MIZUHO

Channel to Discovery

Development of “A Dozen of Actions”

Oct 2008

Mizuho Information and Research Institute

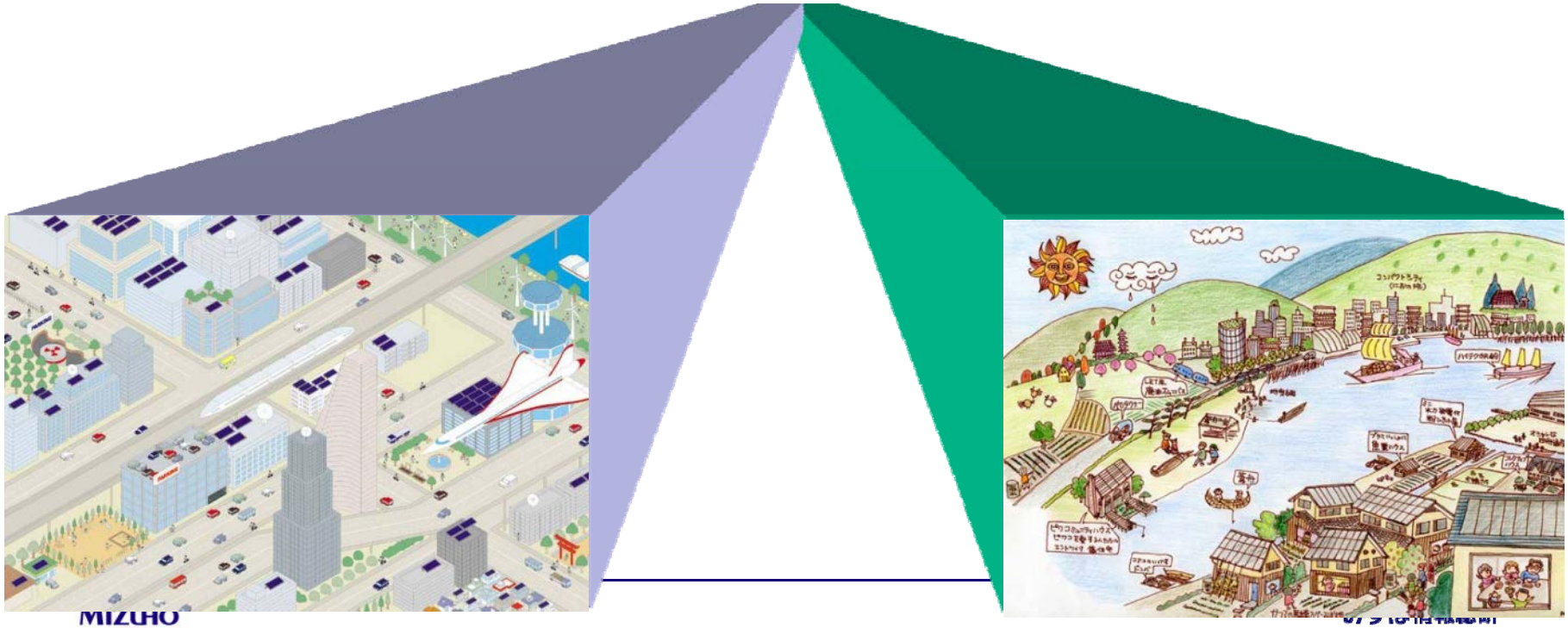
みずほ情報総研

1. Background and Objective

Background

- Two “70% reduction scenarios” were developed
- Both are confirmed to be “technically possible”
- Then the question would be “how to get there ?”

Low carbon society is possible, but how?



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Objective

1. In order to achieve the goals of “Low Carbon Society”, **drastic changes (Innovations)** in social systems, technologies, and lifestyle are needed.
2. Sharing the low carbon strategies among the stakeholders is essential to realize this innovation within a limited period.
3. The objective of the development of “Action” is to **propose practical low carbon strategies** as an example in order to enhance discussion among stakeholders, and to formulate robust low carbon strategies.
4. Therefore, “Action” development should be based on various processes such as expert interview and survey of literature.

