11. Survey Results in “Urbanization and Construction”

11.1. Trends in areas of attention

11.1.1. Urbanization and construction technologies at momentous turning point

According to Isaac Asimov, the earliest engineer to be documented in history books is Imhotep, who is said to have designed the Step Pyramid. As this example testifies, architectural and civil engineering are the oldest and most prestigious technological disciplines, and have been constantly advancing over thousands of years, meeting the needs of the time using the latest technologies available in each period.

Recently, however, society's attitudes towards these time-honored disciplines have begun to change quite rapidly. In the past, the development of farmland and residential land through the reclamation of swamps, construction of embankments to prevent rivers from overflowing and the creation of flatlands by cutting into mountains were unconditionally praised as great and important enterprises. However, the recent trend is that various development projects throughout Japan almost invariably meet with protest movements. For example, the Isahaya Bay reclamation project faces passionate public opposition, and there are groups of people who are proposing a ban on the use of the Nagara River Estuary Dam, even after its completion.

On the other hand, there have been frequent incidents of civil work projects failing to achieve their goals despite their seemingly high standards, as examples such as the tunnel cave-in accident in Furubira, Hokkaido, and debris flow in Otari, Nagano, show. Technologies in this field are therefore now due for a drastic review, even in light of the fact that a sizable part of urbanization and construction projects is integrated into regional economic fabrics as government public works projects in Japan.

Based on the above perspective, as well as building on the accumulated know-how from past surveys, the questionnaires for the latest survey were prepared centering on four technological areas. The first area is the provision of greater safety and security. While this is the starting point of urbanization and construction technologies, further efforts are needed to ensure greater safety and security by introducing cutting-edge technologies. Partly due to the frequent occurrence of accidents during the survey period, respondents' interest centered on this area, with many topics given high degree of importance index scores.

The second area is response to environmental and energy problems, of which public awareness is rapidly increasing on a global scale. Recent developments include a change in the approach to river improvement projects from traditional straight-line concrete structures to the realization of meandering rivers that are more in line with the natural environment. Although respondents considered this aspect in their assessment of the topics, they generally did not seem to regard it a pressing issue, judging from the degree of importance index scores and forecasted realization times.

The third area is response to a mature society, an important issue for Japan as a country whose population is rapidly aging. While in the past urban spaces and architectural spaces were basically designed with only healthy and fit persons in mind, there is a need to change the spatial structure of the entire society, taking into consideration the rapid increase in the aged population in the future. Despite this, the perceived importance of the topics relating to this area was generally low.

The fourth area is cost reduction and quality improvement of projects. Due to the fact that technologies in this field are primarily designed to satisfy national or local needs and are therefore tailored to domestic conditions, the industry has been slow in responding to the need for internationalization. As a result, the level of competition in the industry is still inadequate, leading to high project costs compared to overseas projects. In the face of growing international competition, reducing costs while maintaining quality will soon become the essential survival condition for the industry. Nevertheless, a sense of crisis seems to be lacking among those concerned, judging from the fact that topics relating to technologies in this area were greeted with low degree of importance index scores and pushed-back forecasted realization times. As has been explained, this field encompasses the oldest technological disciplines in human history, but global-scale changes in social conditions now require a fundamental shift in its technological philosophy. It is hoped that in future technological development will be undertaken with this understanding in mind.

(Yoshio Tsukio)

11.1.2. Development of safe and secure urban spaces

The Great Hanshin-Awaji Earthquake and Tokyo subway sarin attack have shown that Japanese cities, which were until recently regarded as the safest in the world, could turn into dangerous spaces, and this made the restoration of that sense of safety an extremely important task. In the past, the Japanese approach towards safety centered on "hardware"-oriented preparatory measures with emphasis placed on the prevention/alleviation of disasters and accidents within the limits assumed possible. This approach, however, turned out to be almost useless in coping with disasters/accidents that exceed these limits or are totally unexpected. Against this background, the establishment of a total crisis management structure incorporating a "software"-oriented approach as well, particularly an emergency response system, has become an important task for the National Government, local governments, private companies, etc. For example, regarding earthquake preparedness, seismometer networks are being strengthened throughout Japan, and various organizations are engaged in the development of real-time earthquake preparedness systems, which, in the event of an earthquake, gather magnitude information from these seismometers and instantly carry out an estimation of expected damage, etc. Info-communications and other cutting-edge technologies are being vigorously introduced in the disaster prevention/preparedness area, and technologies such as the Internet, remote sensing, sensor technology and virtual reality are expected to play an ever greater role as component technologies that support the development of safe urban spaces.

In line with such social trends, six out of the seven topics with highest degree of importance index scores in the urbanization and construction field turned out to be from the "ensuring safety" category. Notably, this seems to be more a sign of high expectations for software-oriented disaster prevention/preparedness based on information systems (see topics 03, 04 and 11) than a result of lingering memories of the recent earthquake disaster. "13: Practical use in Japan of a demolition technology for commercial nuclear power plants", the topic with the highest degree of importance index score in the last survey, was again given the highest degree of importance index score in the latest survey. In terms of purpose-specific importance, "securing safety" was rated relatively high, with the scores of 16 topics classified in this category averaging 68.9.

In terms of future technological forecasts, too, hopes are pinned on topics relating to "safety", which represents the most basic social needs. Future important tasks in this field include the establishment of disaster risk estimation and preparedness systems for new urban spaces which have never experienced major disasters or accidents, such as super-highrise buildings and deep underground spaces. To create safe spaces, adequate consideration at the planning stage is necessary as a first step. While the importance of making the utmost use of human imagination is obvious, the development of new systems such as virtual-reality simulators that enable disaster education/training based on behavioral psychology through the virtual experience of disasters which have never been experienced will also be necessary. It is believed that a disaster monitoring system which can swiftly detect the outbreak or telltale signs of a disaster and issue a warning through the incorporation of the latest sensor and info-communications technologies should be developed on a priority basis. To put crisis management in place, an aspect said to be lacking throughout Japanese society, the establishment of an integrated crisis management system linked to information networks and databases is strongly desired.

(Fumio Yamazaki)

11.1.3. Establishment of environmental conservation and nature rehabilitation technologies

(1) Environmental conservation

Over the years, socioeconomic activities based on mass production, mass consumption and mass disposal have become entrenched, and problems attributable to population concentration in cities, such as air pollution, water pollution and skyrocketing waste generation, have come to the fore. On the other hand, in depopulated areas, the devastation of forests and farmland is advancing due to a decline in productive activities in these areas, raising concerns about increased risks for disasters and the destruction of the natural environment. These environmental problems are quite different from conventional pollution problems. Namely, instead of being attributed to specific toxic substances and geographically limited in terms of their impacts making the

establishment of causal links relatively easy ó they arise from the combined environmental load of daily activities of numerous organizations, such as private companies, and individuals, and affect wide areas, while also having an impact on the soil, air, oceans and other natural resources as mankinds common assets. To solve these problems, it is necessary to change the current socioeconomic systems and people's lifestyles and build a low-environmental-load society which makes sustainable development possible.

Environmental conservation requires answers to these questions: what are the natural ecosystems to be conserved? and what is environmental pollution?. From the viewpoint of coexistence with nature, when undertaking technological development, consideration needs to be given to the expected biological stress caused to each affected species due to the environmental (pollution) load placed on its habitat and cross-species impacts involving all living organisms including animals, plants and microorganisms as well as humans.

In terms of the degree of importance, most topics were rated medium to high. However, with the share of medium actually greater, the perceived importance shown in the survey does not seem to match widespread calls for environmental conservation.

Overall, topics relating to the urban environment are dominant. Regarding the gathering of environmental information and technological development, considerable progress has been made in recent years through both a microscopic approach, involving, for example, a soil microorganism monitoring technology based on genetic engineering techniques, and macroscopic approach involving remote sensing technology based on aircraft and satellites. In future, technological development is expected to make further progress centering on the following topics, accompanying mutual interaction between them: "17: Widespread use of various urban environmental information in urban environmental control in Japan" "23: Development of a technology that detects physiological changes in soil microorganisms and plants to measure the level of environmental pollution" and "25: Widespread use in Japan of development techniques aimed at coexisting with nature". Their forecasted realization times all fell in the 2010~2012 range.

(2) Energy conservation

Energy conservation is one of the most important tasks for Japan as a country with few natural resources, and must be tackled with both a sense of urgency and long-term perspective. Alongside resources conservation technologies, energy conservation technologies, such as the use of natural energy sources, centering on solar energy, waste heat recovery, cogeneration and other multi-stage energy utilization techniques, and the averaging of electric power consumption through heat storage will become a central R&D area for developed countries.

For topics 33~37, which relate to this area, medium was the most common degree of importance rating. Their forecasted realization times ranged as follows: 2008~2011 for 34. Practical use in Japan of a highly efficient heating and cooling system through a combination of solar energy and super heat pumps, 36. Practical use in Japan of a technology to store coldness and waste heat and utilize them for home air conditioning an 37. Practical use in Japan of distributed energy supply systems for houses (practical use of energy conservation technologies); and 2013 for 35. Widespread use in Japan of energy-self-sufficient buildings and houses.

(3) Resource conservation and recycling

As long as people pursue affluent lifestyles, there is mass consumption of resources, and technological advances expedite the sophistication and volume production of goods, leading to increased and more diversified waste generation The following are some of the problems we must all face in the near future: the exhaustion of oil resources, expected to happen within a few tens of years; diminishment of forestry resources, essential for global environmental conservation; shortage of waste landfill disposal sites, expected to reach capacity within several years; and soil pollution by pollutants such as oils/fats and organochlorine compounds, which threaten natural ecosystems. Therefore, identifying them as urgent and top priority issues, the Japanese Government and local governments have been working on the legislative framework for resource conservation, resource recycling, waste treatment/disposal and cleaning up of polluted soils, etc. in recent years, as well as engaging in active technological development.

