

Asia-Pacific  
Economic Cooperation



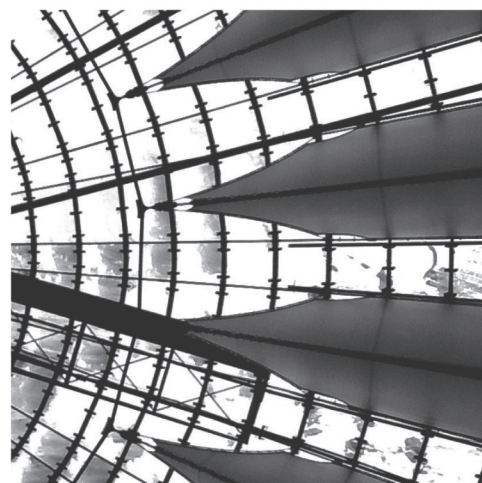
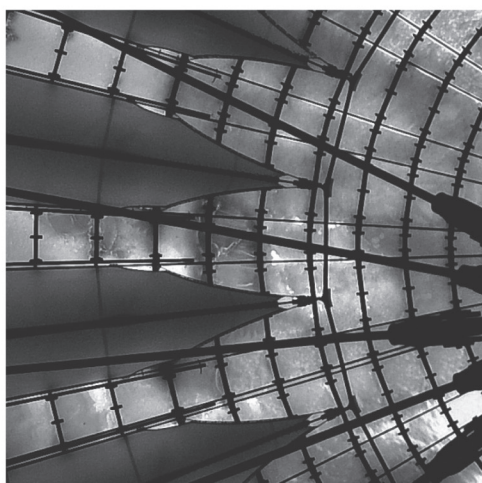
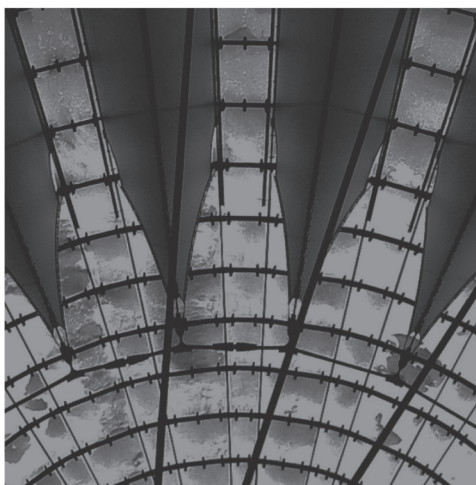
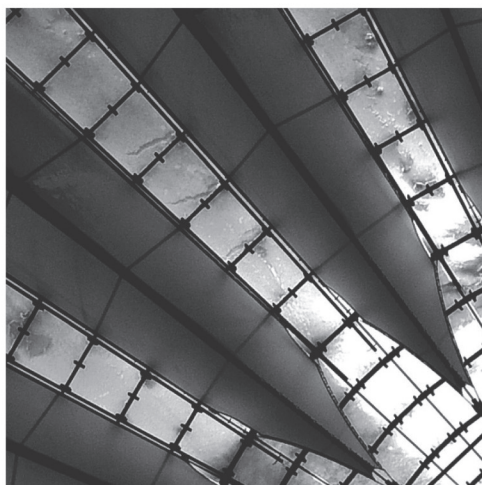
Asia-Pacific  
Economic Cooperation

# Report of Delphi Analysis

FOR THE LOW CARBON SOCIETY  
BEYOND 2050 PROJECT

APEC Center for Technology Foresight (APEC CTF)





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# Analysis the Results of Real-time Delphi survey for the Low carbon Society Project

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## 1. Background of the Survey

The project, *Research on the Futures of Low-carbon Society: Climate Change and Strategies for Economies in APEC Beyond 2050*, is a region-wide foresight research on the future society where low carbon economy and lifestyle becomes the principal driver governing trade and development. Future scenarios for the Asia-Pacific region illustrate social, economical and political demand under such constraints. Science and technology development, including technology transfer, that responds to such demand is also considered through a series of workshop. The future scenarios and policy recommendations developed from this project should reflect differences in economic and social conditions among economies and be consistent with our common but differentiated responsibilities and capabilities. Even though the project focuses on the longer-term perspectives, recommendations should encourage immediate investment and cooperation as strategies for economies in APEC.

The project's official kick-off meeting, *Hong Kong Scoping workshop*, was held in collaboration with Hong Kong University, during 13<sup>th</sup>-14<sup>th</sup> August, 2008 in Hong Kong. It was a roundtable meeting between key members from APEC economies. The participating economies were China, Hong Kong-China, Japan, Republic of Korea, Malaysia, New Zealand, Philippines, Chinese Taipei, Thailand, Vietnam, and Macao-China. The main purpose was to discuss the project strategy and to position the scope for the upcoming activities. From the 2-day discussion, we agreed to use "Low Carbon Society or known as LCS" as the keyword of the project. The focal emphasis should be on "Socio-economic Adaptation", underlining personal lifestyles, social systems, international trade, economic systems, and effective governance (such as political stability and international cohesion).

The next workshop was *International Working Group Meeting*, which took place during 13<sup>th</sup> - 14<sup>th</sup> October, 2008 in Bangkok, Thailand. The workshop aimed to gain valuable inputs from working group members on the direction and detailed structure of Real-Time Delphi (RT-Delphi) survey, including Delphi statements and their questions. Since an extended APEC-wide network of experts is crucial to the success of this survey, members of the Working Group were also requested to identify their local experts to respond to the survey once it is ready. There were altogether 40 participants, representing 10 economies namely China, Hong Kong-China, Republic of Korea, Philippines, Russia, Chinese Taipei, Thailand, USA, Viet Nam, and Macao-China. The survey statements were classified into 5 core categories, namely, Climate change & its impacts, Migration, rural life & natural resources, Society/health, Trade of goods & services and Housing & construction/urban life/transportation. Under each category there were 4-9 Delphi statements and each statement had its own sub-questions. This is a significant progress towards the completion of Real-Time Delphi survey.

Five *Thai Working Group Roundtable Meetings* were held to make further structural adjustment and detailed refinement on Delphi statements and their questions. Each meeting was a brainstorming session with 10-15 representatives from Thai governmental organizations concerning climate change corresponding to the 5 core categories. The process took a few months of discussions and deliberations to complete the Real-Time Delphi statements. Then we were ready to launch the survey online.



*Real-Time (RT) Delphi Survey* was to gather opinions from a wide range of experts in the APEC region to provide initial inputs for the future scenarios. RT-Delphi survey is “roundless”. That is participated experts can answer the questions as many times as they like and can see the results so far as well as comments from other participants in real time. It can be used to encourage a true debate independent of personalities. Anonymity is maintained in the sense that no one knows who else is participating and who gave which answers. The reasons given for extreme opinions are synthesized by the survey system to give them all equal “weight” by allowing the respondents to see other people’s responses without knowing the owners of the opinions. We officially launched our Real-Time Delphi survey for the period of two and a half months (June 15 – August 30, 2009). The analysis of Real-Time Delphi survey results will be used as an input in the upcoming *Low Carbon Society Scenario Workshop*.

*The Low Carbon Society Scenario Workshop* aims to identify main socio-economic drivers relevant and derived from climate change. It is to establish the likelihood of low-carbon society and generate momentous essences for possible scenarios of adaptive lifestyle beyond 2050 in the following areas:

1. Climate change & its impacts
2. Migration, rural life & natural resources
3. Society/health
4. Trade of goods & services
5. Housing & construction/urban life/transportation.

As results, the workshop will put 5 different perspectives on the futures of Low-carbon society beyond 2050 into structure, through the result of a pre-conducted Delphi Survey together with some additional expert opinions. The scenarios will then be discussed in order to create frameworks of technological solutions. At the end of the Workshop, list of science and technology solutions for the future low-carbon society including, where possible, the roadmaps for technology development pathways and means for technology transfer will be summarized. The overall exercise should benefit the academia, R&D community, decision-makers in science and technology policy, members of APEC economies and global organizations.

## **2. Analysis of the Delphi statements**

In this section, each of the 34 Delphi statements from the survey will be analyzed according to response rate by region and economy, respondent profile by gender. The scores of Level of Expertise, Impact, Desirability, Feasibility and Time of Realization will be calculated by median, Inter-Quartile Range (IQR) and Standard Deviation (SD). The Level of Expertise, Impact, Desirability, and Feasibility which are classified into 5 levels will be designated 5 as High, 4 as Rather High, 3 as Moderate, 2 as Rather Low, and 1 as Low. Indication by participated experts where the event will occur will be presented. Remarks on the end of each section will be made as appropriate.

Since the response rate and respondent profile including gender do not vary very much between the 34 statements, we summarize it in Section 2.1. The response rate and respondent profile including gender for each statement are listed in the Appendix



## 2.1 Response rate and respondent profile

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1-2</b>	<b>1.3 - 2.6</b>
Canada	2	1	
USA	3	1-2	
<b>Asia</b>	<b>58</b>	<b>17-21</b>	<b>21.8 - 26.9</b>
China	7	1	
Hong Kong	6	1	
Japan	11	1-2	
Korea	2	2	
Macao	4	2-3	
Philippines	2	1-2	
Taiwan	2	-	
Thailand	21	7-9	
Vietnam	3	2-3	
<b>Europe</b>	<b>13</b>	<b>4-5</b>	<b>5.1 - 6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1-2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23-28</b>	<b>28.2 - 35.9</b>

In this study, 78 experts from five regions were invited to participate in the real-time Delphi survey. Between 23-28 experts from three regions (28.2 - 35.9 percent of the total invited experts) answered in each statement. The majority of respondents were from Asia which accounts between 21.8 - 26.9 percent of the total respondents. Within the Asian region, the respondents are dominated by the experts from Thailand (7-9 out of 23-28 participated experts). There were between 5-7 participated experts from European and American region, while there was no participated expert from Africa and Oceania. In term of gender, about two thirds of respondents were male.

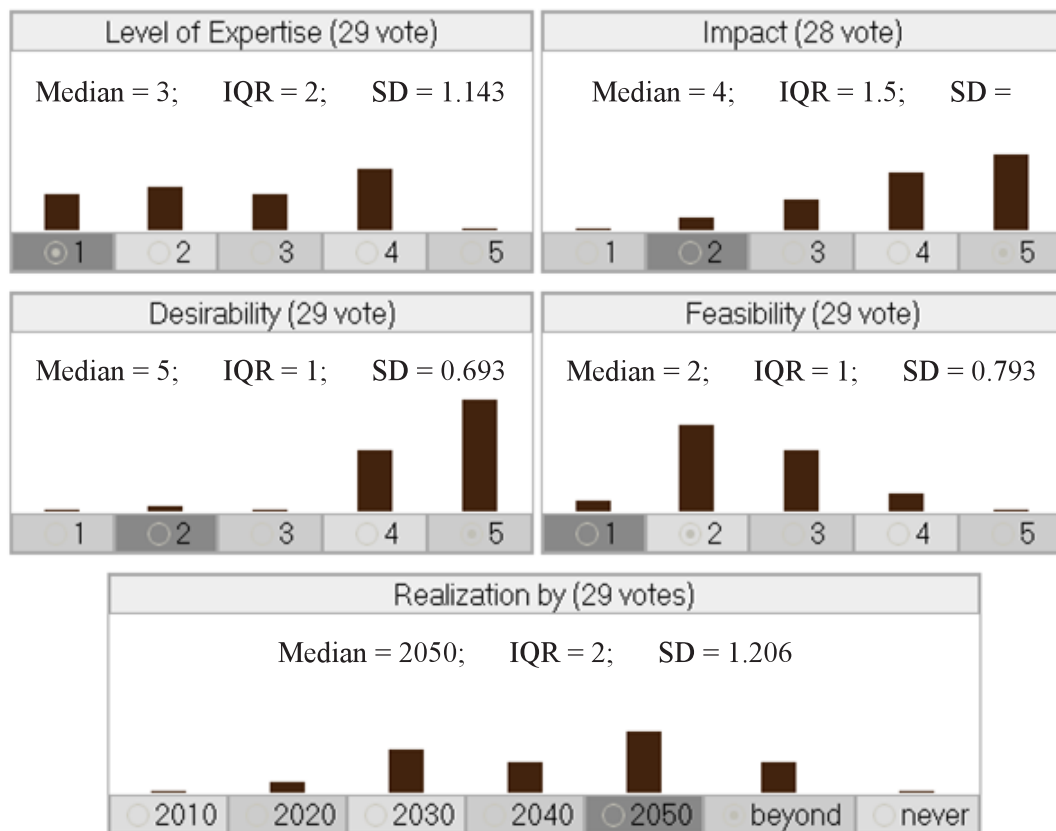
Gender	Number (People)
Male	15-19
Female	6-9
<b>Total</b>	<b>23-28</b>

## 2.2 Analysis of each of the 34 statements

### Section 1: Climate Change & Its Impact

**Statement 1:** Anthropogenic greenhouse gas emissions are stabilized at 1990 level.

- Result of the survey



In each statement, experts were asked to evaluate the level of expertise, impact, desirability, feasibility and time of realization. The median was used (rather than mean) in this analysis to represent the average score for each question due to a skewed nature of the distribution of the responses. Besides, the median is less sensitive to the outliers or extreme values than the mean.

For the statement no. 1 “Anthropogenic greenhouse gas emissions are stabilized at 1990 level”, the median score of level of expertise was 3 out of 5 which represented a Moderate level of expertise. However, the inter-quartile range (IQR) score for the level of expertise was 2; this high IQR score indicated a dispersion of the level of expertise of the respondents.

The average level of impact, desirability and feasibility were 4, 5 and 2 respectively. The IQR of these variables were 1.5 or below which showed the convergence of opinions among the experts. These figures indicated that statement no. 1 “Anthropogenic greenhouse gas emissions are stabilized at 1990 level” had a Rather High level of impact and High level of desirability, while a level of feasibility was Rather Low.

The median year of expected realization of this statement was 2050. In term of the place where this event will happen, the answers were varies ranging from Europe (4 experts), globally (2 experts), developed countries (1 experts), developing countries (1 expert) and Japan (1 expert).

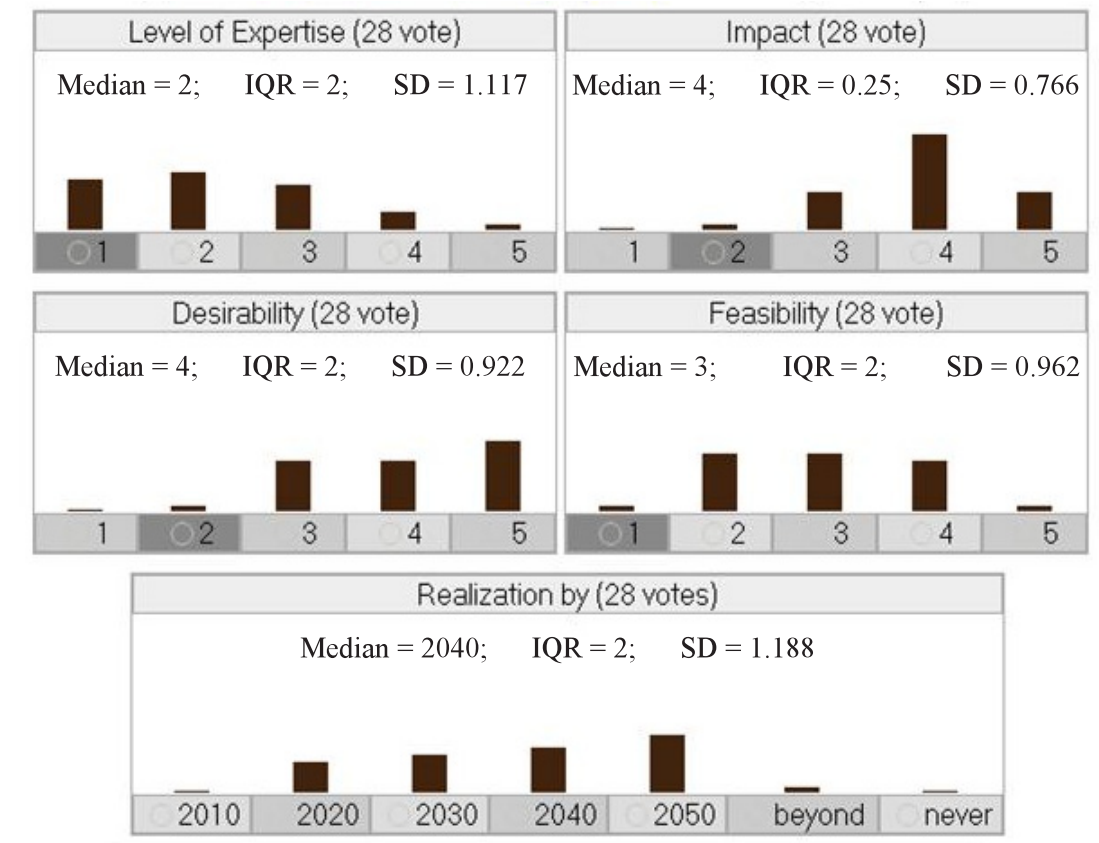


The following were additional comments from participated experts.

- Using 1990 as the level is artificial but perhaps countries need a baseline from which to make assessment and take action. The C-ROADS model will help people.
- The 1990 level is and has been I believe a starting point for a deepening discussion that will take at least 25 years 1990-2015 about how we as a species must change and about the energy sources, use and harvest technologies and socio-economic measures that must prevail. As a starting point its level is not so significant as the fact that a different process has begun to move away from unlimited growth dynamics and consumption patterns for resources.
- The fixation on 1990 levels is somewhat artificial - it likely has more to do with setting a new discipline than reaching a target - just because it is there.

**Statement 2:** Carbon capture and storage (CCS) is effectively and fully implemented.

- Result of the survey



For the statement no. 2 “Carbon capture and storage (CCS) is effectively and fully implemented”, the median score of level of expertise was 2 out of 5 which represented a Rather Low level of expertise. However, the inter-quartile range (IQR) score for the level of expertise was 2; this high IQR score indicated a dispersion of respondents’ expertise.

The average level of impact is 4 and the IQR is 0.25 which indicated the high level of agreement among the experts that statement no. 2 “Carbon capture and storage (CCS) is effectively and fully implemented” had a

Rather High level of impact. In term of desirability and feasibility, the median score were 4 and 3 respectively which shown that this statement had a Rather High level of desirability and Moderate level of feasibility. However, the inter-quartile range (IQR) score for the level of desirability and feasibility were 2; this high IQR score indicated a dispersion of opinion among experts concerning level of desirability and feasibility.

The median year of expected realization of this statement was 2040. In term of the place where this event will happen, the answers were varies ranging from developed countries (5 experts), globally (2 experts), Europe (2 experts), Asia (1 expert) and countries with suitable infrastructure (1 expert).

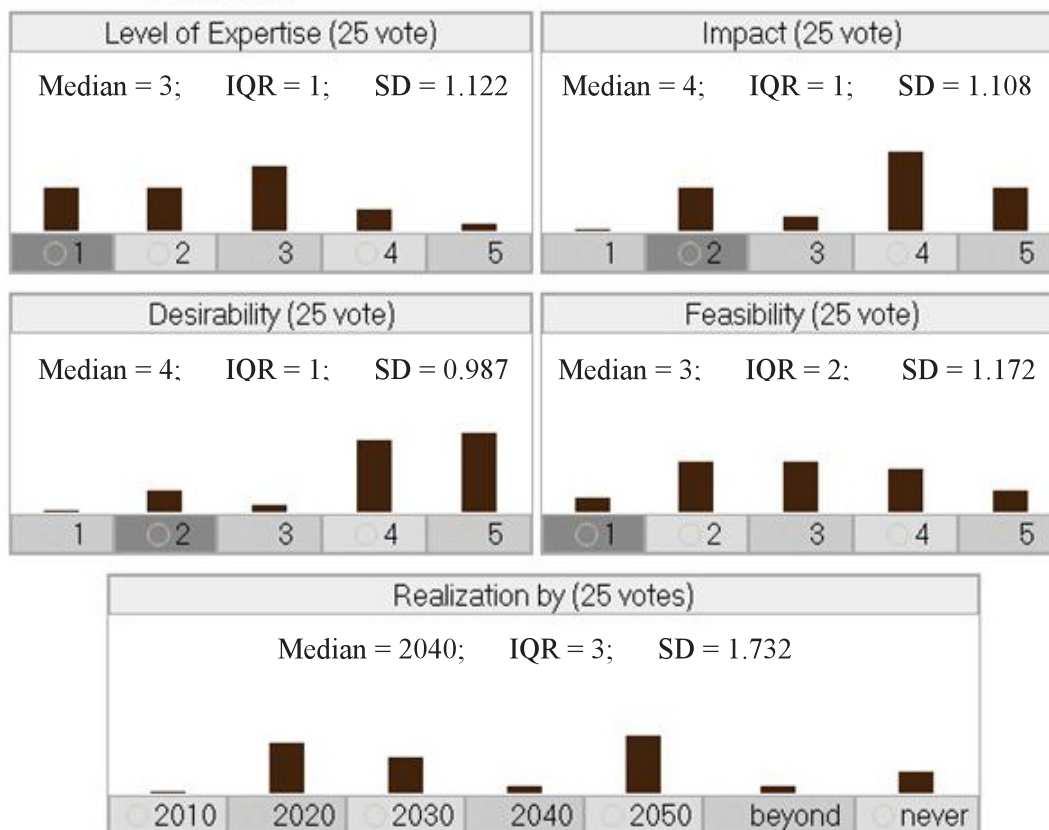
The following were additional comments from participated experts.

- In the recent years, there have been technological breakthroughs in the capture and re-utilization of carbon. It would be great if these technologies are used. However, the same result could be advised by changing our habits of energy consumption.
- It seems likely that there will be great drive to achieve carbon capture and storage but the cost are likely to be very high and we should therefore not rely on innovation here to bail us out.
- There are many technologies and management methods to drive energy efficiency, which are not used. CCS is one group of technologies some of which have great potentials but they are not yet at a stage which can be applied. Communities need to use the technologies and management methods that are proven to drive down consumption and drive up efficiency right now.
- CCS is but one class of solutions and has many variations. CCS for major coal and heavy oil deposits may be achieved by 2040 especially if nanotechnology can help us fine tune at the molecular level the processes where Carbon typically is lost to the atmosphere.
- Carbon capture and storage is still a concept being explored by scientists. Nothing is yet proved especially storage on a long-term timescale. Associated costs are recognized as prohibitory high. Oil companies support CCS as the process may help to extract more oil plus oil companies have the funds to invest in the exploration. Better to perfect processes that avoid or limit release of greenhouse gases.
- CCS has been implemented in some countries. Policy and measure (national and international) will be the driver to accelerate the fully implement of CCS.
- Natural carbon capture using algae can be the future.



**Statement 3:** Technology and management enable forest plantations to act as the main carbon sink.

- Result of the survey



For the statement no. 3 “Technology and management enable forest plantations to act as the main carbon sink”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of moderate level of expertise among the respondents.

The average level of impact and desirability were 4 and 4 respectively. The IQR scores were 1 which showed that collective agreement among the experts towards the level impact and desirability. These figures indicated that statement no. 3 “Technology and management enable forest plantations to act as the main carbon sink” had a Rather High level of both impact and desirability. In contrast, the level of feasibility was 3 and the IQR score was 2. This figure indicated the Moderate level of feasibility, although there was a dispersion of the opinion.