Definition of terms

Terms	Definition
Innovation	Drastic changes in social factors in order to achieve the LCS. Any changes in factors such as social systems, technological development, and lifestyles are included if it is not an extension of current trends and needs drastic trend-breaks.
Policy	General terms for actions aiming to overcome specific political issues.
Action	Actions are defined as packages of options. The actions should be designed to be triggers and engines for innovations towards LCS, while keeping certain degrees of independency with other actions. Information of actions as an overall package such as specific target, features, time schedules, management framework, and feasibilities, should be assessed and identified.
Option	Individual activities that can contribute to achieving LCS. Can be divided into direct options and indirect options. Direct options are options that can directly change the driving forces of CO2 emissions. Indirect options, on the other hand, are options that can influence the effects of direct options and can contribute to LCS development indirectly.

FAQ

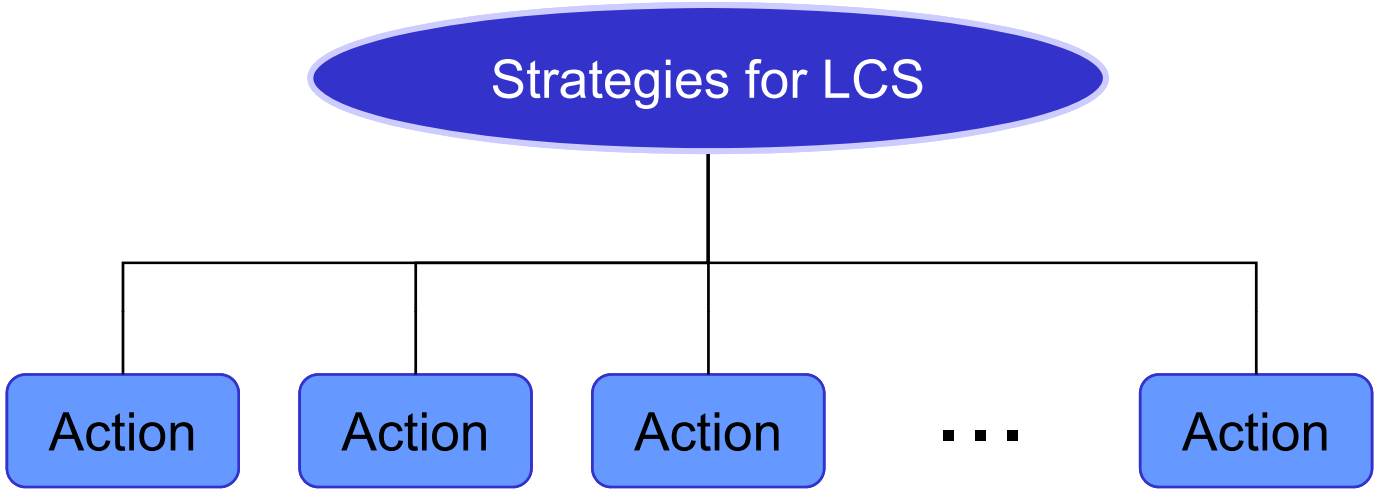
- **Who's Action is described in Dozen of Actions?** : *Government*
- **Actions of private companies or individuals are not important?** : *Clearly these are very important. However, we cannot rely only on private companies or individuals, and government should take leadership role to pursue robust low carbon strategies. Efforts of private companies or individuals are expected to accelerate governments' Actions.*
- **Why the options need to be integrated into actions?:** *The effects of the options can be substantially enhanced or weakened when they are combined with other options. In order to take into account those factors, the effects of integrated options, "Actions" would be evaluated.*
- **To what extent, should the options be integrated? :** *This is heavily dependent on the objectives of the research. In the case of "Dozen of Actions", the objective was sharing the strategies among the stakeholders. Therefore, the number of the Actions were restricted to twelve.*

2. Development of “Actions”

General Flow of the Action development

Developing Preliminary Framework of Actions

- Low carbon strategies should be broken down into certain levels of “Actions”
- The favorable framework of “Actions” is as follows:
  - ✓Whole innovations identified in ESS and Storyline development are covered
  - ✓A set of options in the Actions are highly compatible
  - ✓Actions should be independent of each other as much as possible, although no single actions can be perfectly independent.
- Actions can be formed by stakeholders as well as by sectors