All four topics relating to resource conservation and recycling except for topic 30 i.e., “29: Spread in Japan of community-based efforts to utilize unused energy sources etc., “31: Widespread use in Japan of technological systems for automatic separation of municipal waste into combustibles, metals, etc.,” and “38: Practical use in Japan of technology that facilitates the recycling of almost all construction byproducts”, were given a greater recognition of importance than other topics, with each receiving a degree of importance index score of around 80. Their forecasted realization times were all 2009. The adjustment of relevant regulations (relaxation/toughening/establishment/abolishment) has been identified as an effective measure the government should adopt in Japan, scoring about 50%, which is far greater than the scores of other topics, and this shows that a strong government legislative inducement is desired. For the realization of the above topics, reliance on regulatory controls is insufficient. Rather, the understanding and cooperation of each individual, as a generator of waste, is essential for resource conservation and recycling, as is the technological development to establish a simple system with a low labor requirement.

(Yoichi Nojiri)

11.1.4. Response to mature society

Japan is rapidly approaching an unprecedented aging society, and public opinion agrees that this has made aged welfare and disabled assistance issues that require urgent attention. At the same time, today’s trends towards diverse and individual lifestyles have led to sophistication in the quality requirements for urban and living environments.

In the urbanization and construction field, technological development has been in progress to satisfy these needs. For example, barrier-free urban facilities and houses have begun to spread in recent years. Houses are a typical example of small-volume multi-line production goods, and efforts are being made to offer customers as much choice as possible through the flexible factory production of building components and flexible partitioning designs.

Future technological development topics include Widespread use in cities of information systems with a human interface which can be used by senior citizens and disabled people with the same ease as normal healthy adults (topic 44), and Widespread use of systems for guiding visually impaired people using magnetic sensors (topic 45). These topics rated very high in terms of the expected response to people’s needs effect, with topics 44 and 45 ranked No. 1 (99%) and No. 3 (98%), respectively, among all topics.

In Japan, strong needs exist for the introduction of nursing robots (topic 46) and other similar areas where a strong objection still exists in Europe and North America because of a perceived conflict with human values.

Notably, in areas such as Environmental design based on techniques tailored to measure human sensitivity and feelings (topic 39), Imaginary experience systems utilizing virtual reality technology (topic 40), and Information systems with a human interface friendly to senior citizens and disabled people(topic 44), respondents commonly thought that Europe and North America, especially the US, were leading countries, rather than Japan.

Ever since the collapse of the bubble economy, the trend towards greater diversification and individualization in people’s social lives has been increasing. Although such a trend theoretically leads to the generation of an infinite number of needs, a question remains as to which technologies can actually make a contribution in this respect, as science and technology that supports such social lives tends to take the form of a comprehensive and integrated system of technologies, e.g. computer-related infrastructure, rather than specific individual technologies. For example, if homeworking through telecommuting or short-distance commuting become a way of life, not only will it give workers much more free time and greatly contribute to their lifestyle changes thus further accelerating the diversification and individualization of social lives but it may also trigger a change in urban structure itself.

Against this background, demands for the development of a research base and upgrading of advanced facilities and equipment, as measures the government should adopt in response to a mature society, are relatively subdued, while calls for an improvement in the basic research environment ó through, for example, the promotion of exchanges among industrial, academic and government sectors and different fields, and an increase in government research funding ó are vocal.

Among all areas, response to a mature society scored the lowest (44.2) in terms of the degree of importance to Japan, more than 20 points below the highest score (68.9), which was given to securing safety.

However, instead of indicating a low perceived importance for topics relating to response to a mature society, the results seem to suggest that respondents thought that the development of advanced technologies had a limited applicability in this area. In other words, this may be interpreted that the upgrading of backward technologies, i.e. an improvement in the overall quality of conventional technologies, was considered to have a higher priority than the development of advanced technologies.

Overall, the United States was considered as the current leading country in the response to mature society area, followed by Japan and the EU, in that order. In contrast to most other areas, where Japan was considered the leading country, its rating was relatively low in this area.

Named by an overwhelming number of respondents, response to people's needs was at the top of the expected effects, followed by contribution to socioeconomic development. Regarding potential problems in Japan, adverse effect on morals, culture or society was considered No. 1 in this area. Notably, only a few respondents chose adverse effect on the natural environment or adverse effect on safety, in contrast to other areas.

In terms of forecasted realization times, there was a relatively small variation between the topics in this area, with most falling in the 2006~2010 range.

(Yukio Nishimura)

11.1.5. Productivity improvement, cost reduction and quality maintenance

Even after the collapse of the bubble economy, Japans construction investment has been kept at high levels, 17-18% of the GDP. Nevertheless, the market environment is undergoing a major change, as a fall in private sector capital investment and the struggling stock market attract attention.

Accounting for 10% of the work force, the construction industry is one of Japans core industries, and, combined with associated industries such as construction material and construction machinery industries, its influence is enormous. Nevertheless, it still has backward aspects, such as low productivity and poor working environments, compared to other industries.

While productivity improvement is an ongoing area of attention, the present focus is on the kind of productivity improvement that leads to cost reduction and quality maintenance, which are highly desired by customers.

Cost reduction is a particular focus of attention due to, among other things, an increasing awareness of price differentials relative to other countries and social costs, while the Great Hanshin-Awaji Earthquake, which struck on January 17, 1995 once more reminded us of the importance of quality maintenance, in light of the fact that structures designed and constructed to the same specifications suffered varied degrees of damage, ranging from collapse to minor damage.

Productivity improvement requires a balanced approach towards hardware and software-oriented technologies, involving not only greater mechanization and an improvement in production efficiency but also an improvement in the production and distribution mechanisms, various deregulation measures, and the like. The utilization of rapidly advancing info-communications technologies also holds great promise.

Although the construction industry has traditionally directed its technological development efforts towards productivity improvement, it still needs to achieve a productivity level comparable to those in other fields by strengthening its technological development structure through cooperation and joint research with other industries in the future.

According to the results of the latest survey, topics in the productivity improvement area recorded mid-range degree of importance index scores (47~58), while those in the quality maintenance area, including 14. Practical use in Japan of rational seismic reinforcement techniques, which was classified into these curing safety category, scored high.

Regarding expected effects, most topics in the productivity improvement area were given high sores in terms of contribution to socioeconomic development, with the level of expectation particularly high for new material development (54) and intelligent robot development (55 and 56).

The forecasted realization times of about 80% of the topics fell in the 2006ñ2015 range. Notably, however, topics relating to new material development and intelligent robot development mentioned above have been moved back substantially (7-10 years) from the last survey, despite the high level of expectation expressed. This seems to suggest that respondents made a more realistic assessment of technological development aimed at productivity improvement this time around.

Regarding promotion measures for technological development relating to productivity improvement including cost reduction and quality maintenance, the promotion of exchanges among industrial, academic and government sectors and different fields (60%) and an increase in government research funding (40%) were ranked high, highlighting the importance of the revitalization of private sector technological development through such measures as cooperation between the industrial and academic sectors and the provision of research subsidies.

(Shoichi Kobayashi)

11.2. Forecast topic framework

In the course of compiling forecast topics, a framework representing the organization of technologies in tabulated matrix form was drawn up for each field, with objectives and technological domains defining the rows and columns of the table, respectively. The framework is designed to present an overall picture of technological development in each field in terms of future prospects, importance, etc. as seen from the present perspective, and is also used as a working framework for future reviews of forecast topics.

Table 11.2-1 Forecast Topic Framework for Urbanization and Construction Field

Objective \ Domain	City functions (overall hardware/software infrastructure of cities)	Basic facilities (lifeline facilities etc. of cities in general)	Civil engineering (individual civil engineering structures)	Architecture (individual architectural structures)
Ensuring safety	01 02 03 04 05 06 07 08 09	10 11	12	13 14 15
			16	
Coexistence with nature/environmental conservation	17 18 19	20 21 22 23 24	25 26 27	
			28	
Resource and energy conservation/recycling	29	30 31	32 33	34 35 36 37
			38	
Response to increasingly diverse and individual lifestyles	39			40 41 42 43
Promotion of welfare/response to aging society		44	45	46
Improvement of productivity	47		48 49 50 51	52 53 54 55 56 57
			58	
Advanced use of national land and cities	59 60	61 62 63 64	65	
			66	
Effective use of new frontier spaces	67 68	69	70	71 72 73 74

* Figures appearing in the table represent topic numbers.

11.3. Topics with high degree of importance

Degree of importance index scores (Note 1) averaged at 56.0 for topics in the urbanization and construction field as a whole. Topics considered of particular importance to Japan (top 20 topics in terms of degree of importance index score) are listed in the table below. As many as 9 safety-related topics featured in the top 20. Rated most important, 13. Practical use in Japan of a demolition technology for decommissioned commercial nuclear power plants was the only topic scoring more than 90 points (92).

Table 11.3-1 Top 20 Topics in Terms of Degree of Importance Index

Topic	Degree of importance index	Forecasted realization time (year)
13 Practical use in Japan of a safe and rational demolition technology for decommission of commercial nuclear power plants.	92	2009
05 Practical use in Japan of a mid-term (5 - 10 years in advance) prediction technique for large-scale (Magnitude 8 or stronger) earthquakes based on analyses of the distribution of strains in the earth's crust and past earthquake records.	87	2017
04 Development of a nationwide network for detecting earthquakes, and widespread use in Japan of a disaster prevention system that gives advance warning of earthquakes at a distance of at least 50km.	86	2011
62 Establishment in Japan of a wide-area integrated water management technique covering rivers, dammed reservoirs, etc., leading to widespread use of efficient water resource utilization systems in major urban zones.	83	2009
03 Development of disaster forecasting and information transfer systems incorporating studies in social and behavioral psychology, in order to prevent panic in big cities in event of major earthquakes or fires.	81	2009
11 Widespread use in Japan of remote monitoring and control systems for enhancing the safety of essential services of utilities. (e.g. water, electricity and gas)	80	2007
01 Widespread use in Japan of warning, forecasting, evacuation assistance and crowd control systems that dramatically reduce human loss in the event of a natural disaster involving rivers, roads, etc. based on localized weather forecasts.	80	2008
20 Widespread use in Japan of active environmental clean-up facilities that absorb and fix air pollutants such as CO_2, NO_x and freons in urban areas, where the majority of emissions occur.	79	2016
31 Widespread use in Japan of technological systems for automatic separation of combustibles, metal, glass, and other substances from city garbage and other general wastes in terms of hardness, specific gravity, moisture, and color, etc.	79	2009
29 Spread of community-based efforts to utilize unused energy sources and recycle household wastes etc. in Japan.	79	2009
38 Practical use in Japan of technology that facilitates the recycling of almost all construction by products such as concrete debris, asphalt waste and surplus soil.	78	2009
14 Practical use in Japan of techniques to assess the soundness of foundations of existing structures and to seismically strengthen existing foundations.	78	2004
64 Realization in Japan of the decentralization of various city functions currently concentrated in large cities through significant advancements in telecommunications and transportation systems.	78	2014