The median year of expected realization of this statement was 2040. In term of the place where this event will happen, the answers were varies ranging from globally (1 expert), Europe (1 expert), developing countries (1 expert) and tropical countries (1 expert).

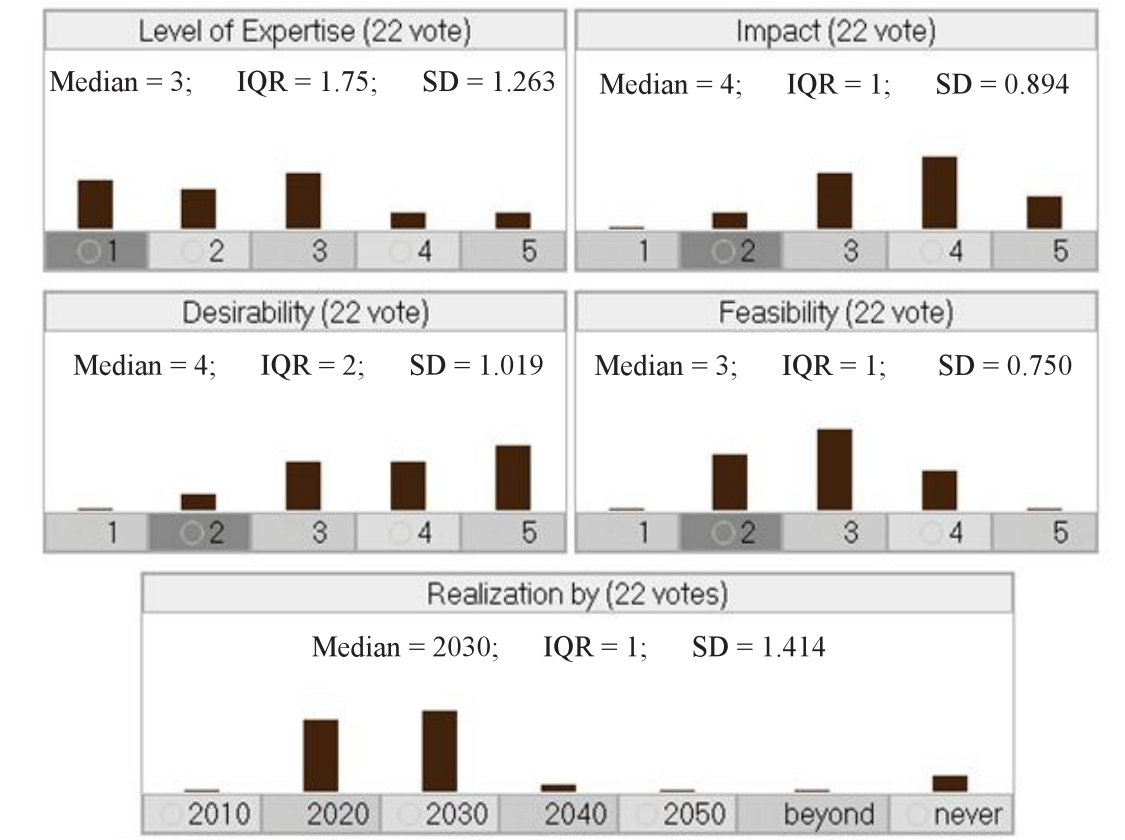
The following were additional comments from participated experts.

- Coral reefs absorb carbon more than trees.

- Forests will never be greater carbon sinks than oceans. Deforestation around the Equator destroys continuously a tremendous volume of thousand-year old trees that probably won't ever be replaced. Technology can't do anything about it.
- Oceans are our major carbon sinks, and policies related to oceans are poor, and many decision makers don't yet really understand the importance of oceans, and the need to curb emissions now.

**Statement 4:** Global and regional earth system modeling (integrated assessment model) provides highly accurate.

• Result of the survey



For the statement no. 4 “Global and regional earth system modeling (integrated assessment model) provides highly accurate”, the median score of level of expertise and desirability were 3 and 4 which represented a Moderate level of expertise and Rather High level of desirability. However, the inter-quartile range (IQR) score for both level of expertise and desirability was 1.75 or over; these high IQR scores indicated a dispersion of level of expertise and desirability among the respondents.

The average level of impact and feasibility were 4 and 3 and the IQR of these variables were 1 which showed that convergence of opinions among the experts. These figures indicated that statement no. 4 “Global and regional earth system modeling (integrated assessment model) provides highly accurate” had a Rather High level of impact and Moderate level of feasibility.



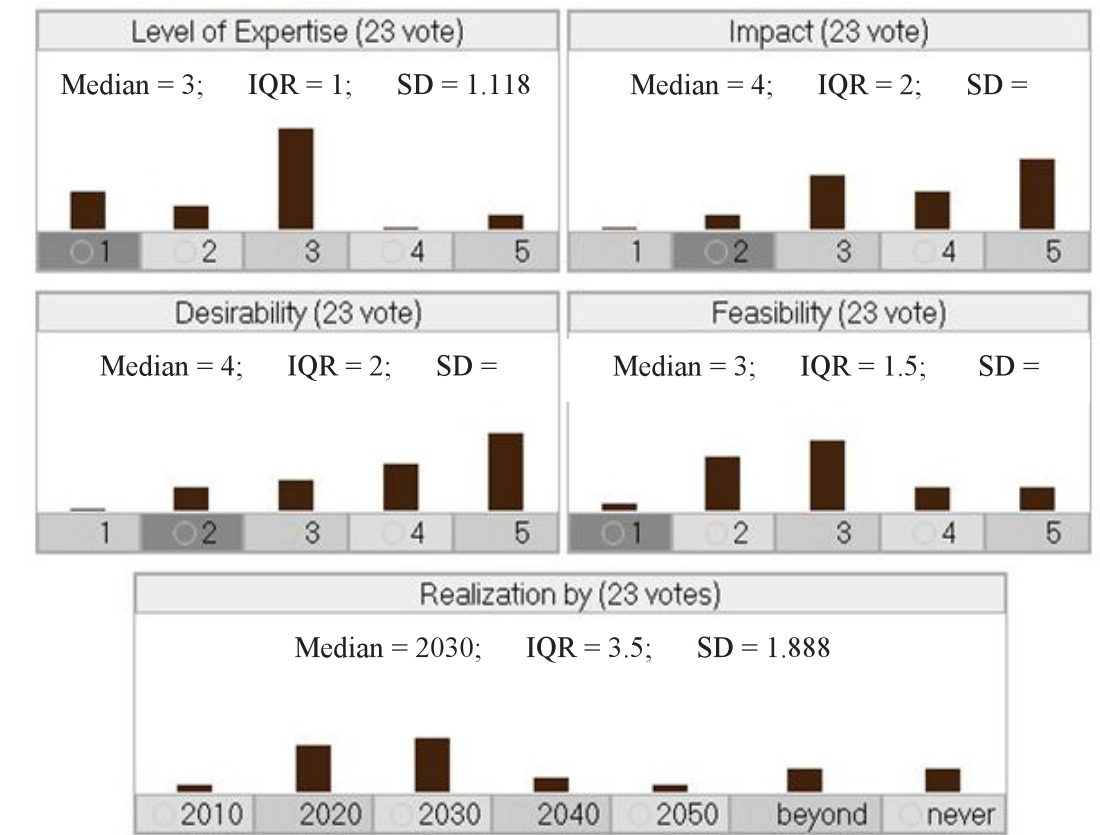
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers were varies ranging from globally (2 experts), developed countries (1 expert), OECD countries (1 expert), Europe (1 expert) and USA (1 expert).

The following were additional comments from participated experts.

- There are many different models developing which make different assumptions. All have limitations. It seems unlikely that a high level of accuracy will be achieved.
- No modeling is ever highly accurate.
- What we seem to learn each time we refine or create a new model is actually how really complex the real world is - and so our reductionist models continue to need to become more agile and complex themselves - this is a gradual learning process that probably needs another 25 years to be fully reliable.
- Highly accurate result from IAM will help planning for any measure and strategies in order to combat with climate change. Therefore, if feasible, it is very important.
- what we seem to learn each time we refine or create a new model is actually how really complex the real world is - and so our reductionist models continue to need to become more agile and complex themselves.

**Statement 5:** Effective mechanisms are devised to cope with the direct impact of climate related events.

• Result of the survey



For the statement no. 5 “Effective mechanisms are devised to cope with the direct impact of climate related events”, the median score of level of expertise and feasibility were 3 and 3 which represented a Moderate level of both expertise and feasibility. However, the inter-quartile range (IQR) score for both level of

expertise and feasibility were 1.5 or below; this score indicated that there is convergence of responses among the experts concerning level of the experts and feasibility.

The average level of impact and desirability were 4 and 4 which indicated that experts evaluated the level of both impact and desirability of this statement as Rather High. However, the inter-quartile range (IQR) score for both level of impact and desirability were 2; these high IQR scores indicated the dispersion of opinions among the respondents concerning level of impact and desirability.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers were varies ranging from developed countries (3 experts), Europe (1 expert) and Japan (1 expert).

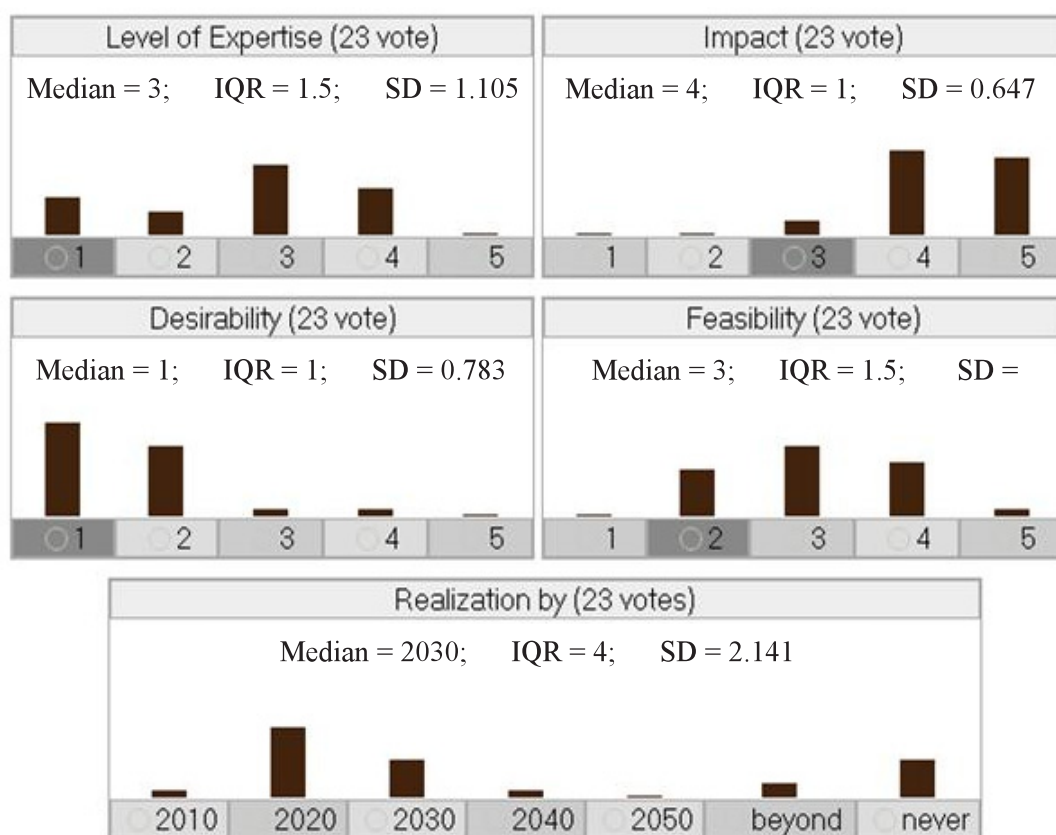
The following were additional comments from participated experts.

- Only some climatic disruption measures will prove to be amenable to human management.
- I am not really sure what this question is asking - does it mean direct impact i.e. adaptation? And what does effective mean here? Technically effective? Or technically effective AND effective as say changing people's behavior?
- Responses to climate-change events are being improved but are highly variable from country to country. (Not all events are known to be triggered by climate-change.) Mechanisms such as protocols/agreements (Kyoto) between nationals or financial tools (CDM/carbon trading) are proving less effective than hoped/planned.

**Statement 6:** Food scarcity occurs as a result of a significant shift in land allocation from food crop to energy crop.

- Result of the survey





For the statement no. 6 “Food scarcity occurs as a result of a significant shift in land allocation from food crop to energy crop”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1.5 which signified a convergence of Moderate level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 1 and 3 respectively. The IQR of these variables were 1.5 or below which showed a convergence of opinions among the respondents. These figures indicated that statement no. 6 “Food scarcity occurs as a result of a significant shift in land allocation from food crop to energy crop” had a Rather High level of impact and Moderate level of feasibility, while having a Low level of desirability.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers were varies ranging from Asia (2 experts), developed countries (1 experts), agricultural countries (1 expert), Sub-Sahara Africa and India (1 expert) and USA, Brazil (1 expert).

There is one additional comment from participated experts that while food scarcity is in fact occurring it is by no means the only reason. There should be more legislative efforts to protect food sources in the future.

## Remarks on Section 1

In the 6 statements on climate change and its impact, the participated experts have an average level of Moderate expertise. All statements in this section have Rather High impact. Most have Rather High desirability except Statement 1 on green house gas reduction which has High desirability but Rather Low feasibility and Statement 6 predicting food scarcity which has Low desirability. All the rest have Moderate feasibility. Three statements have realization date of 2030, two of 2040, and one of 2050. All of them represented fairly diverged opinions on realization dates.

Comments from participated experts can be summarized as follows:

Statement 1: Experts saw 1990 level as somewhat artificial but can be used as a starting point for our species to change behavior.

Statement 2: Some experts are optimistic about the technology. Others are concerned about the high costs and the leakage into the atmosphere. Most seem to favor proven technology and management methods to drive down consumption and drive up efficiency. One thinks that natural carbon capture using algae can be the future.

Statement 3: Experts pointed out that oceans as well as coral reef are greater carbon sinks than forests.

Statement 4: Some are skeptical that no modeling can ever be highly accurate. Others think that a new model needs another 25 years to be fully reliable.

Statement 5: One participant points out that mechanisms like the Kyoto Protocol or CDM are less effective than expected.

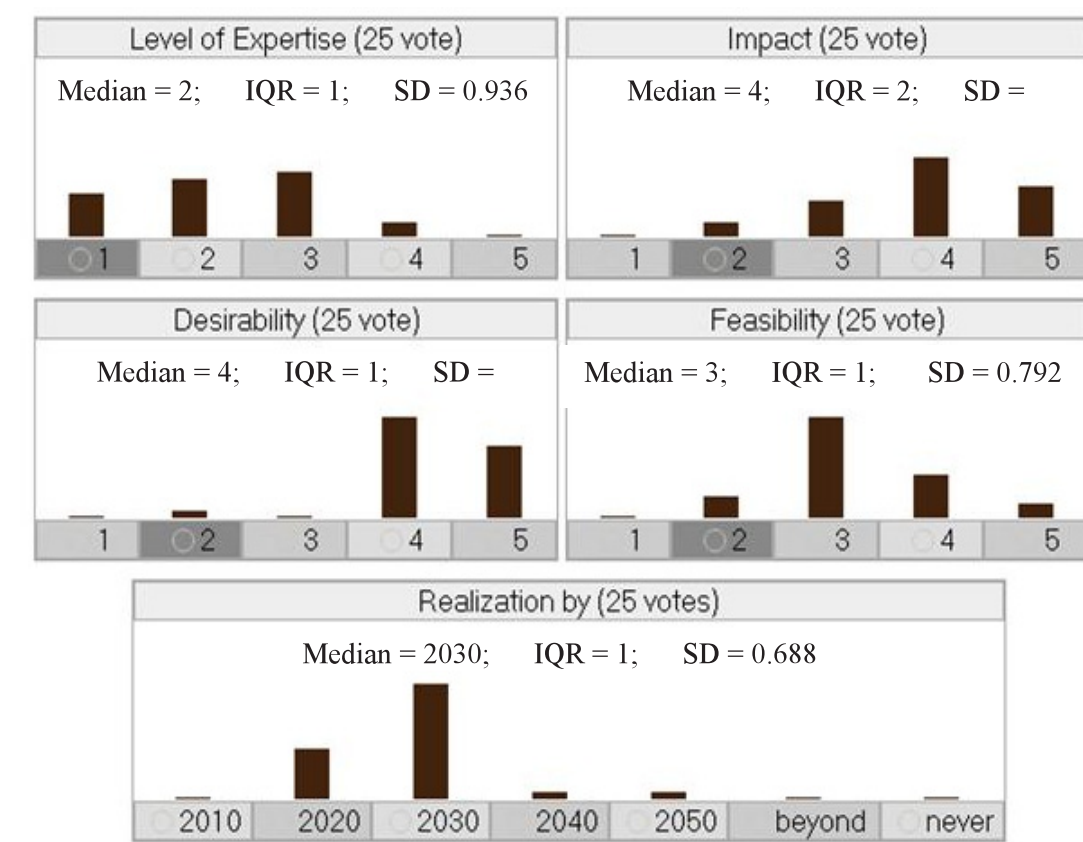
Statement 6: There should be more legislative efforts to protect food sources in the future.

In summary, it seems that the participated experts believed that climate change would have adverse impact but had some doubts about the technologies like carbon capture and storage and earth system modeling as well as the effectiveness of international agreements.

## **Section 2: Migration, Rural Life, and Natural Resources**

**Statement 7:** Coastal ecosystem management becomes widespread and economically beneficial.

- Result of the survey



For the statement no. 7 “Coastal ecosystem management becomes widespread and economically beneficial”, the median score of level of expertise was 2 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of Rather Low level of expertise among the respondents.

The average level of impact was 4 which indicated that experts evaluated the impact of this statement as Rather High. However, the inter-quartile range (IQR) score for level of impact were 2; this high IQR score indicated the dispersion of opinions among the respondents concerning level of impact. The average level of desirability and feasibility were 4 and 3 respectively. The IQR of these variables were 1 which showed that opinions of the experts were consistent. These figures indicated that statement no. 7 “Coastal ecosystem management becomes widespread and economically beneficial” had a Rather High level of impact and Moderate level of feasibility.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers were varies ranging from Coastal countries (2 experts) and Europe (1 expert).

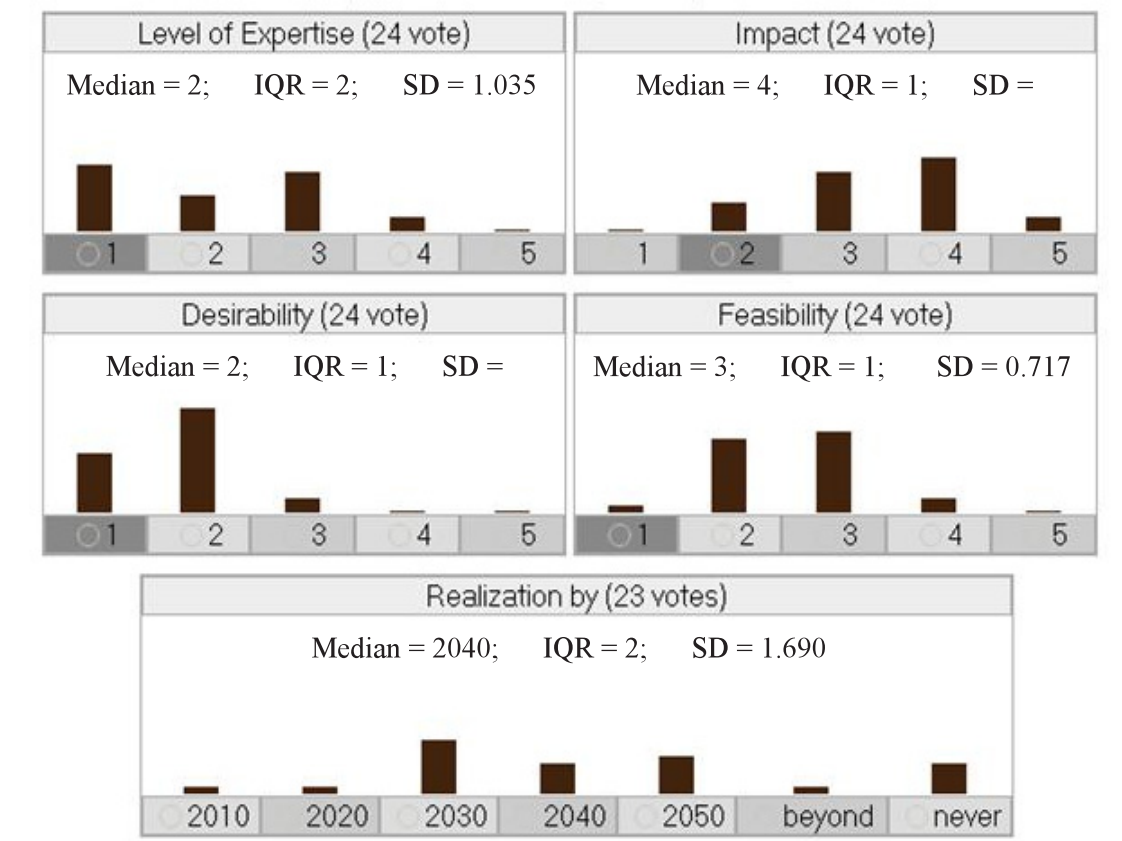
The following were additional comments from participated experts.

- I expect it to become more widespread, but also assuming that it will be economically beneficial requires a leap of faith at this time because the prognosis is for more and more costly challenges.
- There are many barriers to this happening.

**Statement 8:** Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests).



- Result of the survey



For the statement no. 8 “Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests)”, the median score of level of expertise was 2 out of 5 which represented a Rather Low level of expertise of the respondents. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersion of level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 2 and 3 respectively. In addition, the IQR scores of these variables were 1 which showed the consistent opinions among the experts. These figures indicated that statement no. 8 “Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests)” had a Rather High level of impact and Moderate level of feasibility, while the level of desirability was Rather Low.

The median year of expected realization of this statement was 2040. In term of the place where this event will happen, the answers were varies ranging from some low land countries (1 expert), Europe (1 expert) and subtropical regions (1 expert).

