

THE 2050 SCENARIOS : LOW CARBON – HIGH QUALITY LIFESTYLES for THE ASIA - PACIFIC

**REPORT OF LCS BEYOND 2050 : SCENARIO WORKSHOP, 2-4 NOVEMBER 2009, PHUKET, THAILAND
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Introduction

History matters and, in 40 years, all the decisions we take today will be history. Our children's range of options and the number of choices available to them when they in their turn assume the reins of power will be based on the choices we make for them today.

Stephen Kinsella, University of Limerick, 2010

Whether by conscious choice or mere coincidence, the Asia Pacific Economic Cooperation's Center of Technology Foresight (APEC CTF) couldn't have picked a better venue for its scenario workshop to systematically anticipate and manage impacts from the changing climate. The world-class tourist destination of Patong Beach in Phuket was one of the hardest hit human settlements by the 2004 Indian Ocean tsunami. Although the catastrophe did not have climate change connections, the tsunami that took some 230,000 lives across Asia serves as a reminder that we have to be better prepared for an increasing rate and magnitude of natural disasters due to the climate change consequences predicted by science.

Human societies have always been climate dependent, but we are only now coming to grips with the fact that our climate also depends on us. As the second decade of the 21st century gets underway, we now recognize that we are faced with two challenges created by our ever-increasing emissions of greenhouse gasses. First, the atmosphere is warming, setting the stage for a host of problems from droughts, extreme weather events, coastal erosion and inundation, to which we have to adapt. And second, we must begin implementing strategies to

slow down our greenhouse gas emissions to mitigate the scale of these impacts while putting in place corresponding adaptation measures.

These challenges are particularly problematic for countries and economies in the Asia Pacific. On the one hand, the region is slated to face some of the greatest climate related impacts relative to other regions of the world. On the other, developing economies in the region will see substantial expansions of their middle-classes and the greenhouse gas emissions their lifestyles generate.

Mitigation and adaptation are two sides of the same climate change coin, the size of which seems to grow by the day. There are still relatively few international leaders working aggressively on mitigation policies, causing people to question if any mitigation actions will be sufficient to fend off the serious problems, especially given the significant political and economic challenges. It is certain too that it will take

decades to deploy new energy technologies on a global scale. Adaptation is also problematic as it covers many fields and must fit into an integrated system, but such systems are hardly being discussed, much less established. Moreover, changing conditions and extreme events play out most dramatically at the local level, making self-empowerment key. But resources and capacity at the local level are limited at best.

Regional actions are key to bridging both local and global gaps. With nine billion people expected to inhabit the planet in 2050, an unsustainable number should they all aspire to the current middle-class lifestyle, it is critical that changes be made across the globe. And with most of this increase occurring in the Asia Pacific, regional actions here will be pivotal to any successful global response. Conversely, local knowledge and constant monitoring is required to identify critical triggers in the climate system and anticipate their impacts. Regional modeling must unite the global

climate change models with detailed local realities helping to better plan and forecast the changes likely to come.

The APEC CTF project “Research on the Futures of Low - Carbon Society: Climate Change and Strategies for Economies in APEC Beyond 2050” is one of the first efforts of its kind to bring a strategic regional focus to climate change issues, as well as to link global science, technology and policy communities to local initiatives. Specifically, the project aims to envision and describe the future society where a low - carbon economy and adaptive lifestyle become the principle drivers governing trade and development and to formulate short, middle, and long term strategies for the region in terms of technological development.

The Scenario Workshop, held between 2-4 November 2009 in Phuket, is the fourth of a five-step process that began with a scoping meeting in Hong Kong in August 2008. This was followed by an international working group meeting in Bangkok in October 2008 and a real time Delphi survey from June to August 2009. The final step will be a concluding symposium in Bangkok in January 2010.

The Scenario Workshop brought together some 50 creative minds with diverse expertise, roles, ages, genders and nationalities from across Asia Pacific to sketch out a desirable low - carbon future for the region and some paths for how to get there.

THE FORESIGHT PROCESS AT A GLANCE

The core objective of a foresight process is to prudently plan for the future by being aware of the significance and nature of events before they occur. The outputs from a foresight process are typically a variety of scenarios that describe the social, economic and environmental conditions that might materialize if certain actions are or are not taken.

The process undertaken by APEC CTF in Phuket is normative-based, involving a systematic look into the longer-term future of low - carbon societies for Asia Pacific. The process analyzes the potential impacts and opportunities climate change may bring to the region with a view to identifying the emerging change factors, and the source areas of scientific research, policy development and economic trends that are likely to influence change and yield the greatest economic, environmental and social benefits during the four decades between now and 2050.

Foresight provides background for strategic planning activities by enabling early recognition of important changes that must be addressed. Foresight also provides a framework within which to make today's decisions. It helps avoid future negative consequences and costs of ignoring external and internal factors during times of uncertainty.

SCENARIOS, THE KEY TO FORESIGHT PLANNING*

Scenarios are creative and often simple descriptions of complex environments. They are stories, images or maps describing paths from the present to a future time horizon. The key focus of scenarios is uncertainty. The objective is to identify the major uncertainties affecting the strategic decisions - to chart the waters ahead so that the consequences of today's decisions can be played out, evaluated and tested against the uncertainty of the future.

Scenarios enable us to expand the range of our thinking, to expand the limits of our mental maps of the future. In that respect the process of scenario development is as important as the final product. And the more people involved in the process, the greater the impact.

When the external environment is complex and uncertain, scenarios become most useful, as is clearly the case when addressing the future as affected by climate change. Increasingly, systems thinking, which recognizes how behavior within systems can lead to unanticipated feedback, is an important part of scenario thinking.

For situations in which most of the variables are known and quantifiable, or for decisions with relatively short-term outcomes or involving modest investments, scenarios are usually not appropriate.

There are five common properties of scenarios worth noting.

- **Multiple Views:** Scenarios always involve more than one view of the future. That is their explicit objective. A single view is a forecast. For example, one scenario may be based on the extreme impacts of climate change with very little government planning or responses, and another with significant government involvement and leadership.
- **Qualitative Change:** Scenarios are most appropriate when dealing with complex, highly uncertain situations in which qualitative, non-quantifiable forces are at work. This is particularly true in the case of climate change when addressing the future quality of life and development goals desired as climate change progresses.
- **Objective:** Scenarios must be internally consistent and feasible. If scenarios are viewed as impossible or not feasible, then they are rejected.
- **Open-Ended:** Scenarios are not precise maps to the future. They allow for details to be filled-in and changed as both events and plans change.
- **Relevant:** Scenarios must be relevant to the situation at hand. They must highlight the uncertainties and driving forces relevant to strategic decisions facing an organization or country.

* Adapted from "A Brief Primer on Scenarios" by Arden Brummell, Global Business Network, in STFPF Scenarios Report # 6, 2003

The characteristics of good scenarios include:

- **Plausible:**
Are the scenarios believable?
- **Grounded:**
Are the scenarios linked to events in the past and present?
- **Challenging:**
Do the scenarios challenge our thinking? Do they expand our mental maps?
- **Relevant:**
Do the scenarios throw light on important strategic issues facing us?
- **Internally Consistent:**
Are there contradictions in the logic or outcomes within a scenario?

Scenarios are not meant to be certainties, but merely our best guess of the range of future outcomes should the underlying assumptions of a particular scenario come to pass. Most importantly, scenarios should challenge our concepts of the future and lead us to the right questions we should be asking as we map our way forward.

SOME LOW - CARBON SOCIETY GUIDELINES

To help frame some of the specific challenges to the development and implementation of low - carbon societies, Peter King, Senior Policy Advisor, the Institute for Global Environmental Strategies outlines some principles and tactics for workshop participants to keep in mind.

Basic elements of a low-carbon society are :

- Reducing energy demand.
- Moving away from carbon-intensive fossil fuels and GHG emissions.
- Meeting the development needs of all groups in society.
- Measuring energy security.

It's important to have visionary goals, not just targets. Such goals might include: carbon minimization in all sectors; a simpler lifestyle that realizes a richer quality of life; and coexistence with nature. This might require: rates of use of renewable resources below rates of regeneration; rates of use of non-renewable resources below the rate at which sustainable renewable substitutes are developed; and rates of polluting emissions, including GHGs, below the assimilative capacity of nature. With such goals in mind, then targets, both for the short and long term can be set. It is important to have building blocks that work

toward achieving specific targets, to help break the problem down and demonstrate intermediate success.

As many developing countries continue working to integrate low - carbon society strategies into sustainable development plans and the attainment of millennium development goals, they need to find the right policy balance between development co-benefits and climate change mitigation and adaptation to reach the poverty reduction goals. This may require some countries to reconsider zero-growth pathways.

Some key elements of a low - carbon society strategy should include :

- Reduce energy demand in every sector: residential and commercial buildings, transportation and industry.
- Develop plans for the use of alternative energy: wind, wave, solar, geothermal, hydropower, biomass are competitive now. Nuclear energy, hydrogen and biofuels may also play a role, but may need to overcome technological and/or political barriers prior to becoming major components of some countries' alternative energy portfolios.
- Promote co-benefits of climate change measures: rural electrification and distributed, renewable energy; community-based management of forests and carbon sequestration; flood prevention and mitigation and climate change adaptation; control of disease vectors, and livable cities and towns.
- Create green jobs for poverty reduction: renewable energy, green buildings, recycling and forest management.
- Integrate climate change mitigation and

action plans into all aspects of policy making:

enact enabling legislation that reinforces the need for sectors to achieve specific targets, incorporate climate change into national plans, sustainable development plans and socio economic plans at all levels of government.

Participants should also keep in mind those barriers that impede the implementation of low - carbon society strategies.

- Political: lack of common vision, disagreement on goals and targets, uncertainty over modeling, emissions scenarios and technologic advances and transfers.
- Psychological and human nature: emotional denial, can't overcome the tragedy of the commons and impacts on the consumer lifestyle.
- Economic and financial: carbon price; costs of inaction and delay, transaction costs of implementation and management; debate over carbon tax versus cap and trade emissions trading, and the viability of Reducing Emissions from Deforestation and Forest Degradation in developing countries (REDD).

Despite these challenges, it is critical that we urgently move to a war-like crash program toward low - carbon society, as further delay means failure. We need at least two plans, one that assumes we meet reasonable reductions in carbon dioxide by 2050, and another if we don't and/or science informs us that such targets may be too high and more drastic measures are needed.

LOW - CARBON SOCIETY UNDERWAY IN ASIA

Japan

Mikiko Kainuma with the Asia-Pacific Integrated Model Team of Japan's National Institute for Environmental Studies outlines how Japan's low - carbon society strategies evolved. The process began with a five-step process focusing on energy consumption.

Mikiko Kainuma with the Asia-Pacific Integrated Model Team of Japan's National Institute for Environmental Studies outlines how Japan's low - carbon society strategies evolved.