Topic	Degree of importance index	Forecasted realization time (year)
25 Widespread use in Japan of development techniques aimed at coexisting with nature (e.g. conservation of ecosystems and creation of wildlife habitats) through the elucidation of the mechanisms whereby development impacts on ecosystems.	74	2011
06 Practical use in Japan of online data base on natural disasters in Japan necessary for risk management.	71	2009
21 Widespread use in Japan of compact wastewater treatment systems capable of treating persistent substances and harmful materials with high efficiency via biotechnology.	69	2010
16 Practical use in Japan of a technology to effectively control and absorb vibrations in massive structures caused by winds and earthquakes.	64	2004
22 Practical use in Japan of a technology to clean up polluted closed sea areas in the vicinity of major cities by constructing various facilities for seawater purification, replacement, etc.	64	2014
48 Development of a technology capable of measuring locations of active faults and their stress conditions using a vibration generator placed on the ground without relying on blasting tests.	63	2009
30 Widespread use in Japan of community-level nonpotable water supply systems to reuse highly treated wastewater and sewage for landscaping and other miscellaneous purposes in large cities.	62	2009

Note 1: Degree of importance index = (number of “high” responses × 100 + number of “medium” responses × 50 + number of “low” responses × 25 + number of “unnecessary” responses × 0) ÷ total number of degree of importance responses

11.4. Forecasted realization times

Forecasted realization times were distributed as shown in the diagram below.

Compared to the general trend covering all topics, the distribution of forecasted realization times peaked early, but was similar after the peak. While 84% of the topics were forecasted to be realized by 2015, there is a fair degree of unevenness, with realization times for some topics falling in 2026 or later. The earliest realization time was 2004, which was given to the following two topics: “14: Practical use in Japan of techniques to seismically strengthen existing foundations” and “16: Practical use in Japan of a technology to effectively control and absorb vibrations in massive structures.” The latest realization time, on the other hand, was 2026 or later, which was given to “73: Realization of manned laboratories on Mars.”

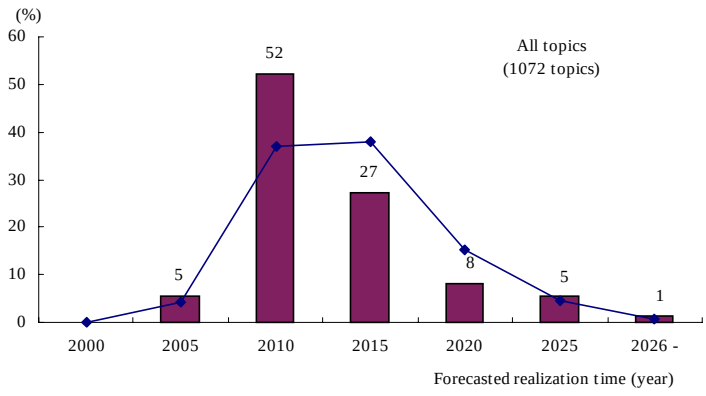

Fig. 11.4-1 Trends in Forecasted Realization Times

11.5. Current leading countries etc.

Responses to the question concerning current leading countries etc. were as shown in the diagram below. Named by almost half of the respondents, Japan ranked No. 1, followed by the U.S. and the EU, with do not know responses outstripping EU responses.

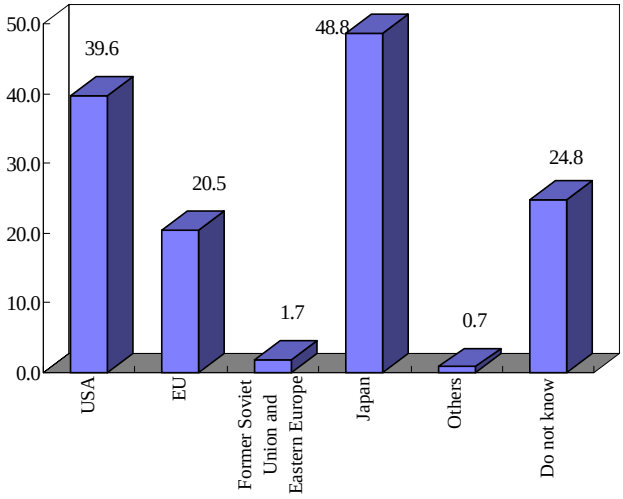

Fig. 11.5-1 Current Leading Countries etc. (%)

11.6. Comparison with the 5th Survey (previous survey)

Of the 73 topics included in the latest survey, 32 (44%) were identical to the previous survey, 16 (22%) were modified, and 25 (34%) were newly introduced. For identical topics, the results of the latest survey were compared with those of the previous survey in terms of degree of importance index scores and forecasted realization times, as shown in the table below.

Degree of importance index scores rose only for 2 topics (“13: Practical use in Japan of a demolition technology for decommissioned commercial nuclear power plants” and “62: Widespread use of efficient water resource utilization systems in major urban zones based on a wide-area integrated water management technique”), remained the same for 1 topic and fell for the remaining 29 topics. Five topics saw their degree of importance index scores plunge by 20 or more points, with “56: Widespread use in Japan of intelligent robots on construction sites experiencing the greatest drop” (26 points).

Compared to the 5th Survey, forecasted realization times were pushed back for all topics. The change was smallest for “06: Practical use in Japan of online data base on natural disasters in Japan” and “19: Widespread use in Japan of city planning etc. based on an understanding of the relationship between green resources and human physiology and psychology” (3 years) and greatest for “71: Elucidation of the impact of living in a super high-rise building on human physiology and psychology” (13 years).

Table 11.6-1 Comparison with 5th Survey for Identical Topics

Topic	Degree of importance index / forecasted realization time	
	6th survey	5th survey
03 Development of disaster forecasting and information transfer systems incorporating studies in social and behavioral psychology, in order to prevent panic in big cities in event of major earthquakes or fires.	81/2009	81/2005
04 Development of a nationwide network for detecting earthquakes, and widespread use in Japan of a disaster prevention system that gives advance warning of earthquakes at a distance of at least 50Km.	86/2011	87/2007
06 Practical use in Japan of online data base on natural disasters in Japan necessary for risk management.	71/2009	75/2006
07 Development of fire-fighting and rescuing technologies for fires occuring in high-rise buildings.	59/2006	79/2001
08 Introduction of robots to fire-fighting activities and their widespread use in search and rescue operations in fire events in Japan.	55/2010	67/2003
09 Practical use of emergency response systems to deal with disasters (e.g. fires and earthquakes) occurring in deep underground facilities in Japan.	54/2013	69/2007
10 Widespread use in Japan of continuous-removal and clearing systems of snow to eliminate snow-related disasters involving roads and buildings in snowy regions.	46/2011	58/2002
11 Widespread use in Japan of remote monitoring and control systems for enhancing the safety of essential services of utilities. (e.g. water, electricity and gas)	80/2007	83/2002
13 Practical use in Japan of a safe and rational demolition technology for decommission of commercial nuclear power plants.	92/2009	91/2004
18 Better understanding in Japan of environmental preservation function of trees, grass, and shrubs (in preventing urban “heat stress” and noise), resulting in the practical use of “urban tree and shrubs” which are highly durable and can be easily maintained.	47/2011	65/2004
19 Elucidation of the relationship between green resources, such as forests, and human physiology and psychology, leading to the widespread use of city planning, forest development and landscaping techniques based on it in Japan.	53/2010	66/2007
22 Practical use in Japan of a technology to clean up polluted closed sea areas in the vicinity of major cities by constructing various facilities for seawater purification, replacement, etc.	64/2014	89/2006
31 Widespread use in Japan of technological systems for automatic separation of combustibles, metal, glass, and other substances from city garbage and other general wastes in terms of hardness, specific gravity, moisture, and color, etc.	79/2009	85/2003
34 Practical use in Japan of a highly efficient heating and cooling system through a combination of solar energy and super heat pumps.	60/2008	68/2002
35 Widespread use in Japan of energy-self-sufficient buildings and houses through advancements in natural energy source utilization technologies.	60/2013	68/2008
41 Development of interior finishing materials which possess sensing functions for temperature, humidity, etc., and to adjust indoor environment.	32/2011	49/2002
43 Widespread use in Japan of houses in which rooms and furnishing can be easily altered or converted in step with alternation of generations or shift in life stages.	51/2008	61/2003
46 Widespread use in Japan of houses equipped with robots and other devices that assist senior citizens and disabled people with everyday tasks, including eating meals, bathing, going to the toilet, and having entertainment, to carry these out without human assistance.	56/2014	79/2006
51 Widespread use in Japan of a comprehensive database of design conditions, such as soil characteristics, geology and weather, to be used in planning and designing.	55/2008	73/2002
54 Development of highly durable high-performance bonding agents for steel, enabling substantial rationalization of steel construction.	47/2015	60/2005

Topic	Degree of importance index / forecasted realization time	
	6th survey	5th survey
55 Development of new materials to replace reinforced concrete leading to easier field work.	53/2018	71/2008
56 Widespread use in Japan of intelligent robots on construction sites to reduce construction period and to ensure safety.	53/2011	79/2004
58 Development of construction techniques which incorporate built-in maintenance and demolition functions for buildings and civil structures.	56/2013	67/2004
62 Establishment in Japan of a wide-area integrated water management technique covering rivers, dammed reservoirs, etc., leading to widespread use of efficient water resource utilization systems in major urban zones.	83/2009	80/2002
63 Widespread use in Japan of new joint-use duct systems in cities to contain housing cable for wire broadcasting, vacuum garbage collection pipelines, distribution pipelines, and regional heating and cooling pipes.	55/2013	80/2004
65 Practical use in Japan of technologies for surveying existing embedded objects and ground properties lying deeper than 5 meters from the surface, in response to increasing use of underground space.	48/2009	67/2000
67 Realization of deep underground cities where people can reside.	25/2023	33/2016
68 Realization of marine cities by progress in offshore engineering.	37/2021	52/2009
70 Practical use in Japan of a technology to construct super high-rise buildings (around 1,000 m tall) with living spaces.	27/2020	37/2015
71 Elucidation of the impact of living in a super high-rise building (around 1,000 m tall) on human physiology and psychology.	32/2018	44/2005
72 Realization of facilities in the outer space where people in general can live in long period.(at least one year)	30/2025	32/2019
73 Realization of manned laboratories on Mars.	23/2026 or later	30/2020 or later

Note: Up until the 5th Survey, realization meant realization in Japan unless otherwise specified. However, this was changed to mean realization somewhere in the world in the 6th Survey. Therefore, care should be taken when comparing forecasted realization times from the two surveys.