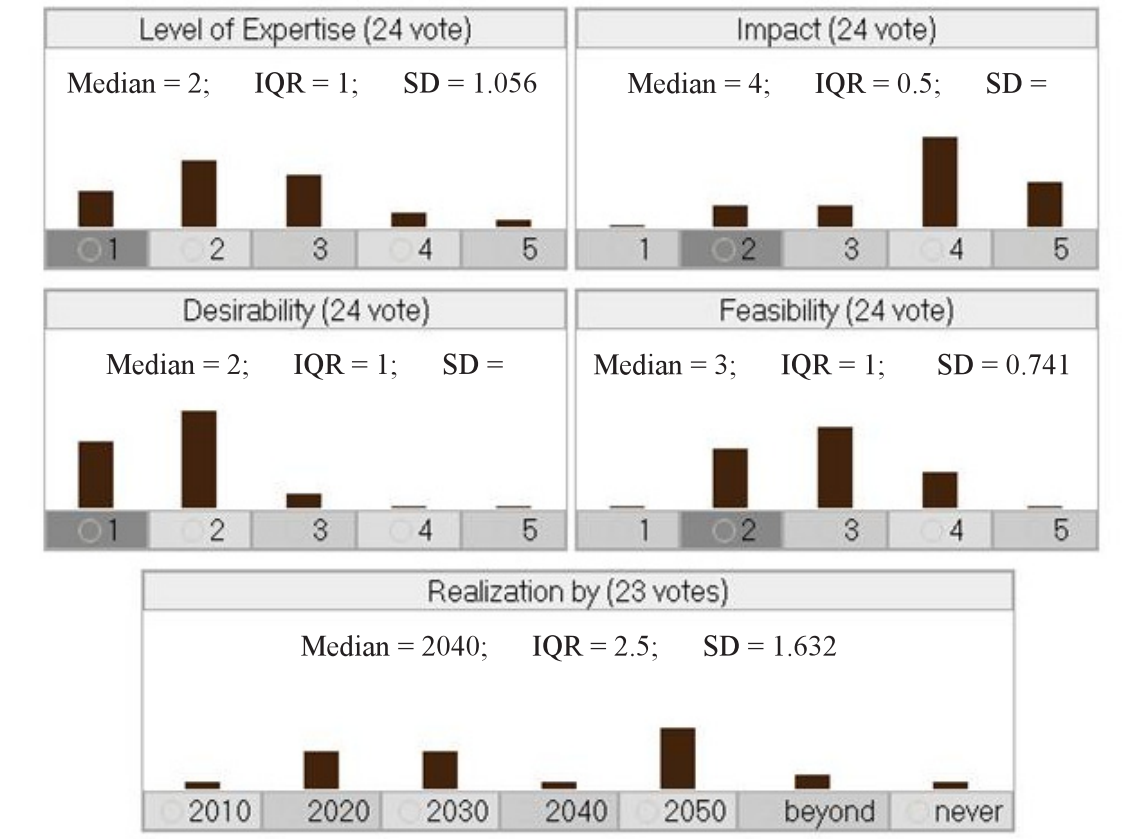
The following were additional comments from participated experts.

- Rapid rate of deforestation arising from expansion of agricultural land already occurs especially in developing countries. Climate change will have negative impacts on agriculture which may cause more forest encroaching which will worsen the existing deforestation problem and destruction of the most important carbon sink.

- While this represents a real threat, there is a growing awareness about the tradeoffs between land cultivation and forest cover, so governments are likely to become more active arbitrators in this area, as they have already in some jurisdictions.

**Statement 9:** Migration of people from coastal area towards inland induces major conflicts over land and resources.

- Result of the survey



For the statement no. 9 “Migration of people from coastal area towards inland induces major conflicts over land and resources”, the median score of level of expertise was 2 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of Rather Low level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 2 and 3 respectively. In addition, the IQR scores of these variables were 1 or below which showed that consistent opinions among the experts. These figures indicated that statement no. 9 “Migration of people from coastal area towards inland induces major conflicts over land and resources” had a Rather High level of impact and Moderate level of feasibility, while having a Rather Low level of desirability.

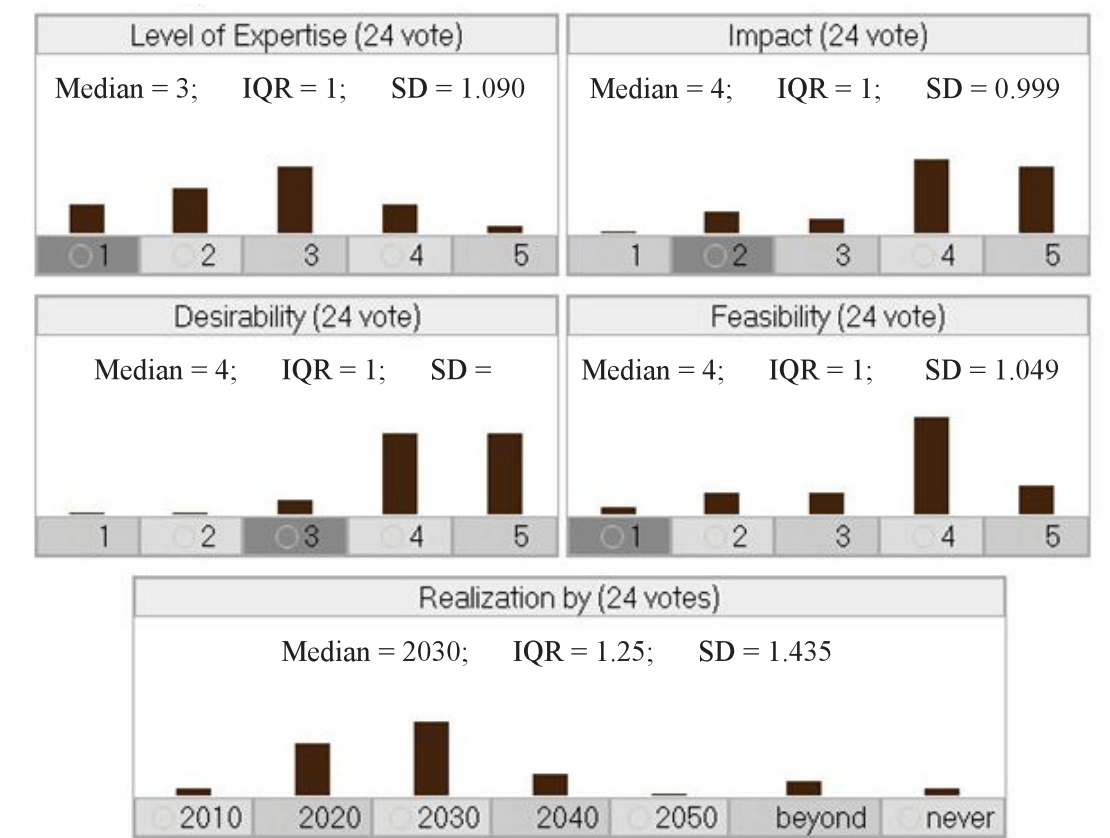
The median year of expected realization of this statement was 2040. In term of the place where this event will happen, the answers were varies ranging from globally (2 experts), Asia (1 expert) and coastal area (1 expert).

The following were additional comments from participated experts.

- This is a quite predictable and foreseeable consequence that can be mitigated to varying degrees by governments depending upon their power and resolve.
- There is a lot of uncertainty about the likely scale of future migration patterns around the world. Estimates vary widely. The evidence about how people behave when migrating because of conflict, scarce resources is also quite patchy and complex.
- There is considerable variation in countries' circumstances which will mitigate the severity of impact.

**Statement 10:** New generations of well-educated people choose new knowledge-intensive, agriculture-based industries that are more sustainable.

• Result of the survey



For the statement no. 10 “New generations of well-educated people choose new knowledge-intensive, agriculture-based industries that are more sustainable”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of Moderate level of expertise among the experts who answered this statement.

The average level of impact, desirability and feasibility were 4, 4 and 4 respectively. In addition, the IQR scores of these variables were 1 which showed the collective opinions of the experts. These figures indicated that statement no. 10 “New generations of well-educated people choose new knowledge-intensive, agriculture-based industries that are more sustainable” had a Rather High level on all impact, feasibility and desirability dimensions.



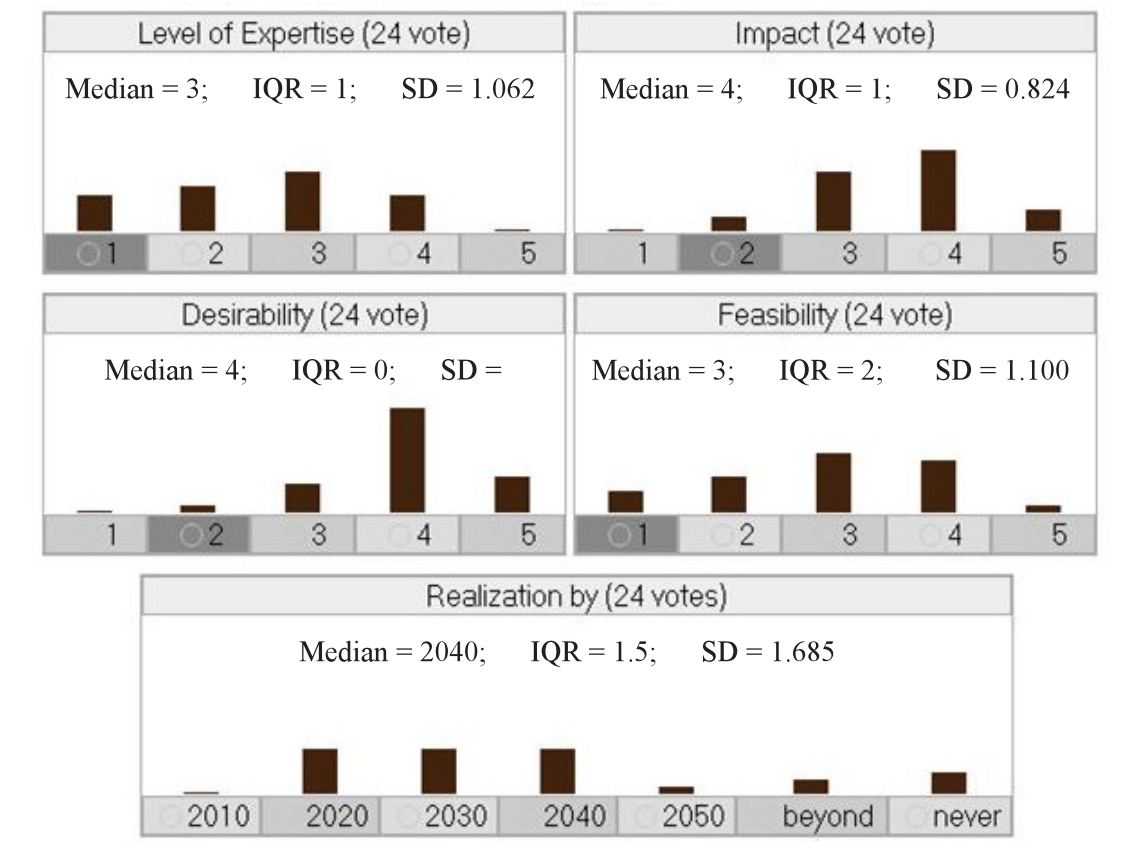
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers varied ranging from Asia (2 experts), and developing countries (1 expert).

The following were additional comments from participated experts.

- Well educated new generation will not cover the majority of the world population therefore although positively selected but the impact to global issue is not high.
- This is feasible in some areas but its impact is likely to be low as these industries will not be universally adopted and the impact to climate change in some areas will preclude their adoption.

**Statement 11:** High demand on carbon deduction creates sustainable income from the poor rural people who plant trees and energy crops.

• Result of the survey



For the statement no. 11 “High demand on carbon deduction creates sustainable income from the poor rural people who plant trees and energy crops”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified an intensity of the Moderate level of expertise among the experts who answered this statement.

The average level of impact and desirability were 4 and 4. In addition, the IQR of these variables were 1 or below which showed that opinions of the experts were consistent. These figures indicated that statement 11 “High demand on carbon deduction creates sustainable income from the poor rural people who plant trees and energy crops” had a Rather High level of both impact and desirability. In contrast, the level of feasibility was

3 and the IQR score was 2. These figures indicated the Moderate level of feasibility as well as a dispersion of the opinion.

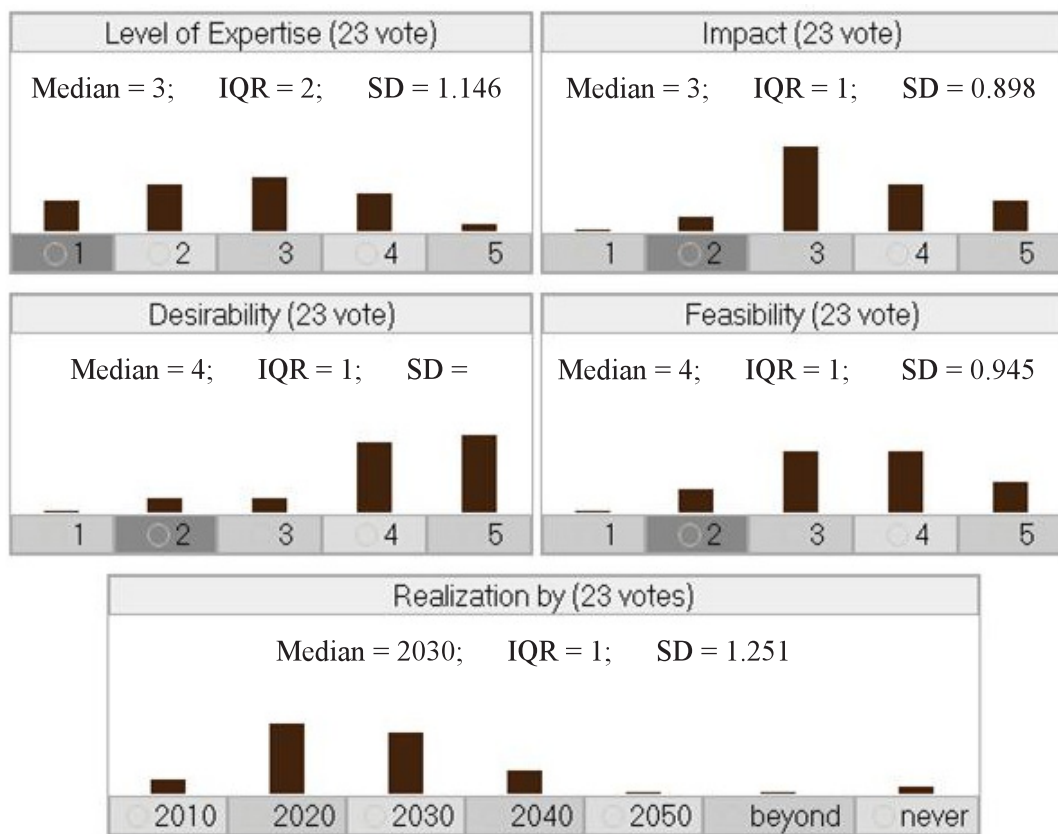
The median year of expected realization of this statement was 2040. In term of the place where this event will happen, the answers were varies ranging from globally (1 expert), many developing countries (1 expert) and Asia (1 expert).

The following were additional comments from participated experts.

- Markets tend to favor the agile and the innovative- so I am not expecting the rural poor to receive proportionately more from a low carbon economy than they now receive from an unsustainable one.
- Carbon reduction will likely involve many forms and technologies, only some of which will be accessible to the rural poor - so whilst very desirable, its feasibility can be questioned.
- Rich economies will fund more projects involving natural carbon capture, e.g. tree planting, coral farming, etc. not too busy poor people will do the job.
- I don't see how this helps the poor.

**Statement 12:** Ecotourism becomes dominant in the tourism industry.

- Result of the survey



For the statement no. 12 “Ecotourism becomes dominant in the tourism industry”, the median score of level of expertise was 3 out of 5 which represented a Moderate level of expertise of the participated experts in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersion of expertise’s level among the respondents.

The average level of impact, desirability and feasibility were 3, 4 and 4 respectively. In addition, the IQR scores of these variables were 1 which showed the consistent opinions among the experts. These figures indicated that statement no. 12 “Ecotourism becomes dominant in the tourism industry” had a Moderate level of impact and Rather High level of both desirability and feasibility.

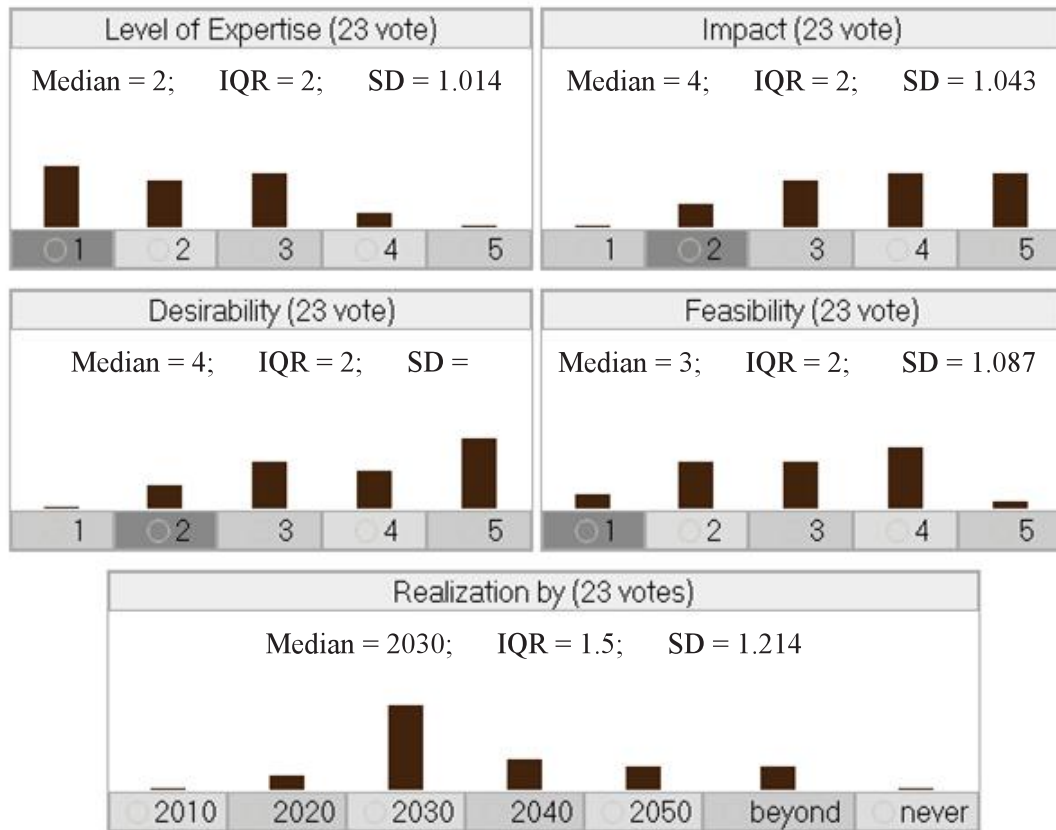
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers were varies ranging from Asia (1 expert), Europe (1 expert) and tourism countries (1 expert).

The following were additional comments from participated experts.

- Tourism is always more about transferring resources and income between economies than as a mechanism for eco improvement - although there can be benefits. The real issue is whether one of the impacts is to transfer knowledge and expertise quicker and thus advance and embed sustainability practices faster.
- This is not likely to have major impact as it may be expensive or only valued by educated tourists. Helping local communities to move to low carbon economies may be attractive. But cheap long haul holidays for ordinary working people will inevitably decline.
- Greening of the tourism industry will be the standard in the future. Unsustainable tourism activities will be a thing of the past. Economical benefits will no longer be the main issue in the future.

**Statement 13:** Algae technology capable of producing fuel (H<sub>2</sub>, oil, or ethanol) becomes commercially widespread.

- Result of the survey



For the statement no. 13 “Algae technology capable of producing fuel (H<sub>2</sub>, oil, or ethanol) becomes commercially wide-spread”, the median score of level of expertise was 2 out of 5 which represented a Rather Low level of expertise of respondents in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated the disperse level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 4 and 3 respectively which indicated that experts evaluated the impact and desirability of this statement as Rather High, while the feasibility of this statement was Moderate. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersion of opinions among the respondents.

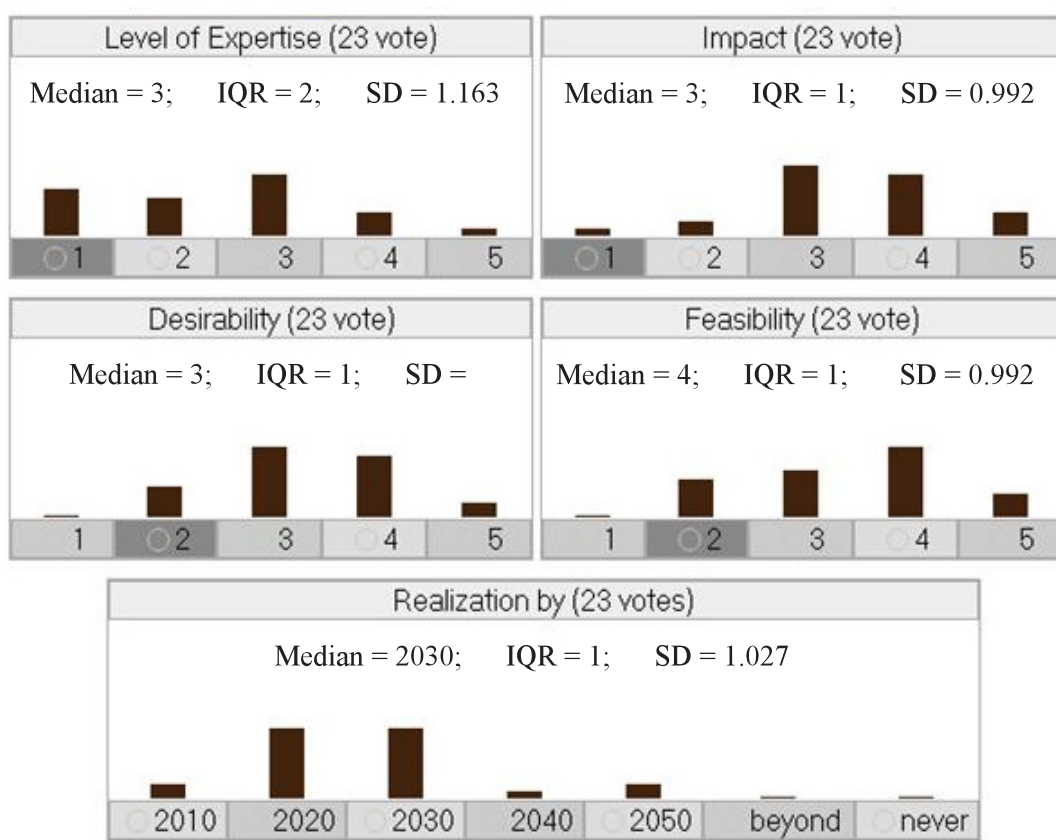
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, one expert stated that this event will happen globally and another expert indicated that it will happen in Japan.

There was also one comment from participated experts for this statement that current R&D on Algae technology looks promising.

**Statement 14:** Skilled immigration applicant increase and are easily accepted.

- Result of the survey





For the statement no. 14 “Skilled immigration applicant increase and are easily accepted”, the median score of level of expertise was 3 out of 5 which represented a Moderate level of expertise of the participated experts in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersion of level of expertise among the respondents.

The average level of impact, desirability and feasibility were 3, 3 and 4 respectively. In addition, the IQR scores of these variables were 1 which showed that opinions of the experts were consistent. These figures indicated that statement no. 14 “Skilled immigration applicant increase and are easily accepted” had a Moderate level of both impact and desirability, while the level of feasibility was Rather High.