CO₂ emission projections based on a dozen actions toward 70% reduction

AIM/LCS

A Dozen Actions

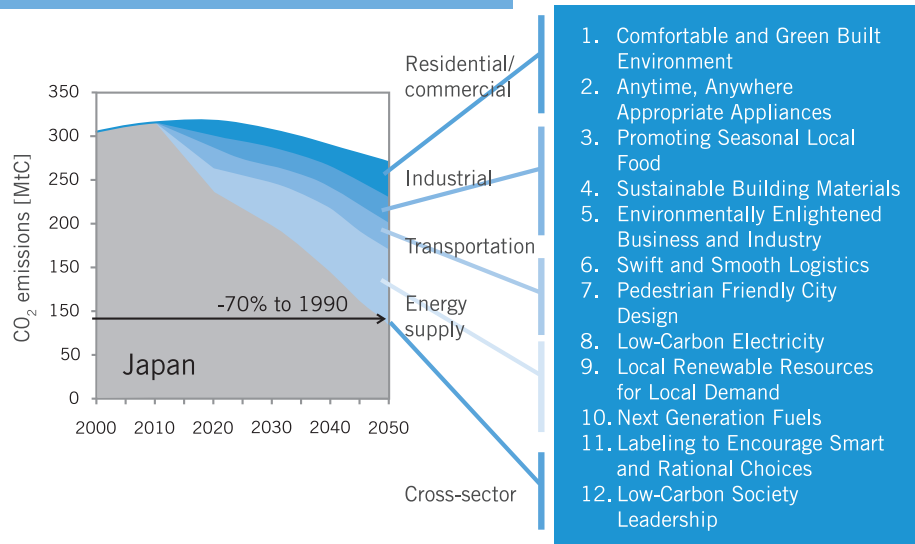


Figure I
Source:
Kainuma, 2009

First, a vision for the country's social and economic conditions in 2050 was created. Energy service demand estimates to serve those conditions were derived. Innovations for meeting this demand were then explored. Carbon emissions associated with meeting this demand utilizing the proposed energy supply mix were then quantified. And finally, energy supply potentials were checked.

Two scenarios were formulated. One assumes more rapid economic growth through technological advances, and the other projects slower growth and more modest community-centered lifestyles.

Each scenario worked toward significant carbon emissions reduction in 2050 brought on by both increased energy efficiency to reduce demand, and increases in the use of biomass, wind and solar energy.

Backcasting was critical to the process. Planners took the social and economic vision for 2050, then began backing in options that might be implemented over the 40-year period to achieve that vision. Time estimates were made for how long it would take for each of these options to be implemented and for them to achieve their intended results. Their feasibility and carbon cost trajectories were also examined.

A road map was then established that included: implementation policies, financing, assure sufficient technology and capacity are available to deliver the policies, and regulations to enforce the policies. All of these are seen as core steps in the implementation process, none of which can be neglected or skipped.

As depicted in Figure I, ultimately a dozen actions were identified for how Japan might achieve a 70 percent reduction in carbon emissions.

Thailand

Sirintornthep Towprayoon points out the Low - carbon society that is in harmony with a development philosophy unique to Thailand.

Low - carbon society is in harmony with a development philosophy unique to Thailand, points out Sirintornthep Towprayoon, with the Earth System Science Research Center and the Joint Graduate School of Energy and Environment at King Mongkut's University of Technology Thonburi.

The Sufficiency Economy, which has gained momentum in Thailand since the 1997 Asian financial crisis, stresses that the middle path (not too much, not too little) is the overriding principle for appropriate conduct by the populace at all levels.

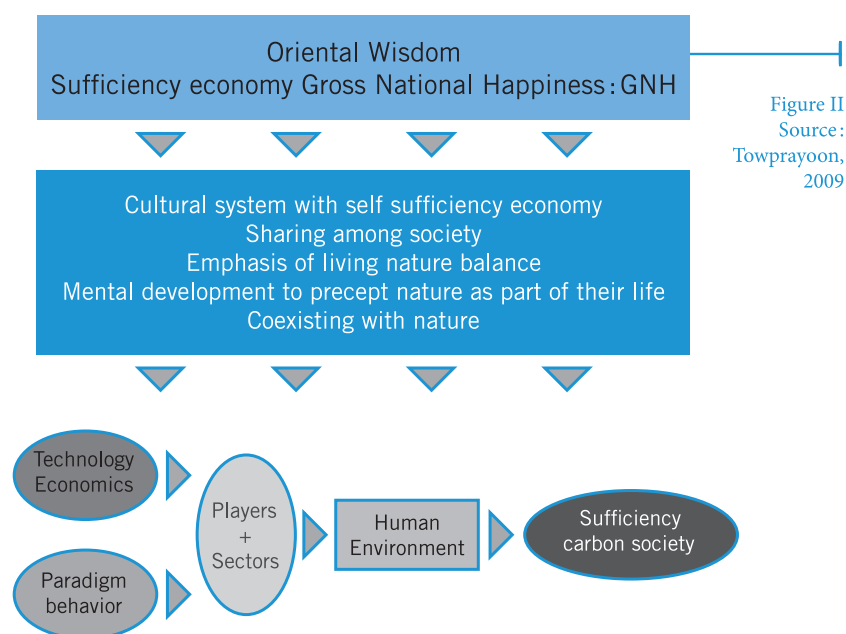


Figure II
Source:
Towprayoon,
2009

This also applies to the choice of a balanced development strategy so as to modernize in line with the forces of globalization while shielding against inevitable shocks and excesses that arise.

With such a principle in place, the steps to achieve a low - carbon society are driven as much by the publics overall awareness of the impact of their living practices as by any technological shifts.

Rural communities with sufficiency economic concerns are more likely to drive towards a low - carbon society due to their attitudes and consciousness than those in urban areas where technology plays a greater role in mitigation.

Such a strategy is also consistent with measures aimed toward increasing a country's Gross National Happiness. By reducing carbon emissions, a cleaner, simpler and richer quality of life can be achieved. Success with such attitudinal changes can bring about changes quickly, even independently, of technological advances.

TERMS OF REFERENCE FOR THE PHUKET WORKSHOP SCENARIOS

The specific issues to be tackled by the scenario workshop participants were largely the product of a Delphi survey conducted via the Internet from 15 June to 30 August, 2009.

The Delphi analysis involved a panel of experts logging in as often as they liked to anonymously answer a questionnaire. As the survey progressed, participants were encouraged to revise their earlier answers in light of the recorded feedback from other participants. Four was the maximum number of times a respondent chose to make such revisions. Utilizing such an approach tends to narrow the range of answers, causing the group to converge toward some common ideas.

Chatri Sripaipan presents the key findings
of the Delphi survey

**Key findings of the Delphi
survey for each of the five core
categories were presented by
Chatri Sripaipan:**

- **Climate change & its impacts:**
Climate change will have adverse impacts. Doubts exist about the effectiveness and timeliness of technologies like carbon capture and storage, earth system modeling, and the effectiveness of international agreements.
- **Migration, rural life and natural resources:**
Rising sea levels will force farmers to shift to higher attitudes despite coastal ecosystem management strategies. Impacts on eco-tourism and skilled immigration are only moderate. Water scarcity is a major concern. There are conflicting views whether well-educated people will undertake farming, and whether rural poor benefit from planting trees for carbon sequestration or cultivating energy crops.
- **Society & health:**
Experts are optimistic that technologies can improve the healthcare system. The low - carbon concept is spreading and some consumers are willing to pay more for green products.
- **Trade of goods and services:**
Participants are generally positive regarding movement towards green trade and services despite some doubts about the effectiveness of policy implementations to support these activities. Housing and construction / urban life / transportation: Experts have faith in technologies to boost energy efficiency, public transportation, and renewable energy, but are unconvinced that conventional fuels will disappear quickly.

Seventy-eight experts from five regions (Africa, the Americas, Asia, Europe, Asia and Oceania) were solicited to participate in the survey. Nearly one third of the participants were from Thailand. Approximately two third of the participants were male.

The survey questions were informed by the scoping workshop in Hong Kong in August 2008, and the working group meeting in Bangkok in October 2008. The working group developed 34 statements (See Figure III) for the Delphi survey, distributed across five categories: climate change & its impacts, migration, rural life & natural resources, society/health, trade of goods & services and housing & construction/urban life/transportation. Five Thai working group roundtable meetings were then held to further refine the Delphi statements and their questions.

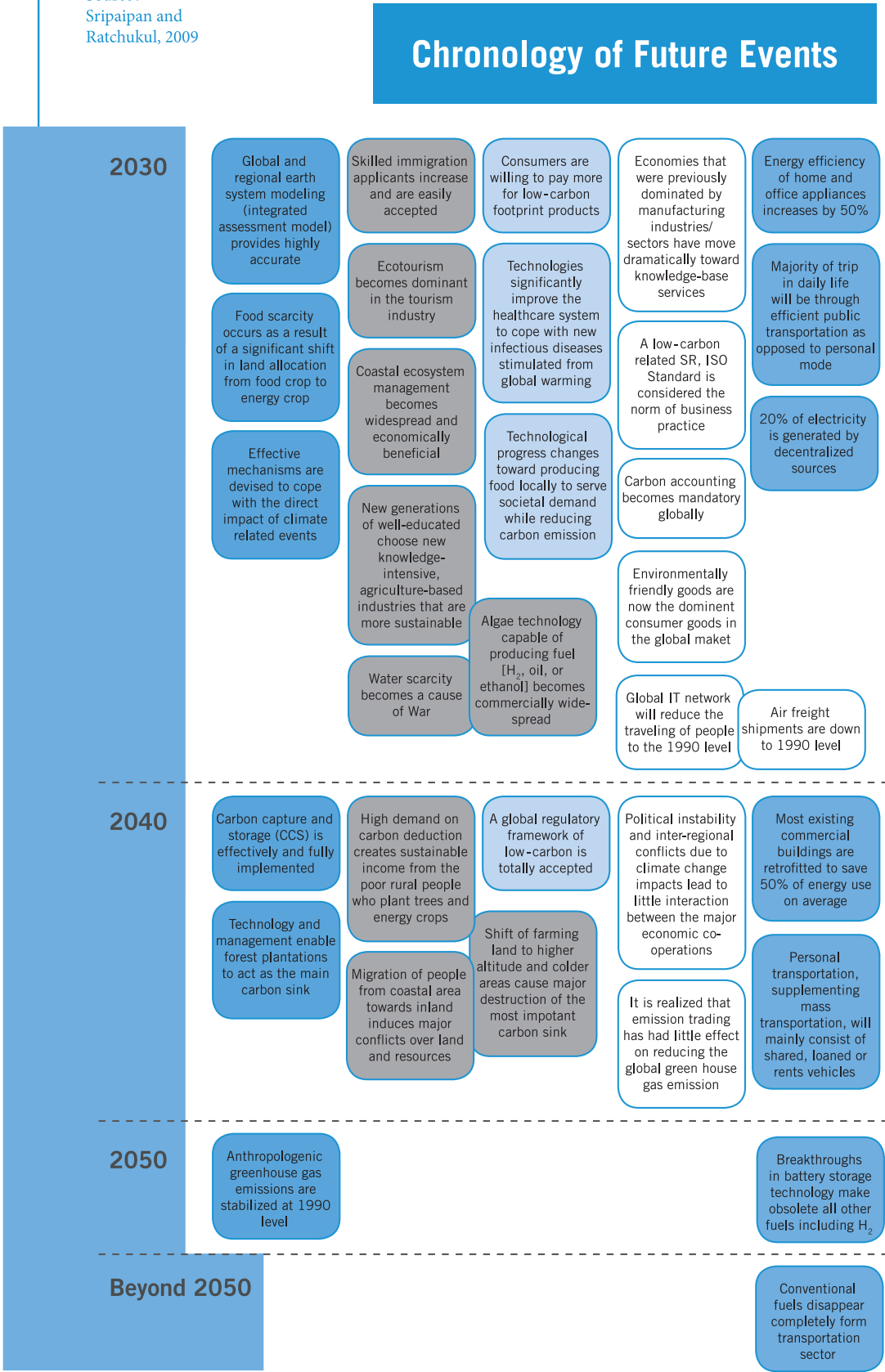
Key trends that the survey results suggest the region must prepare for include:

- Rising temperatures, more severe storms and extreme weather events.
- Greater water scarcity leading to changes in migration patterns and land use.
- Technological advances improving healthcare systems.
- Increased regulations on carbon emissions and individual carbon footprints.
- Greater energy efficiency to achieve gains in energy conservation.

Key uncertainties the survey highlighted included:

- The feasibility of: carbon capture and storage
- Energy generation via algae farms.
- The viability of a global regulatory framework
- The impact information technology can have on reduced travel
- The role conventional fuel supplies will play in future transportation.

Figure III
Source:
Sripaipan and
Ratchukul, 2009



THE SCENARIO WORKING GROUPS

Task:

work with your team to create the low - carbon future you want for 2050, then work backward (backcasting) to identify what should happen in each decade from 2050 to now to realize your low - carbon future.

Brainstorming rules:

every idea is good; suspend judgment; once it's underway, it's underway (to maintain momentum of idea flows); shamelessly steal ideas from other groups (for something you forgot or haven't thought of).

The precise description of the three-day challenge draws some nervous laughs. The task of imagining a future 40 years from now is seen as incredibly demanding by many participants. Half of the people in the room won't even live long enough to see 2050. A quarter may still be alive, but barely. Intellectually, all know the importance of making choices now to minimize the problems handed down to the future generations, and that a low - carbon society in 2050 is unlikely to materialize unless key choices are identified and acted upon today, but this does little to lessen the daunting nature of the work ahead.

To help set the stage for the groups, participants find their meeting room transformed from the rows of tables and chairs in place for the opening ceremony into five circular working areas with ample vertical surfaces to accommodate drawings, charts, pictures and written

ideas. Participants are encouraged to be on their feet often, even to commingle with neighboring groups to usurp whatever ideas they may find useful. They are also introduced to the self-serve beverage and snack corner at their disposal to ensure the creative juices are not hindered by lack of food or caffeine.

Participants split into groups to begin discussing the five different aspects of low - carbon society identified via the Delphi survey process:

- Climate change and its impact.
- Housing and construction/urban life/transportation.
- Migration, rural life and natural resources.
- Society and health.
- Trade of goods and services.

When confronting these issues, the groups generate quite positive scenarios for the Asia Pacific in 2050. This result is not surprising given the normative scenario method employed for this workshop, which is designed to identify ways to overcome a negative force, the impacts of climate change.

As a whole, the groups see the world achieving a dramatic reduction in global carbon emissions and, in doing so, taking advantage of ongoing opportunities to make major changes in how society is organized. Such actions lead to less conflict, a dramatic reduction in poverty, greater access to health care, improved quality of life and greater independence in food production for each

locality. This comes with an equally dramatic shift in accounting priorities away from currencies such as the US dollar standard to a greater emphasis on trade in carbon emissions.

Critical success drivers to realizing such a scenario include continued advances in technology, technology access for developing countries, stronger governance, education reform, open access to information, more equitable access to communication, and a dramatic shift away from fossil fuels toward alternative energy sources. While global leadership and cooperation is important, individual and community behavioral changes are seen as far more pivotal to realizing the forecasted outcomes, reinforcing the importance of assuring equitable access to information and participation in decision making.



Group 1

Climate Change and Its Impact

Advance Technologies for forecasting and climate modeling can make people realize their situation that happen around them.



The world becomes more “predictable”

as advances in climate modeling technology provide greater certainty when projecting climate trends and their impacts. By 2050, modeling accuracy increases to 98-100 percent due to a 10,000-fold expansion in computer processing power, affording much more sophisticated real-time predictions of weather and climate. Of special concern to many in the region is the ability to more accurately forecast, and prepare for, extreme weather events. Weather prediction accuracy between 2020-2050 increases five-fold over 2010's modeling. More accurate and reliable forecasting information allows policy makers and the public to better prepare for the longer-term changes caused by the changing climate.

There is a massive upscaling of public investment for both super computers dedicated to climate modeling, and building the capacity of climate scientists around the world to utilize these new computational resources. It is anticipated that such investment priorities will remain high beyond 2050.

In 2050, spending on greenhouse gas mitigation accounts for 2.5 percent of world GDP, allowing for a 90 percent reduction in global CO₂ emissions from 1990 levels. Adaptation strategies necessary to combat climate change impacts account for another 5 percent share of global GDP.

Mitigation mechanisms include establishing a pricing system for carbon emission, along with taxes, subsidies and special legal

instruments designed to provide incentives for the private sector to invest in low - carbon technologies. A global financing institution is established for carbon emissions' reduction.

Lifestyles are significantly different from 2010, largely the result of educational systems that stress sustainability values and the need for low - carbon living. Renewable energy, energy efficiency standards and mandated conservation practices are vital to the evolution of low - carbon lifestyles. Innovative housing and commercial building design parallel new materials' innovation to further lay the foundation for carbon neutral consumption practices. Mass transit is the dominant mode moving people to and from work in urban areas, while highly green and fuel-efficient technology assures a clean flow of goods within and across national borders.

Challenges to successful climate change mitigation include:

- Climate data sharing, analytical capacity building and skilled personnel to advance climate science and modeling technology.
- Financial management and access to investment capital.
- Required changes in lifestyle.
- Insufficient understanding by policy makers and the public of the urgent need for a response to climate change—possibly the greatest challenge of all.

Daily lifestyles are important cause of global warming



	2050	2040
What	<p>Climate Science</p> <ul style="list-style-type: none">- Data processing power 10^4X- Accuracy factor is 5X- High capacity and 98-100% accuracy in real-time modeling <p>Finance</p> <ul style="list-style-type: none">- Mitigation, 2.5% of GDP- GHG reduce by 90%- Adaptation, 5% of GDP <p>Lifestyle</p> <ul style="list-style-type: none">- Renewable energy use- Energy efficiency & conservation- New materials- 3R-Recycle, Reuse, Reduce- Carbon neutral	<p>Climate Science</p> <ul style="list-style-type: none">- Data processing power 10^3X- Accuracy factor is 4X <p>Finance</p> <ul style="list-style-type: none">- Mitigation, 2% of GDP- GHG reduce by 70%- Adaptation, 4% of GDP
How	<p>Climate Science</p> <ul style="list-style-type: none">- Continue developing data collection with accuracy- Stronger networks for data collection- Increase number and capacity building of climate scientists	<p>Climate Science</p> <ul style="list-style-type: none">- Continue developing data collection with accuracy- Stronger networks for data collection- Increase number and capacity building of climate scientists

2030	2020	2010
Climate Science <ul style="list-style-type: none"> - Data processing power 100X - Completion of knowledge of ecological system feedback (most likely) - Extreme weather events predicted in more detail - Accuracy increases 3X Finance <ul style="list-style-type: none"> - Mitigation, 1.5% of GDP - GHG reduce by 50% - Adaptation, 3.5% of GDP 	Climate Science <ul style="list-style-type: none"> - Feed models with real-time data - Completion of knowledge of ecological system feedback - Extreme weather event predicted in more details - Accuracy increases 2X Finance <ul style="list-style-type: none"> - Mitigation, 1% of GDP - GHG reduce by 40% - Adaptation, 3% of GDP 	Climate Science with Decadal Climate Modeling <ul style="list-style-type: none"> - Data processing power X (baseline) - Feed models with assumptions Finance <ul style="list-style-type: none"> - Financing to correspond with GHG emissions at $< 2^{\circ}\text{C}$ temperature rise
Climate Science <ul style="list-style-type: none"> - Continue developing data collection with accuracy - Stronger network of association for data collection - Increase number and capacity building of climate scientists 	Climate Science <ul style="list-style-type: none"> - Data collection with accuracy - Network of association for data collection - Increase number and capacity building of climate scientists 	Climate Science with Decadal Climate Modeling <ul style="list-style-type: none"> - Financing development of super computers - Massive upscale of public investment - Capacity Building of climate scientists Finance <ul style="list-style-type: none"> - Global carbon pricing in Copenhagen, - Tax scheme for private sector to invest in LCT, Subsidies and incentives through laws Lifestyle <ul style="list-style-type: none"> - Regulations for house insulation, efficiency of electronics appliances - Efficient use of scarce resources



Group 2

Housing and construction/urban life/transportation

A key characteristic of the 2050 society is increased diversity in demography and cultures. Metropolitan and city planning is greatly improved, supported by vastly upgraded transportation infrastructure. Ninety percent of urban commuters are able to take for granted an efficient and reliable mass transit system, leading to significant reductions in urban carbon emissions. The elderly represent a much greater percentage of urban residents, and enjoy increased mobility and a better quality of life as they too benefit from the greater emphasis placed on quality urban planning.



By 2040 transportation change upside-down because of an alternative energy that which completely replace fossil energy.

Technological advances are critical drivers to low - carbon solutions for urban areas. Technological innovation continues apace though 2040, and likely accelerate further as 2050 arrives. Artificial intelligence grows in importance allowing computers to manage a greater percentage of complex tasks. The use of nano-technology for self-assembly manufacturing of personal goods like clothing, and for air and water filtration, will become widespread contributing to reductions in emissions related to transportation logistics. Technological advances will also continue to fuel improved wellness and healthcare, and growth in personalized medicine.

