosophy of the Honda Foundation is the harmonious synthesis of ecology (nature and the universe) and technology (humanity), devotion to protecting the environment.

For its part, the Library of the First President of the Republic of Kazakhstan - Elbasy, being a multifunctional institution, is open to dialogue with a view to discussing scientific and technical developments, the constant search for new ways of research, innovations and opportunities.

Allow me to express my gratitude to all the moderators and speakers of the symposium. These are well-known scientists not only in our countries, but also in the world. For example, Professor Zhumabay Bakkenov conducts research on lithium-sulfur batteries at the Tokyo Technological University, the University of Waterloo in Canada and the Nazarbayev University in Astana.

The appeal to the richest experience of Japanese scientists in the application of innovative technologies in the field of rational use of natural resources is of invaluable importance both for the world science and for Kazakhstan science.

Moderators of panel sessions will now sum up the results of the work, where the topics of scientific and applied nature were discussed. Dr. Kazuko Matsumoto, director of the Honda Foundation, will make a closing remarks.

Undoubtedly, the results of the symposium will contribute to achieving the goals of environmental protection, rational use of natural resources, increasing the contribution of science and technology to the preservation and prosperity of the environment, addressing both general social and general economic problems.

I propose to continue the practice of holding such international symposia on modern trends in innovation, economics, politics, and ecology. Thus, to provide an opportunity for scientists, researchers and specialists to meet and discuss the state and future of civilization.

Also, to make the bilateral relations initiated by the Elbasy Library and the Honda Foundation dynamic, I believe it is advisable to outline the cooperation vectors with the National Institute for Political Studies of Japan, the Graduate School of Political Science of the National University (GRIPS), Tokai University, Kyoto, Kyushu and other leading organizations in Japan.

I am sure that the symposium will promote mutual understanding and strengthening of friendly ties between our peoples and countries!

I wish you new scientific ideas and further prosperity!

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