Framework setting of Actions

脱温暖化2050 ポリシーパッケージ

2007.10.4

Actions by stakeholders

Actions by sectors

Examples of option

排出部門	活動主体	生活				企業					インフラ				
	（〇〇を普及さえるための）ポリシーパッケージ	a. 低炭素型「買物」	b. 低炭素型「食」	c. 低炭素型「住」	d. 低炭素型「余暇」	e. 低炭素型「移動」	f. 低炭素型「働き方」	低炭素型マニュファクチャリング（⑦の再掲）	g. 低炭素型オフィス環境	h. 低炭素型ビジネススタイル(企業の姿勢)	i. 低炭素型情報通信システム	低炭素型交通システム（再掲）	j. 低炭素型教育システム	k. エネルギーの面的利用	l. 脱炭素系統電力
家庭	①低炭素型居住空間	グリーン購入（省エネ家電）	高効率調理機器 高効率冷蔵庫	省エネ・創エネ機器，高断熱，見える化，省エネ行動	高効率映像機器，エコツアー		SOHO，在宅勤務	省エネ家電の供給		省エネ家電の供給，社員教育	高効率IT機器，HEMS			創エネ機器，エネ融通，分散電力制御技術	
業務	②低炭素型オフィス・商業施設						クールビズ・ウォームビズ，	省エネ業務機器の供給	高効率機器，高断熱，見える化，省エネ行動	省エネ業務機器の供給，環境情報公開，社員教育	高効率IT機器，BEMS			創エネ機器，エネ融通，分散電力制御技術	
運輸旅客	③低炭素型自動車交通					軽量車体，エコドライブ，モータ駆動，パーソナル輸送		良燃費自動車の供給		良燃費自動車の供給	ITS，交通代替通信機器			地域バイオ燃料利用，ソーラーパネル自動車	
	④低炭素型短距離交通	買い物／配達		職住近接		公共・徒歩・自転車，エコドライブ，モータ駆動	SOHO，在宅勤務	高効率輸送機器の供給	職住近接	高効率輸送機器の供給	ITS，交通代替通信機器	公共交通機関，LRT，自転車道，シームレス輸送，ITS	見える化，環境教育（自動車教習所，企業，政府公報）		
	⑤低炭素型長距離交通	グリーン購入（低炭素貨物輸送の選択）			脱長距離ドライブ，レンタカー		テレビ会議			グリーン購入（低炭素貨物輸送の選択）	ITS，交通代替通信機器	公共交通機関，LRT，シームレス輸送，ITS			
運輸貨物	⑥低炭素型物流		地産地消，見える化，フードマイレージ					インバースマニュファクチャリング（Inv. Mnf.）			ITS，輸送効率改善	貨物鉄道・ターミナル，貨物港湾，ITS		地域バイオ燃料利用	
製造業	⑦低炭素型マニュファクチャリング	グリーン購入（低炭素製造品の選択）		木造住宅				高効率製造機器，LC商品購入の率先行動，見える化，Inv, Mnf.	木造建築物	グリーン調達，環境情報公開，高効率製造機器	高効率制御機器，SCM			エネルギー融通	
農林水産	⑧低炭素型アグリ	グリーン購入（低炭素生産の農林水産物の選択）	旬の食材，高効率農耕器具，高効率漁船	高効率伐採法							見える化技術			エネルギー融通，バイオマス農業	
エネ転換	低炭素エネルギーシステム（k, lの再掲）	グリーン電力購入	部門間エネルギー融通	エネルギー融通，太陽光発電，燃料電池		バイオ燃料，水素燃料インフラ			太陽光発電，燃料電池	グリーン電力購入	見える化技術，分散エネルギー制御技術	バイオ燃料，水素燃料インフラ		地域熱供給	CCS，原子力，バイオマス，風力発電
部門横断							炭素税，カーボンオフセット，環境金融商品								

見える化システム

Ref:

Narrative description of visions by Actions

- Based on Narrative storyline and parameters of ESS, summarize future objectives of each Action
- The future objective is to explain the goals of actions to the stakeholders
- The following four factors should be clarified in the future objectives:

Factors	Contents
Technologies	What technologies will be mainstream in 2050? Where and how will those technologies be applied?
Infrastructure	What kind of infrastructure should be developed in order to realize low carbon society ?
Social systems /Governance	What kind of innovations in social systems are needed in 2050? Who (which stakeholders) would have a central role in the innovations?
Environmental awareness / mindsets	To what extent should the environmental awareness of citizens or private companies be enhanced?