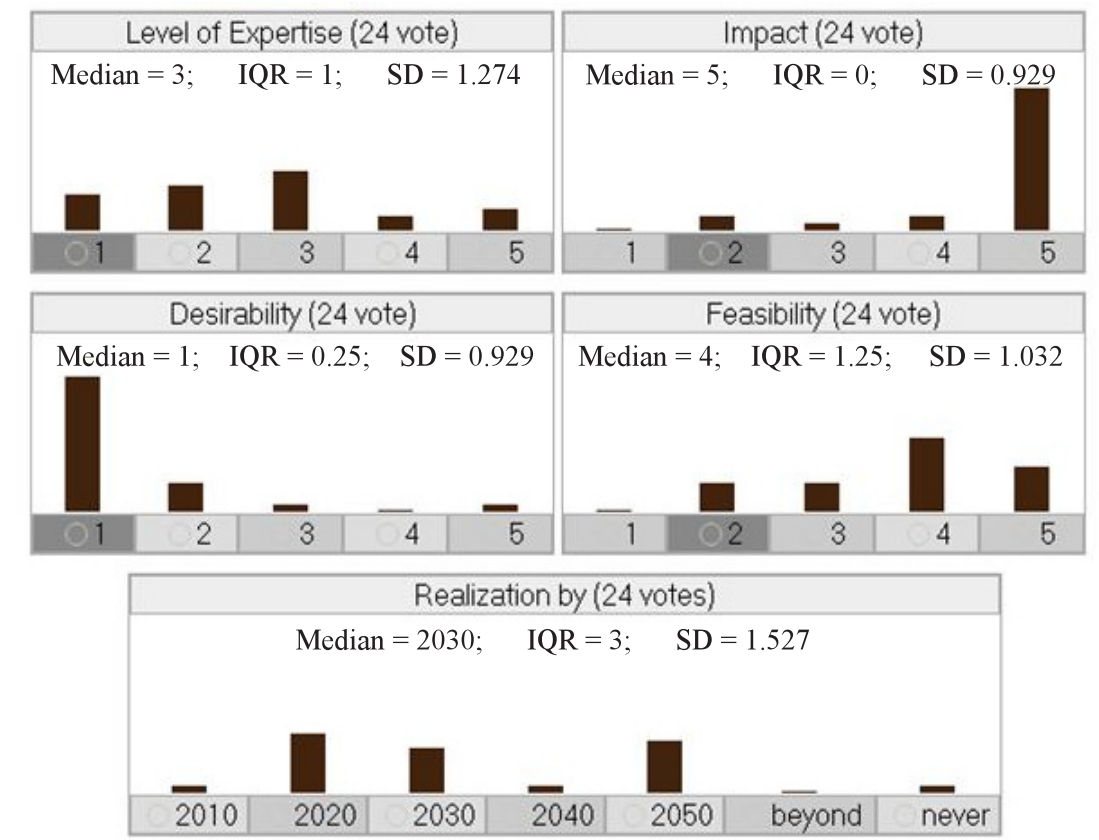
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, two experts stated that this event will happen globally and another expert indicated that it will happen in Asia region.

The following were additional comments from participated experts.

- In one sense this is and always has been true, so why would it change- because if economies try to restrict emigration they are not likely to succeed either - e.g. North Korea and Myanmar.
- The two features of this variable- increased migration of skilled people and easier acceptance may not be mutually contiguous- in fact they may be conflicting as climate induced conflicts push more skilled people to seek changed circumstances, but the same drivers also create more intolerance and tighter restrictions.
- Demand for skilled migrants can be expected to continue in the next 20 years but as climate change volatility becomes established thereafter, scarcity of resources is likely to become a major source of conflict and immigration will become conflated with environmental migration.

**Statement 15:** Water scarcity becomes a cause of war.

- Result of the survey



For the statement no. 15 “Water scarcity becomes a cause of War”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

The average level of impact, desirability and feasibility were 5, 1 and 4 respectively. In addition, the IQR scores of these variables were 1.25 or below which showed that opinions of the experts were consistent. These figures indicated that statement no. 15 “Water scarcity becomes a cause of war” had a High level of impact and a Rather High level of feasibility, while a level of desirability was Low.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, one expert indicated that this event will happen globally and another expert stated that it will happen in Asia.

The following were additional comments from participated experts.

- This is already a factor in the Middle East, and it certainly reflects a potential disparity, so it ranks as one of the most urgent domains for many countries.
- In the Middle East this may be true but in most other regions, there are other solutions that migrate against wars over water.
- By 2030, 30-50% increases are expected for water. Conflict seems very probable, if not actual wars.

## Remarks on Section 2

This section has 9 statements 2 on migration, 3 on rural life, and 4 on natural resources. The participated experts professed Rather Low expertise on 4 statements. Six impacts were rated Rather High. Water scarcity had High impact but ecotourism and skilled migration were rated as Moderate. Desirability levels depended on the content of the statements but the opinions were converged except on algae. There were 5 Rather High, 3 Moderate, 2 Rather Low and 1 Low on water scarcity. As for feasibility, 4 statements had Rather High and 5 Moderate. Realization dates were mainly 2030 with 3 were 2040.

Additional comments by participated experts are summarized as follows:

Statement 7: The experts express worries about the costs and other barriers for coastal ecosystem management.

Statement 8: One commented that shifting of farming land would be a vicious cycle but another believed that there is a growing awareness about the tradeoffs between land cultivation and forest cover such that a balance could be reached.

Statement 9: Migration can cause conflicts but there is high uncertainty regarding scale of future migration patterns and the negative consequence can be mitigated by government.

Statement 10: Two additional comments that the majority of people will not be well-educated and the impact is likely to be low seem to go against the collective opinions of Rather High impact, desirability, and feasibility. These could be extreme minority views.

Statement 11: Despite receiving Rather High scores for impact and desirability and Moderate score for feasibility, all 4 comments seem to be negative about rural poor benefiting from planting trees and energy crops.

Statement 12: One states that tourism is always more about transferring resources and income between economies than eco-improvement. Ecotourism is unlikely to have major impact since it is valued only by a few. However, the third opinion believes in greening of the tourism industry and economical benefits will no longer be the main issue in the future.

Statement 13: There is one comment that current R&D on algae technology looks promising.

Statement 14: All three commentators agree that skilled immigration will increase though it may create intolerance and restrictions but restriction on emigration is unlikely to succeed. Skilled people have the choice to move for better environment.

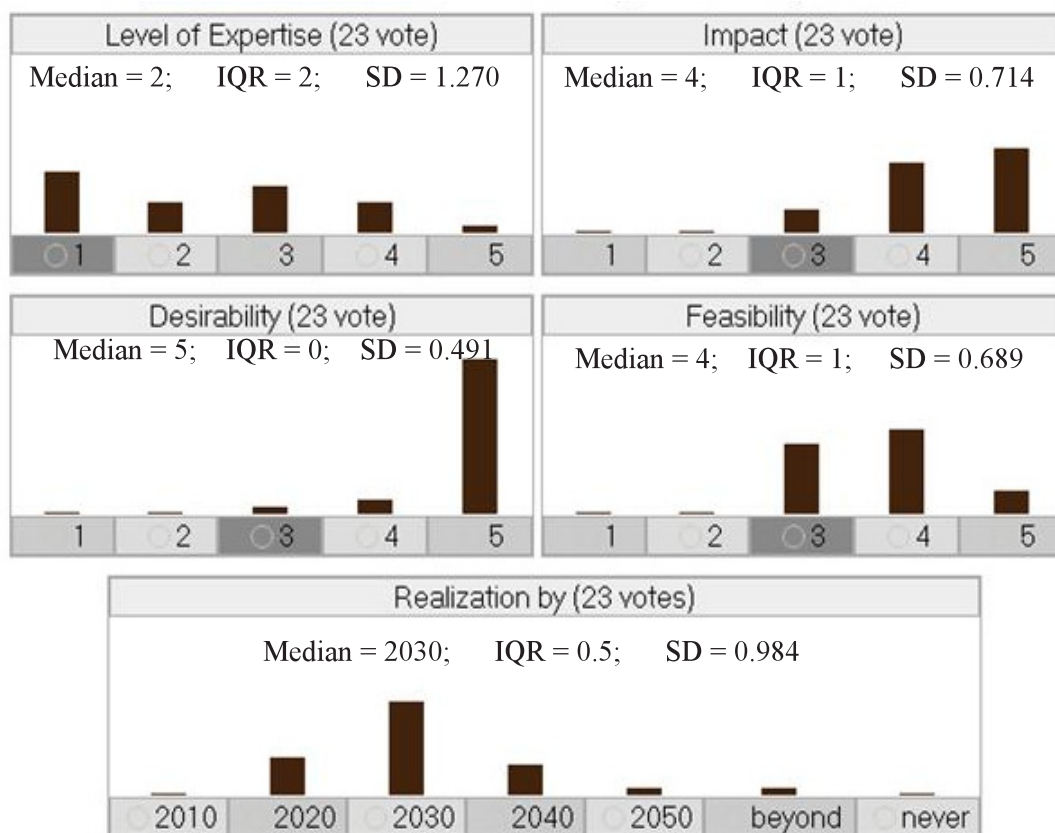
Statement 15: Water scarcity can cause conflicts in the Middle East but there are other solutions in other regions.

In summary, participated experts seem to believe that rising sea level will force farmers to shift to higher attitude despite coastal ecosystem management. Impacts of ecotourism and skilled immigration are only moderate. Water scarcity of course is a major concern. There are conflicting views whether well-educated people will go farming and whether rural poor can gain benefits planting trees and energy crops.

### Section 3: Society / Health

**Statement 16:** Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming.

- Result of the survey



For the statement no. 16 “Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming”, the median score of level of expertise was 2 out of 5 which represented a Rather Low level of expertise of participated experts in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated the dispersed level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 5 and 4 respectively. In addition, the IQR scores of these variables were 1 or below which showed the consistent opinions among the experts. These figures indicated that statement no. 16 “Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming” had a Rather High level of both impact and feasibility, while a level of desirability was High.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers were varies ranging from globally (1 expert) Europe (1 expert) and Asia (1 expert).

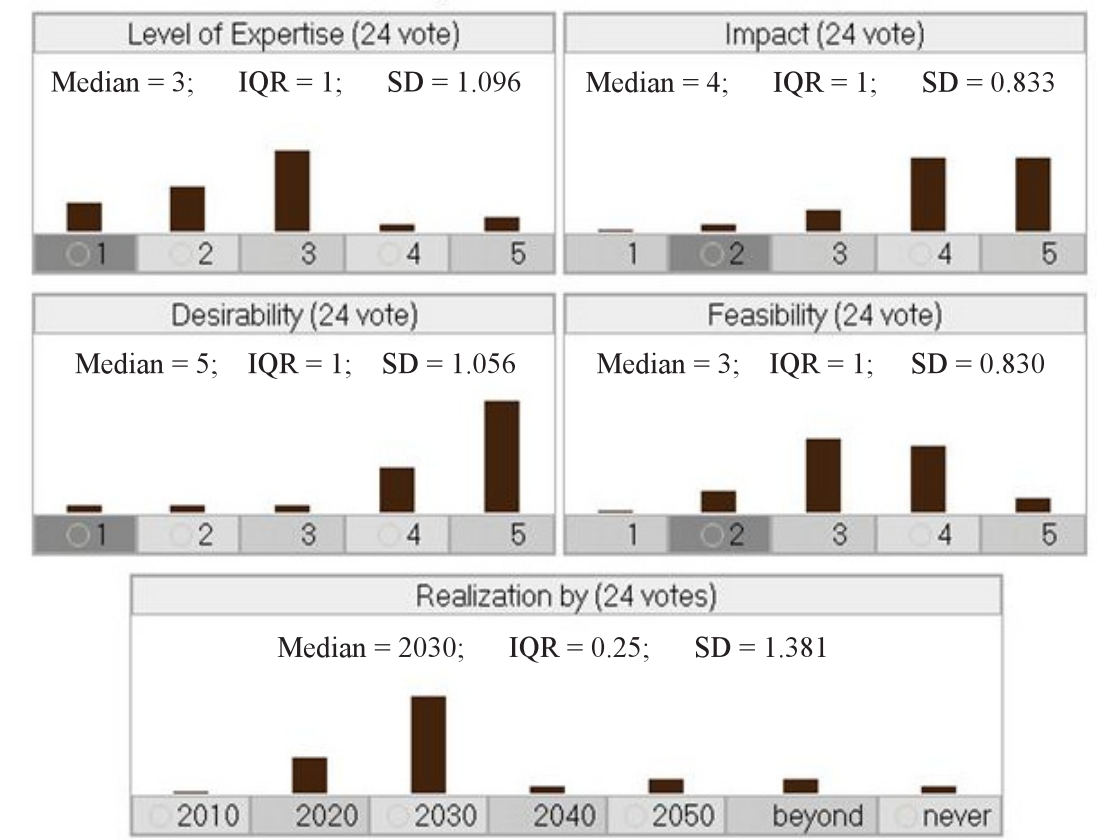
The following were additional comments from participated experts.



- Detection, identification and monitoring technologies are improving rapidly but their deployment in areas where many diseases arise - e.g. Africa - is very uncertain.
- As the APEC project on a roadmap for converging technologies indicates, many opportunities are now becoming accessible to improve early detection, tracking and mitigation of such diseases.

**Statement 17:** Technological process changes toward producing food locally to serve societal demand while reducing carbon emission.

• Result of the survey



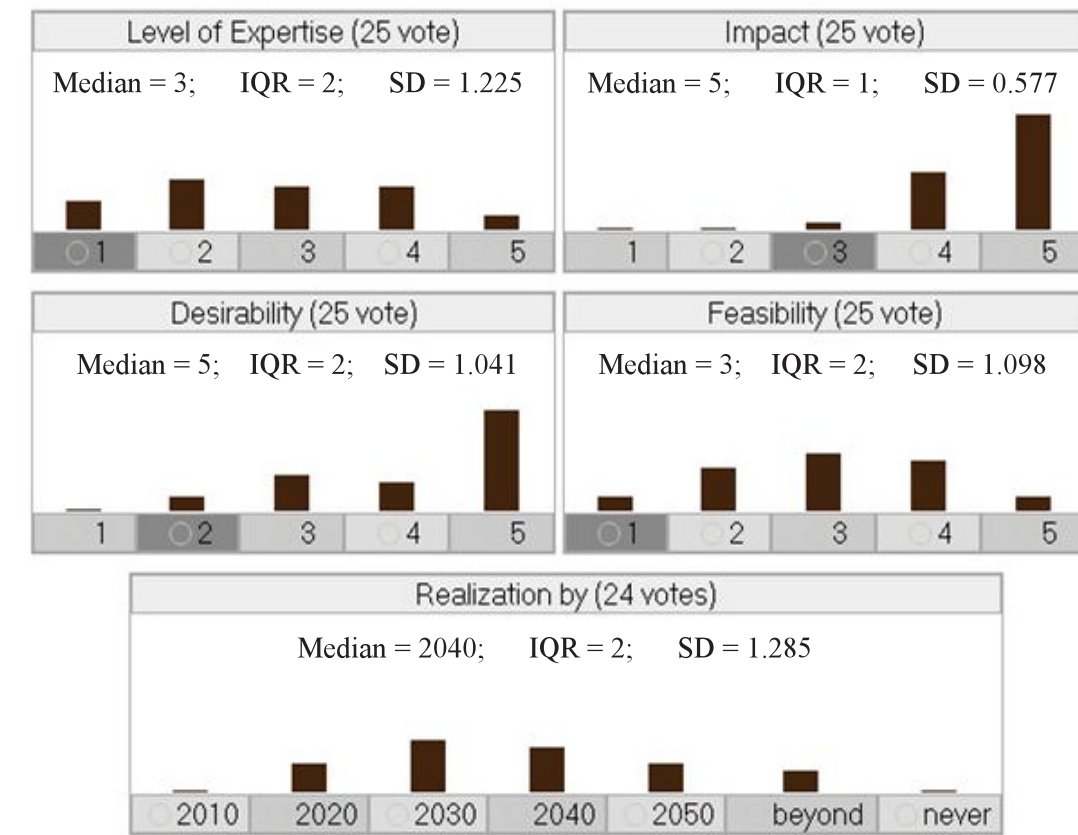
For the statement no. 17 “Technological process changes toward producing food locally to serve societal demand while reducing carbon emission”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the moderate level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 5 and 3 respectively. In addition, the IQR scores of these variables were 1 which showed the convergence of opinions among the respondents. These figures indicated that statement no. 17 “Technological process changes toward producing food locally to serve societal demand while reducing carbon emission” had a Rather High level impact and High level of desirability, while a level of feasibility was Moderate.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, one expert indicated that this event will happen globally and another expert stated that it will happen in Asia.

**Statement 18:** A global regulatory framework of low carbon is totally accepted.

- Result of the survey



For the statement no. 18 “A global regulatory framework of low carbon is totally accepted”, the median score of level of expertise was 3 out of 5 which represented a Moderate level of expertise of the participated experts in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersed level of expertise among the respondents.

The average level of impact was 5 and the IQR score was 1 which signified the convergence of opinions among the experts that statement no. 18 “A global regulatory framework of low carbon is totally accepted” had High level of impact. In contrast, although the level of desirability and feasibility of this statement were 5 and 3 which indicated a High level of desirability and Moderate level of feasibility, the opinions among the experts were not in consensus.

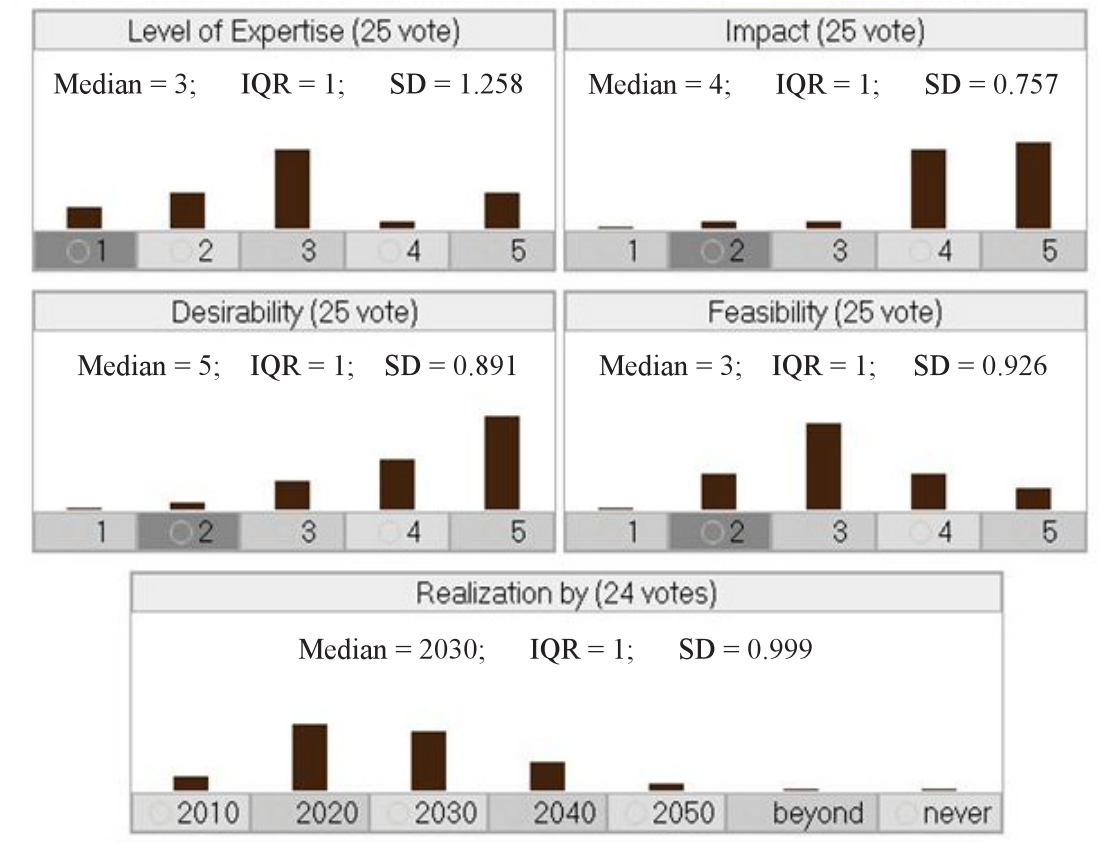
The median year of expected realization of this statement was 2040. In term of the place where this event will happen, three experts indicated that this event will happen globally.

The following were additional comments from participated experts.

- Many countries have studied and try to implement the low carbon concept and it is likely to be accepted widely.
- More likely a market alignment solution will lead to de facto conformance with best practices, delayed by a usual factor for some economies - so total acceptance may be misleading or naive.

**Statement 19:** Consumers are willing to pay more for low carbon footprint products.

- Result of the survey



For the statement no. 19 “Consumers are willing to pay more for low carbon footprint products”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the moderate level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 5 and 3 respectively. In addition, the IQR scores of these variables were 1 which showed that opinions of the experts were consistent. These figures indicated that statement no. 19 “Consumers are willing to pay more for low carbon footprint products” had a Rather High level impact and High level of desirability, while a level of feasibility was Moderate.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, two experts stated that this event will happen in Europe.

The following were additional comments from participated experts.

- Some market segments are testing out the mechanisms for this with reasonable success - but it is difficult to see this as having a real impact unless regulated not voluntary.
- The environmental consciousness of the global population will reach its peak sometime in the future. Economic feasibility will no longer be the main issue specially when most, if not all of us can feel the effects of global warming.

### **Remarks on Section 3**

This section has 4 statements on society/health. Participated experts had Moderate levels of expertise except on technologies of new infectious diseases. All impacts were consistently Rather High and there is one High. All desirability were consistently High. There was one Rather High feasibility and the rest were Moderate. As for time of realization, 3 had the date of 2030 and 1 of 2040.

The comments by participated experts may be summarized as follows:

Statement 16: Technologies are improving rapidly but still not applicable in certain areas like Africa.

Statement 17: There is no comment.

Statement 18: The low carbon concept may be spreading but not total acceptance.

Statement 19: One thinks the some market segments are willing to pay more for low carbon footprint products, but will not have real impact unless forced by regulation. Another thinks that the economics will no longer be the issue when most of us feel the effects of global warming.

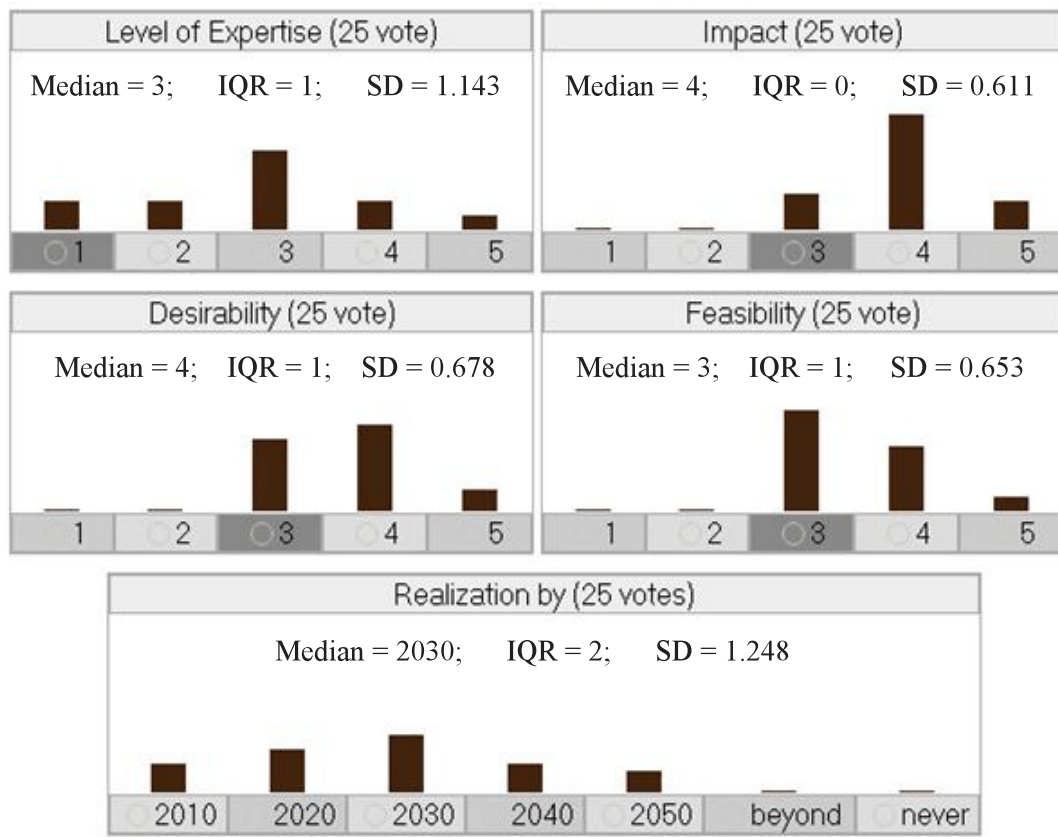
In summary, participated experts were optimistic that technologies can improve healthcare system. The low carbon concept is spreading and some consumers are willing to pay more for green product.