Division	Topic serial No.	Topic	Questionnaire round	Number of respondents	Degree of expertise (%)			Importance (index, %)					Expected effect (%)				Forecasted realization time			Leading countries (%)						Measures the government should adopt (%)							Potential problems (%)			
					High	Medium	Low	Index	High	Medium	Low	Unnecessary	Socioeconomic development	Resolution of global problems	People's needs	Expansion of intellectual resources	2001 2006 2011 2016 2021 2026	Will not be realized (%)	Do not know (%)	USA	EU	Former Soviet Union and Eastern Europe	Japan	Other countries	Do not know	Foster human resources	Promote exchanges among industrial, academic and government sectors and different fields	Upgrade advanced facilities and equipment	Develop a research base	Increase government research funding	Adjust regulations (relax/toughen)	Others	Adverse effect on the natural environment	Adverse effect on safety	Adverse effect on morals, culture or society	Other adverse effects
Ensuring safety	1	Widespread use in Japan of warning, forecasting, evacuation assistance and crowd control systems that dramatically reduce human loss in the event of a natural disaster involving rivers, roads, etc. based on localized weather forecasts.	1	188	10	30	60	76	53	44	3	0	21	10	92	4		3	4	39	7	0	50	1	31	45	51	28	10	51	16	5	13	40	5	2
			2	172	8	30	62	80	61	38	1	0	20	5	98	2		1	4	38	3	0	65	0	26	48	59	24	7	64	12	1	11	52	3	1
			X	14	100	0	0	96	93	7	0	0	21	21	100	0		0	0	50	7	0	93	0	0	71	36	50	0	86	0	0	7	57	7	0
	2	Widespread use in Japan of high-speed, high-efficiency seawater desalination and sewage purification systems to cope with urban disasters and droughts.	1	175	8	25	67	60	32	45	22	1	31	61	66	3		5	4	26	22	1	54	5	29	29	49	27	3	56	20	3	41	14	3	4
			2	156	5	27	68	59	27	56	17	0	23	61	75	0		1	3	23	21	1	68	3	21	26	62	22	1	66	15	1	55	8	1	3
			X	8	100	0	0	75	63	13	25	0	50	75	75	0		0	0	50	50	0	75	0	0	50	63	13	0	88	38	0	38	0	0	0
	3	Development of disaster forecasting and information transfer systems incorporating studies in social and behavioral psychology, in order to prevent panic in big cities in event of major earthquakes or fires.	1	187	11	25	64	75	55	37	8	0	22	7	95	6		5	5	57	13	1	34	1	22	55	57	10	11	44	13	2	2	43	27	3
			2	168	7	26	68	81	63	35	2	0	20	3	96	3		4	3	71	8	0	38	1	16	67	69	7	7	56	8	1	2	50	26	2
			X	11	100	0	0	95	91	9	0	0	18	0	91	18		0	0	64	9	0	55	0	9	82	55	9	9	82	0	0	9	55	27	0
	4	Development of a nationwide network for detecting earthquakes, and widespread use in Japan of a disaster prevention system that gives advance warning of earthquakes at a distance of at least 50km.	1	197	11	31	58	79	61	32	6	1	26	5	95	8		14	6	37	8	2	73	3	13	44	40	25	12	63	5	4	3	32	12	5
			2	176	8	30	62	86	74	22	4	0	28	2	95	2		8	5	39	4	1	79	2	9	57	44	19	6	74	2	2	2	44	10	1
			X	14	100	0	0	93	86	14	0	0	29	7	93	0		14	0	50	7	0	93	0	7	64	43	21	14	71	0	7	7	29	7	7
	5	Practical use in Japan of a mid-term (5 - 10 years in advance) prediction technique for large-scale (Magnitude 8 or stronger) earthquakes based on analyses of the distribution of strains in the earth's crust and past earthquake records.	1	182	8	31	61	81	66	27	7	1	28	9	88	18		21	6	35	8	2	70	7	13	58	34	27	14	62	3	2	4	28	20	5
			2	163	5	29	66	87	77	19	4	1	29	4	93	7		22	4	34	4	1	80	1	12	69	29	19	6	71	1	3	2	33	19	2
			X	8	100	0	0	94	88	13	0	0	25	13	88	0		38	0	38	13	0	100	0	0	88	25	13	0	75	0	0	25	38	0	0
	6	Practical use in Japan of online data base on natural disasters in Japan necessary for risk management.	1	185	13	25	62	67	42	44	14	1	40	10	92	3		4	4	56	12	1	32	0	23	30	45	21	38	54	11	2	3	34	15	2
			2	163	10	22	68	71	45	50	5	0	42	2	96	1		3	4	69	7	0	34	0	18	28	50	13	40	64	6	0	1	42	13	0
			X	16	100	0	0	94	88	13	0	0	63	0	100	0		6	0	94	6	0	44	0	0	31	50	13	63	63	0	0	0	31	13	0
	7	Development of fire-fighting and rescuing technologies for fires occuring in high-rise buildings.	1	150	7	27	67	59	27	56	17	1	27	1	95	1		1	3	71	9	0	31	0	18	23	45	25	1	40	37	1	3	38	4	3
			2	137	5	20	74	59	24	64	11	1	28	0	99	0		1	2	82	7	1	33	0	11	17	64	23	1	46	34	1	1	48	1	1
			X	7	100	0	0	68	43	43	14	0	14	0	100	0		0	0	71	14	0	71	0	0	14	86	29	0	29	43	0	0	57	0	0
	8	Introduction of robots to fire-fighting activities and their widespread use in search and rescue operations in fire events in Japan.	1	121	7	14	79	54	22	53	25	1	23	1	97	3		6	3	42	11	0	49	1	29	29	54	28	0	51	15	1	0	35	7	5
			2	115	3	11	85	55	19	63	17	0	20	0	98	1		3	2	50	9	0	63	1	22	23	75	25	0	61	12	0	0	48	3	3
			X	4	100	0	0	75	50	50	0	0	0	0	100	0		0	0	25	0	0	75	0	0	25	75	25	0	50	25	0	0	50	0	0
	9	Practical use of emergency response systems to deal with disasters (e.g. fires and earthquakes) occurring in deep underground facilities in Japan.	1	178	11	26	63	54	22	52	25	1	50	15	79	2		4	6	29	24	4	40	1	28	34	52	20	1	42	32	1	13	28	6	1
			2	157	9	23	68	54	19	58	22	1	54	6	83	1		3	4	25	24	0	50	1	29	33	64	16	1	51	32	0	14	38	3	1
			X	14	100	0	0	75	50	50	0	0	43	21	79	0		0	0	36	50	0	57	14	7	43	71	14	0	86	21	0	21	43	7	0
	10	Widespread use in Japan of continuous-removal and clearing systems of snow to eliminate snow-related disasters involving roads and buildings in snowy regions.	1	138	6	22	72	48	15	47	36	2	44	13	89	1		11	7	6	12	5	38	2	42	26	43	20	1	53	10	2	35	16	8	3
			2	124	4	19	77	46	11	51	37	1	40	6	94	0		7	5	4	9	6	52	2	39	21	54	13	1	72	7	2	53	11	2	1
			X	5	100	0	0	80	60	40	0	0	40	20	100	0		0	0	20	0	20	100	20	0	40	80	40	0	80	0	0	20	60	0	0

(Note) See page 7 for the interpretation of the graphs.