Narrative description of visions by Actions

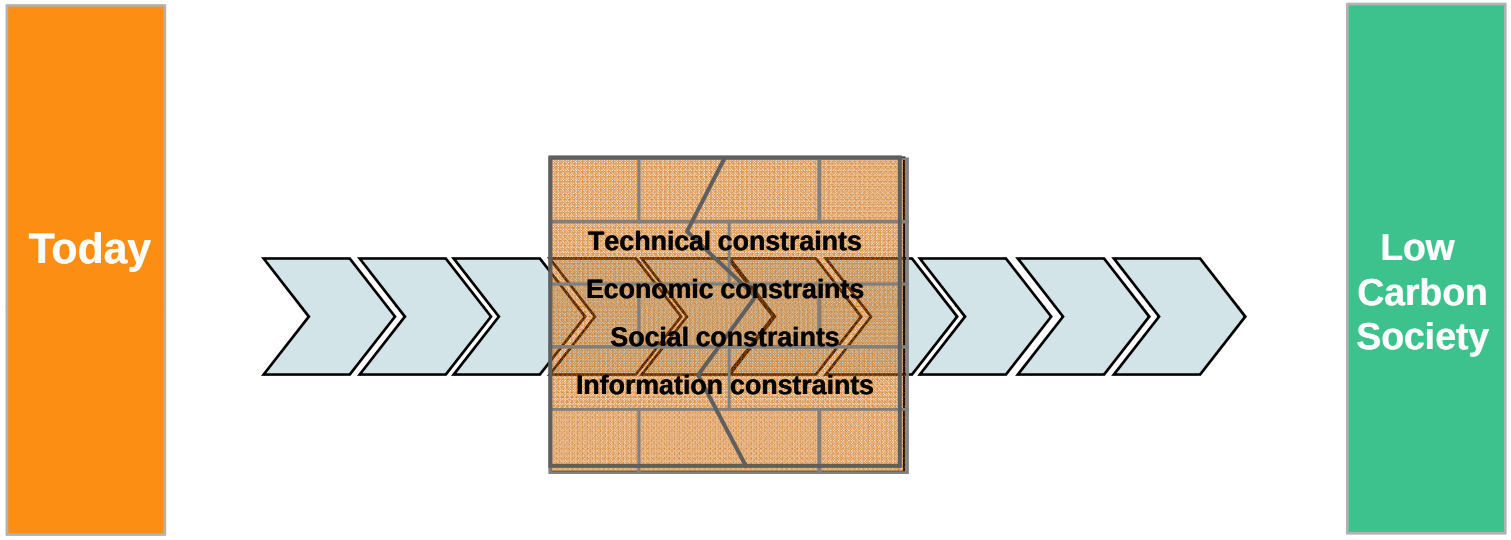
Category	Factor	A	B	Innovation	Achievement Level
industry	reduction in service demand	○	○	seasonal production and consumption of agricultural products	average 30% reduction in fuel consumption for agricultural goods
	improvement in energy efficiency	○	○	use of high efficiency boilers, motors, etc.	efficiencies improve by: boilers: 11%, direct heating: 67%, motors: 25%, etc.
	improvement in CO2 intensity	○	○	switchover from oil and coal to natural gas fuel	70% shift from steam, heating oil, coal to natural gas
			○	switchover to low-carbon construction materials: wood, etc.	70% of 2000 levels input coefficient of cement, iron and steel, nonferrous metal, metal products in construction
Household/ Commercial	reduction in service demand	○	○	dissemination and promotion of superinsulated buildings	next generation housing standard: 100% implementation
		○	○	optimal control of energy consumption via HEMS and BEMS	10% of air conditioning demand, 20% of lighting demand
	improvement in energy efficiency and CO2 intensity	○	○	dissemination of high-efficiency heat pump air conditioning, water heaters, and lighting	heat pump for air conditioning: COP=8.0, for water heating: COP=6.0
		○		development and dissemination of fuel cells	dissemination of fuel cell cogeneration: 10% of heating demand
		○	○	dissemination of solar energy generation	solar generating capacity：42～86GW
			○	dissemination of solar thermal water heaters	supply of energy for water heating: 2.0～10Mtoe
			○	proliferation of biomass-fueled heating and cooking implements	share of biomass heating services: 50%