### **Section 4: Trade of Goods and Services**

**Statement 20:** Economies that were previously dominated by manufacturing industries /sectors have moved dramatically towards knowledge-based services.

- Result of the survey





For the statement no. 20 “Economies that were previously dominated by manufacturing industries /sectors have moved dramatically towards knowledge-based services”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of a Moderate level of expertise among the respondents.

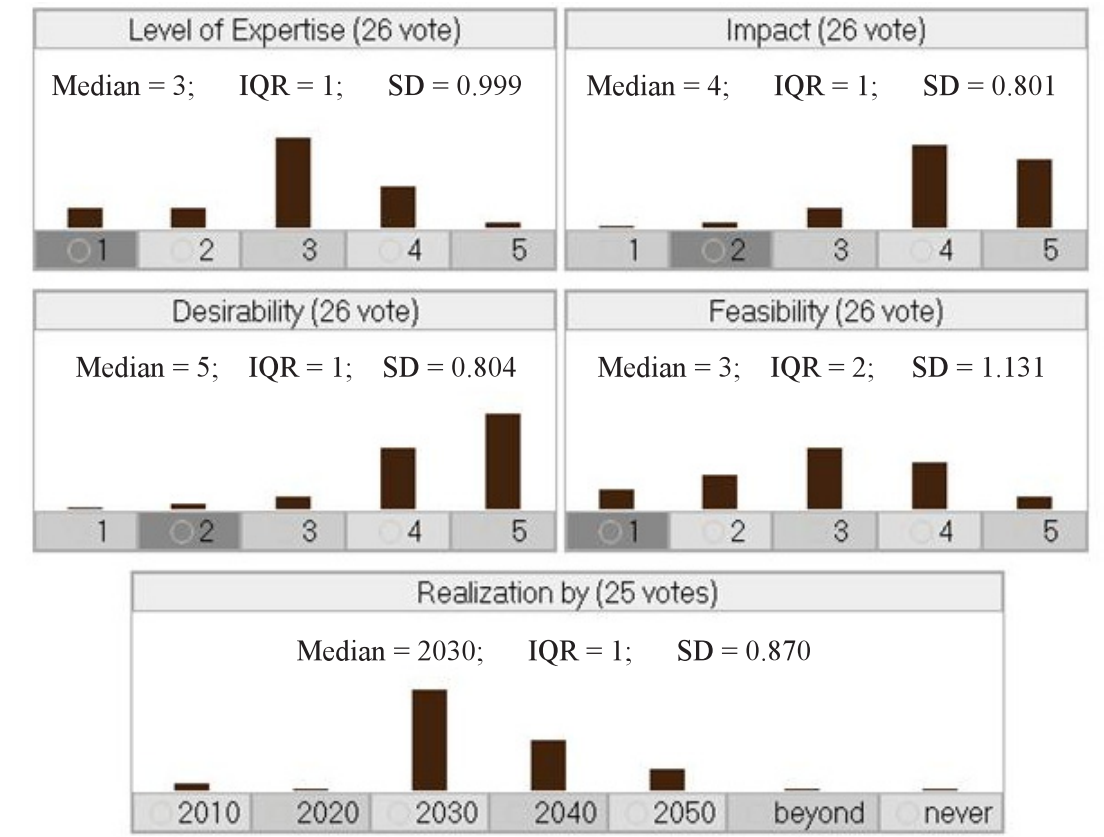
The average level of impact, desirability and feasibility were 4, 4 and 3 respectively. In addition, the IQR scores of these variables were 1 or below which showed the convergence of opinions among the respondents. These figures indicated that statement no. 20 “Economies that were previously dominated by manufacturing industries/sectors have moved dramatically towards knowledge-based services” had a Rather High level of both impact and desirability, while a level of feasibility was Moderate.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, one expert stated that this event will happen globally while another indicated that it will happen in Europe.

There was one additional opinion that most economies seek to move up the value chain in this regard, but not all can get there or remain competitive.

**Statement 21:** Environmentally friendly goods is now the dominant consumer goods in the global market.

- Result of the survey



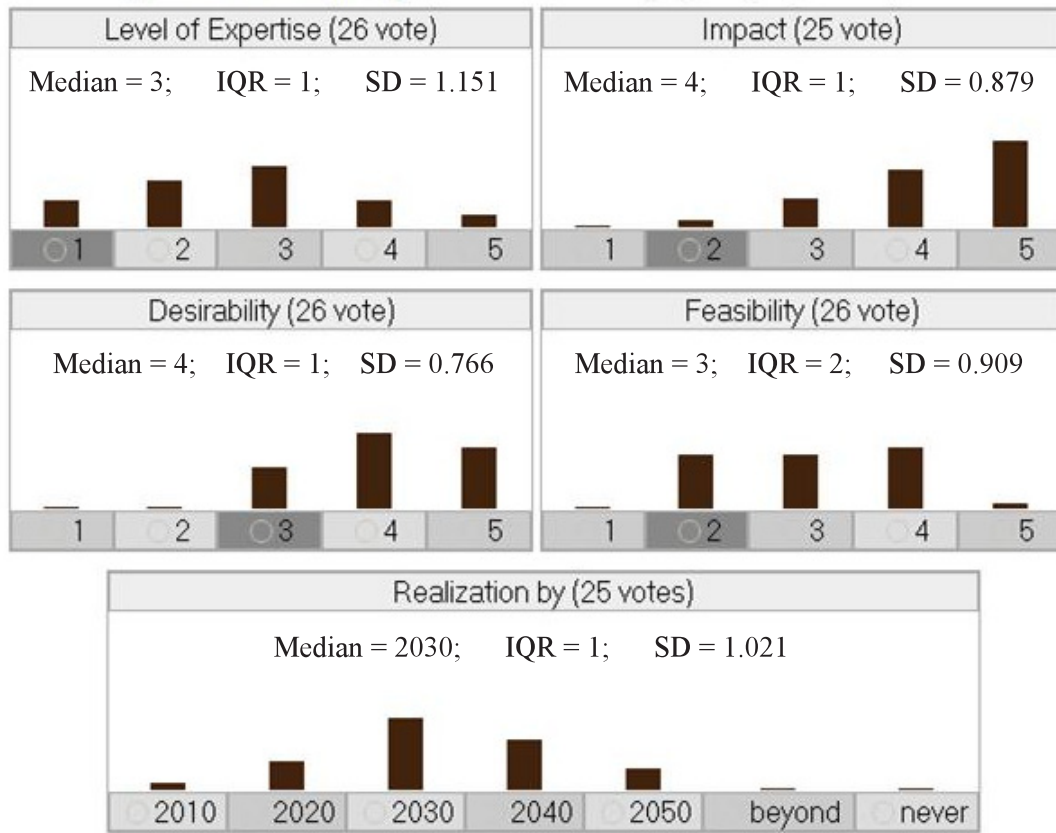
For the statement no. 21 “Environmentally friendly goods is now the dominant consumer goods in the global market”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

The average level of impact and desirability were 4 and 5. In addition, the IQR of these variables were 1 which showed the consistent opinions of the experts. These figures indicated that experts evaluated that statement no. 21 “Environmentally friendly goods is now the dominant consumer goods in the global market” had a Rather High level of impact and High level of desirability. In contrast, the level of feasibility was 3 and the IQR score was 2. This figure indicated the Moderate level of feasibility, although there was a dispersion of the opinion.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, two experts stated that this event will happen in Europe and one expert indicated that it will happen globally.

**Statement 22:** Carbon accounting becomes mandatory globally.

- Result of the survey



For the statement no. 22 “Carbon accounting becomes mandatory globally”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the experts who answered this statement.

The average level of impact and desirability were 4 and 4 which indicated that experts evaluated that statement no22 “Carbon accounting becomes mandatory globally” had a Rather High level of both impact and desirability. In addition, the IQR of these variables were 1 which showed that opinions of the experts were consistent. In contrast, the level of feasibility was 3 and the IQR score was 2. This figure indicated the Moderate level of feasibility, although there was a dispersion of the opinion.

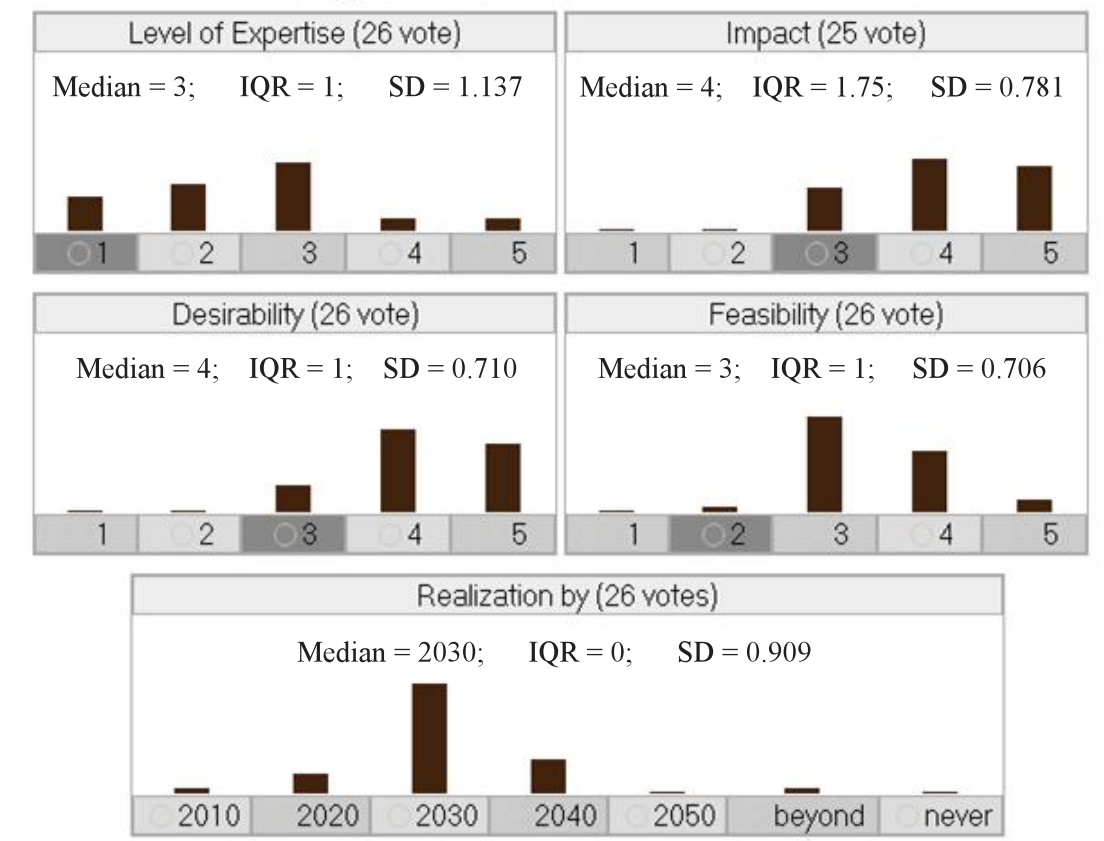
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, two experts stated that this event will happen in Europe and one expert indicated that it will happen globally.

The following were additional comments from participated experts.

- Desirability depends on country's readiness in domestic regulatory and institutional framework and level of economic and social development.
- Level of mandatory is necessary
- This is clearly highly desirable but a truly global mandatory system is beset with major obstacles.

**Statement 23:** A low carbon related SR (Social Responsibility) ISO Standard is considered the norm of any business practice.

- Result of the survey



For the statement no. 23 “A low carbon related SR (Social Responsibility) ISO Standard is considered the norm of any business practice”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

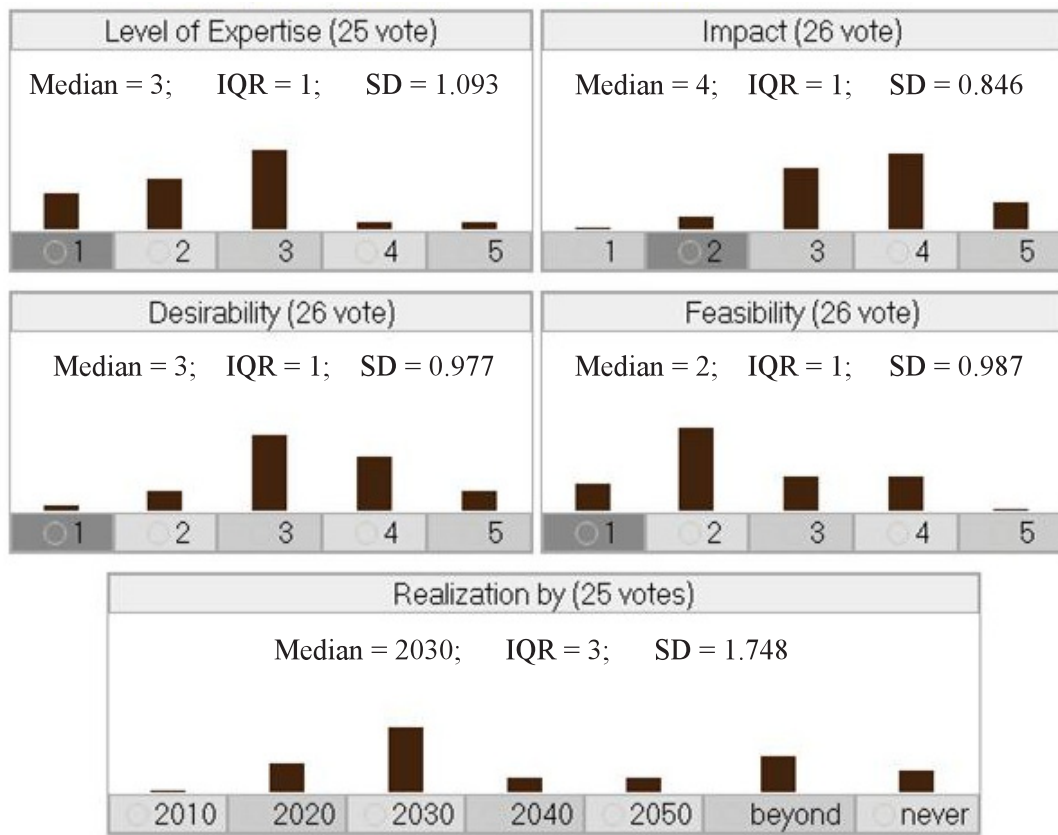
The average level of impact was 4 which indicated that experts evaluated the impact of this statement as Rather High. However, the inter-quartile range (IQR) score for level of impact were 1.75; this high IQR score indicated the dispersion of opinions among the respondents concerning level of impact. The average level of desirability and feasibility were 4 and 3 respectively. The IQR of these variables were 1 which showed that opinions of the experts were consistent. These figures indicated that statement no. 23 “A low carbon related SR (Social Responsibility) ISO Standard is considered the norm of any business practice” had a Rather High level of impact and Moderate level of feasibility.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, two experts stated that this event will happen globally.

**Statement 24:** Air freight shipments are down to 1990 level.

- Result of the survey





For the statement no. 24 “Air freight shipments are down to 1990 level”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 3 and 2 respectively. In addition, the IQR scores of these variables were 1 which showed the convergence of opinions among the experts. These figures indicated that statement no. 24 “Air freight shipments are down to 1990 level” had a Rather High level of impact and Moderate level of desirability, while a level of feasibility was Rather Low.

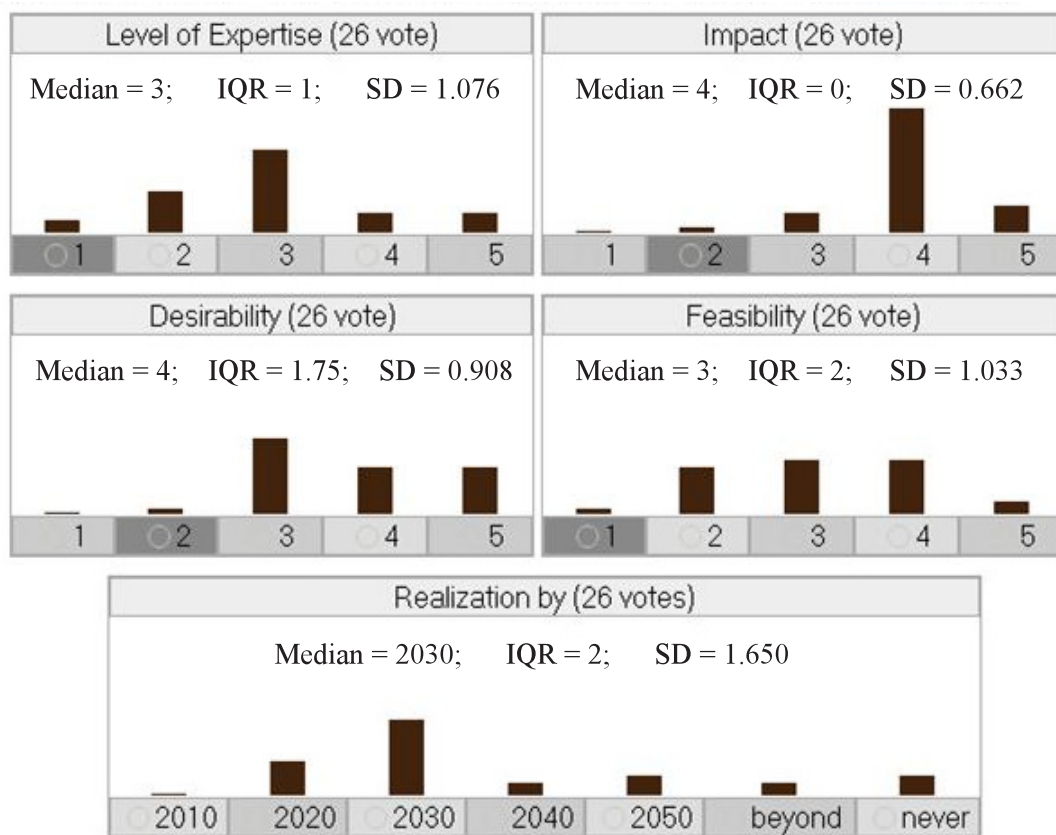
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, two experts stated that this event will happen globally and one expert stated that it will happen in Annex I countries.

The following were additional comments from participated experts.

- Desirable but aviation is not a big contributor to carbon emissions.
- Why don't just saying Emissions from air freight shipment.
- EU regulation on carbon tax imposed on aviation will cause Air freight shipment less attractive.
- 1990 levels are fine to have as a starting point but are unlikely to become the eventual base for most eco-related practices.
- A benchmark is needed, e.g. 1990 level to quantify & evaluate (compare) emissions.

**Statement 25:** Global IT network will reduce the traveling of people to the 1990 level.

- Result of the survey



For the statement no. 25 “Global IT network will reduce the traveling of people to the 1990 level”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the experts who answered this statement.

The average level of impact was 4 and the IQR score was 0 which indicated a consensus of opinions among the experts that this statement had a Rather High level of impact. In contrast, the level of desirability and feasibility were 4 and 3 and the IQR score was 1.75 or more. These figures indicated that statement no. 25 “Global IT network will reduce the traveling of people to the 1990” had a Rather High level of desirability and Moderate level of feasibility, although there was a dispersion of the opinion.

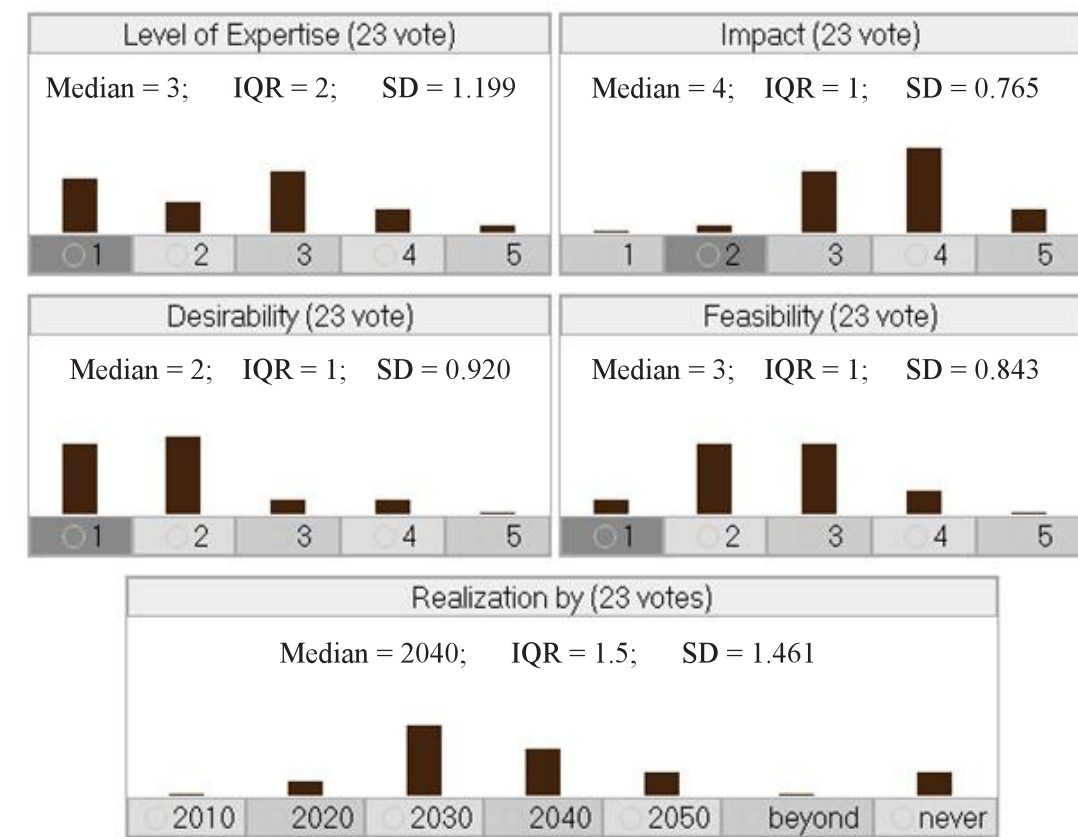
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, one expert stated that this event will happen globally.

The following were additional comments from participated experts.

- The reductions in emissions are not likely to have a major impact.
- IT will have an important and perhaps pivotal impact, but reducing the number of travelers is likely not one of the most promising applications.

**Statement 26:** Political instability and inter-regional conflicts due to climate change impacts lead to little interaction between the major economic co-operations.