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Ensuring safety	11	Widespread use in Japan of remote monitoring and control systems for enhancing the safety of essential services of utilities. (e.g. water, electricity and gas)	1	171	15	29	57	77	58	36	7	0	53	6	94	1		1	1	42	13	1	51	1	26	29	68	14	7	37	31	2	2	37	5	2
			2	158	12	28	60	80	63	32	4	0	53	1	96	0		0	1	48	10	0	62	1	18	23	75	12	4	42	33	1	1	46	5	1
			X	19	100	0	0	87	74	26	0	0	68	0	89	0		0	0	53	16	0	95	0	0	16	79	16	5	53	42	0	0	53	5	0
	12	Widespread use in Japan of systems that detect the danger of rock mass collapse in advance based on the elucidation of its mechanisms and that accordingly assist with appropriate accident prevention measures such as road closure.	1	165	14	30	56	62	32	51	17	0	24	3	95	5		13	8	12	12	1	41	1	44	48	44	15	15	55	16	1	13	25	3	5
			2	152	11	32	58	62	28	64	9	0	22	1	95	3		9	8	8	6	1	48	1	44	54	51	11	7	72	9	1	9	35	2	3
			X	16	100	0	0	72	50	38	13	0	25	0	81	6		19	0	19	31	0	88	0	0	69	56	13	13	88	0	0	6	38	0	0
	13	Practical use in Japan of a safe and rational demolition technology for decommission of commercial nuclear power plants.	1	131	10	31	60	85	71	28	1	0	39	80	53	6		2	5	66	48	3	43	1	14	49	60	21	1	57	24	2	56	40	11	2
			2	124	6	32	61	92	83	17	0	0	32	83	49	2		3	2	78	50	2	46	1	8	44	70	13	0	66	21	1	70	42	4	1
			X	8	100	0	0	100	100	0	0	0	38	75	50	0		13	0	75	63	0	38	0	13	38	88	13	0	63	25	0	50	50	13	0
	14	Practical use in Japan of techniques to assess the soundness of foundations of existing structures and to seismically strengthen existing foundations.	1	213	30	44	26	75	53	41	6	0	46	8	91	2		1	1	29	7	0	81	0	10	44	58	19	4	51	29	2	3	28	5	2
			2	189	26	46	29	78	56	41	3	0	52	4	94	0		1	1	32	4	0	91	1	6	46	68	12	2	58	26	1	2	40	4	1
			X	49	100	0	0	87	73	27	0	0	53	4	94	0		0	2	27	2	0	98	0	0	43	78	18	2	53	24	0	4	29	2	0
	15	Widespread use in Japan of systems that control the safety and efficiency of energy-related building facilities using remote measuring technology.	1	112	9	25	66	48	13	55	31	1	41	55	55	2		1	5	49	16	4	34	0	29	36	57	16	9	33	21	3	11	31	5	2
			2	119	5	17	78	47	8	66	27	0	33	56	62	0		1	3	61	13	1	44	0	25	31	72	8	4	40	17	3	9	39	5	3
			X	6	100	0	0	67	33	67	0	0	50	83	67	0		0	0	83	17	0	50	0	17	33	33	17	0	67	50	0	33	33	33	0
	16	Practical use in Japan of a technology to effectively control and absorb vibrations in massive structures caused by winds and earthquakes.	1	209	29	30	42	68	41	50	9	0	53	9	82	7		1	2	38	7	0	90	1	5	41	56	24	2	45	31	2	5	25	4	4
			2	188	25	28	47	64	32	63	5	0	59	4	88	2		1	1	39	3	0	94	1	4	36	70	14	1	52	22	2	4	35	2	3
			X	47	100	0	0	73	48	50	2	0	62	6	79	4		0	2	49	4	0	98	0	0	36	77	15	2	60	23	2	9	30	2	4
Coexistence with nature/environmental conservation	17	Widespread use of various urban environmental information obtained through monitoring based on remote sensing technology etc. (e.g. levels of pollution and greening) in urban environmental control in Japan.	1	149	8	25	67	57	22	61	16	1	22	74	60	4		3	7	52	34	1	29	0	28	40	46	20	22	45	17	3	23	15	10	2
			2	135	6	22	72	53	13	74	14	0	17	79	64	1		1	4	59	29	1	31	0	24	41	58	13	21	48	11	1	33	9	13	1
			X	8	100	0	0	81	63	38	0	0	50	63	88	0		0	0	88	50	0	63	0	0	50	63	25	38	50	25	0	38	0	13	0
	18	Better understanding in Japan of environmental preservation function of trees, grass, and shrubs (in preventing urban "heat stress" and noise), resulting in the practical use of "urban tree and shrubs" which are highly durable and can be easily maintained.	1	121	8	17	74	46	10	55	31	3	22	62	61	5		2	8	17	24	1	31	0	45	36	45	15	22	35	14	0	55	8	3	2
			2	118	7	14	79	47	10	63	26	2	18	68	69	1		3	7	13	25	1	35	0	46	40	60	5	17	42	8	0	64	3	2	0
			X	8	100	0	0	63	25	75	0	0	75	50	88	0		0	0	63	50	0	75	0	0	38	63	13	25	38	13	0	63	0	0	0
	19	Elucidation of the relationship between green resources, such as forests, and human physiology and psychology, leading to the widespread use of city planning, forest development and landscaping techniques based on it in Japan.	1	127	11	24	65	48	15	52	27	6	18	54	76	12		7	9	23	36	2	22	2	39	45	50	10	12	46	20	2	33	11	13	1
			2	119	6	23	71	53	16	64	18	2	12	65	82	5		4	7	23	43	1	22	1	39	45	62	3	8	50	18	2	48	7	9	0
			X	7	100	0	0	71	43	57	0	0	29	43	86	29		0	0	29	86	0	29	0	0	43	57	0	0	43	57	0	29	14	29	0
	20	Widespread use in Japan of active environmental clean-up facilities that absorb and fix air pollutants such as CO_2, NO_x and freons in urban areas, where the majority of emissions occur.	1	108	6	19	75	74	53	38	5	4	33	83	56	7		7	11	30	32	1	38	0	33	44	53	22	8	58	17	1	40	13	7	3
			2	105	3	15	82	79	61	37	2	1	27	90	55	2		5	7	34	35	1	49	1	27	47	61	16	2	66	13	1	53	10	3	1
			X	3	100	0	0	100	100	0	0	0	67	67	67	0		0	0	67	0	0	67	33	0	0	100	0	0	100	33	0	67	67	0	0

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Coexistence with nature/environmental conservation	21	Widespread use in Japan of compact wastewater treatment systems capable of treating persistent substances and harmful materials with high efficiency via biotechnology.	1	119	8	18	74	70	46	46	8	1	41	84	66	8		3	8	40	34	1	45	1	26	39	53	24	24	44	28	2	46	9	8	1
			2	109	6	12	82	69	39	59	2	0	39	83	73	4		1	6	38	30	1	53	0	28	44	60	20	18	49	25	1	55	7	6	1
			X	7	100	0	0	100	100	0	0	0	43	86	86	0		0	0	57	14	0	71	0	0	29	57	14	0	57	71	0	29	0	0	0
	22	Practical use in Japan of a technology to clean up polluted closed sea areas in the vicinity of major cities by constructing various facilities for seawater purification, replacement, etc.	1	121	10	25	65	64	38	47	13	3	31	80	48	4		11	6	27	28	0	38	0	39	47	48	25	10	58	15	2	53	7	5	2
			2	112	10	18	72	64	34	55	11	0	23	87	52	1		7	4	23	24	0	45	0	36	43	50	19	8	71	9	1	61	1	4	1
			X	11	100	0	0	75	55	36	9	0	27	100	36	0		9	0	36	45	0	82	0	9	36	64	0	27	73	36	0	45	0	9	0
	23	Development of a technology that detects physiological changes in soil microorganisms and plants to measure the level of environmental pollution.	1	79	6	15	78	54	21	56	22	1	24	70	48	19		1	13	39	25	0	29	0	42	58	39	24	27	41	6	0	39	8	3	0
			2	77	5	9	86	55	18	66	16	0	19	86	47	9		0	6	43	25	0	27	0	39	68	35	18	19	49	3	0	44	4	3	0
			X	4	100	0	0	100	100	0	0	0	25	75	50	0		0	0	75	50	0	75	0	0	25	0	0	50	50	25	0	25	25	0	0
	24	Practical use in Japan of a technology designed to remove nitrogen and phosphorus from closed water areas such as lakes and reservoirs to prevent the outbreak of water blooms and other abnormal algae growth.	1	116	11	20	69	59	29	52	18	1	22	76	53	5		3	4	19	29	0	45	1	33	36	53	21	17	54	16	2	44	3	3	1
			2	107	7	21	73	60	26	63	11	0	16	81	57	1		3	3	14	33	0	61	0	28	34	62	13	8	65	9	1	52	2	3	0
			X	7	100	0	0	75	57	29	14	0	43	71	86	0		14	0	43	57	0	100	0	0	29	29	14	14	86	29	0	57	14	0	0
	25	Widespread use in Japan of development techniques aimed at coexisting with nature (e.g. conservation of ecosystems and creation of wildlife habitats) through the elucidation of the mechanisms whereby development impacts on ecosystems.	1	129	19	24	57	72	48	44	6	2	36	78	53	18		4	10	28	56	1	24	2	21	53	52	14	19	43	23	2	38	5	12	2
			2	122	13	18	69	74	51	45	3	1	23	89	50	11		2	7	25	62	0	28	0	20	60	60	7	11	48	20	1	49	2	8	2
			X	16	100	0	0	90	80	20	0	0	44	88	63	6		0	0	25	69	0	44	0	0	69	63	13	13	44	31	0	38	6	19	0
	26	Widespread use in the world of desert greening technology to control the desertification.	1	135	4	11	84	47	20	33	40	7	37	93	17	9		7	10	33	16	1	24	5	43	51	45	13	14	47	2	1	44	4	6	4
			2	124	3	6	91	45	16	36	42	6	28	99	11	2		6	6	35	10	2	27	6	46	65	49	6	6	56	2	2	56	2	6	1
			X	4	100	0	0	56	25	50	25	0	0	100	0	0		25	0	50	0	0	50	0	25	75	50	0	25	75	0	0	50	0	0	0
	27	Widespread use in Japan of road noise barriers capable of reducing noise effectively by active noise control technology.	1	136	7	27	66	52	19	51	29	2	29	15	91	4		9	9	21	17	0	48	1	35	35	45	29	1	42	17	2	20	20	4	2
			2	129	4	26	70	51	16	57	27	0	23	9	95	2		6	5	22	14	0	63	0	28	33	57	16	1	53	11	2	27	24	4	2
			X	5	100	0	0	80	60	40	0	0	40	40	80	0		0	0	20	40	0	100	0	0	60	80	0	0	40	20	0	20	40	0	0
	28	Widespread use in Japan of a technology that dramatically increases the earthquake-safety of historic buildings.	1	189	19	32	49	52	20	49	30	1	28	5	53	20		1	5	32	13	1	66	2	18	42	38	14	4	54	24	4	3	14	25	2
			2	170	17	31	52	51	14	64	22	0	25	3	61	25		0	1	35	9	0	81	1	11	46	40	5	1	66	22	3	1	13	36	1
			X	29	100	0	0	66	34	62	3	0	31	7	76	17		0	0	62	10	0	79	0	3	31	38	3	0	59	38	0	7	7	24	3
Resource and energy conservation/recycling	29	Spread of community-based efforts to utilize unused energy sources and recycle household wastes etc. in Japan.	1	167	10	31	59	73	51	40	8	1	38	85	51	3		0	3	18	53	1	31	1	23	31	55	13	4	51	47	3	28	13	21	2
			2	153	8	29	63	79	59	39	2	1	32	90	57	0		1	1	14	63	0	36	1	21	28	69	7	1	59	46	4	44	8	16	1
			X	12	100	0	0	92	83	17	0	0	42	92	83	0		0	0	42	92	0	42	8	0	33	92	0	0	75	42	17	42	8	25	8
	30	Widespread use in Japan of community-level nonpotable water supply systems to reuse highly treated wastewater and sewage for landscaping and other miscellaneous purposes in large cities.	1	160	12	29	59	63	35	47	17	1	29	69	63	3		3	4	18	39	3	36	1	27	24	49	16	3	47	46	5	25	11	13	1
			2	143	9	27	64	62	29	62	9	0	21	80	69	0		0	1	13	50	1	50	1	25	20	63	10	1	57	49	2	38	6	10	0
			X	13	100	0	0	85	69	31	0	0	38	85	77	0		0	0	15	62	0	77	0	8	15	77	15	8	62	54	0	15	15	15	0