Narrative description of visions by Actions

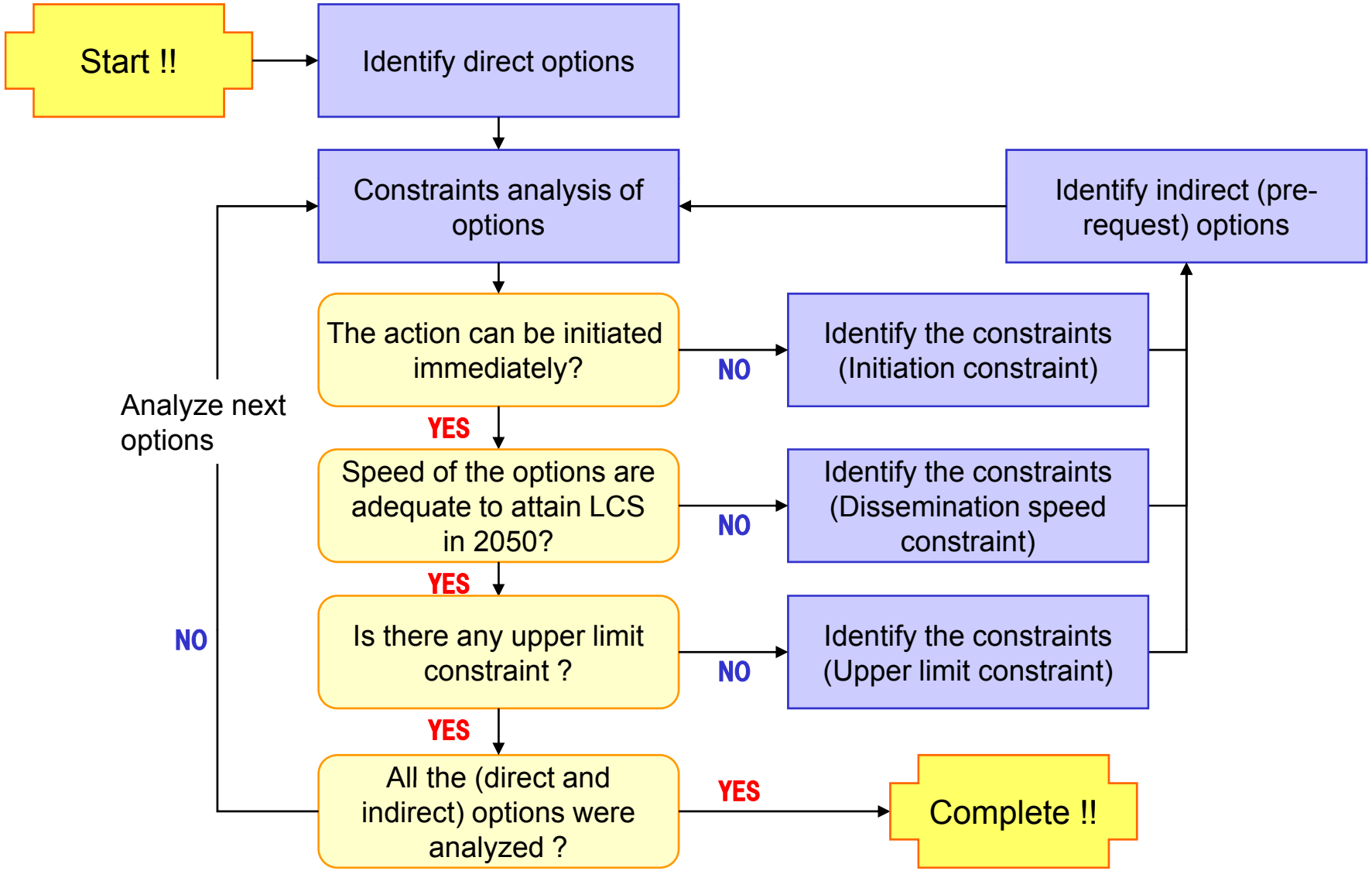
Category	Element	A	B	Innovation	Achievement Level
trans-portation	reduction in service demand	○	○	well-utilized property, consolidation of city functions, walkable livable cities	26% reduction in automotive transport (person-km), more buses and trains
		○		promotion of a modal shift in travelers to public transportation (train, LRT, bus)	
			○	infrastructure to promote walkers and bicyclists (parking lots, special bike paths)	increase in walking/bicycling by 17% (person-km)
	improvement in energy efficiency and CO2 intensity	○	○	dissemination of electric automobiles	Share of Electric cars Mini passenger vehicle: 40-100% Mini Freight Vehicle: 40% etc.
		○		dissemination of fuel cell automobiles	Share of Fuel cell cars Passenger vehicle: 60% Mini Freight Vehicle: 40% etc.
			○	dissemination of biodiesel	biodiesel mixing rate 50～100%
		○	○	dissemination of high efficiency transportation vehicles	fuel efficiency: better than 30% improvement over 2000 levels
		○	○	improve energy efficiency of freight on rail, sea, and air	rail: 2x as efficient as 2000 shipping: 1.33x as efficient as 2000
Energy conversion	improvement in CO2 intensity	○	○	switchover to low-carbon energy sources (natural gas, nuclear, reusable energies)	CO2 emission intensity : 67%-99% reduction
		○		utilize nighttime power effectively, increase electrical storage capacity	
		○		hydrogen processing using reusable energy	reusable-energy-based hydrogen production capacity: 4.5Mtoe
		○		CO2-free energy and hydrogen production from CCS	CO2 sequestration & storage: 36MtC/year