- Result of the survey



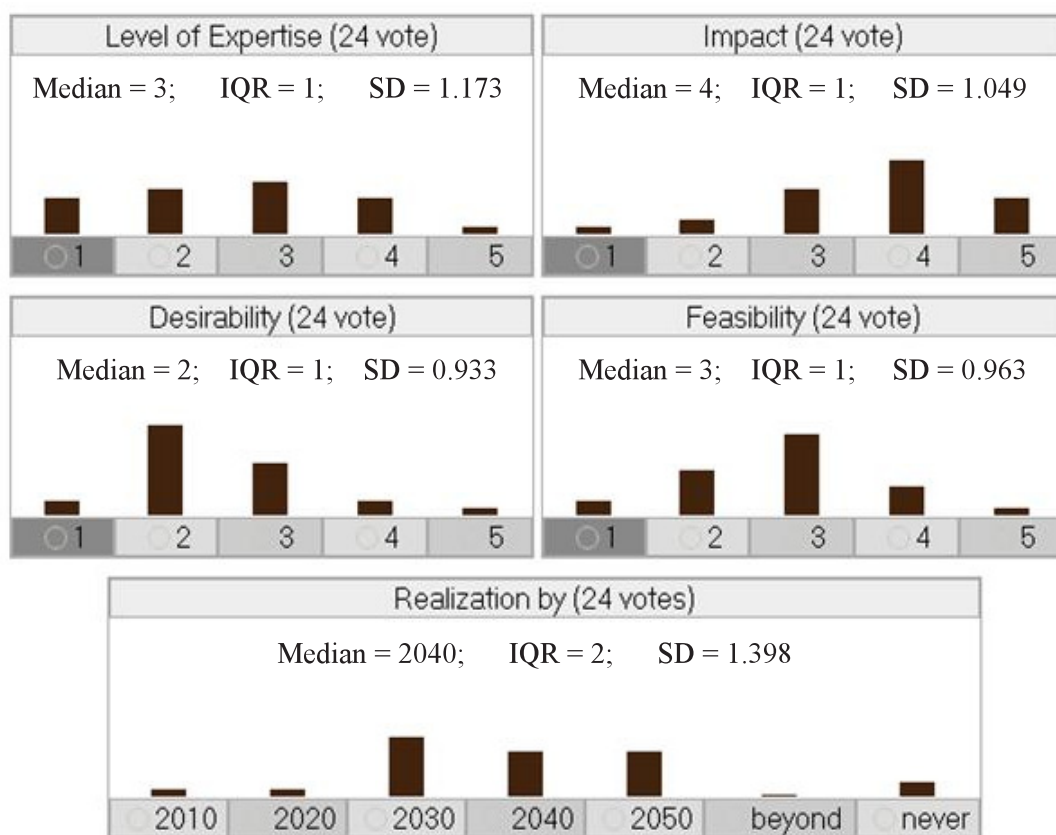
For the statement no. 26 “Political instability and inter-regional conflicts due to climate change impacts lead to little interaction between the major economic co-operations”, the median score of level of expertise was 3 out of 5 which represented a Moderate level of expertise of the participated experts in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersion of level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 2 and 3 respectively. In addition, the IQR scores of these variables were 1 which showed that opinions of the experts were consistent. These figures indicated that statement no. 26 “Political instability and inter-regional conflicts due to climate change impacts lead to little interaction between the major economic co-operations” had a Rather High level of impact and Moderate level of feasibility, while a level of desirability was Rather Low.

The median year of expected realization of this statement was 2040. In term of the place where this event will happen, two experts stated that this event will happen globally.

**Statement 27:** It is realized that emission trading has had little effect on reducing the global green house gas emission in 2050.

- Result of the survey



For the statement no. 27 “It is realized that emission trading has had little effect on reducing the global green house gas emission in 2050”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

The average level of impact, desirability and feasibility were 4, 2 and 3 respectively. In addition, the IQR scores of these variables were 1 which showed the consistent opinions among the experts. These figures indicated that statement no. 27 “It is realized that emission trading has had little effect on reducing the global green house gas emission in 2050” had a Rather High level of impact and Moderate level of feasibility, while a level of desirability was Rather Low.

The median year of expected realization of this statement was 2040. In term of the place where this event will happen, two experts stated that this event will happen globally and one expert indicated that it will happen in Annex I countries.

There was one additional comment from the experts that the emission trading represents an important early measure but may not after an initial flurry of activity to be able to deliver the results needed - so will most likely require complementary measures or regulations to move beyond early success levels.

#### Remarks on Section 4

This section has 8 statements on trade of goods and services. All participated experts had Moderate levels of expertise with consistency except one statement. All impacts were also rated as Rather High with consistency except one statement. Levels of desirability varied according to the content of the statements. It scored 1

High, 4 Rather High, 1 Moderate, and 2 Rather Low with consistency except one. All statement had Moderate feasibility except the one on air freight which had Rather Low feasibility. Most of the realization dates were 2030 except 2 statements which had 2040.

The comments from participated experts are summarized as follows:

Statement 20: Most economies would want to move up the value chain but not everyone can be competitive.

Statement 21: There is no comment.

Statement 22: Global mandatory system is beset with many obstacles. Whether it works depends on the readiness of the country.

Statement 23: There is no comment.

Statement 24: Most of the five commentators seem to think it is desirable to reduce air freight shipment while one argued that aviation is not a big contributor to carbon emissions.

Statement 25: The 2 comments are that global IT networks is not likely to have an impact on emissions and reducing travelers is not a promising application of IT.

Statement 26: There is no comment.

Statement 27: One commented that emission trading represent an important early measure and will require other complimentary regulations to be successful.

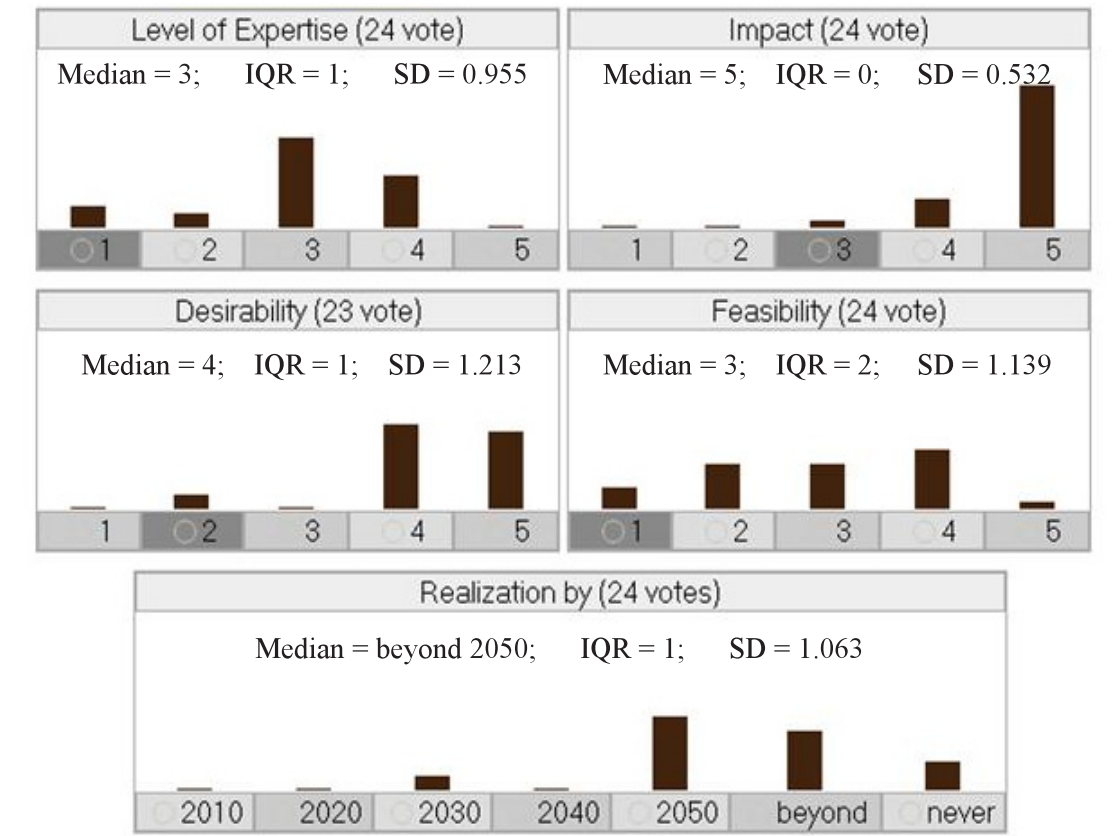
In summary, participated experts generally are positive regarding movements towards green trade and services despite some doubts about the effectiveness of implementation.



## Section 5: Housing and Construction / Urban Life / Transportation

**Statement 28:** Conventional fuels disappear completely from transportation sector.

- Result of the survey



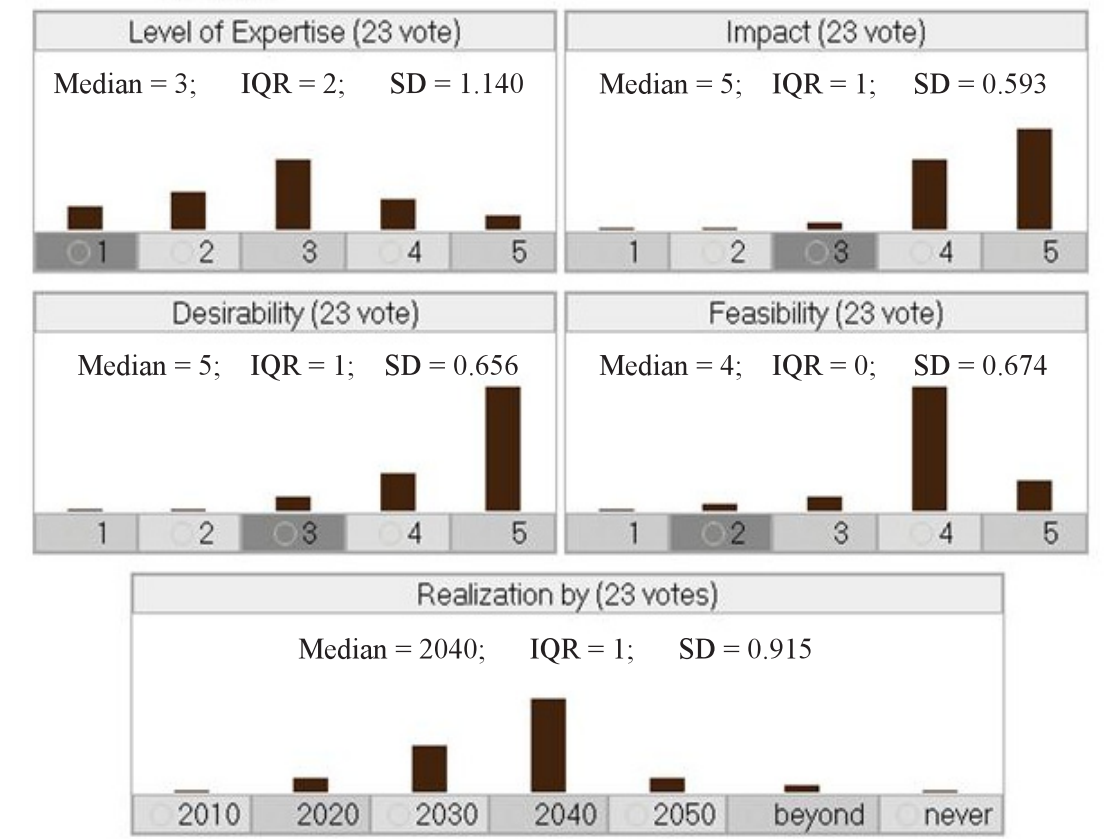
For the statement no. 28 “Conventional fuels disappear completely from transportation sector”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

The average level of impact and desirability were 5 and 4 which indicated that experts evaluated that statement no 28 “Conventional fuels disappear completely from transportation sector” had a High level of impact and Rather High level of desirability. In addition, the IQR of these variables were 1 which showed the consistent opinions among the experts. In contrast, the level of feasibility was 3 and the IQR score was 2. This figure indicated the Moderate level of feasibility, although there was a dispersion of the opinion.

The median year of expected realization of this statement was beyond 2050. In term of the place where this event will happen, one expert stated that this event will happen in Japan.

**Statement 29:** Most existing commercial buildings are retrofitted to save 50% of energy use on average.

- Result of the survey



For the statement no. 29 “Most existing commercial buildings are retrofitted to save 50% of energy use on average”, the median score of level of expertise was 3 out of 5 which represented a Moderate level of expertise of the participated experts in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersed level of expertise among the respondents.

The average level of impact, desirability and feasibility were 5, 5 and 4 respectively. In addition, the IQR scores of these variables were 1 or below which showed the convergence of opinions among the respondents. These figures indicated that statement no. 29 “Most existing commercial buildings are retrofitted to save 50% of energy use on average” had a High level of both impact and desirability, while a level of feasibility was Rather High.

The median year of expected realization of this statement was 2040. In term of the place where this event will happen, one expert stated that this event will happen globally and another expert indicated that it will happen in Europe.

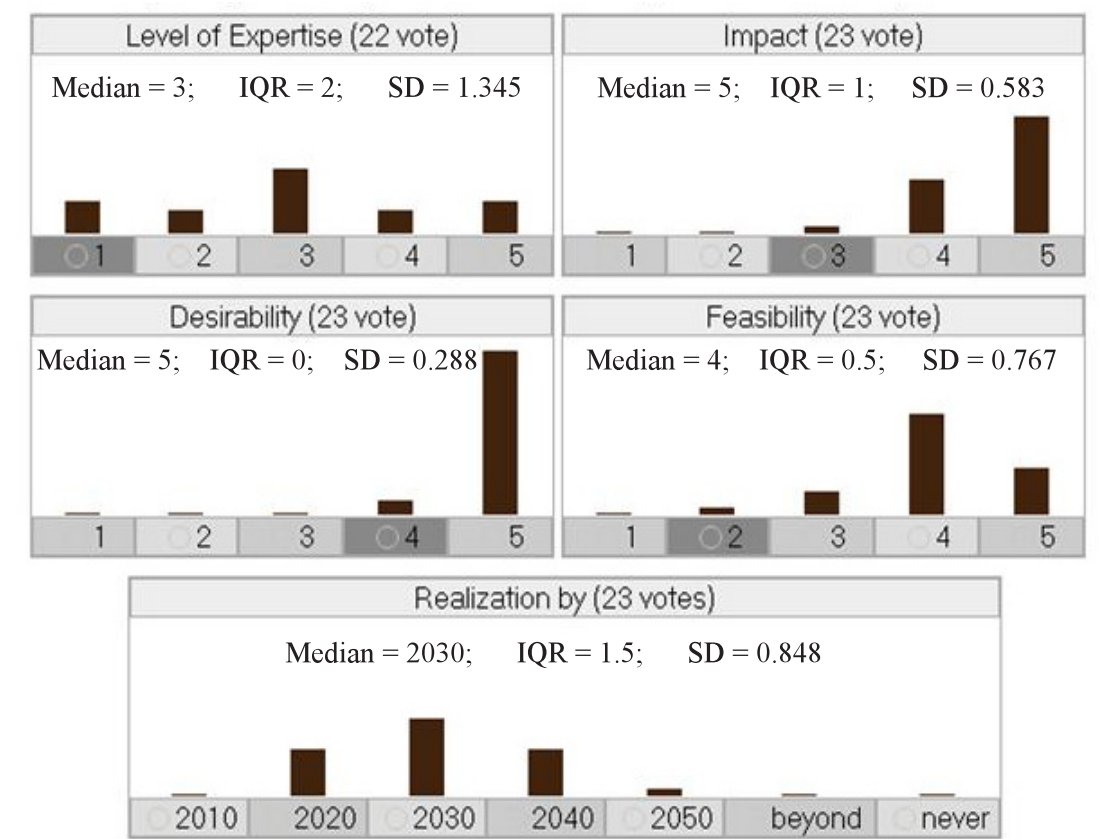
The following were additional comments from participated experts.

- Over 50% of UK’s emissions come from peoples activities in buildings. Retrofitting requires a range of incentives and government leadership – the UK is retrofitting its social housing using area based approach. This will be the mainstream by 2030 - and earlier if recession is not too prolonged.

- This is currently feasible and economic in most extreme climate zones - but incentive structures are weak and market failures prevail, so these will need to change before the retrofit penetration rate reaches a high level.
- Those who retrofitted are already reaping the benefits. They are always on the lookout for new technologies so continuous improvement is on the go. Studying the total cost of retrofit towards its entire life cycle will show the hidden costs. Considering the retrofit as a long-term investment will make it economically feasible (since short payback period is no longer the issue). Oil prices will never go down and energy efficiency will be the only way to go.

**Statement 30:** Energy efficiency of home and office appliances increases by 50%.

- Result of the survey



For the statement no. 30 “Energy efficiency of home and office appliances increases by 50%”, the median score of level of expertise was 3 out of 5 which represented a Moderate level of expertise of the participated experts in this topic. However, the inter-quartile range (IQR) score was 2; this high IQR score indicated a dispersion of level of expertise among the respondents.

The average level of impact, desirability and feasibility were 5, 5 and 4 respectively. In addition, the IQR scores of these variables were 1 or below which showed the consistent opinions among the respondents. These figures indicated that statement no. 30 “Energy efficiency of home and office appliances increases by 50%” had a High level of both impact and desirability, while a level of feasibility was Rather High.

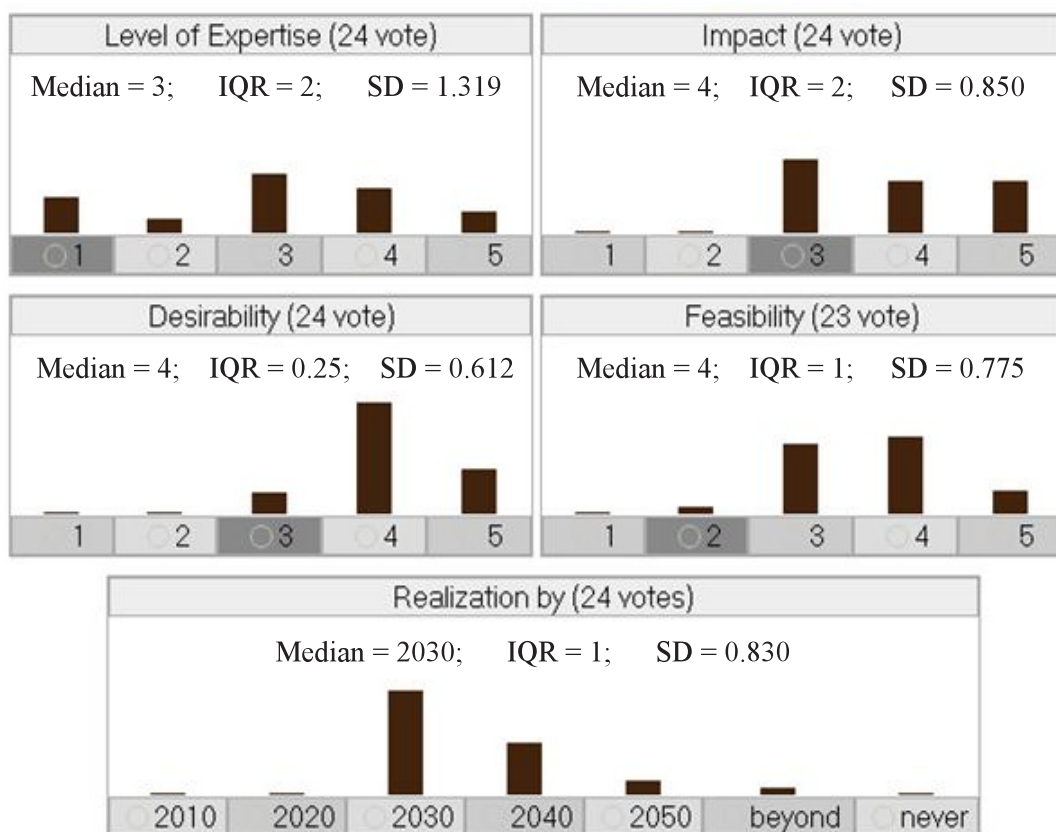
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, one expert stated that this event will happen globally and another expert indicated that it will happen in Europe.

The following were additional comments from participated experts.

- Global green building networks will continuously promote green building principles & energy efficient appliances are one of the major sources of savings. Consumers will buy more expensive efficient products simply because it will save them money in the long run as well as lower their carbon footprint. Inefficient products will be less competitive in the future unless oil prices go down which will remotely happen.
- Regulation to mandate energy efficiencies in appliances will be required. Consumer pull helps as energy prices rise but consumers are quite slow to respond in UK when outlay required is substantial and payback long term.

**Statement 31:** 20% of electricity is generated by decentralized sources.

- Result of the survey



For the statement no. 31 “Anthropogenic 20% of electricity is generated by decentralized sources”, the median score of level of expertise was 3 out of 5 which represents a Moderate level of expertise. However, the inter-quartile range (IQR) score for the level of expertise was 2; this high IQR score indicated a dispersion of the level of expertise of the respondents.

The average level of impact was 4 which indicated that experts evaluated the impact of this statement as Rather High. However, the inter-quartile range (IQR) score for level of impact was 2; these high IQR scores indicated the dispersion of opinions among the respondents concerning level of impact. The average level of desirability and feasibility were 4 and 4 respectively. The IQR of these variables were 1 or below which showed that opinions of the experts were consistent. These figures indicated that statement no. 31 “Anthropogenic 20% of electricity is generated by decentralized sources” had a Rather High level of both impact and feasibility.

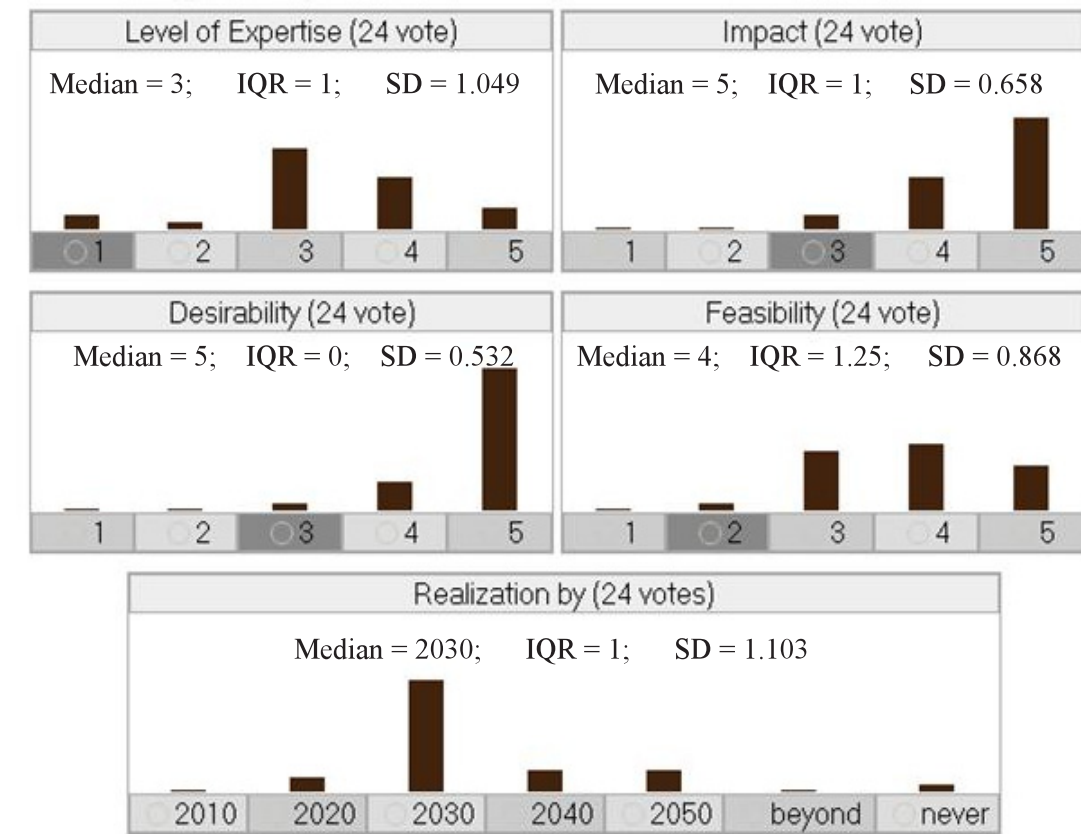
The median year of expected realization of this statement was 2030. In term of the place where this event will happen, two experts stated that this event will happen in Europe.