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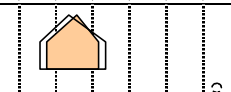
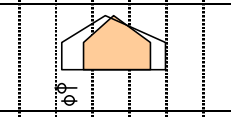
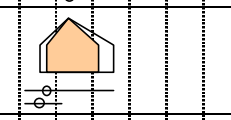
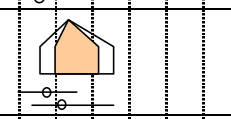
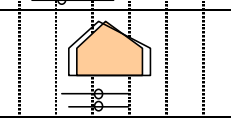
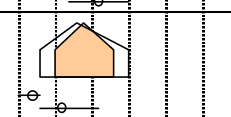
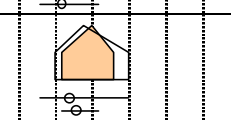
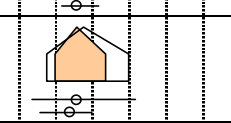
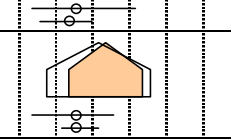
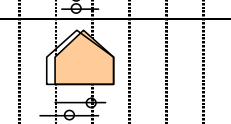
					High	Medium	Low	Index	High	Medium	Low	Unnecessary	Socioeconomic development	Resolution of global problems	People's needs	Expansion of intellectual resources	2001 2006 2011 2016 2021 2026	Will not be realized (%)	Do not know (%)	USA	EU	Former Soviet Union and Eastern Europe	Japan	Other countries	Do not know	Foster human resources	Promote exchanges among industrial, academic and government sectors and different fields	Upgrade advanced facilities and equipment	Develop a research base	Increase government research funding	Adjust regulations (relax/toughen)	Others	Adverse effect on the natural environment	Adverse effect on safety	Adverse effect on morals, culture or society	Other adverse effects
Resource and energy conservation/recycling	31	Widespread use in Japan of technological systems for automatic separation of combustibles, metal, glass, and other substances from city garbage and other general wastes in terms of hardness, specific gravity, moisture, and color, etc.	1	124	3	25	72	74	53	38	9	1	40	83	42	3		4	5	15	41	0	43	1	31	23	54	15	2	52	34	2	26	9	15	2
			2	118	1	20	79	79	60	38	3	0	35	91	43	2		3	3	10	52	0	54	1	22	19	66	8	0	66	34	2	37	3	14	3
			X	1	100	0	0	25	0	0	100	0	0	100	0	0		100	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	32	Widespread use in Japan of "snow dam" technology to store snow and use it as cold heat source.	1	88	8	26	66	39	8	43	40	9	34	70	30	6		17	14	6	22	9	30	1	45	41	42	17	1	52	15	2	57	8	2	1
			2	87	5	22	74	37	2	44	50	3	31	78	25	1		10	6	3	30	7	45	1	38	38	52	13	0	64	6	1	71	3	2	1
			X	4	100	0	0	31	0	50	25	25	50	25	25	0		50	0	0	50	25	50	0	25	25	50	0	0	50	0	0	25	0	0	0
	33	Widespread use in Japan of economical and stable photovoltaic power generation systems designed for road and tunnel lighting.	1	142	6	22	73	49	19	42	35	4	36	77	25	4		6	3	36	18	0	43	1	37	24	53	17	3	51	26	1	23	13	6	4
			2	136	2	18	79	46	10	54	36	0	29	85	25	2		3	2	36	15	0	53	1	32	25	63	13	1	58	19	1	35	10	1	2
			X	3	100	0	0	67	33	67	0	0	0	67	33	0		0	0	67	33	0	33	0	0	33	67	0	0	67	0	0	33	0	0	0
	34	Practical use in Japan of a highly efficient heating and cooling system through a combination of solar energy and super heat pumps.	1	121	8	23	69	61	33	44	21	1	43	87	33	2		1	2	32	20	1	48	2	32	32	62	17	3	52	23	2	32	12	3	2
			2	119	8	17	76	60	26	62	12	0	39	91	30	1		0	0	32	20	1	61	1	24	25	71	10	2	62	18	0	41	8	2	2
			X	9	100	0	0	78	56	44	0	0	44	78	33	0		0	0	78	44	0	67	0	0	44	78	22	0	67	33	0	44	22	0	0
	35	Widespread use in Japan of energy-self-sufficient buildings and houses through advancements in natural energy source utilization technologies.	1	163	12	21	66	61	34	42	23	1	36	91	40	4		9	7	30	40	0	31	1	32	33	56	23	4	46	34	4	28	10	10	2
			2	153	10	18	72	60	27	57	15	1	27	91	41	0		3	4	32	57	0	31	1	25	25	70	14	3	54	32	2	38	7	7	2
			X	16	100	0	0	81	63	38	0	0	31	94	44	0		0	0	50	81	0	44	6	6	25	63	19	13	63	44	0	44	0	13	6
	36	Practical use in Japan of a technology to store coldness and to waste heat and utilize them for home air conditioning.	1	143	10	23	67	55	21	58	21	1	34	88	41	1		3	7	24	29	1	36	1	38	28	54	24	3	41	30	1	24	10	7	1
			2	135	8	19	73	53	13	72	15	0	24	92	36	0		2	3	25	35	0	50	0	30	23	67	14	2	47	28	0	33	7	4	2
			X	11	100	0	0	61	27	64	9	0	55	82	36	0		9	0	45	64	0	64	0	9	0	73	18	9	82	45	0	36	0	0	0
	37	Practical use in Japan of distributed energy supply systems for houses utilizing fuel cells, cogeneration, etc..	1	135	9	28	63	53	18	57	24	1	37	85	39	1		2	4	43	27	1	45	1	26	27	55	23	3	44	33	2	21	13	9	1
			2	126	9	23	68	54	17	66	17	0	30	90	36	0		1	4	48	24	0	58	1	21	21	75	13	2	52	30	1	35	9	4	2
			X	11	100	0	0	70	45	45	9	0	36	91	45	0		0	0	82	45	0	55	0	9	9	82	18	9	64	82	0	36	0	9	0
	38	Practical use in Japan of technology that facilitates the recycling of almost all construction by products such as concrete debris, asphalt waste and surplus soil.	1	194	23	38	39	70	46	44	9	1	48	88	23	2		12	7	12	27	1	53	0	24	31	59	16	3	53	45	4	33	5	8	1
			2	177	20	41	39	78	57	41	2	0	44	95	18	1		3	3	10	31	0	72	0	17	21	73	8	2	60	47	1	45	6	5	1
			X	36	100	0	0	83	66	34	0	0	33	100	14	0		3	0	8	42	0	92	0	6	17	78	3	0	58	58	3	50	3	0	0
Response to increasingly diverse and individual lifestyles	39	Practical use of environmental design based on techniques tailored to measure human sensitivity and feelings towards the environment in Japan.	1	117	12	21	67	44	11	47	36	5	16	22	70	20		11	11	33	24	0	31	0	36	52	48	17	8	25	11	2	13	12	26	1
			2	106	9	16	75	42	5	55	40	1	9	14	84	17		8	8	42	24	0	33	0	36	61	60	11	4	25	6	1	12	8	39	2
			X	10	100	0	0	58	30	40	30	0	0	10	80	30		10	0	70	30	0	20	0	20	50	40	10	0	40	0	0	0	10	70	0
	40	Widespread use in Japan of devices in ordinary households that enable people to enjoy imaginary experiences of trips, sporting events, etc. utilizing virtual reality technology.	1	101	4	18	78	25	3	14	60	22	31	3	65	18		8	12	73	11	0	44	0	14	24	45	24	4	10	14	5	1	13	58	3
			2	107	3	12	85	24	1	12	66	21	24	2	79	16		8	7	78	7	0	44	0	11	25	56	23	1	6	10	3	1	8	65	3
			X	3	100	0	0	42	0	67	33	0	0	0	100	0		0	0	33	33	0	100	0	0	67	100	33	0	0	0	0	0	0	100	0