By 2030, food moves directly from farmers to consumers without intermediate handlers. More highly advanced communication technologies enable information to be accessible anywhere and at anytime, facilitating universal access to education. Improved educational opportunities increase interest in environmental protection. Modeling and gaming play an increased role in environmental education. Manufacturing and consumption processes move toward zero waste, especially as any waste products serve as feed for electricity generation. A “Back to the basics” environmentally friendly lifestyle gains popularity as the “Consumption for happiness” lifestyle begins to fade. Carbon footprints and green eco-accounting are firmly established in people’s mindsets by 2040. Renewable energy including solar, wind, hydro and nuclear power become prominent sources for electricity generation. Urban highrises are “wrapped” with PVs for self-electrification, while power generation gradually shifts to a less decentralized distribution system to afford greater supply options for rural areas. Demand side management is also key to success in reducing emissions from the energy sector.

Transportation improvements include: a 75 percent increase in airliner fuel efficiency due to alternative fuels and advances in aeronautical engineering; improved battery storage and hydrogen fuel cells lead to the complete phase out of fossil fuel land vehicles; further advances in teleconferencing technology reduces the need for business-related air travel, and robots take over mail and parcel delivery to both homes and businesses.

Good governance and forward-thinking policies create a healthy atmosphere for innovation. Financial incentives help accelerate the realization of benefits from research into viable commercial ventures that support low - carbon lifestyles. Conversely, disincentives such as carbon

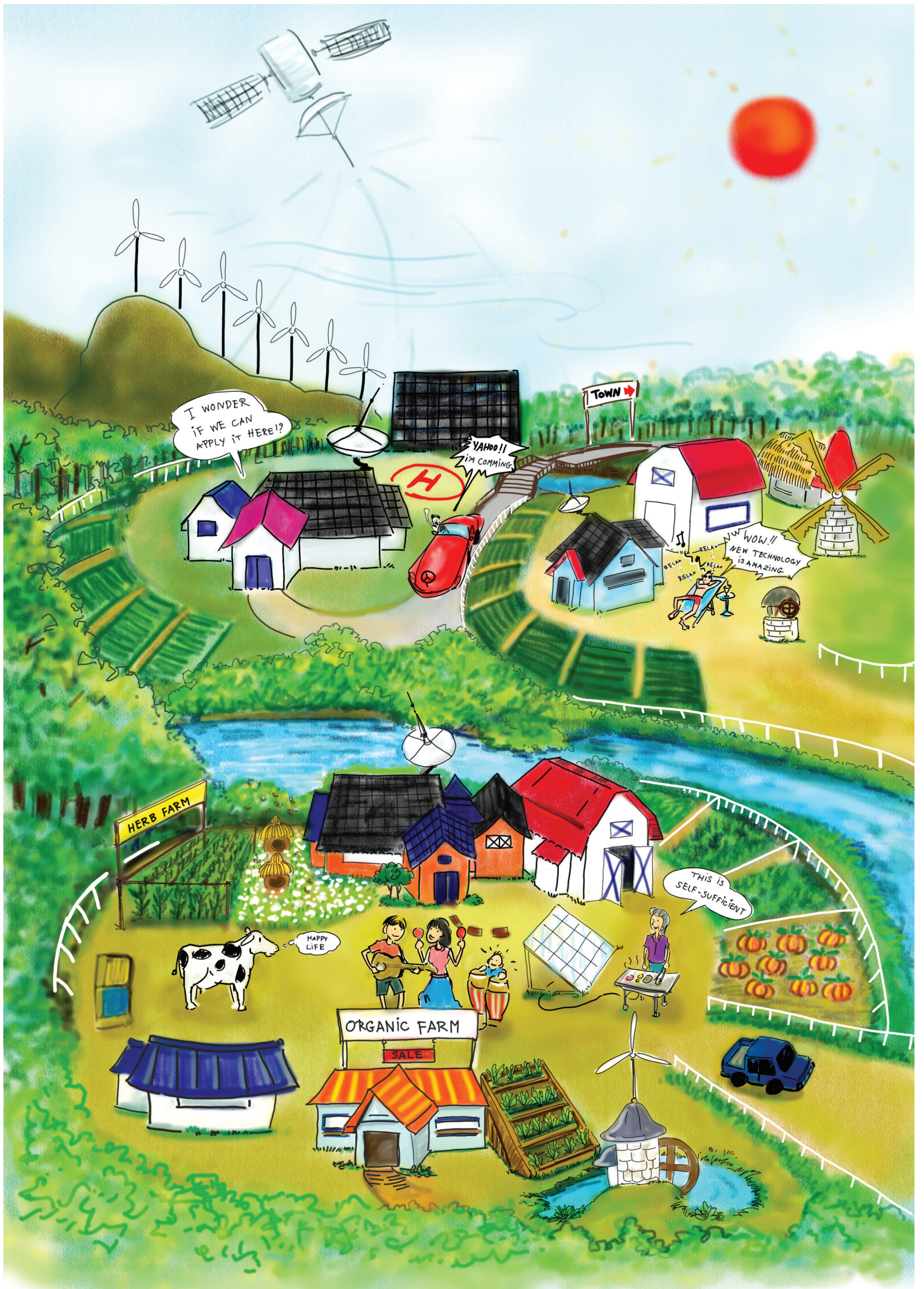
taxes manage those activities that contribute to greenhouse gas emissions. Additionally, reforestation policies help to build and manage carbon sinks as central components to an overall mitigation strategy.

Challenges to a successful transition to a low - carbon urban lifestyle include :

- Public policy to support low - carbon development and regional collaboration initiatives.
- Technology to expand alternative energy portfolios, international collaboration for technological breakthroughs, and demonstrating and sharing best low - carbon practices.
- Public awareness and commitment via: education about the multiple benefits of green practices to adults and children, communicating the problems if such changes are not embraced, and facilitating stronger interaction and feedback between the public and governments.

2050	2040
<p>Waste to energy contribute 50% of total energy</p> <p>Increase research collaboration between developed and developing countries</p> <p>Computers and human intelligence computers to manage complex tasks</p> <p>Environmental resources are precious</p> <p>80% of electricity generated by nuclear</p> <p>Space program solved lack of natural resource</p> <p>50% energy saving around the world</p> <p>Post energy after hydrogen society</p> <p>Increase the level of life standard by the co-operations of countries in APEC and around the world</p> <p>World policy is endorsed by agreement of regional and world government</p>	<p>Technology adapted to life style of rural people</p> <p>Computational intelligences rapidly advanced</p> <p>Green society both urban and rural area Demand Side Management</p> <p>Environment war on land / water/food</p> <p>Nuclear fusion prototype plant launched</p> <p>PV system or other RE system in house subsidized from government</p> <p>Storage technology & recycling system established</p> <p>Decentralized power unit becomes widespread</p> <p>LCS on rural life style : getting to 'simplicity'</p> <p>Chip implant technology is innovated for the use for both human and ecology/ environment that the technology is getting common and is affordable</p> <p>The regional government is founded</p> <p>(UN) Global common treaty 2040 bans fossil fuel emission</p>

2030	2020	2010
<p>Ubiquitous learning</p> <p>License free for technology and innovation</p> <p>Education reformation in energy and environment</p> <p>Carbon footprints becomes widespread</p> <p>Every commercial building install one of renewable energy system</p> <p>Mechanism of hydrogen in metals is fully understood</p> <p>Fuel cell is the main energy at home</p> <p>Hydrogen becomes more widespread used</p> <p>All waste generate energy</p> <p>Increase diversity of demography and cultures</p> <p>No more language barrier/ create all language translator machine</p> <p>Imagination of uncertainties or wildcard by any tools</p> <p>Sufficient economy helps in attitude changing that one should carefully consume resources to get the most benefit such as water and energy</p> <p>Innovations on economic trade and market that concern about energy and environment crisis, which leads to flexible economic systems that can form new ideas or creative thinking</p> <p>80% of participants for all process policy of community bring about best practice of community which is open and accepted by the government</p>	<p>Growth of nanotechnology and alternative technology</p> <p>Fuel cell vehicle fully produced that governments provide tax credits for purchasing and hydrogen stations are constructed</p> <p>All appliances are energy sufficiency</p> <p>Land use planning for food and energy crop</p> <p>PV with 40-50% efficiency</p> <p>The digital world is highly developed that farmers can connect directly to customers, so that the market is not needed anymore</p> <p>More LCS in Global level</p> <p>Energy and environment policies are better formulated by deploying more information on advantages and disadvantages, which lead to a good decision.</p>	<p>Save energy house</p> <p>public awareness in environment and energy</p> <p>Software is widely adopted for modeling on energy / environment impact estimation</p> <p>Waste reduction from goods processes</p> <p>Forest and mangrove area are increased</p> <p>Carbon market price is \$200/ton</p> <p>Recycle technology expanded</p> <p>Light metallic hydrogen storage materials</p> <p>Zoning of all area by city planning</p> <p>10% energy from renewable sources</p> <p>City planning for rural area</p> <p>National agenda on energy efficiency is developed</p> <p>Transparency is needed for energy and environment policies with participation of community and public hearing</p> <p>Energy and environment policies become important issues</p> <p>Domestic energy laws are launched to support energy efficient technology in buildings by means of both incentives and disincentives</p> <p>Decentralization process of energy is developed via the promote of local development plan</p>





Group 3

Migration, Rural life and Natural Resources

Rural life in 2050 grows in desirability as urban residents, especially retirees and the elderly, seek a cleaner environment and more relaxed lifestyle. Rural communities achieve greater and more egalitarian control of their natural resources, increasing opportunities for self-sufficiency relative to urban dwellers. Free education is the driving force, opening doors for rural residents to improve their livelihoods and quality of life. Rural poverty becomes a distant memory.

Land zoning plays a critical role in assuring that rural communities maintain a competitive land advantage for food production, despite significant population pressures. Sustainable agricultural productivity becomes the norm, enhanced by a high level of education among farmers, and their commitment to “computerized farming” and other technological advances. Absent a guaranteed supply of healthy food, a low - carbon future is difficult to foresee.

To protect the rural environment against the cumulative impacts of industrial pollution from both inside rural areas and migrating in from urban-based industry, strict controls are placed on the emission of carbon and other pollutants. Physical or virtual domes are placed around factories and industrial estates to ensure through structural and/or policy barriers that no unwanted emissions or effluent enters the surrounding environment. The existence of such a policy framework, and the regulatory apparatus to maintain it, also reinforces the value good governance plays in this low - carbon society.



Rural communities achieve greater and more egalitarian control of their natural resources, increasing opportunities for self-sufficiency relative to urban dwellers. In 2050s Rural poverty becomes a distant memory

The greatest threat to a more positive outlook for rural residents is migration from urban areas brought on by the potential failure of urban planners to manage their response to climate change and associated low-carbon growth opportunities. Permanent residences for urban migrants are expanding. Even well-managed urban areas, with their green buildings, clean energy and efficient transport systems, may be of such densities that residents will still seek the quality of life advantages offered by rural communities.

When this group reported their stark, 2050 urban/rural contrast to the other groups, someone posed the question, “Who would want to live in the city?” Following a brief silence, one of the younger participants responded: “I would.”