The following were additional comments from participated experts.

- From renewable energy sources.
- Centralized energy supply and alternative energy sources are not compatible. Energy self sufficiency for individual communities will be the future.

**Statement 32:** Majority of trips in daily life will be through efficient public transportation as opposed to personal mode.

- Result of the survey





For the statement no. 32 “Majority of trips in daily life will be through efficient public transportation as opposed to personal mode”, the median score of level of expertise was 3 out of 5 and the inter-quartile range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

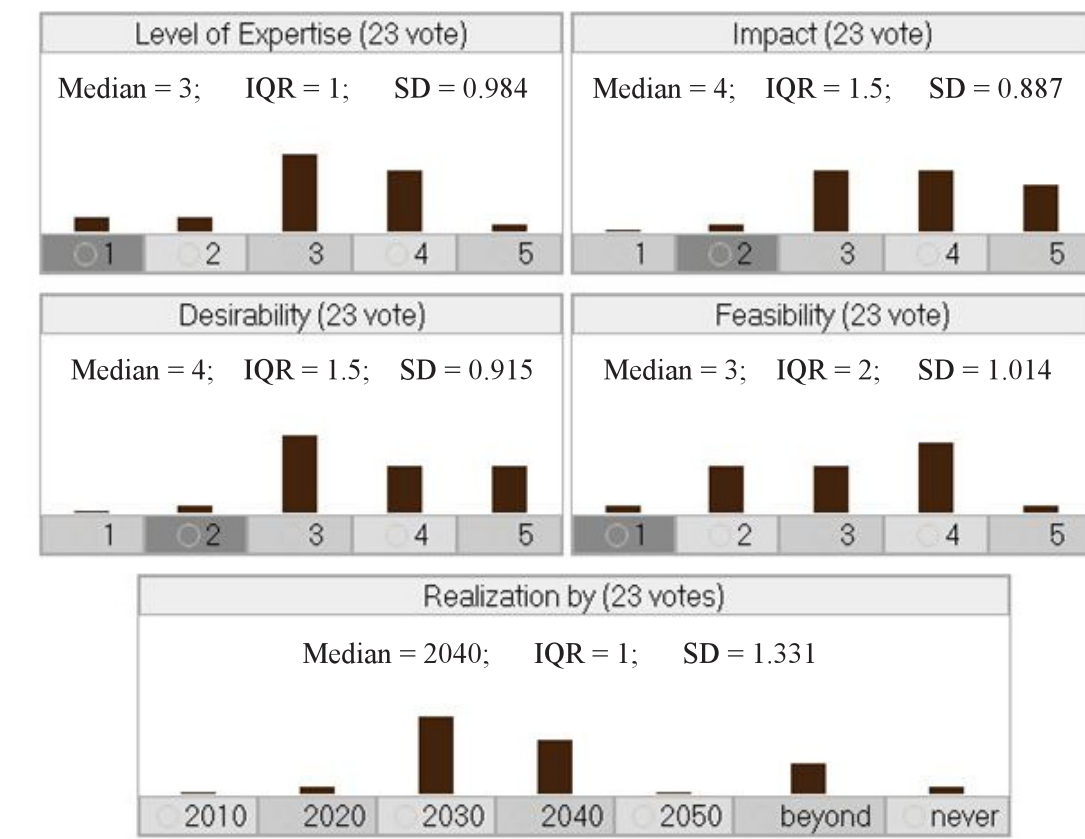
The average level of impact, desirability and feasibility were 5, 5 and 4 respectively. In addition, the IQR scores of these variables were 1.25 or below which showed that opinions of the experts were consistent. These figures indicated that statement no. 32 “Majority of trips in daily life will be through efficient public transportation as opposed to personal mode” had a High level of both impact and desirability, while a level of feasibility was Rather High.

The median year of expected realization of this statement was 2030. In term of the place where this event will happen, the answers were varies ranging from Europe (2 experts), East Asia (1 expert) and globally (1 expert).

There is one additional comment from participated experts indicated that an efficient public transportation will require huge long term investment.

**Statement 33:** Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles.

- Result of the survey



For the statement no. 33 “Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles”, the median score of level of expertise was 3 out of 5 and the inter-quartile

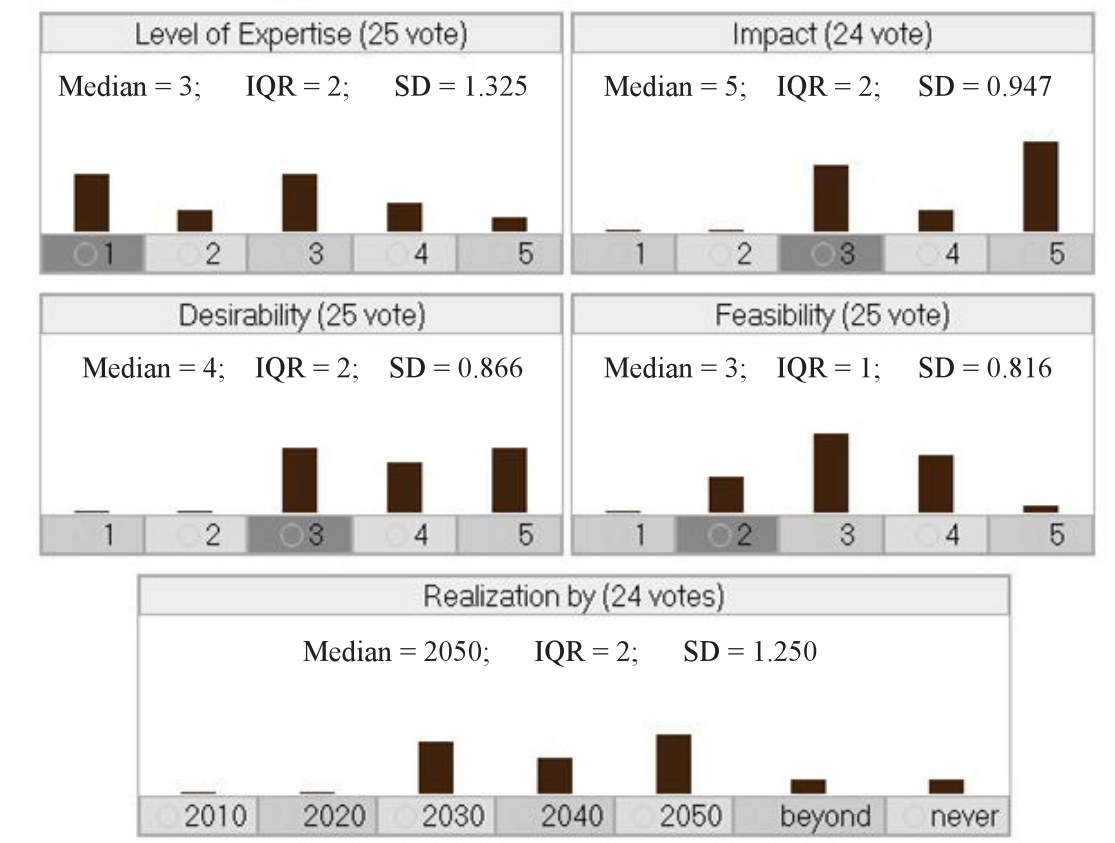
range (IQR) score was 1 which signified a clustering of the Moderate level of expertise among the respondents.

The average level of impact and desirability were 4 and 4 which indicated that experts evaluated statement no 33 “Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles” had a Rather High level of both impact and desirability. In addition, the IQR of these variables were 1.5 which showed that opinions of the experts were consistent. In contrast, the level of feasibility was 3 and the IQR score was 2. These figures indicated the Moderate level of feasibility, although there was a dispersion of the opinion.

The median year of expected realization of this statement was beyond 2040. In term of the place where this event will happen, one expert stated that this event will happen globally and another indicated that it will happen in Europe.

**Statement 34:** Breakthroughs in battery storage technology make obsolete all other fuels including H<sub>2</sub>.

- Result of the survey



For the statement no. 34 “Breakthroughs in battery storage technology make obsolete all other fuels including H<sub>2</sub>”, the median score of level of expertise was 3 out of 5 which represents a Moderate level of expertise. However, the inter-quartile range (IQR) score for the level of expertise was 2; this high IQR score indicated a dispersion of the level of expertise of the respondents.

The average level of impact and desirability were 5 and 4 which shown that this statement had a High level of impact and Rather High level of desirability. However, the inter-quartile range (IQR) score for the level of impact and desirability were 2; this high IQR score indicated a dispersion of opinion among the respondents. In contrast, the average level of feasibility was 3 and the IRQ was 1 which indicated the high level of agreement among the experts that statement no. 34 “Breakthroughs in battery storage technology make obsolete all other fuels including H<sub>2</sub>” had a Moderate level of feasibility.

The median year of expected realization of this statement was 2050. In term of the place where this event will happen, one expert stated that this event will happen globally and another indicated that it will happen in Europe.

The following were additional comments from participated experts.

- Battery storage is not a fuel so cannot make other fuels obsolete.
- Improved battery storage will make electric vehicles more feasible but the point is that there is a great deal of uncertainty about energy systems of the future and what will work effectively. It is necessary at this stage that many different approaches are tried to achieve low carbon economies - some will fail but some will work. The risk of backing a small number is that they may all fail.

## Remarks on Section 5

In the 7 statements on housing and construction/urban life/transportation, the participated experts have an average level of Moderate expertise. It is remarkable that 5 out of 7 of the statements in this section have High impact. The rest have Rather High impact. Three of the High impact statements concerning efficient use of energy also have High desirability. The rest have Rather High desirability. Four have Rather High desirability and the rest have Moderate feasibility. On realization date, three have the date of 2030, two of 2040, one of 2050 and one of beyond 2050.

Additional comments from participated experts are summarized as follows:

Statement 28: There is no comment.

Statement 29: Retrofitting old buildings are economical in the long term especially in regions of extreme climate. However, incentives are needed to induce more retrofitting.

Statement 30: One thinks consumers are willing to buy more efficient products to save energy in the long run. Another believes regulations to mandate energy efficiencies in appliances is required because of the sizeable investment and long payback period.

Statement 31: Decentralized electricity generation will be from renewable sources.

Statement 32: There is no comment.

Statement 33: There is no comment.

Statement 34: One commented that battery is not a fuel. The other thinks that there is a great deal of uncertainty about energy system of the future and therefore we should only back a small number.

In summary, it seems that participated experts have good faith in technologies to boost energy efficiency, public transportation, and renewable energy though conventional fuel will not disappear so quickly.

### 3. Finding the level of agreement and disagreement among experts

#### 3.1 Ranking by level of feasibility

To identify the level of agreement among the experts concerning the level of feasibility, the IQR score of each statement was computed. The lower IQR score indicated the higher the level of agreement, while the higher IQR score indicated the low level of agreement. Where the IQRs are equal, SDs are used instead. From the top ten statements with the highest level of agreement concerning the level of feasibility, we had 3 statements for migration, rural life and natural resources (section 2, statement no. 7, 8 and 9); 3 for housing and construction / urban life/ transportation (section 5, statement no. 29, 30 and 31); 2 for trade of goods and services (section 4, statement no. 20 and 23), 1 for climate change & its impact (section 1, statement 4) and 1 for society and health (section 3, statement 16). The result of the analysis on feasibility was presented in the following table.

Rank	S-no.	Statement	Md	IQR	SD
1	29	Most existing commercial buildings are retrofitted to save 50% of energy use on average.	4	0	0.674
2	30	Energy efficiency of home and office appliances increases by 50%.	4	0.5	0.767
3	20	Economies that were previously dominated by manufacturing industries /sectors have moved dramatically towards knowledge-based services.	3	1	0.653
4	16	Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming.	4	1	0.689
5	23	A low carbon related SR (Social Responsibility) ISO Standard is considered the norm of any business practice.	3	1	0.706
6	8	Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests).	3	1	0.717
7	9	Migration of people from coastal area towards inland induces major conflicts over land and resources.	3	1	0.741
8	4	Global and regional earth system modeling (integrated assessment model) provides highly accurate.	3	1	0.750
9	31	20% of electricity is generated by decentralized sources.	4	1	0.775
10	7	Coastal ecosystem management becomes widespread and economically beneficial.	3	1	0.792
11	1	Anthropogenic greenhouse gas emissions are stabilized at 1990 level.	2	1	0.793
12	34	Breakthroughs in battery storage technology make obsolete all other fuels including H <sub>2</sub> .	3	1	0.816
13	17	Technological process changes toward producing food locally to serve societal demand while reducing carbon emission.	3	1	0.830
14	26	Political instability and inter-regional conflicts due to climate change impacts lead to little interaction between the major economic co-operations.	3	1	0.843
15	19	Consumers are willing to pay more for low carbon footprint products.	3	1	0.926
16	12	Ecotourism becomes dominant in the tourism industry.	4	1	0.945
17	27	It is realized that emission trading has had little effect on reducing the global green house gas emission in 2050.	3	1	0.963
18	24	Air freight shipments are down to 1990 level.	2	1	0.987
19	14	Skilled immigration applicant increase and are easily accepted.	4	1	0.992
20	10	New generations of well-educated people choose new knowledge-	4	1	1.049

Rank	S-no.	Statement	Md	IQR	SD
		intensive, agriculture-based industries that are more sustainable.			
21	32	Majority of trips in daily life will be through efficient public transportation as opposed to personal mode.	4	1.25	0.868
22	15	Water scarcity becomes a cause of War.	4	1.25	1.032
23	6	Food scarcity occurs as a result of a significant shift in land allocation from food crop to energy crop.	3	1.5	0.869
24	5	Effective mechanisms are devised to cope with the direct impact of climate related events.	3	1.5	1.087
25	22	Carbon accounting becomes mandatory globally.	3	2	0.909
26	2	Carbon capture and storage (CCS) is effectively and fully implemented.	3	2	0.962
27	33	Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles.	3	2	1.014
28	25	Global IT network will reduce the traveling of people to the 1990 level.	3	2	1.033
29	13	Algae technology capable of producing fuel (H <sub>2</sub> , oil, or ethanol) becomes commercially wide-spread.	3	2	1.087
30	18	A global regulatory framework of low carbon is totally accepted.	3	2	1.098
31	11	High demand on carbon deduction creates sustainable income from the poor rural people who plant trees and energy crops.	3	2	1.100
32	21	Environmentally friendly goods is now the dominant consumer goods in the global market.	3	2	1.131
33	28	Conventional fuels disappear completely from transportation sector.	3	2	1.139
34	3	Technology and management enable forest plantations to act as the main carbon sink.	3	2	1.172



### 3.2 Ranking by level of desirability

To identify the level of agreement among the experts concerning the level of desirability, the IQR score of each statement was computed. The lower IQR score indicated the higher the level of agreement, while the higher IQR score indicated the low level of agreement. Where the IQRs are equal, SDs are used instead. From the top ten statements with the highest level of agreement concerning the level of desirability, four of these top ten statements were in the area of migration, rural life and natural resources (section 2, statement no. 8, 9, 10, 11 and 15); four statements were in the area of housing and construction / urban life / transportation (section 5, statement no. 29, 30, 31 and 32) and one statement was in the area of society and health (section 3, statement no. 16). The result of the analysis was presented in the following table.

Rank	S-no.	Statement	Md	IQR	SD
1	30	Energy efficiency of home and office appliances increases by 50%.	5	0	0.288
2	16	Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming.	5	0	0.491
3	32	Majority of trips in daily life will be through efficient public transportation as opposed to personal mode.	5	0	0.532
4	11	High demand on carbon deduction creates sustainable income from the poor rural people who plant trees and energy crops.	4	0	0.751
5	31	20% of electricity is generated by decentralized sources.	4	0.25	0.612
6	15	Water scarcity becomes a cause of War.	1	0.25	0.929
7	8	Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests).	2	1	0.608
8	9	Migration of people from coastal area towards inland induces major conflicts over land and resources.	2	1	0.624
9	10	New generations of well-educated people choose new knowledge-intensive, agriculture-based industries that are more sustainable.	4	1	0.647
10	29	Most existing commercial buildings are retrofitted to save 50% of energy use on average.	5	1	0.656
11	20	Economies that were previously dominated by manufacturing industries /sectors have moved dramatically towards knowledge-based services.	4	1	0.678
12	7	Coastal ecosystem management becomes widespread and economically beneficial.	4	1	0.690
13	1	Anthropogenic greenhouse gas emissions are stabilized at 1990 level.	5	1	0.693
14	23	A low carbon related SR (Social Responsibility) ISO Standard is considered the norm of any business practice.	4	1	0.710
15	22	Carbon accounting becomes mandatory globally.	4	1	0.766
16	6	Food scarcity occurs as a result of a significant shift in land allocation from food crop to energy crop.	1	1	0.783
17	21	Environmentally friendly goods is now the dominant consumer goods in the global market.	5	1	0.804
18	14	Skilled immigration applicant increase and are easily accepted.	3	1	0.885
19	19	Consumers are willing to pay more for low carbon footprint products.	5	1	0.891
20	26	Political instability and inter-regional conflicts due to climate change impacts lead to little interaction between the major economic co-operations.	2	1	0.920

Rank	S-no.	Statement	Md	IQR	SD
21	27	It is realized that emission trading has had little effect on reducing the global green house gas emission in 2050.	2	1	0.933
22	12	Ecotourism becomes dominant in the tourism industry.	4	1	0.937
23	24	Air freight shipments are down to 1990 level.	3	1	0.977
24	3	Technology and management enable forest plantations to act as the main carbon sink.	4	1	0.987
25	17	Technological process changes toward producing food locally to serve societal demand while reducing carbon emission.	5	1	1.056
26	28	Conventional fuels disappear completely from transportation sector.	4	1	1.213
27	33	Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles.	4	1.5	0.915
28	25	Global IT network will reduce the traveling of people to the 1990 level.	4	1.75	0.908
29	34	Breakthroughs in battery storage technology make obsolete all other fuels including H <sub>2</sub> .	4	2	0.866
30	2	Carbon capture and storage (CCS) is effectively and fully implemented.	4	2	0.922
31	4	Global and regional earth system modeling (integrated assessment model) provides highly accurate.	4	2	1.019
32	18	A global regulatory framework of low carbon is totally accepted.	5	2	1.041
33	5	Effective mechanisms are devised to cope with the direct impact of climate related events.	4	2	1.087
34	13	Algae technology capable of producing fuel (H <sub>2</sub> , oil, or ethanol) becomes commercially wide-spread.	4	2	1.100

### 3.3 Comparing the level of agreements on feasibility and desirability of 34 statements

Level of feasibility	Level of desirability
29	30
30	16
20	32
16	11
23	31
8	15
9	8
4	9
31	10
7	29
1	20
34	7
17	1
26	23
19	22
12	6
27	21
24	14
14	19
10	26
32	27
15	12
6	24
5	3
22	17
2	28
33	33
25	25
13	34
18	2
11	4
21	18
28	5
3	13

The above table illustrated the relationship between the level of feasibility and level of desirability. The ranking of each statement in this table is based on the IQR score. The higher ranking of the statement represents the higher level of agreement among expert opinions, while the lower the rank indicates the high level of disagreement in that statement.

From the top ten ranking, there are six out of ten statements having high ranking on both level of feasibility and level of desirability which are:

- Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests) (statement no. 8).

- Migration of people from coastal area towards inland induces major conflicts over land and resources (statement no. 9).
- Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming (statement no. 16).
- Most existing commercial buildings are retrofitted to save 50% of energy use on average (statement no. 29).
- Energy efficiency of home and office appliances increases by 50% (statement no. 30).
- 20% of electricity is generated by decentralized sources (statement no. 31).

From the bottom ten ranking, there are six out of ten statements having low ranking on both level of feasibility and level of desirability which are:

- Carbon capture and storage (CCS) is effectively and fully implemented (statement no. 2).
- Algae technology capable of producing fuel (H<sub>2</sub>, oil, or ethanol) becomes commercially wide-spread (statement no. 13)
- A global regulatory framework of low carbon is totally accepted (statement no. 18).
- Global IT network will reduce the traveling of people to the 1990 level (statement no. 25).
- Conventional fuels disappear completely from transportation sector (statement no. 28).
- Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles (statement no. 33).

### 3.4 Chronology of Future Events

In this study, the median year is used to represent the year of realization for each event. Based on the year of realization, it is possible to construct a chronology of the events based on median year of realization. Where there are same medians, means are used. Most statements (21 out of 34 statements) are expected to be realized in 2030 which is the earliest year of realization. Ten events have a realization date in 2040. Only two events “Anthropogenic greenhouse gas emissions are stabilized at 1990 level (statement no. 1)” and “Breakthroughs in battery storage technology make obsolete all other fuels including H<sub>2</sub> (statement no. 34)” have a realization date in 2050. The latest date of realization is beyond 2050, for “Conventional fuels disappear completely from transportation sector (statement no. 28)”.

Time of Realization	S-no.	Statements
2030	14	Skilled immigration applicant increase and are easily accepted.
	19	Consumers are willing to pay more for low carbon footprint products.
	12	Ecotourism becomes dominant in the tourism industry.
	7	Coastal ecosystem management becomes widespread and economically beneficial.
	20	Economies that were previously dominated by manufacturing industries /sectors have moved dramatically towards knowledge-based services.
	4	Global and regional earth system modeling (integrated assessment model) provides highly accurate.
	30	Energy efficiency of home and office appliances increases by 50%.
	23	A low carbon related SR (Social Responsibility) ISO Standard is considered the norm of any business practice.
	10	New generations of well-educated people choose new knowledge-intensive, agriculture-based industries that are more sustainable.
	16	Technologies significantly improve the healthcare system to cope with new infectious

Time of Realization	S-no.	Statements
		diseases stimulated from global warming.
	22	Carbon accounting becomes mandatory globally.
	15	Water scarcity becomes a cause of War.
	17	Technological process changes toward producing food locally to serve societal demand while reducing carbon emission.
	21	Environmentally friendly goods is now the dominant consumer goods in the global market.
	32	Majority of trips in daily life will be through efficient public transportation as opposed to personal mode.
	31	20% of electricity is generated by decentralized sources.
	6	Food scarcity occurs as a result of a significant shift in land allocation from food crop to energy crop.
	5	Effective mechanisms are devised to cope with the direct impact of climate related events.
	13	Algae technology capable of producing fuel (H <sub>2</sub> , oil, or ethanol) becomes commercially wide-spread.
	25	Global IT network will reduce the traveling of people to the 1990 level.
	24	Air freight shipments are down to 1990 level.
2040	29	Most existing commercial buildings are retrofitted to save 50% of energy use on average.
	18	A global regulatory framework of low carbon is totally accepted.
	2	Carbon capture and storage (CCS) is effectively and fully implemented.
	11	High demand on carbon deduction creates sustainable income from the poor rural people who plant trees and energy crops.
	9	Migration of people from coastal area towards inland induces major conflicts over land and resources.
	26	Political instability and inter-regional conflicts due to climate change impacts lead to little interaction between the major economic co-operations.
	33	Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles.
	27	It is realized that emission trading has had little effect on reducing the global green house gas emission in 2050.
	3	Technology and management enable forest plantations to act as the main carbon sink.
	8	Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests).
2050	1	Anthropogenic greenhouse gas emissions are stabilized at 1990 level.
	34	Breakthroughs in battery storage technology make obsolete all other fuels including H <sub>2</sub> .
Beyond 2050	28	Conventional fuels disappear completely from transportation sector.