Constraints Analysis

- Constraints Analysis is to identify gaps between the current situation and visions described in “Future objective”
- options can be defined as countermeasures to overcome the constraints
- Various types of constraints should be taken into account including;
  - ✓ Initiation constraints
  - ✓ Dissemination speed constraints (Cost, amenity, and efficiency)
  - ✓ Dissemination limit constraints (Physical, Social, and Technological)

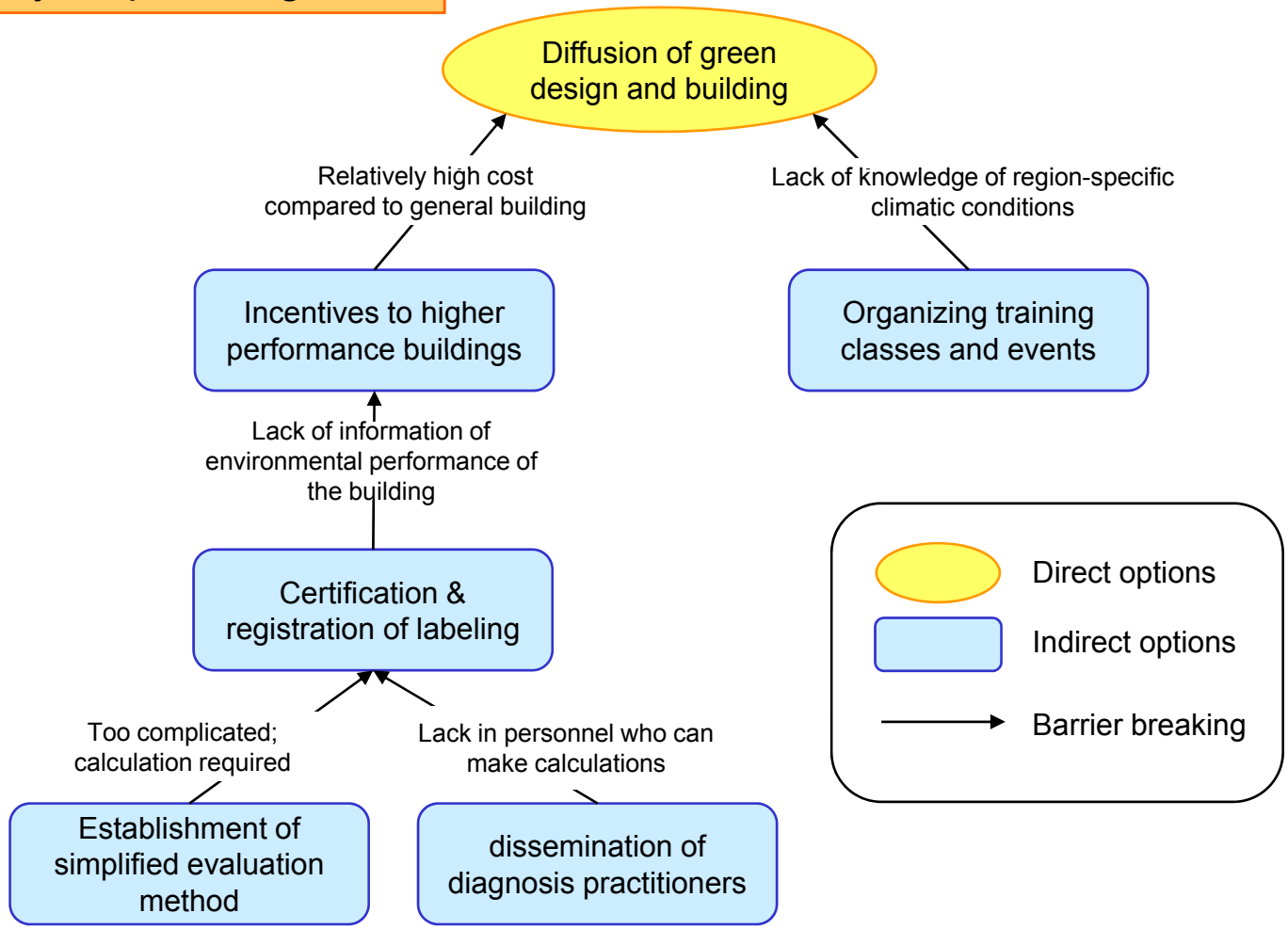


Constraints Analysis



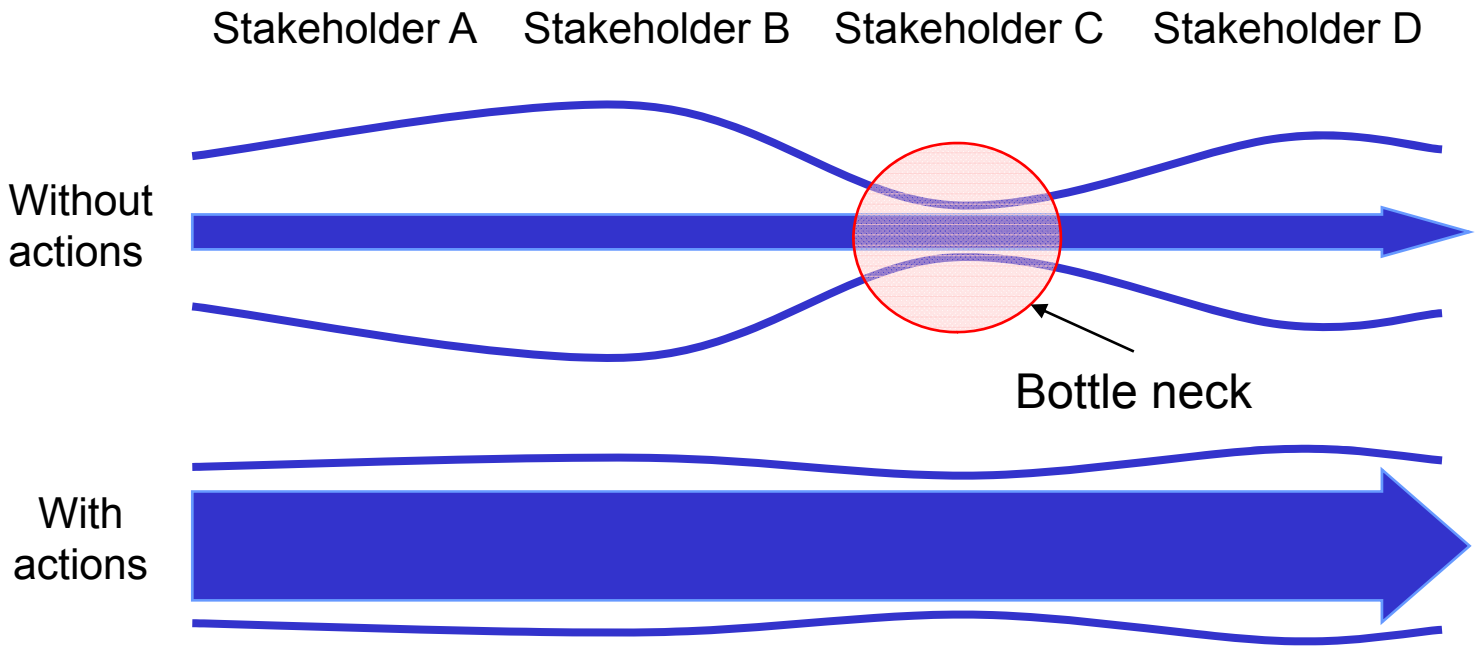
Identification of necessary actions

Step by step strategies



Stakeholders Analysis

- Stakeholder analysis is to assess Actions bottlenecks
- Identify all stakeholders related to the Actions and analyze barriers and benefits qualitatively
- Well-designed and efficient Actions should equalize the benefits of stakeholders and maximize the effects