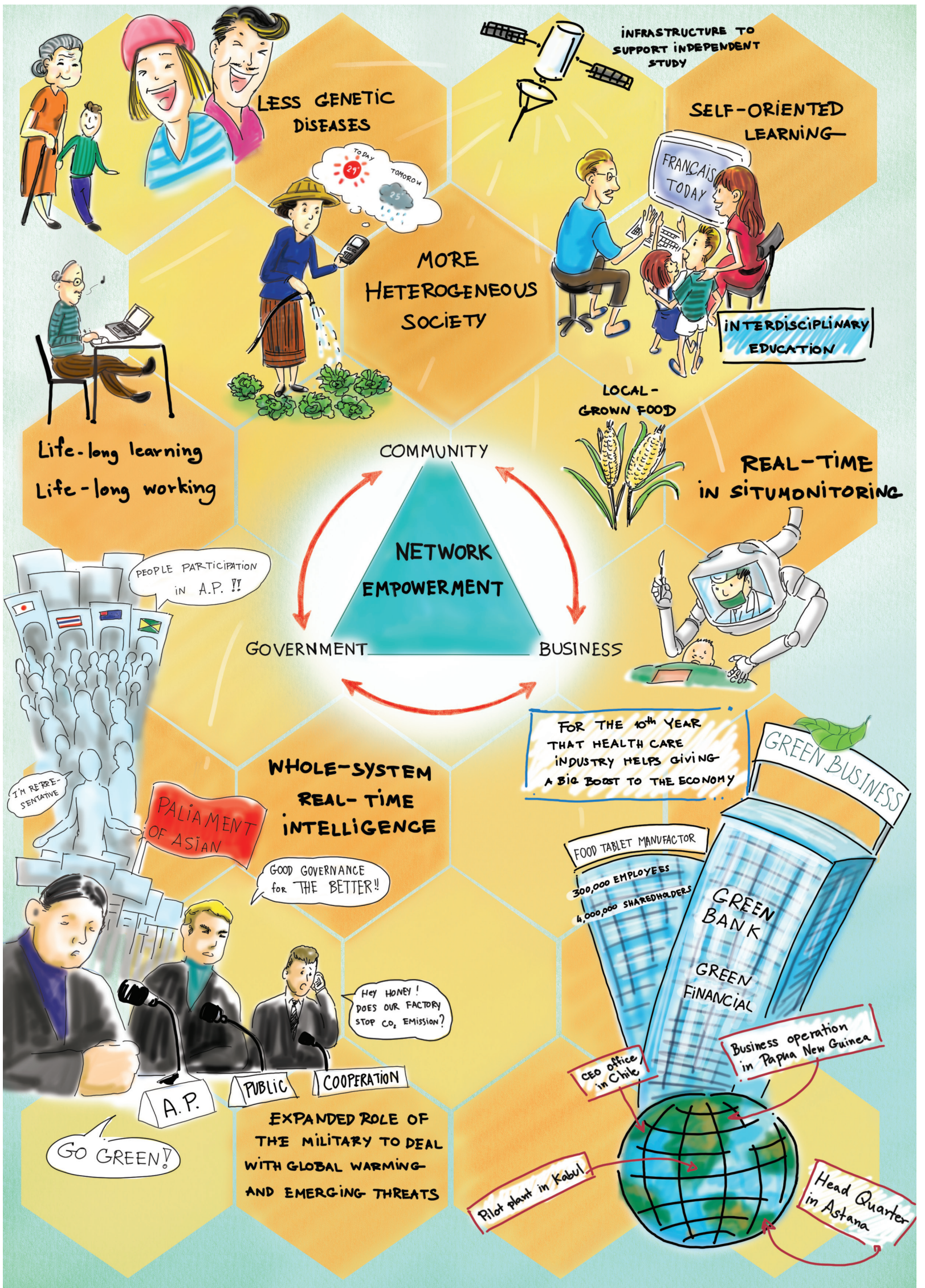
She then explained that if one is born in the city, and therefore comfortable with its urban lifestyle and social structure, there is not necessarily a huge incentive to relocate. She added that one’s decision to migrate out of the city or not is based on a much more complex set of personal circumstances, not just one’s perception of the rural quality of life.

Two key issues the groups sees affecting all aspects of the region's low - carbon society in 2050 are education reform and behavioral changes. The growth in natural disasters in the 2020s and cumulative population pressures in the 2030s represent "tipping points" that will stimulate greater incentive for behavioral changes to achieve low - carbon lifestyles. To take advantage of these stimuli low - carbon development strategies must be in place at the national level in all countries. And these plans must be accompanied by educational reforms that make learning free and accessible to all to inspire the creativity necessary to realize low - carbon lifestyles.

In summing up, this group sees three crucial challenges to its scenario: education reform, good governance and sustainable agriculture. None are insurmountable, but each must receive sufficient attention from the beginning to assure a solid foundation is set for 2050's low - carbon societies.

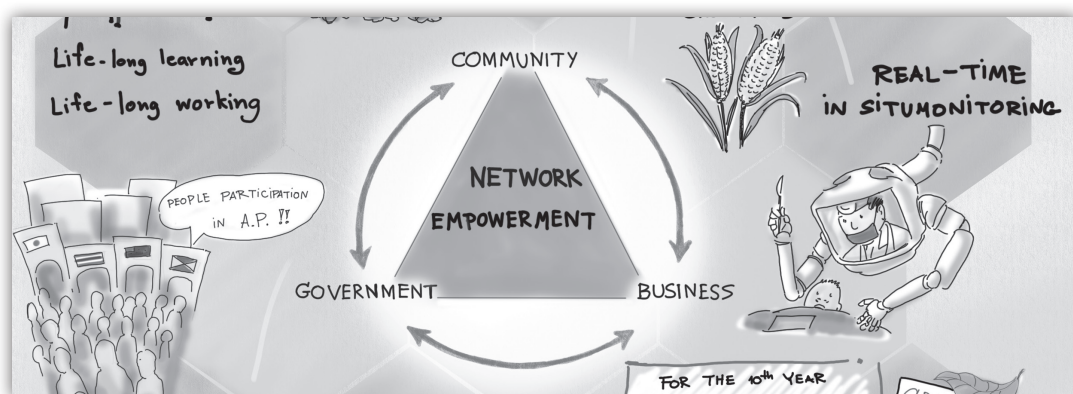
2050	2040	2030
<ul style="list-style-type: none"> - New Air-Con fully developed with zero emission - Minimal mobility lifestyle - Recycling 50 % - Renewable energy peak - Renewable energy 90% - New fuels replace fossil fuels - 9 or 1 billion people - Grey& weak / grey & healthy - Population tipping point 	<ul style="list-style-type: none"> - Energy technology - Technology availability and affordable for rich and poor - Energy generating technology - No IPR and non-profit barrier for technology - Sequestration of CO2 - Technology breakthrough and widespread (LCS) 	<ul style="list-style-type: none"> - Population reduction - Local production and consumption - Focus on local markets - Energy efficiency is the norm - Energy is seen as valuable resources - Trans-disciplinary education and university level - New agriculture methods - Cheap solar power - Technology implementation and commercial
<p>Behavioral change</p> <ul style="list-style-type: none"> - Social equity - Social justice - Rural life still supplies city but on fair basis - Educational yourself continuously <p>Educational reform</p> <ul style="list-style-type: none"> - For all ages, whole life - Free education in all level for all - Global classroom - Online global access <p>Sustainable agriculture</p> <p>Maintenance and prevention of mangrove degradation</p>	<p>Behavioral change</p> <p>Educational reform</p> <p>Sustainable agriculture</p>	<p>Behavioral change</p> <ul style="list-style-type: none"> - Campaign on birth control - Rural life has negotiating power <p>Educational reform</p> <ul style="list-style-type: none"> - Free education for fifteen year <p>Sustainable agriculture</p> <ul style="list-style-type: none"> - Water technology - new rehabilitation of degraded mangroves ecosystem

2020	2010	
<ul style="list-style-type: none"> - LCS infrastructure standard and implement - Awareness of the whole society - Holistic approach thinking - Integrated efforts - Awareness of system thinking - Behavioral change of communities - Green as a way of life - Poor people get paid to plant trees and maintenance them - Rich helps poor - Ecotourism sustainable agriculture - Centralized information system 	<ul style="list-style-type: none"> - LCS set as national development target - Set priority towards LCS - Consensus regional - Landslide, forest fires and earthquake - R&D funding institutionalization - set institutionalization and long term national development policy and also regional level - Post-Copenhagen: Every countries have quantitative abatement target base on priority of UNFCCC 	What
<p>Behavioral change</p> <ul style="list-style-type: none"> - Knowledge management-learning house - E-learning preparation <p>Educational reform</p> <ul style="list-style-type: none"> - Farmers highly educated - Good knowledge and technology - Knowledge about efficient farming method - Free education for twelve years <p>Sustainable agriculture</p> <ul style="list-style-type: none"> - Moratorium of logging on protected forest - Law on agriculture reform (for farmer benefits)Land zoning 	<p>Behavioral change</p> <ul style="list-style-type: none"> - Subsidy for fuel and renewable energy - Promotion of green business and push renewable energy <p>Educational reform</p> <ul style="list-style-type: none"> - Change educational system - Free education for nine years - Mandatory for increasing lapse of time <p>Sustainable agriculture</p> <ul style="list-style-type: none"> - R&D in increasing of productivity of agriculture incentive - Enforce existing environmental laws - Monitoring and improving protocols - Tax incentive for investment - Revised TBT under WTO - Green facts for all products 	How



Group 4

Society and health



To reduce gap such as different among groups countries, culture, belief, etc. Network is a necessary tool to make collaboration and reduce strangeness between the whole.

Community networking is the key to the 2050 society envisioned by this group. Community-driven initiatives drive the changes the world requires in pursuit of a low - carbon development path.