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					High	Medium	Low	Index	High	Medium	Low	Unnecessary	Socioeconomic development	Resolution of global problems	People's needs	Expansion of intellectual resources	2001 2006 2011 2016 2021 2026			USA	EU	Former Soviet Union and Eastern Europe	Japan	Other countries	Do not know	Foster human resources	Promote exchanges among industrial, academic and government sectors and different fields	Upgrade advanced facilities and equipment	Develop a research base	Increase government research funding	Adjust regulations (relax/toughen)	Others	Adverse effect on the natural environment	Adverse effect on safety	Adverse effect on morals, culture or society	Other adverse effects
Response to increasingly diverse and individual lifestyles	41	Development of interior finishing materials which possess sensing functions for temperature, humidity, etc., and to adjust indoor environment.	1	117	15	19	67	35	5	33	55	7	36	23	85	7		3	13	21	13	0	36	2	47	32	50	19	4	23	21	3	8	20	9	3
			2	111	10	20	70	32	3	26	65	5	25	12	89	4		2	10	19	10	1	36	0	50	30	69	12	0	19	16	0	8	33	7	1
			X	11	100	0	0	48	9	73	9	9	36	9	73	18		0	9	45	18	0	55	0	36	55	55	18	0	18	18	0	9	36	9	0
	42	Practical use in Japan of an indoor environment control technology to prevent the outbreak and propagation of household mites and molds.	1	101	13	18	69	46	13	49	34	4	14	7	93	8		3	11	18	18	1	40	0	43	34	52	11	15	26	14	1	16	21	12	4
			2	97	6	19	75	44	9	51	38	2	9	4	98	3		1	6	13	12	1	53	1	36	33	69	4	8	27	9	1	13	33	7	3
			X	6	100	0	0	67	33	67	0	0	33	0	100	0		0	0	50	33	0	67	0	33	33	83	0	0	50	33	0	0	50	17	0
	43	Widespread use in Japan of houses in which rooms and furnishing can be easily altered or converted in step with alternation of generations or shift in life stages.	1	154	18	30	52	50	17	50	32	1	31	19	88	1		6	5	18	19	1	45	1	34	23	49	9	3	29	47	2	4	18	18	3
			2	135	15	29	56	51	15	58	27	0	25	12	96	1		5	2	17	17	0	53	0	35	17	62	5	1	28	55	1	3	23	23	1
			X	20	100	0	0	73	50	40	10	0	40	30	90	0		5	0	20	20	0	70	0	15	20	70	5	0	65	40	5	10	20	30	0
Promotion of welfare/response to aging society	44	Widespread use at Japanese urban public facilities of information systems with a human interface, which can be used by senior citizens and disabled people with the same ease as normal healthy adults.	1	126	3	26	71	60	27	58	13	2	29	0	98	9		2	4	53	48	0	15	1	17	31	45	19	7	50	29	3	0	25	26	1
			2	115	2	19	79	58	19	74	7	0	21	0	98	4		0	3	63	56	0	11	1	15	27	64	11	5	63	21	2	0	31	32	1
			X	2	100	0	0	100	100	0	0	0	50	0	100	0		0	0	100	50	0	100	0	0	0	100	0	0	100	0	0	0	0	0	0
	45	Widespread use in Japan of systems for guiding visually impaired people on footpaths using magnetic sensors.	1	102	2	22	76	49	15	53	30	2	19	0	97	6		2	9	28	35	0	33	0	32	29	46	18	0	53	27	5	1	34	21	3
			2	101	1	14	85	47	7	67	26	0	11	0	99	4		0	5	32	39	0	33	0	31	28	56	10	0	61	24	3	1	47	20	2
			X	1	100	0	0	100	100	0	0	0	0	0	100	0		0	0	100	100	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
	46	Widespread use in Japan of houses equipped with robots and other devices that assist senior citizens and disabled people with everyday tasks, including eating meals, bathing, going to the toilet, and having entertainment, to carry these out without human assistance.	1	116	3	16	80	54	21	55	21	3	30	0	96	3		6	7	33	36	1	29	1	29	27	51	17	3	57	22	5	0	31	31	1
			2	109	3	12	85	56	20	67	12	1	22	0	97	1		5	6	30	49	0	24	0	34	25	61	9	1	67	17	2	0	42	38	0
			X	3	100	0	0	83	67	33	0	0	33	0	100	0		33	0	0	33	0	33	0	67	0	33	33	0	67	0	0	0	0	33	0
Improvement of productivity	47	Widespread use in Japan of a technology capable of creating 3-D map images from such materials as numerical maps and photographic images for application in city planning, etc.	1	171	12	31	57	50	16	53	31	0	65	14	40	19		0	4	61	19	1	45	0	22	42	47	21	22	33	8	4	5	18	15	5
			2	153	10	26	64	49	11	61	27	0	82	8	42	14		0	2	70	14	1	51	0	18	42	61	14	20	37	7	2	3	23	15	3
			X	15	100	0	0	68	36	64	0	0	93	7	40	13		0	0	80	33	0	67	0	0	47	80	7	20	40	7	0	0	7	13	0
	48	Development of a technology capable of measuring locations of active faults and their stress conditions using a vibration generator placed on the ground without relying on blasting tests.	1	151	11	30	59	64	36	49	14	1	29	19	66	25		11	9	40	11	1	54	1	26	48	46	28	9	48	5	3	7	18	5	2
			2	136	10	27	63	63	31	61	7	2	34	11	74	18		7	5	56	6	2	74	1	18	53	51	21	4	63	1	1	6	29	1	2
			X	14	100	0	0	79	58	42	0	0	43	14	57	14		7	0	71	21	0	86	0	7	50	71	21	7	71	7	0	14	21	0	0
	49	Widespread use in Japan of new structural materials made from polymeric fibers, ceramics and other new raw materials for application in buildings, bridges, weirs, etc.	1	183	23	29	48	49	17	46	37	1	81	23	38	8		3	4	43	26	0	58	1	24	37	56	23	4	42	30	2	17	20	4	4
			2	162	20	32	48	50	15	55	29	1	87	17	31	2		2	3	46	23	0	73	1	16	31	68	16	2	48	29	1	17	32	1	1
			X	32	100	0	0	56	24	55	17	3	78	16	31	6		3	3	56	13	0	75	0	6	34	69	22	0	63	16	0	6	38	3	0
	50	Practical use of design techniques that ensure the desired performance of structures based on a quantitative evaluation of the durability and earthquake resistance of reinforced concrete members.	1	197	31	38	31	60	29	53	17	0	54	13	66	12		3	4	51	32	0	57	3	16	47	47	18	7	42	31	3	5	20	8	5
			2	179	30	38	32	60	25	67	8	0	68	7	74	5		1	2	53	25	0	72	1	11	47	61	10	4	50	31	0	3	35	4	1
			X	53	100	0	0	72	45	53	2	0	70	6	70	9		2	0	64	38	0	81	0	0	51	77	6	8	51	26	0	2	30	6	4

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Improvement of productivity	51	Widespread use in Japan of a comprehensive database of design conditions, such as soil characteristics, geology and weather, to be used in planning and designing.	1	206	20	33	46	58	27	51	21	1	67	22	51	12		1	5	47	17	0	38	0	29	33	41	15	37	44	16	2	11	26	6	3
			2	186	19	34	47	55	19	62	18	1	83	13	49	10		1	2	62	13	0	47	1	24	30	45	10	38	58	12	1	9	32	5	3
			X	35	100	0	0	69	43	49	9	0	91	11	63	9		0	3	71	20	0	60	0	17	37	51	11	37	66	26	0	3	40	11	3
	52	Development of intelligent materials with self-diagnostic and self-repairing functions.	1	143	13	29	58	44	11	48	37	4	69	15	52	18		9	17	34	10	0	31	0	43	52	46	29	7	45	8	1	8	20	3	5
			2	130	10	29	61	44	8	57	33	2	75	10	47	11		8	8	43	6	0	35	0	42	57	51	22	2	48	8	1	8	34	2	2
			X	13	100	0	0	58	23	62	15	0	85	8	69	15		8	8	46	23	0	62	0	31	77	38	23	0	69	8	0	0	38	0	0
	53	Widespread use in Japan of inspection techniques that enable easy detection of deterioration and crack existing inside steel structures.	1	179	17	33	50	61	31	51	19	0	51	12	70	7		2	8	37	17	0	55	1	29	42	54	27	4	37	13	1	2	21	4	2
			2	156	13	33	54	57	21	66	13	0	61	6	76	2		2	3	40	10	1	70	1	21	46	72	19	1	37	7	0	1	34	3	2
			X	20	100	0	0	73	50	40	10	0	60	0	80	15		10	0	70	20	5	85	0	0	65	80	15	0	50	15	0	0	40	5	5
	54	Development of highly durable high-performance bonding agents for steel, enabling substantial rationalization of steel construction.	1	140	14	29	58	45	9	58	30	3	73	10	31	10		16	17	31	11	1	28	0	49	42	45	24	5	24	20	1	7	25	6	6
			2	126	13	30	57	47	10	62	28	1	92	4	25	5		13	10	39	7	0	31	0	54	52	59	17	1	22	18	1	4	40	4	2
			X	16	100	0	0	66	38	50	13	0	81	0	19	13		25	13	44	13	0	63	0	38	56	63	19	0	38	19	0	0	38	0	6
	55	Development of new materials to replace reinforced concrete leading to easier field work.	1	170	21	33	46	53	21	51	27	2	79	28	25	14		22	19	23	16	2	22	1	51	45	44	22	5	32	14	2	15	12	8	6
			2	151	24	29	47	53	17	60	23	1	94	18	25	8		20	17	30	14	1	27	0	57	54	52	16	1	38	15	1	22	20	6	3
			X	36	100	0	0	58	28	50	19	3	86	25	28	11		36	19	36	14	3	42	0	47	61	50	14	3	39	14	3	22	19	8	8
	56	Widespread use in Japan of intelligent robots on construction sites to reduce construction period and to ensure safety.	1	198	14	34	53	54	20	55	24	1	75	8	45	6		2	5	28	9	1	72	1	15	34	60	23	2	35	20	3	2	24	11	6
			2	174	13	31	56	53	15	66	18	0	89	2	39	2		1	2	29	5	0	86	1	10	33	72	20	0	36	18	1	0	41	8	3
			X	22	100	0	0	58	18	77	5	0	91	5	50	0		0	0	41	14	0	100	0	0	45	73	36	0	59	14	0	0	27	9	14
	57	Widespread use in Japan of architectural design systems with an improved human interface for designers through the introduction of artificial intelligence and virtual reality technologies.	1	154	13	29	58	43	7	52	39	2	60	4	40	23		3	8	59	20	0	43	1	25	48	53	18	6	29	6	3	1	11	17	5
			2	138	12	28	59	42	4	55	40	0	74	1	38	16		1	5	72	14	0	49	1	17	50	72	9	4	25	3	3	0	11	30	3
			X	17	100	0	0	58	25	56	19	0	71	0	35	24		0	6	76	18	0	59	0	18	35	76	0	6	35	6	6	0	12	35	12
	58	Development of construction techniques which incorporate built-in maintenance and demolition functions for buildings and civil structures.	1	186	16	34	49	55	23	54	21	2	69	40	32	8		5	8	30	12	0	34	0	41	43	49	17	2	28	32	2	8	22	7	3
			2	161	17	32	51	56	20	64	14	1	81	37	28	4		3	4	36	9	0	45	0	37	39	64	8	0	29	35	1	6	35	4	2
			X	27	100	0	0	74	48	52	0	0	67	52	41	7		4	7	44	19	0	63	0	22	48	70	4	0	44	41	0	4	22	7	7
Advanced use of national land and cities	59	Widespread use in Japan of "three-dimensional" cities where the space above railway lines etc. is utilized through the establishment of artificial ground foundations and the like.	1	178	16	32	52	51	20	45	31	3	79	13	44	3		13	8	26	18	0	46	2	25	17	38	7	1	27	66	2	21	37	15	4
			2	162	14	28	57	49	15	53	29	3	88	7	44	2		10	2	25	18	0	66	2	17	12	46	2	0	25	75	2	17	50	10	3
			X	23	100	0	0	62	35	48	13	4	87	17	35	4		9	0	52	30	0	78	0	0	4	52	4	0	26	83	0	30	35	22	9
	60	Widespread use in Japan of integrated data (land ownership, use, transactions etc.) obtained through GIS (geographical information system) in land policy and urban planning.	1	170	20	26	54	59	28	54	17	1	80	13	48	8		4	5	59	22	1	42	1	24	31	42	11	32	37	36	2	6	40	20	4
			2	156	17	24	59	59	25	65	10	1	89	6	46	5		4	1	69	17	1	50	1	16	21	54	8	29	38	37	1	3	35	22	2
			X	27	100	0	0	81	63	37	0	0	96	7	70	15		0	0	81	33	0	67	4	4	15	48	15	33	52	41	4	4	41	22	4