## 4. Discussions

Here, we will try to see how the results of the Real-Time Delphi survey can serve as inputs to the upcoming *Low Carbon Society Scenario Workshop*. The discussions will be divided into three parts. The first part is to discuss the validity of the survey, the second on trends and uncertainties, and the third on scenario logics.



## 4.1 Validity of the survey

After a number of workshops, the organizer of the Real-Time Delphi survey came up with 34 well-constructed statements. The software for web-based survey worked well. However, this survey's weakness is the small number of participated experts (23-28 persons) making it almost impossible to make any statistical conclusions. Fortunately, the most of respondents (18-23 persons) are in APEC economies. Another thing is that the organizer did not define the meanings for the five levels from High to Low of Expertise, Impact, Desirability, and Feasibility. Leaving for the experts to decide the meanings for themselves may cause more variations.

Therefore, we would have to rely on the consistency of the answers from the participated experts to gain validity of the information. Fortunately, despite having a varied range of expertise from statement to statement, the experts managed to have an average (median) expertise level of Moderate most of the time (only in 4 statements where the expertise levels were Rather Low). For impact, most statements also have a score of Rather High and 6 statements have High scores while only 2 on ecotourism and skilled immigration have Moderate scores. The opinions of the experts are also consistent: only 6 statements out of 34 have an IQR equal or greater than 1.5. This shows the importance of the statements.

Desirability level depends on the content of the statements. For example, the statements on food scarcity and water scarcity though having Rather High and High impacts logically have Low desirability. Desirability has 8 statements with IQR equal or greater than 1.5 while the numbers for feasibility and realization date are 12 and 18 respectively. The higher the IQR the more disperse opinions of participated experts. Whether the high levels of agreements among experts in both desirability and feasibility can be proxy for trends and whether the low levels of agreements among experts in both desirability and feasibility can be proxy for uncertainties (as in the table of Section 3.3) will be discussed in the next section.

In each statement, a few experts responded to the question where the event will occur but the answers were too few and very diverse. Therefore, it is not possible to get any conclusion from them.

As for the year of realization, there were 7 boxes to choose from. The first five were separated by a decade while the sixth box was "beyond" and the seventh was "never". The results (Section 3.4) showed that the time of realization fell overwhelmingly in 2030 (21 out of 34 statements) with 10 for 2040, 2 for 2050, and 2 for beyond 2050. Nevertheless, the experts have rather consistent opinions when deciding on 2030: only 7 out of 21 statements have IQR equal or greater than 1.5.

## 4.2 Trends and uncertainties

In the scenario building exercise, trends and uncertainties are identified to form the skeletons for the scenarios. Trends are defined as things that exist for some time and have historical facts and figures to extrapolate into the future with certain mathematical rules (rate of growth, cycle, etc.). Usually, there are underlying drivers under trends. Here, we try to see whether the high levels of agreements (low IQR) among experts in both desirability and feasibility can be proxy for trends. From Section 3.3, we have the following statements.

- Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests) (statement no. 8).

- Migration of people from coastal area towards inland induces major conflicts over land and resources (statement no. 9).
- Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming (statement no. 16).
- Most existing commercial buildings are retrofitted to save 50% of energy use on average (statement no. 29).
- Energy efficiency of home and office appliances increases by 50% (statement no. 30).
- 20% of electricity is generated by decentralized sources (statement no. 31).

We can see that the underlying driver for the first two statements is rising sea level. The third statement is the trend of technology advancement in healthcare system. The fourth and fifth statements are trends in energy efficiency technologies. The last one is the trend where electricity can be generated economically from alternative sources. Therefore, the answer is that they can be proxy for trends but they may need to be regrouped. We can also see that this list is not comprehensive. That is it does not cover all the trends. Some other trends apart from rising temperature could be severity of storms and extremity of weathers. For trade and services, the trends would be more regulations on carbon emissions and footprints.

Next, we try to see whether the low levels of agreements (high IQR) among experts in both desirability and feasibility can be proxy for uncertainties. From Section 3.3, we have the following statements:

- Carbon capture and storage (CCS) is effectively and fully implemented (statement no. 2).
- Algae technology capable of producing fuel ( $H_2$ , oil, or ethanol) becomes commercially wide-spread (statement no. 13)
- A global regulatory framework of low carbon is totally accepted (statement no. 18).
- Global IT network will reduce the traveling of people to the 1990 level (statement no. 25).
- Conventional fuels disappear completely from transportation sector (statement no. 28).
- Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles (statement no. 33).

Uncertainties are events that are not well known and may appear ridiculous or unbelievable, but if occur will have high impact on the future for opportunity or threat. Emerging issues inherently have high uncertainties. The 6 statements above seem to fit the definition of uncertainty well. Their levels of impact are Rather High with 2 having High impact. Surprisingly, they are well distributed into all 5 sections of the questionnaire with two statements for the last section on housing and construction/urban life/transportation. Naturally, it is not possible to cover all uncertainty. The above 6 statements seem to be good candidates for scenario logics.

### 4.3 Scenario logics

A popular way of building scenarios is to select two most critical uncertainties as axes to form a 2x2 matrix. The two uncertainties have to be independent from one another. The end states of each axis should be opposite in their presentation. Then we have the skeleton for 4 scenarios. For example, if we choose Statement 18 “A global regulatory framework of low carbon is totally accepted” as one axis. The opposite end would be that no regulation is accepted and everyone is free to emit carbon. The second axis could be whether the technology of carbon capture and storage works. Therefore, the 4 scenarios of could be “High Regulation and CCS”, “High Regulation and No CCS”, “No regulation and CCS”, and “No Regulation and No CCS”. Another example could be to use conventional fuels versus renewable energy as one axis and personal transportation versus public transportation as another axis.

However, if the organizer of the scenario workshop wants to divide participants in 5 groups according to the five sections of the Delphi questionnaire, we can readily introduce at least one uncertainty into each group using the 6 uncertainty statements listed above. More uncertainties may be obtained from brainstorming the participants.



# Appendix



## A: Names of participated experts, gender, and economy

Name	Gender	Economy
Elie Faroult	Male	Belgium
Jack Smith	Male	Canada
Duan Anmin	Male	China
Jean-Loup Loyer	Male	France
Josie Close	Female	Hong Kong, China
Urashima	Female	Japan
Yoshinori Kondo	Male	Japan
Hiroshi Nagano	Male	Japan
Bong-Geun Song	Male	Korea
Soojeong Myeong	Male	Korea
Iu Man Tang	Male	Macao, China
Mang Neng Wong	Male	Macao, China
Wai Tim Ho	Male	Macao, China
Allan Johansson	Male	Norway
Edna L. Juanillo	Male	Philippines
Eric Raymundo	Female	Philippines
Amnat Chidthaisong	Male	Thailand
Angkana	Female	Thailand
Athipong Hiranraengchok	Male	Thailand
Kitti Limskul	Male	Thailand
Marupong Tansatcha	Male	Thailand
Sirintornthep Towprayoon	Female	Thailand
Sompong Sirisopolsilapa	Male	Thailand
Buntoon Srethasirote	Male	Thailand
Sittapong Rattanakat	Male	Thailand
Chuleeporn Boonyamalik	Female	Thailand
Shirin Elahi	Female	UK
Sandy Thomas	Female	UK
Evan Michelson	Male	USA
Jerome Glenn	Male	USA
Quynh Hoa Do	Female	Vietnam
Thanh Binh Le	Male	Vietnam
Tran Ngoc Ca	Male	Vietnam

## B: Response rate and respondent profile of each of the 34 statements

### Section 1: Climate Change & Its Impact

**Statement 1:** Anthropogenic greenhouse gas emissions are stabilized at 1990 level.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>2</b>	<b>2.6</b>
Canada	2	-	
USA	3	2	
<b>Asia</b>	<b>58</b>	<b>21</b>	<b>26.9</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	2	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>28</b>	<b>35.9</b>

In this statement, 78 experts from five regions were invited to participate in the real-time Delphi survey. Only 28 experts from three regions or 35.9 percent of the total invited experts answered in this statement. The majority of respondents (21 experts) were from Asia which accounts around 26.9 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the experts from Thailand (9 out of 21 participated experts). There were 7 participated experts from Europe and America region, while there was no participated expert from Africa and Oceania region. In term of gender, 67.86% of the respondents were male as compared to 32.14% female.

Gender	Number	Percentage
Male	19	67.86

Female	9	32.14
<b>Total</b>	<b>28</b>	<b>100</b>

**Statement 2:** Carbon capture and storage (CCS) is effectively and fully implemented.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>2</b>	<b>2.6</b>
Canada	2	-	
USA	3	2	
<b>Asia</b>	<b>58</b>	<b>21</b>	<b>26.9</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	3	
Philippines	2	2	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	-
<b>Oceania</b>	<b>1</b>	<b>-</b>	
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>28</b>	<b>35.9</b>

From 78 invited experts, only 28 experts or 35.9 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 26.9 percent of the total respondents. There were seven participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 67.86% of the respondents are male as compared to 32.14% female.

Gender	Number	Percentage
Male	19	67.86
Female	9	32.14
<b>Total</b>	<b>28</b>	<b>100</b>

**Statement 3:** Technology and management enable forest plantations to act as the main carbon sink.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>19</b>	<b>24.4</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>25</b>	<b>32.1</b>

A total of 25 experts or 32.1 percent of the total invited experts answered in this statement. The majority of respondents (19 experts) were from Asia which accounts around 24.4 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 19 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 68% of the respondents are male as compared to 32% female.

Gender	Number	Percentage
Male	17	68.00
Female	8	32.00
<b>Total</b>	<b>25</b>	<b>100</b>

**Statement 4:** Global and regional earth system modeling (integrated assessment model) provides highly accurate.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>17</b>	<b>21.8</b>
China	7	-	
Hong Kong	6	-	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	-	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>22</b>	<b>28.2</b>

From 78 invited experts, only 22 experts or 28.2 percent of the total invited experts answered in this statement. The majority of respondents are from Asia, Thailand in particular, which accounts around 21.8 percent of the total respondents. There were only five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (72.73%).

Gender	Number	Percentage
Male	16	72.73
Female	6	27.27
<b>Total</b>	<b>22</b>	<b>100</b>



**Statement 5:** Effective mechanisms are devised to cope with the direct impact of climate related events.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>17</b>	<b>21.8</b>
China	7	-	
Hong Kong	6	-	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	-	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

A total of 23 experts or 29.5 percent of the total invited experts answered in this statement. The majority of respondents (17 experts) were from Asia which accounts around 21.8 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 17 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.57% of the respondents are male as compared to 30.43% female.

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 6:** Food scarcity occurs as a result of a significant shift in land allocation from food crop to energy crop.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	2	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

A total of 23 experts or 29.5 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 18 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.57% of the respondents are male as compared to 30.43% female.

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

## Section 2: Migration, Rural Life, and Natural Resources

**Statement 7:** Coastal ecosystem management becomes widespread and economically beneficial.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>2</b>	<b>2.6</b>
Canada	2	1	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>19</b>	<b>24.4</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	-
<b>Oceania</b>	<b>1</b>	-	
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>25</b>	<b>32.1</b>

From 78 invited experts, only 25 experts or 32.1 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 24.4 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 72% of the respondents are male as compared to 28% female.

Gender	Number	Percentage
Male	18	72.00
Female	7	28.00
<b>Total</b>	<b>25</b>	<b>100</b>

**Statement 8:** Shift of farming land to higher altitude and colder areas cause major destruction of the most important carbon sink (forests).

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

From 78 invited experts, only 24 experts or 30.8 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 23.1 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (66.67%).

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>

**Statement 9:** Migration of people from coastal area towards inland induces major conflicts over land and resources.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

A total of 24 experts or 30.8 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 18 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 66.67% of the respondents are male as compared to 33.33% female.

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>



**Statement 10:** New generations of well-educated people choose new knowledge-intensive, agriculture-based industries that are more sustainable.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

From 78 invited experts, only 24 experts or 30.8 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 23.1 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (66.67%).

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>

**Statement 11:** High demand on carbon deduction creates sustainable income from the poor rural people who plant trees and energy crops.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

In this statement, 78 experts from five regions were approached which resulted in 24 responses or 30.8 % of the total approached experts. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 18 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 66.67% of the respondents are male as compared to 33.33% female.

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>

**Statement 12:** Ecotourism becomes dominant in the tourism industry.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

From 78 invited experts, only 23 experts or 29.5 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 23.1 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (69.57%).

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 13:** Algae technology capable of producing fuel (H<sub>2</sub>, oil, or ethanol) becomes commercially widespread.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

A total of 23 experts or 29.5 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 18 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.57% of the respondents are male as compared to 30.43% female.

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 14:** Skilled immigration applicant increase and are easily accepted.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>17</b>	<b>21.8</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	-	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

From 78 invited experts, only 23 experts or 29.5 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 21.8 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (65.22%).

Gender	Number	Percentage
Male	15	65.22
Female	8	34.78
<b>Total</b>	<b>23</b>	<b>100</b>



**Statement 15:** Water scarcity becomes a cause of war.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

In this statement, 78 experts from five regions were approached which resulted in 24 responses or 30.8 % of the total approached experts. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 18 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 66.67% of the respondents are male as compared to 33.33% female.

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>

### Section 3: Society / Health

**Statement 16:** Technologies significantly improve the healthcare system to cope with new infectious diseases stimulated from global warming.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	-	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

From 78 invited experts, only 23 experts or 29.5 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 23.1 percent of the total respondents. There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (69.57).

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 17:** Technological process changes toward producing food locally to serve societal demand while reducing carbon emission.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	7	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

A total of 24 experts or 30.8 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (7 out of 18 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 70.83% of the respondents are male as compared to 29.17% female.

Gender	Number	Percentage
Male	17	70.83
Female	7	29.17
<b>Total</b>	<b>24</b>	<b>100</b>

**Statement 18:** A global regulatory framework of low carbon is totally accepted.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>19</b>	<b>24.4</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>25</b>	<b>32.1</b>

From 78 invited experts, only 25 experts or 32.1 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 24.4 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (68%).

Gender	Number	Percentage
Male	17	68.00
Female	8	32.00
<b>Total</b>	<b>25</b>	<b>100</b>

**Statement 19:** Consumers are willing to pay more for low carbon footprint products.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>19</b>	<b>24.4</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>25</b>	<b>32.1</b>

A total of 25 experts or 32.1 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (7 out of 18 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 70.83% of the respondents are male as compared to 29.17% female.

Gender	Number	Percentage
Male	17	68.00
Female	8	32.00
<b>Total</b>	<b>25</b>	<b>100</b>



#### Section 4: Trade of Goods and Services

**Statement 20:** Economies that were previously dominated by manufacturing industries /sectors have moved dramatically towards knowledge-based services.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>20</b>	<b>25.7</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>25</b>	<b>32.1</b>

From 78 invited experts, only 25 experts or 32.1 percent of the total invited experts answered in this statement. The participants of this statement were predominantly Asian, as 25.7 percent of the respondents were from Asia region. There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (72%).

Gender	Number	Percentage
Male	18	72.00
Female	7	28.00
<b>Total</b>	<b>25</b>	<b>100</b>

**Statement 21:** Environmentally friendly goods is now the dominant consumer goods in the global market.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>20</b>	<b>25.6</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>26</b>	<b>33.3</b>

A total of 26 experts or 33.3 percent of the total invited experts answered in this statement. The majority of respondents (20 experts) were from Asia which accounts around 25.6 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (9 out of 20 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.23% of the respondents are male as compared to 30.77% female.

Gender	Number	Percentage
Male	18	69.23
Female	8	30.77
<b>Total</b>	<b>26</b>	<b>100</b>

**Statement 22:** Carbon accounting becomes mandatory globally.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>20</b>	<b>25.6</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>26</b>	<b>33.3</b>

From 78 invited experts, only 26 experts or 33.3 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 25.6 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (69.23%).

Gender	Number	Percentage
Male	18	69.23
Female	8	30.77
<b>Total</b>	<b>26</b>	<b>100</b>

**Statement 23:** A low carbon related SR (Social Responsibility) ISO Standard is considered the norm of any business practice.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>20</b>	<b>25.6</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>26</b>	<b>33.3</b>

A total of 26 experts or 33.3 percent of the total invited experts answered in this statement. The majority of respondents (20 experts) were from Asia which accounts around 25.6 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (9 out of 20 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 70.83% of the respondents are male as compared to 29.17% female.

Gender	Number	Percentage
Male	18	69.23
Female	8	30.77
<b>Total</b>	<b>26</b>	<b>100</b>

**Statement 24:** Air freight shipments are down to 1990 level.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>20</b>	<b>25.6</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>26</b>	<b>33.3</b>

In this statement, 78 experts from five regions were approached which resulted in 26 responses or 33.3 % of the total approached experts. The majority of respondents (20 experts) were from Asia which accounts around 25.6 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (9 out of 20 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.23% of the respondents are male as compared to 30.77% female.

Gender	Number	Percentage
Male	18	69.23
Female	8	30.77
<b>Total</b>	<b>26</b>	<b>100</b>

**Statement 25:** Global IT network will reduce the traveling of people to the 1990 level.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>20</b>	<b>25.6</b>
China	7	-	
Hong Kong	6	1	
Japan	11	2	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>26</b>	<b>33.3</b>

From 78 invited experts, only 26 experts or 33.3 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 25.6 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (69.23%).

Gender	Number	Percentage
Male	18	69.23
Female	8	30.77
<b>Total</b>	<b>26</b>	<b>100</b>



**Statement 26:** Political instability and inter-regional conflicts due to climate change impacts lead to little interaction between the major economic co-operations.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	-	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	-
<b>Oceania</b>	<b>1</b>	<b>-</b>	
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

A total of 23 experts or 29.5 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (9 out of 18 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.57% of the respondents are male as compared to 30.43% female.

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 27:** It is realized that emission trading has had little effect on reducing the global green house gas emission in 2050.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>19</b>	<b>24.4</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	9	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

In this statement, 78 experts from five regions were approached which resulted in 24 responses or 30.8 % of the total approached experts. The majority of respondents (19 experts) were from Asia which accounts around 24.4 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (9 out of 19 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 70.83% of the respondents are male as compared to 29.17% female.

Gender	Number	Percentage
Male	17	70.83
Female	7	29.17
<b>Total</b>	<b>24</b>	<b>100</b>

## Section 5: Housing and Construction / Urban Life / Transportation

**Statement 28:** Conventional fuels disappear completely from transportation sector.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

From 78 invited experts, only 24 experts or 30.8 percent of the total invited experts answered in this statement. The largest percentages of respondents were from Asia, Thailand in particular, which accounted around 23.1 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (66.67%).

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>

**Statement 29:** Most existing commercial buildings are retrofitted to save 50% of energy use on average.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>17</b>	<b>21.8</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	7	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

From 78 invited experts, only 23 experts or 29.5 percent of the total invited experts answered in this statement. The majority of respondents are from Asia, Thailand in particular, which accounts around 21.8 percent of the total respondents. There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.57% of the respondents are male as compared to 30.43% female.

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 30:** Energy efficiency of home and office appliances increases by 50%.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

A total of 23 experts or 29.5 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (9 out of 18 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.57% of the respondents are male as compared to 30.43% female.

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 31:** 20% of electricity is generated by decentralized sources.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

In this statement, 78 experts from five regions were approached which resulted in 24 responses or 30.8 % of the total approached experts. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 18 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 66.67 of the respondents are male as compared to 33.33% female.

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>



**Statement 32:** Majority of trips in daily life will be through efficient public transportation as opposed to personal mode.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>24</b>	<b>30.8</b>

From 78 invited experts, only 24 experts or 30.8 percent of the total invited experts answered in this statement. The majority of respondents are from Asia, Thailand in particular, which accounts around 23.1 percent of the total respondents. There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (66.67%).

Gender	Number	Percentage
Male	16	66.67
Female	8	33.33
<b>Total</b>	<b>24</b>	<b>100</b>

**Statement 33:** Personal transportation, supplementing mass transportation, will mainly consist of shared, loaned or rents vehicles.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	<b>-</b>	<b>-</b>
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>18</b>	<b>23.1</b>
China	7	-	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>4</b>	<b>5.1</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	-	
Switzerland	2	-	
UK	4	1	
<b>Oceania</b>	<b>1</b>	<b>-</b>	<b>-</b>
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>23</b>	<b>29.5</b>

A total of 23 experts or 29.5 percent of the total invited experts answered in this statement. The majority of respondents (18 experts) were from Asia which accounts around 23.1 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 18 participated experts). There were five participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, 69.57% of the respondents are male as compared to 30.43% female.

Gender	Number	Percentage
Male	16	69.57
Female	7	30.43
<b>Total</b>	<b>23</b>	<b>100</b>

**Statement 34:** Breakthroughs in battery storage technology make obsolete all other fuels including H<sub>2</sub>.

Region/Economy	No. Invited	No. of Responses	Response Rate (%)
<b>Africa</b>	<b>1</b>	-	-
South Africa	1	-	
<b>America</b>	<b>5</b>	<b>1</b>	<b>1.3</b>
Canada	2	-	
USA	3	1	
<b>Asia</b>	<b>58</b>	<b>19</b>	<b>24.4</b>
China	7	1	
Hong Kong	6	1	
Japan	11	1	
Korea	2	2	
Macao	4	2	
Philippines	2	1	
Chinese Taipei	2	-	
Thailand	21	8	
Vietnam	3	3	
<b>Europe</b>	<b>13</b>	<b>5</b>	<b>6.4</b>
Belgium	1	1	
France	2	1	
Hungary	1	-	
Ireland	1	-	
Norway	1	1	
Russia	1	1	
Switzerland	2	-	
UK	4	2	
<b>Oceania</b>	<b>1</b>	-	-
Australia	1	-	
<b>Total</b>	<b>78</b>	<b>25</b>	<b>32.1</b>

In this statement, 78 experts from five regions were approached which resulted in 25 responses or 32.1 % of the total approached experts. The majority of respondents (19 experts) were from Asia which accounts around 24.4 percent of the total respondents. Within the Asia region, the respondents strongly dominated by the expert from Thailand (8 out of 19 participated experts). There were six participated experts from Europe and America region while there was no participated expert from Africa and Oceania region. In term of gender, the largest percent of respondents were male (68%).

Gender	Number	Percentage
Male	17	68.00
Female	8	32.00
<b>Total</b>	<b>25</b>	<b>100</b>