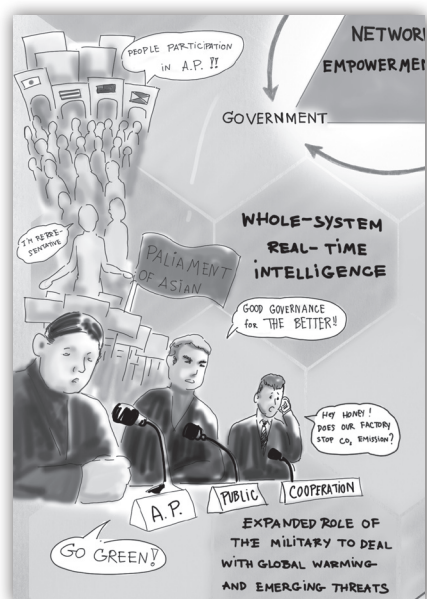
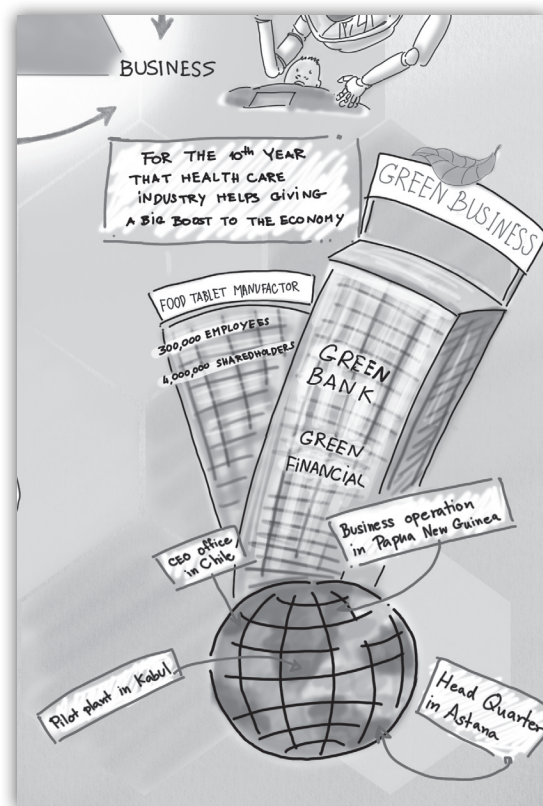
As evidenced by the challenges faced by the United Nations Framework Convention on Climate Change, national governments have limited success in demonstrating an ability to react quickly to critical issues affecting the planet. Instead, significant social and economic transformation towards a low - carbon society occurs at sub-national levels because of initiatives undertaken by individuals, communities, villages, businesses (small and medium) and even actions from the street.

Stronger political will and well-designed decentralized structures allow small communities in 2050 to be far more politically and economically liberated than their 2010 counterparts. Government assistance and market organizing are driven through community organization. Networking of communities, whether on-line or face-to-face, plays a major role in the achievement of development trajectories through cleaner energy paths, greener business and industrial practices, democratic access to technology, knowledge sharing, improved health care and education reform.

The 2010-2030 period is critical to the successful transformation to a low - carbon green growth society by 2050. A major shift in mindset is achieved early in 2020s while the major structural shifts occur a decade

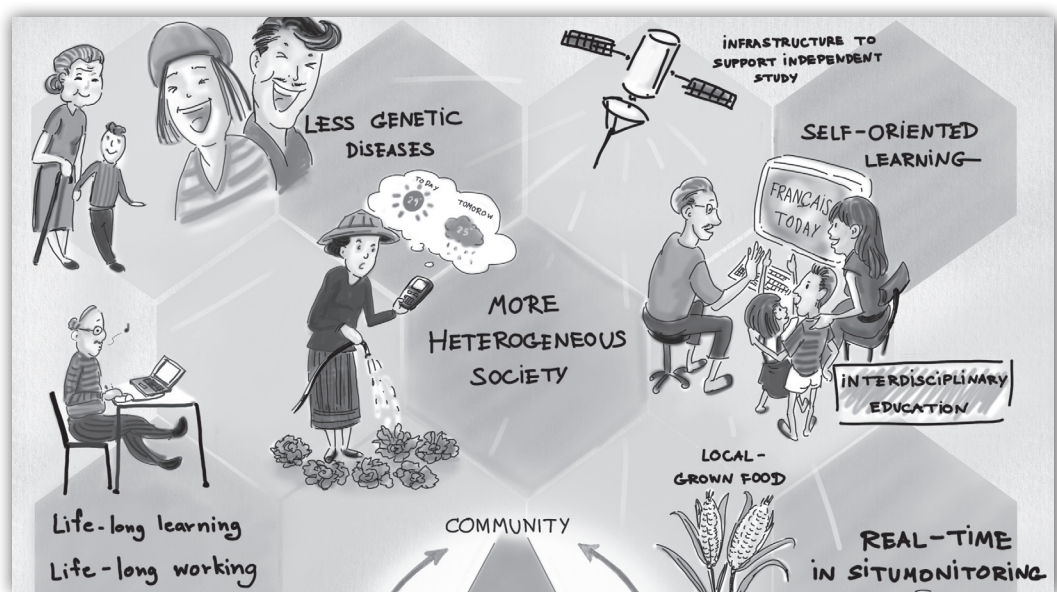
later. The transformation during these two decades leads to more subtle changes on the path to 2050 and beyond. An acupuncture analogy is offered: when a needle is inserted at the right point, a wave of new energy is released that changes the state of the entire system.

Paralleling the increased role played by communities in advancing needed societal changes is a greater level of regional collaboration within the Asia Pacific. The 20th century atmosphere of regional competition gives way to the era of regional collaboration. The ASEAN blood bank and the European solar energy



collaboration provide models for regional efforts that can quickly deliver benefits to communities. This regional teamwork is enhanced by an Asian Parliament made up of community representatives working to stimulate alliances that foster passion, creativity and innovation for low - carbon development paths. Key areas of collaboration that emerge across the Asia Pacific include epidemic control policies and targeted R&D investments for common societal needs such as green energy and food production.

The greatest challenge to realizing these changes is the quantity and quality of information for political leaders and the public to make sensible choices. Another crucial issue is the timeliness and accessibility of technological R&D for low - carbon development. The shift to greater regional collaboration represents another hurdle that must be overcome to achieve the necessary low-carbon innovation across all sectors.



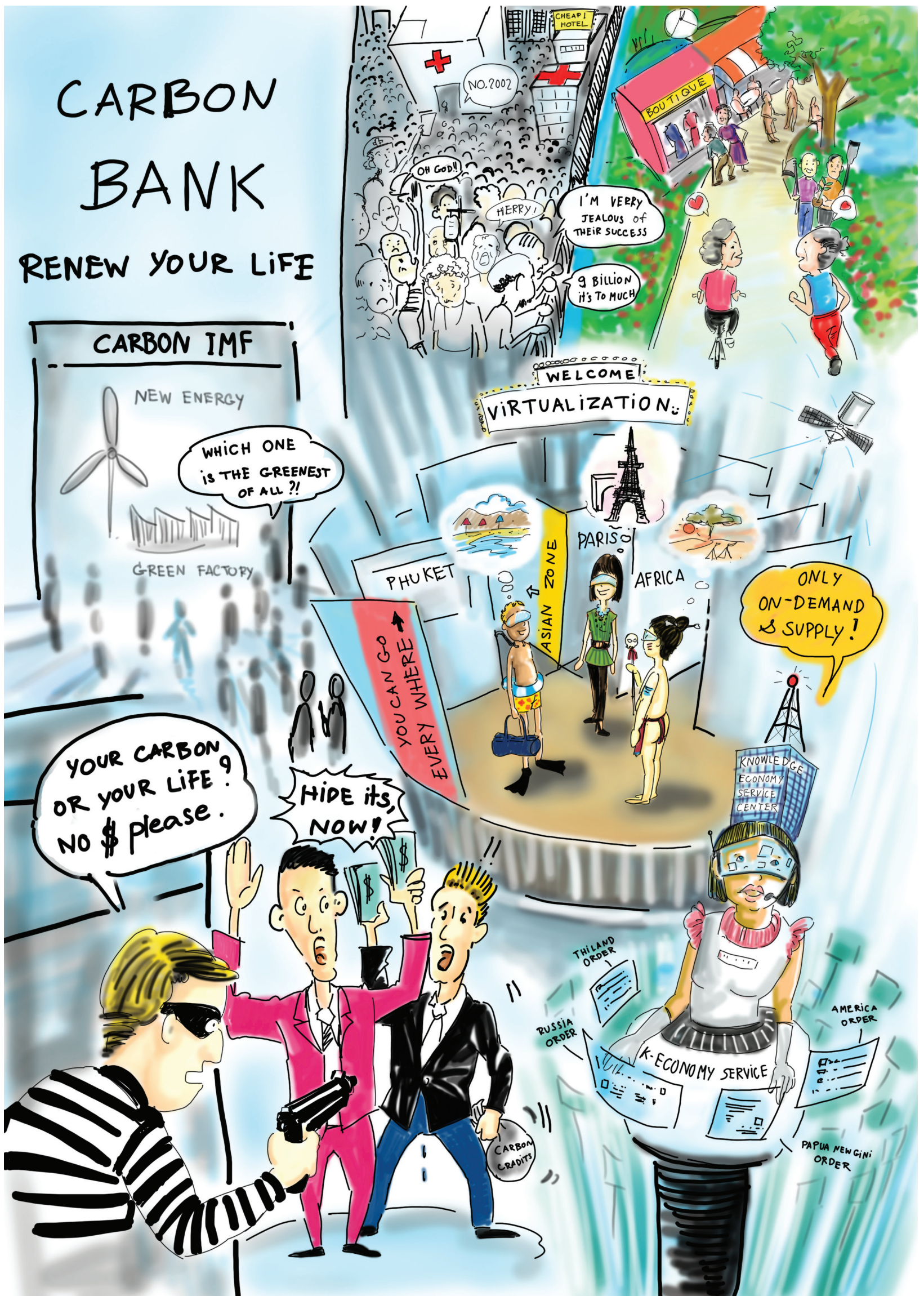
Community networking is the key to the 2050 society.
Community-driven initiatives drive the changes the world
requires in pursuit of a low-carbon development path.

