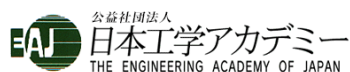


Survey Results on China-Japan-Korea Technology Cooperation



1. Introduction of the Survey

The National Academy of Engineering of Korea, Chinese Academy of Engineering and Engineering Academy of Japan conducted a survey on their members in July 2013 to investigate the status of technology cooperation among the three countries in green technology. The results were reviewed in the following months, September and October. Though it was initially led by the National Academy of Engineering of Korea, the three academies will take turns in investigating the perception and direction of the technology cooperation among three countries each year and share the findings. Among the total of 539 respondents, 151 or 28.0% were from Korea, 281 or 52.1% from China, and 107 or 19.9% from Japan.

2. Evaluation on the China-Japan-Korea Technology Cooperation Index

The technology cooperation index was produced by indexing the five categories - ① need for cooperation; ② expectations on the benefit of cooperation; ③ level of cooperation in terms of quantity; ④ level of cooperation in terms of quality; ⑤ future prospect, and calculating their arithmetic average.¹

The respondents showed high expectation on the benefit of cooperation as well as high need for the technology cooperation, but in the meanwhile the current quantitative and qualitative level of technology cooperation and future prospect were not evaluated so high as the above two. As a result, the overall technology cooperation index of the three nations was evaluated as 64.4 out of a perfect 100.

<Technology cooperation index by country and category>

	Need for cooperation	Expectations on the benefit of cooperation	Level of cooperation in terms of quantity	Level of cooperation in terms of quality	Future prospect and potentials
Korea	96.3	92.6	44.8	38.3	62.2
China	79.3	69.4	56.7	56.0	62.4
Japan	81.8	79.9	42.9	41.3	62.4

3. Cooperation on Green Technology

The following result was collected by asking the respondents about the area which needs the

¹ In the five categories, a "very positive" response, "mildly positive" response, "mildly negative" response and "very negative" response were given 100, 67, 33 and 0 points respectively and their average was calculated.

$$\text{Technology cooperation index} = \frac{\text{Factor 1} + \text{Factor 2} + \text{Factor 3} + \text{Factor 4} + \text{Factor 5}}{5}$$

most urgent attention in the areas of energy and environmental technology cooperation.

Across the general areas of energy technology, Korean and Chinese respondents selected "new and renewable energy" which is strongly related to energy production or supply and development of related industries, while those from Japan selected "energy efficiency."

The survey on the five categories of energy technology revealed the following findings.

First, in new and renewable energy, the respondents from all three countries selected "solar cells" as top priority. Second, in energy efficiency improvement, respondents from all three countries selected "industrial equipment and complexes". Third, in nuclear power generation, most of the respondents chose "nuclear power safety technology" as top priority based on the common perception regarding the need to secure technology to safely use nuclear energy.

Fourth, in electrical power, Japan, which has attempted to replace nuclear energy with thermal power after the Fukushima nuclear disaster, and China, the world's biggest fossil fuel user, selected "environmentally-friendly coal power generation", while Korea selected "smart grid (distributed power grid)" since it is aiming to improve its power supply efficiency based on its high competitiveness in information technology.

Fifth, in greenhouse gas reduction from fossil fuel usage, the awareness of the three countries varied. Korea selected the "environment-friendly (clean) energy development", China picked "substitution and combined use between/of fossil fuels", and Japan opted for "technology for improvement in thermal power generation efficiency," as their top priority.

Next in the overall area of environmental technology, all three countries unanimously picked "air quality" as the area which most urgently requires cooperation.

The survey on the eight categories of environmental technology highlighted the following results.

First, in air quality, Korea and Japan selected "reduction of yellow dust damage" as top priority, while China selected "reduction of fine dust."

Second, in sewage and waste water, Korea and China selected "reduction of sewage flowing into river, stream and ocean" as top priority, while Japanese respondents chose "factory waste water treatment."

Third, in drinking water, all of the three nations selected "securing and utilizing safe stream water" as top priority due to water shortage or concerns thereof.

Fourth, in solid waste treatment, China suffering from the side effects of rapid industrialization and Japan valuing environmental protection selected "factory waste treatment" as top priority, while Korea with a relatively strong emphasis on industrial growth selected "resourcization of waste."

Fifth, in soil protection and marine environment, all three selected "monitoring of soil contamination" and "prevention of marine pollution" respectively.

Sixth, in clean production, all three opted for "sustainable manufacturing" amidst growing social cost related to manufacturing.

Seventh, in environmentally-benign life-style, Korea and China sensitive in power supply selected "development of energy-independent houses and communities" as top priority., while Japan which traditionally stresses recycling and waste control picked "recycling and reuse."

4. Need for China-Japan-Korea Communication regarding Nuclear Power Generation, Green Technology Cooperation, and Obstacles of Cooperation

First, in the need for China-Japan-Korea communication on the nuclear power generation, Korea and Japan strongly feel the need for risk communication among the three nations, but in the meanwhile China is less aware of the need than the other two. That is, the Fukushima nuclear disaster raised keen awareness and concerns of Koreans as well as Japanese, while Chinese in general are less sensitive to the threats.

Second, in the green technology cooperation, Korea and China selected joint research and development as top priority, while Japanese believe that human exchange is more urgent. In other words, Korea and China focus more on practical cooperation while Japan strongly feels the need to establish mutual trust prior to the actual cooperation.

Third, in obstacles of green technology cooperation, all three pointed out the absence of mechanism for cooperation as well as limited awareness of the government and cultural difference. It can also be explained by the fact that no mechanism among China, Japan and Korea is established for the implementation of joint projects while bilateral projects between Korea and China or between Korea and Japan do exist. Culturally speaking, Korea is very fast in decision-making and more proactive while Japan is considered as less fast. China with socio-political backgrounds different from Korea and Japan is focused more on what is needed in the course of catching-up.

Member for 2013 Joint Survey Project

(Alphabetical order by Last Name)

	Chinese Academy of Engineering	Engineering Academy of Japan	National Academy of Engineering of Korea
Chair	Kechang XIE Vice President, CAE	Hideaki KOIZUMI Fellow of Hitachi Ltd. & Chair of the Committee on Int'l Affairs of EAJ	Kunwoo LEE Dean of College of Engineering, Seoul National Univ & Chariman of the Int'l Affairs of NAEK
Members	Xiangwan DU Former Vice President of CAE	Takashi IBUSUKI Managing Director of Japan Environmental Management Association for Industry	Youngsup JOO Professor, Graduate School of Convergence Science&Technology at Seoul National Univ
	Jiming HAO Professor of Tsinghua Univ	Shuichi IWATA Professor of the Graduate School of Project Design	Kyung Ho SHIN Director of Korea Institute of Science and Technology
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	Guofang SHEN Former Vice President of CAE	Nozomu MISHIMA Professor of Akita Univ	Doo Hie KIM CEO of Donga Science
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