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					High	Medium	Low	Index	High	Medium	Low	Unnecessary	Socioeconomic development	Resolution of global problems	People's needs	Expansion of intellectual resources	2001 2006 2011 2016 2021 2026	Will not be realized (%)	Do not know (%)	USA	EU	Former Soviet Union and Eastern Europe	Japan	Other countries	Do not know	Foster human resources	Promote exchanges among industrial, academic and government sectors and different fields	Upgrade advanced facilities and equipment	Develop a research base	Increase government research funding	Adjust regulations (relax/toughen)	Others	Adverse effect on the natural environment	Adverse effect on safety	Adverse effect on morals, culture or society	Other adverse effects
Advanced use of national land and cities	61	Development in Japan of design and construction technology for floating airports along coastal areas.	1	163	16	26	58	62	35	43	20	2	89	35	24	6		1	4	26	14	0	67	1	18	28	57	17	1	57	42	4	60	24	7	2
			2	149	15	24	60	62	30	59	10	1	93	32	20	3		0	1	35	8	0	83	0	9	21	68	8	1	69	47	1	70	26	1	1
			X	23	100	0	0	83	65	35	0	0	100	35	22	0		0	0	26	13	0	100	0	0	17	87	17	0	70	39	0	57	17	0	4
	62	Establishment in Japan of a wide-area integrated water management technique covering rivers, dammed reservoirs, etc., leading to widespread use of efficient water resource utilization systems in major urban zones.	1	141	18	23	59	80	62	32	6	0	57	70	57	1		3	7	22	16	1	52	1	28	28	40	13	9	49	39	4	38	12	13	1
			2	133	15	20	65	83	67	30	2	0	59	70	59	1		5	2	21	14	0	67	1	22	20	53	9	5	66	45	0	58	14	6	0
			X	20	100	0	0	88	75	25	0	0	70	65	55	0		0	0	30	25	0	85	0	0	30	50	15	5	80	30	0	40	10	5	0
	63	Widespread use in Japan of new joint-use duct systems in cities to contain housing cable for wire broadcasting, vacuum garbage collection pipelines, distribution pipelines, and regional heating and cooling pipes.	1	172	13	24	63	58	27	52	20	1	76	30	69	2		3	8	37	39	1	36	0	24	15	46	15	1	37	62	4	14	28	12	4
			2	154	10	26	64	55	19	63	18	0	80	15	71	1		3	3	43	55	1	45	0	16	12	62	8	1	44	68	1	15	40	6	3
			X	16	100	0	0	73	50	44	6	0	88	19	75	6		0	0	69	50	0	81	0	6	25	81	0	0	50	56	6	13	31	19	0
	64	Realization in Japan of the decentralization of various city functions currently concentrated in large cities through significant advancements in telecommunications and transportation systems.	1	176	15	23	63	74	52	42	6	1	84	33	62	3		19	13	44	27	0	15	2	26	13	40	11	5	32	57	5	16	13	30	3
			2	160	11	23	66	78	57	38	4	0	86	21	61	2		16	8	63	29	0	12	1	21	8	50	6	6	34	66	3	14	7	41	2
			X	18	100	0	0	85	72	22	6	0	94	17	72	11		0	6	61	33	0	28	6	11	6	61	6	6	44	94	11	6	6	33	0
	65	Practical use in Japan of technologies for surveying existing embedded objects and ground properties lying deeper than 5 meters from the surface, in response to increasing use of underground space.	1	153	14	29	57	50	18	51	28	3	63	13	44	11		5	7	33	19	3	42	1	34	41	50	20	8	34	9	3	8	18	3	4
			2	141	11	28	61	48	12	58	27	2	80	6	43	6		2	5	43	15	1	60	1	23	40	72	16	1	36	6	1	7	30	3	1
			X	16	100	0	0	69	44	44	13	0	94	0	56	13		13	6	56	25	0	69	0	13	50	69	38	0	44	0	6	13	31	0	0
	66	Practical use in Japan of the technology to utilize long service-life concrete and steel (at least 100 years) aiming at improving the durability of buildings and civil structures.	1	195	30	31	39	62	33	53	13	2	72	54	35	4		2	11	30	25	2	56	1	26	39	48	24	3	43	19	3	10	13	10	5
			2	167	29	33	38	61	28	63	9	1	86	51	29	1		2	7	34	23	1	69	1	20	38	69	19	1	52	15	1	15	22	10	3
			X	49	100	0	0	74	49	49	2	0	98	53	33	2		2	0	47	31	2	92	0	2	49	71	16	0	57	14	0	8	31	6	6
Effective use of new frontier spaces	67	Realization of deep underground cities where people can reside.	1	174	17	27	56	28	6	20	47	27	61	20	30	7		45	9	21	25	10	21	2	30	20	32	13	1	25	41	2	25	39	33	3
			2	160	14	25	61	25	3	19	53	26	71	13	21	4		47	7	21	30	8	19	3	40	19	38	12	1	25	46	1	26	50	29	3
			X	23	100	0	0	34	4	35	48	13	65	9	39	9		57	4	35	57	17	22	4	13	13	48	4	0	17	65	0	26	39	30	0
	68	Realization of marine cities by progress in offshore engineering.	1	156	12	29	58	39	11	34	45	10	79	31	30	6		20	10	21	13	0	38	2	36	29	44	17	1	40	40	1	46	31	19	3
			2	143	8	24	68	37	9	29	51	11	85	21	17	4		25	8	20	10	0	44	1	38	20	52	9	1	45	48	1	57	34	11	3
			X	12	100	0	0	52	25	42	25	8	100	25	33	8		33	8	17	0	0	75	8	17	25	67	0	0	58	42	0	67	42	8	0
	69	Practical use of technology system needed to systematically build cities in remote areas such as deserts and polar regions.	1	130	8	18	74	28	7	15	53	25	50	55	14	8		16	18	40	10	10	9	4	34	45	38	12	3	34	5	3	52	7	12	2
			2	119	7	12	82	25	2	14	66	18	50	68	7	8		18	13	61	9	8	8	3	32	58	43	7	2	42	3	1	70	6	13	0
			X	8	100	0	0	25	0	25	50	25	25	75	13	13		38	13	75	13	0	13	0	25	75	50	0	0	38	13	0	50	0	25	0
	70	Practical use in Japan of a technology to construct super high-rise buildings (around 1,000 m tall) with living spaces.	1	191	18	34	48	27	3	23	51	23	73	18	27	12		30	9	48	4	0	58	1	15	29	47	17	1	23	43	5	36	50	30	3
			2	171	16	34	50	27	2	22	53	22	84	10	19	9		32	6	54	0	0	70	1	15	25	60	8	0	21	56	2	36	62	26	4
			X	27	100	0	0	26	4	15	59	22	89	11	30	11		30	7	59	0	0	93	0	4	11	70	7	0	30	63	0	41	52	37	4

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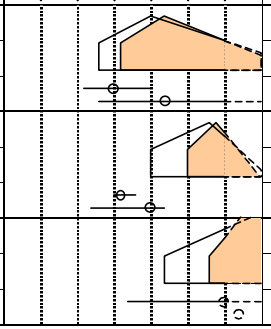
Effective use of new frontier spaces	71	Elucidation of the impact of living in a super high-rise building (around 1,000 m tall) on human physiology and psychology.	1	149	10	26	64	34	6	30	50	14	36	7	58	23		13	12	39	10	1	27	0	36	46	48	13	6	29	11	1	9	28	34	1
			2	129	8	22	70	32	4	27	59	11	33	2	64	21		12	9	50	6	0	35	1	35	52	60	8	3	27	8	1	9	36	43	4
			X	10	100	0	0	25	0	10	80	10	20	0	70	20		30	0	30	10	0	40	0	40	40	80	0	0	40	10	0	10	30	40	0
	72	Realization of facilities in the outer space where people in general can live in long period.(at least one year)	1	98	4	7	89	31	3	34	43	20	49	33	8	57		10	14	88	9	39	10	0	4	52	38	26	2	58	2	2	9	21	39	5
			2	94	2	6	91	30	2	29	52	17	43	21	4	66		15	11	98	4	43	5	0	1	68	34	17	2	71	1	1	6	26	53	4
			X	2	100	0	0	75	50	50	0	0	50	50	50	100		0	0	100	0	50	0	0	0	100	50	100	0	50	0	0	0	0	50	0
	73	Realization of manned laboratories on Mars.	1	65	3	6	91	25	3	17	52	28	38	29	2	65		14	18	89	6	32	6	0	3	52	32	25	3	52	0	3	6	17	25	6
			2	72	1	4	94	23	0	18	54	28	25	17	0	76		17	15	97	0	32	3	0	1	65	29	21	1	58	0	3	4	18	47	4
			X	1	100	0	0	25	0	0	100	0	0	0	0	100		0	0	100	0	100	0	0	0	0	0	100	0	100	0	0	0	0	0	0

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