	2050		2040	
What - Community	<ul style="list-style-type: none"> • (2050) Global population decreased to 3 billion • (2050) or we are all dead! 	<ul style="list-style-type: none"> • (2045) Personal DNA medical profile is a part of national I.D. scheme 	<ul style="list-style-type: none"> • (2040) Sustainable agriculture community 	
What - Governance			<ul style="list-style-type: none"> • (2040) Collapse of OPEC and OECD 	
What - Business		<ul style="list-style-type: none"> • (2045) Real-time in situ health monitoring and treatment for 90% of diseases • (2045) Coal-based energy enterprise control the economic policy 	<ul style="list-style-type: none"> • (2040) 60% of multi-national SMEs comprise enterprise in the world. • Sustainable agriculture 	
How			<ul style="list-style-type: none"> • Utilization of GAP, technology and local wisdom for higher yield crop production, adaptation, environmental and economical benefit 	<ul style="list-style-type: none"> • Real-time in situ health monitoring

2030		2020		2010
<ul style="list-style-type: none"> • (2030) Grid computing revolutionizes learning – individual schools become community learning centers. 	<ul style="list-style-type: none"> • (2025) Experimental learning defines individual knowledge 	<ul style="list-style-type: none"> • (2020) Integrated health profile database • (2020) Knowledge-based community for better informed decision • (2015) Social partnership is a mean of alternate family rights. 	<ul style="list-style-type: none"> • (2015) ASEAN food/ water protection authority established • (2015) Transportation for disable and elderly • Knowledge design & integration (connected sharing) 	<ul style="list-style-type: none"> • (2010) Expand opportunity for elderly to work longer • (2010) ASEAN re... blood bank established
<ul style="list-style-type: none"> • (2030) Taiwan-China unification • (2030) ... • (2030) Community Gene... solar (CSP) becomes available at scale 	<ul style="list-style-type: none"> • (2025) Asian Parliament 	<ul style="list-style-type: none"> • (2020) Prevalence of interdisciplinary education • (2020) Yuan becomes reserve currency of ASEAN region. • (2020) Center of International Emerging Infectious Disease • (2020) Free health care for all 	<ul style="list-style-type: none"> • (2015) ASEAN Economic Community (AEC) starts • (2015) Delegation of authority for local governance to communities • (2015) Increased social welfare for elderly 	<ul style="list-style-type: none"> • (2010) S&T focuses more on disease prevention
<ul style="list-style-type: none"> • (2030) Expand locally grown crops 	<ul style="list-style-type: none"> • (2025) Zero-pollution transportation mode 	<ul style="list-style-type: none"> • (2020) Network of enterprises • (2020) Agricultural business cooperatives grow and sell their products only for their local communities. • Increased in accessibility of new drugs • Conscious capitalism becomes law! 	<ul style="list-style-type: none"> • (2015) ASEAN mandate revolutionary cap-and-dividend law of carbon • (2015) Green bank for technology investment • (2015) Local grown food • (2015) New regional bank linking capital with green technology entrepreneurs • (2015) Interdisciplinary low - carbon models 	<ul style="list-style-type: none"> • (2010) Public database of democratic green technologies become available
<ul style="list-style-type: none"> • Negative global population growth (2 decades) • Variety of High-yield and high quality crops with adaptation 	<ul style="list-style-type: none"> • Inform 'quality' information to Asian president 	<ul style="list-style-type: none"> • (2020) Joint-initiatives of public/ industry/community • (2020) Knowledge design and integration of new technology with local wisdom towards environmental/ economical benefit • Realistic assessment of progress 	<ul style="list-style-type: none"> • (2015) Only inter-disciplinary university programs • Scientific development to ensure ecosystem-based approach • Variety of drought-tolerant crops • Crops with better natural utilization • Tax incentives to promote green lifestyles • More investment in low - carbon technologies • ASEAN innovation commons 	<ul style="list-style-type: none"> • (2010) PC in every home for access to information • Do not only focus on technological solutions • Provide correct knowledge on (climate change impacts to how to adopt) to the community/people

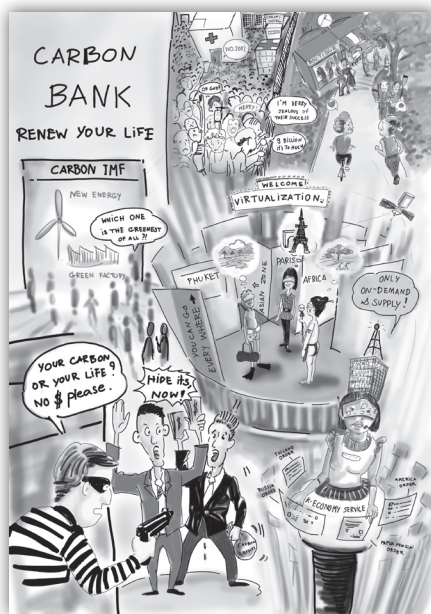
CARBON BANK

RENEW YOUR LIFE



Group 5

Trade of goods and services



Global trade in 2050 is driven by four factors: energy supplies, demography, carbon accounting and services. The world is well into the post-fossil era.

Ninety percent of Asia Pacific's energy needs are fed by renewable sources such as solar, algae and geothermal. Nuclear fusion has become a realistic energy source. Providers of goods and services stress their commitment to green production techniques, energy efficiency and clean transportation. For example, the air conditioning industry has moved into zero-emission production. There is a decoupling of economic growth from environmental impacts. APEC citizens now require the environment to become a beneficiary, not a casualty, of economic growth.

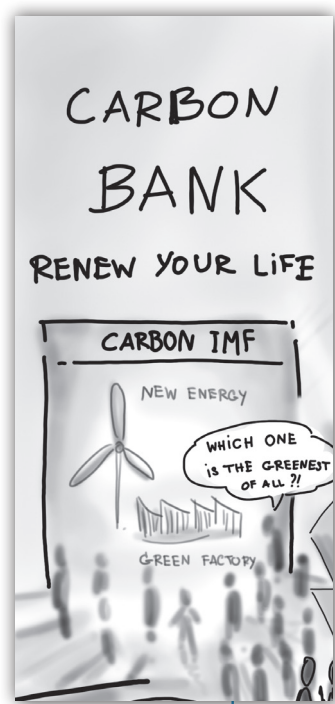
There are nine billion people sharing this planet in 2050, with a tripling of the 65 and older population from 2010. But it is great to be a senior citizen as they are no longer a marginalized segment of society. Consumer goods, fashion, politics and services have evolved to better meet the needs of older consumers and constituencies.

Not only must people exhale carbon, but we now must also “inhale” it, constituting a key element of the 2050 way of life.

Carbon accounting has become commonplace, to the point where carbon replaces the US dollar as the dominant global currency.

Carbon rights can be used as collateral for loans, and given as loans themselves through the International Monetary Fund. Global carbon trading is governed by an entity modeled after the World Trade Organization. Carbon clearing houses allow almost everything to be accounted for in terms of carbon emissions.

Services become far more information-technology and knowledge driven than in 2010. Computers are now intuitive, providing a good technological framework for virtual tourism among other things. Interest in virtual tourism grows causing world-class tourist destinations such as Phuket to become a virtual theme park accessible to anyone without the need to leave their homes. But for those who have the urge to be



Carbon accounting has become commonplace, to the point where carbon replaces the US dollar as the dominant global currency.

Challenges to a successful transition to a low-carbon market include:

- Shifting to green production will not happen without regulation.
- Achieving mandatory, global carbon accounting in 2020.
- Transforming economic development to become sustainable, green and low-carbon, may not be possible in some countries without financial assistance from wealthier nations.

in real places, they can choose in situ eco-tourism as an extension to virtual tourism.

Between 2010-2040 the world experiences a gradual transition in key technologies. Renewable energy sees its stake in global energy supplies grow from 10 percent in 2010 to 70 percent in 2040, and ultimately reaches 90 percent in 2050. Geothermal technology becomes economically feasible in 2020, with a corresponding growth in algae technologies in the 2030s. The common theme is the bridging of today's best technologies with something more efficient and less costly (economically, socially and environmentally) to come. By 2040, energy services become fully liberalized globally. The "green

industrial revolution" that got underway at the turn of the century, is fully integrated in 2050 aided by financial instruments such as shifting taxes from production to pollution. Other regulations, incentives, institutions and production standards also come into play. In 2030 the Asia Pacific begins to see the emergence of zero-emission industries and the large-scale use of solar power. The private sector is instrumental in driving these positive changes, but the most fundamental change that occurs is society's change in thinking.

	2050	2040
What	<ul style="list-style-type: none"> - Relocation of local production - Online shopping - Recycle 10% - Green factory & building - Renewable energy 10% 	<ul style="list-style-type: none"> - Pollution tax - Shift tax base from product to pollution tax - Telecommunication infrastructure for service - Service on platform - Recycling initiatives (3Rs) - Eco-service industry - DOHA ROUND concluded (trade negotiation) - Renewable energy 30% - Refrigeration technologies - phasing out GHG - Increased energy efficiency for cooling
How	<p>Carbon Accounting:</p> <ul style="list-style-type: none"> - Certificate of local production – GR.4 - Carbonaccounting policy enforcement <p>R&D:</p> <ul style="list-style-type: none"> - Data center established by high-stage server hardware <p>Incentive & Regulations:</p> <ul style="list-style-type: none"> - Kick start green market through regulation and incentive - Enforce existing environmental laws - Monitoring and improving protocols - Tax incentive for investment - Revised TBT under WTO - Green facts for all products <p>Public Acceptance:</p> <ul style="list-style-type: none"> - Green campaigns - Awareness building on 3Rs - Education on green industry - Awareness on green industry <p>Standard:</p> <ul style="list-style-type: none"> - LEED certificate on green building - Green labeling - Sustainability standards - Industrial association creates the common standard - Green certification - Expanding ISO 14000 <p>Institution:</p> <ul style="list-style-type: none"> - Set target and process phrase - Cooperate with Microsoft 	<p>Energy sources:</p> <ul style="list-style-type: none"> - Geothermal becomes feasible - Biomass fuel: cellulosic technology - New Nuclear plant (high efficiency) <p>Carbon Accounting:</p> <ul style="list-style-type: none"> - Certificate for green factory (process) - Emission trade (ET) expanded - Massive technology transfer taking place - International agreement on carbon trading - Clean house establishment - Manual on carbon accounting - Mandatory green procurement <p>R&D:</p> <ul style="list-style-type: none"> - Embedded software development - New advanced materials for less consumption - Synthesized waste materials <p>Incentive & Regulations:</p> <ul style="list-style-type: none"> - Soft loan for investment - Moving towards eco-tax for non-green technology - Environmental laws by the parliament - Reduce import duties on green technologies - New business models: green services <p>International Cooperation:</p> <ul style="list-style-type: none"> - National/regional/global laws must be widely established and practiced <p>Standard:</p> <ul style="list-style-type: none"> - Promoting green-standard in goods and services

2030	2020	2010
<ul style="list-style-type: none"> - Fully digitized living - Private (living) energy efficiency enhanced - Service on application - Recycle 30% - Carbon becomes collateral - Emergence of zero-emission industry - Waste to energy share 50% - Viable of large -scale solar power in wide use - Renewable energy 50% 	<ul style="list-style-type: none"> - Green process: Bio process in chemistry - All cars become Eco-cars - Electricity mobility: new fuel mobility - Urban planning to minimize need for cars - Global Energy Authority (GEA) conceived - Renewable energy 70% - Aging population 	<ul style="list-style-type: none"> - New Air-Con fully developed with zero emission - Minimal mobility lifestyle - Recycling 50 % - Renewable energy peak - Renewable energy 90% - New fuels replace fossil fuels- 9 or 1 billion people - Grey& weak / grey & healthy - Population tipping point
<p>R&D:</p> <ul style="list-style-type: none"> - Intensified investment in Algae technology <p>Incentive & Regulations:</p> <ul style="list-style-type: none"> - Common pool of green technology (locally and globally) 	<p>Energy sources:</p> <ul style="list-style-type: none"> - Energy services fully liberalized globally 	<p>Carbon Accounting:</p> <ul style="list-style-type: none"> - GMO products: new product innovation - Carbon-account banking system - “C” as new currency <p>R&D:</p> <ul style="list-style-type: none"> - Breakthrough in Nuclear fusion technology

Towards APEC's Low - Carbon Collaboration

As if a transformation into low - carbon society at the country level is not enough of a challenge, workshop participants go further and design an immediate plan for regional collaboration for the Asia Pacific. Media and communications are seen as the key strategies to generate regional consensus for a climate-aware lifestyle and complementary economic development strategy. Young people are the primary targets.

Most urgent is the need to spread news about best practices and positive developments in the shift toward low - carbon initiatives within the region. "Success stories inspire people", say Phuket workshops participants.

(aged 15-25). Arrange a wide range of publicity for the winners.

- Create an APEC Youth Forum on sustainable futures with a regional summit and media events.

The participants also recommend several other possible mechanisms for regional linkages including :

The media plan should include :

- Coordinate with leading editors, journalists, in traditional print and broadcast sectors along with those in new media, to enact a plan for a regional media network to promote best practices to achieve a low - carbon society.
- Develop press kits with articles, features, and documentaries about low - carbon society for distribution by APEC CTF.
- Prepare low - carbon society scenario packages for local and regional opinion leaders and policy makers.
- Create regional art and multimedia production competitions to illustrate or reflect the scenarios by young artists

- A trans-Indochina rail or marine low - carbon transport systems.
- A regional network of "Centers of R&D Excellence" for innovations such as efficient batteries.
- Climate modeling data sharing and transferring.
- International agencies to improve access and management of climate finance.

The most crucial regional issue cited by the Phuket workshop participants is the need for a greater shift within APEC from its current competitive mindset toward a collaborative philosophy that fosters meaningful involvement of APEC citizens to achieve low - carbon development.

The Technical Tour “Low - Carbon Community”

After spending the morning of Day 2 imaging and planning for 2050, the workshop participants boarded a time capsule – a double-decker bus – to bring them back to the present and deliver them to a local Phuket community to spend the afternoon observing a low - carbon lifestyle in practice today.

The village of Ban Bang Rong shelters some 1,000 members whose livelihood is still supported by their surrounding natural environment. Most of the families derive their protein and a portion of their incomes from small-scale fisheries that thrive amidst the healthy mangrove forest. Appreciation of the mangrove was enhanced after the 2004 tsunami. The residents say the mangroves here helped to protect them by reducing the intensity of the giant waves.

What will Ban Bang Rong be like in 2050?

Community leader Seb Kerdsap, 49, begins his analysis by describing the village in the 1970s when he was nine years old. “Of course there were fewer people and more fish, and larger areas were covered by mangrove,” he recalls. “But in terms of the way we live, things haven’t changed that much. My grandfather put food on the table by taking his boat out to sea, as did my father and now me. I’m doing what I can to preserve the sea’s abundance so that my children and grandchildren can continue to live here over the next 40 years and beyond.”

Workshop participants are learning from Ban Bang Rong

But some things have changed over the last four decades. In the early 1990s, the village lost a large tract of mangrove to shrimp farms. Mangrove encroachment continues today from land speculation, as some try to cash in on Phuket's expanding tourism industry. The community is fighting back by replanting mangrove with support from environmental organizations. Seb says the community gains some additional land through the process as coastal erosion declines and the tide brings in new soil.

Ban Bang Rong is also riding the growing movement of community-based eco tourism by developing its own small-scale programs. Colorful canoes have been introduced to the web of channels that crisscross the lush mangrove and bring additional revenue from tourists who enjoy the trips. Workshop participants experienced this service first hand by taking a guided boat tour along the serene bay and through mangroves learning about the vitality of the area's aquatic diversity.

While appreciating the opportunities it brings, some participants observed that an economy increasingly dependent on the volatile tourism sector may put their self-sufficiency at risk. But villager Pramote Krajangros, 33, says the community is

crafting its "Plan B" by working out a long-term sustainability plan to balance its internal support with income from outside. Key to this is the launch of a community investment fund so the needy have access to capital in accordance with their Islamic faith.

"We're committed to the teaching of Islam that reinforces a humble way of life and natural resource protection," Seb adds. "We stress that the mangrove, the sea and our food are given to us by God. Taking it away selfishly would be a sin. This is more effective than public laws. People are more afraid of being seen as sinners than law breakers."

In 2050, Pramote will be 73, and hopes he will be a happy old man continuing to live a simple life amidst the natural abundance offered by Ban Bang Rong. Seb is not certain he will live to see 2050, as he would be 89, but says he would be content to know that he's done his part to allow his grandson, who will be 43, to have the same opportunities for a healthy and prosperous life.

Workshop participants experienced this boat tour along the serene bay and through mangroves learning about the vitality of the area's aquatic diversity.

Refection on the process

Future networking with people outside their own circles is another element most participants say they appreciate.

For most of the participants, the scenario workshop is a novel exercise, illustrating in many respects that the process undertaken in Phuket was equally as important as the product.

“This workshop is nothing like what I’m used to. We work hard but have fun at the same time,” says participant Goay Peck Sim, General Manager of Techno-Economy and Commercialisation Centre, SIRIM Berhad, Malaysia.

Goay Peck Sim is no stranger to foresight gatherings, but most of the workshops she’s attended have participants, mostly experts in the same fields, sitting stiffly in sterile meeting rooms awaiting a pre-appointed opportunity to offer their remarks.

Other participants join Goay Peck Sim in commending the workshop process as “exciting”, “fresh”, “fun” and “not-so-traditional”, adding that they are looking forward to applying the techniques employed in Phuket to their work at home.

“I’m familiar with foresight and scenario-based planning, but we usually hire consultants to do it,” says Dana Kartakusuma from Indonesia’s Ministry of Environment. “This is the first time I’ve taken part in a real process and it’s been a very thought-provoking exercise. I certainly want to introduce it to my colleagues at home.”

One element, participants note, that makes the workshop different from others is that the organizers have invited a diversity of participants: climate change scientists, modelers, educators, meteorologists, epidemiologists, engineers, economists, industrialists, environmentalists, agriculturalists, technologists, government planners and foresight specialists.

The goal of “ice breaking” exercises is to get participants to feel more comfortable with one another and the need to think differently receive high marks.

They are asked to introduce themselves to other fellow participants by drawing their faces below their names on a large chart spread across a wall. They are also requested to offer their expectations and expected contributions to the workshop, and a short forecast of what they think they will be doing in 2050.

“Low - carbon society is not just an issue for some specialized scientists; everybody needs to get involved,” says workshop architect and builder Nares Damrongchai. “That’s why our participants represent a wide range of groups in society.”

Climate scientist Anond Sanidvongs from Thailand couldn't agree more. He points out that a diverse field of social scientists has a much bigger role to play than a scientist like himself when it comes to dealing with the complexity of climate change impacts and adaptation problems facing our society.

While recognizing the challenges in putting people with such diverse backgrounds and interests at the same tables, foresight strategist Richard Hames, admits: "the most enjoyable part is meeting everybody". Future networking with people outside their own circles is another element most participants say they appreciate.

The "ice breaking" exercises to get participants to feel more comfortable with one another and the need to think differently receive high marks. Before sitting down at their assigned tables, for example, participants are asked to form a circle in front of the room to play a five minute game where they have to make strange sounds like "zouf", "boing" and "peeuw". Such activities precede each new discussion session throughout the three-day workshop. One morning begins with shoulder massage on the beach from fellow participants, generating relaxing smiles from everyone as they enter the meeting room.

"We get participants to do funny things not just to make people feel comfortable, but even more to reinforce it's acceptable for them to generate ideas that are strange, wild, far-fetched and creative," explains Ruben van der Laan, creativity trainer and facilitator from the organizing team. "Forty years is a long time; these activities will help them imagine a far off future."

Another technique to stimulate creativity is to remove participants from today's reality as much as possible, suggests Jack Smith, Chief of Staff (Science and Technology) Defence R&D Canada. "For example, get them to think of future fuel efficient cars with 100 miles to a gallon."

Such diversion strategies are especially important when it comes to working with a normative scenario. "You have a very special activity. This is exclusively a normative scenario; it's not usual that a group creates a world that it wants and prefers and hopes will happen. That gives a special power to the community here to create a future that can be persuasive for people to see it will be reachable within our lifetime."

Participants are also encouraged to draw and cut pictures from magazines to aid them in expressing their ideas as pictures expand imagination. On Day 2, the five working groups illustrated their 2050 low - carbon society with diagrams consisting of intriguing images: the world's tallest tree, a shiny solar panel, high-tech buildings, futurist looking sport cars, a smiling elderly man wrapping his arm around a fashion model, and a muscular man looking proud of his health drink.

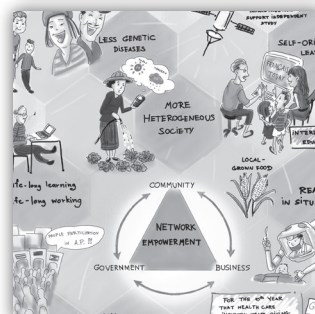
Such a process is also new for APEC CTF. Although the center has organized many foresight workshops, the approach this time is by far the most creative to date. Participant feedback seemed to reinforce the likelihood that the center might pursue similar methods in the future.

Future workshops might also make use of multimedia presentation devices for both audio and video and real time data and maps, adds Richard Hames, who's also an expert in cutting edge learning techniques. Complex systems like a 2050 low - carbon society are difficult to grasp and can therefore benefit from sophisticated techniques to help synthesize the information and ideas.

To Hames, building idea walls with post-it notes, a simple technique used in this workshop is a bit old school in today's foresight world. Workshop architect Nares welcomes his suggestions: "We hope our process provides learning opportunities for other people who wish to embark on similar

workshops in the future. They can certainly consider techno-aids to create a different kind of dynamism for the discussion.”

But eventually it is connecting the dots that matters, Nares states. “The year 2050 is so far away, we have no evidence nor accurate information to guide our decision making,” he explains. “This scenario approach, designed for a group with disparate expertise, tried to extract maximum creativity from every participant in imagining living and flourishing under climate change, and the role science and technology will play in adapting our future lifestyles to a new climate regime. I think this workshop provides us the context and relevancy to embrace a low - carbon future, and complements well the results from the more systemic Delphi process.”



Appendix:

List of Participants

Group 1 : CLIMATE CHANGE AND ITS IMPACT

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Group 2 : HOUSING AND CONSTRUCTION/URBAN LIFE/TRANSPORTATION

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Japan

Toshihiko Katagiri
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Japan

John Edward Smith
Defence Research and Development Canada
Canada

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Chulalongkorn University
Thailand

Noppan Piboonvong
Thailand Environment Institute
Thailand

Group 3 : MIGRATION, RURAL LIFE AND NATURAL RESOURCES

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Thanh Binh LE

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Japan

Boonya Sirisakdi

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Goay Peck Peksim

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Facilitator and Co- facilitator

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Group 2:

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Ms. Sopida Tongsopt

Group 3:

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Ms. Wanida
Wanichpongpan

Group 4:

Dr. Suchat Udomsopagit

Group 5:

Dr. Nares Damrongchai
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