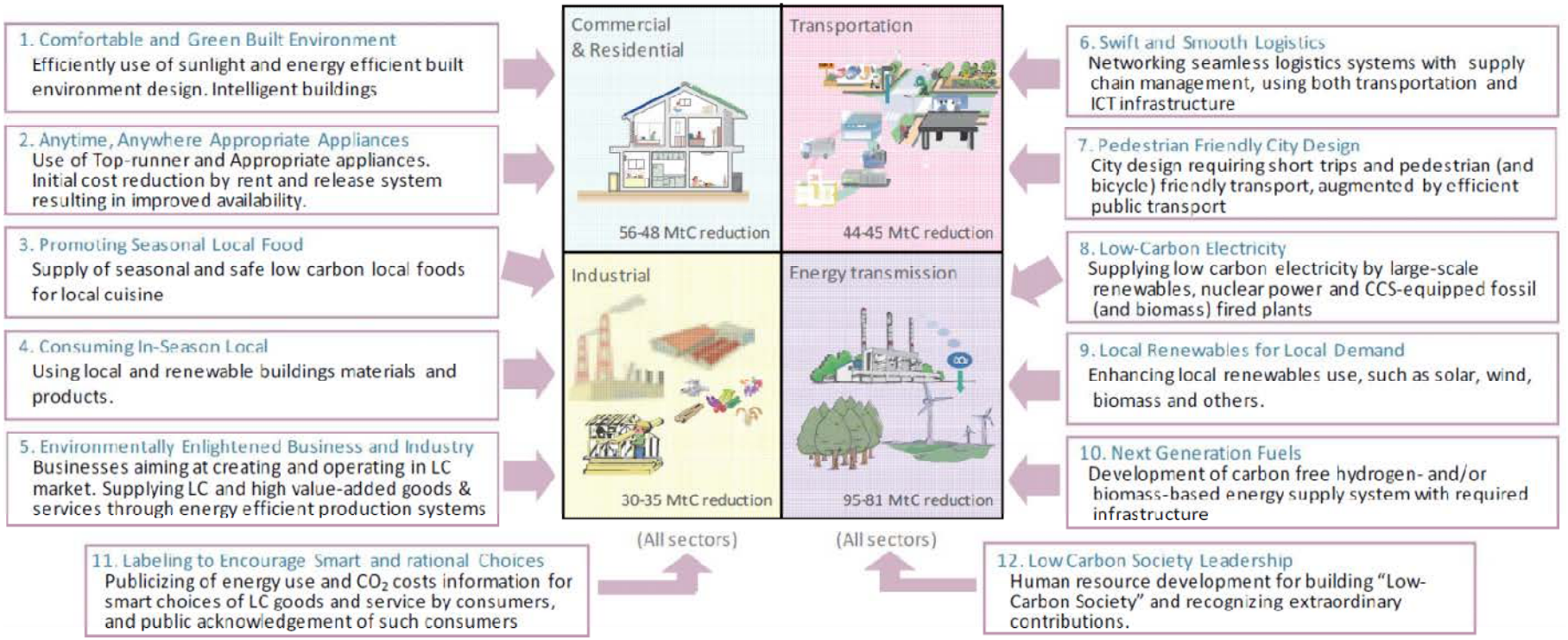


Compatibility and conflict evaluation

- When Actions are developed, compatibility and conflict among the options should be reassessed.
- Reform the framework of Actions where necessarily, and follow the Action development procedures

3. Example of output: “A Dozen of Actions”

A Dozen of Actions



Future Objectives

Solar and Wind Utilization Design

Architectural technologies and designs that are suitable for the climate of each region, using passive design layout for introducing sunlight and natural wind into the building, are widely disseminated. In addition, the individual levels of insulation technologies, screen technologies, ventilation technologies have been improved drastically, thereby enabling reduction of energy consumption while retaining comfort within residences and buildings. Consequently, the demand for energy per household will decline by about 40% from 2000 levels; also, the energy demand per unit area of non-residential building floor space will decrease by 40%. Furthermore, for the walls and roof in each building, installation of solar water heaters and solar power generators will be standardized. In particular, most of low rise housing will become zero carbon residences through the combination of high insulation, passive design, and solar energy use.

Household Finance-friendly Environmental Efficiency

For newly built or renovated buildings, reduction and exemption scheme of real estate tax and loan interest rates in response to certification results of household environmental efficiency (CO_2 emissions and energy consumption) becomes available. The scheme provides incentives for purchasing of residences with high environmental efficiency. For existing residences, low cost environmental efficiency consulting services are provided. The services offer advices on the structural alteration of the building in order to enhance environmental efficiency and act as an intermediary for alteration expense discount programs and favorable loan interest rates. As such, a framework system for the entire society to place a high value on the level of environmental efficiency of residences is in place. Therefore, even citizens with low environmental awareness choose residences with superior environmental efficiency.

Nurturing of Worker Skills; Information Transmission

Designers and architects who are highly skilled in bonding architectural designs that make use of local and regional climate and the use of leading edge equipment are nurtured in each area; their know-how will be handed over to the next generation. Moreover, long-life buildings such as “200-year homes” have become widespread, limiting unnecessary consumption of resources and energy.

Implementation Barriers and Strategic Steps

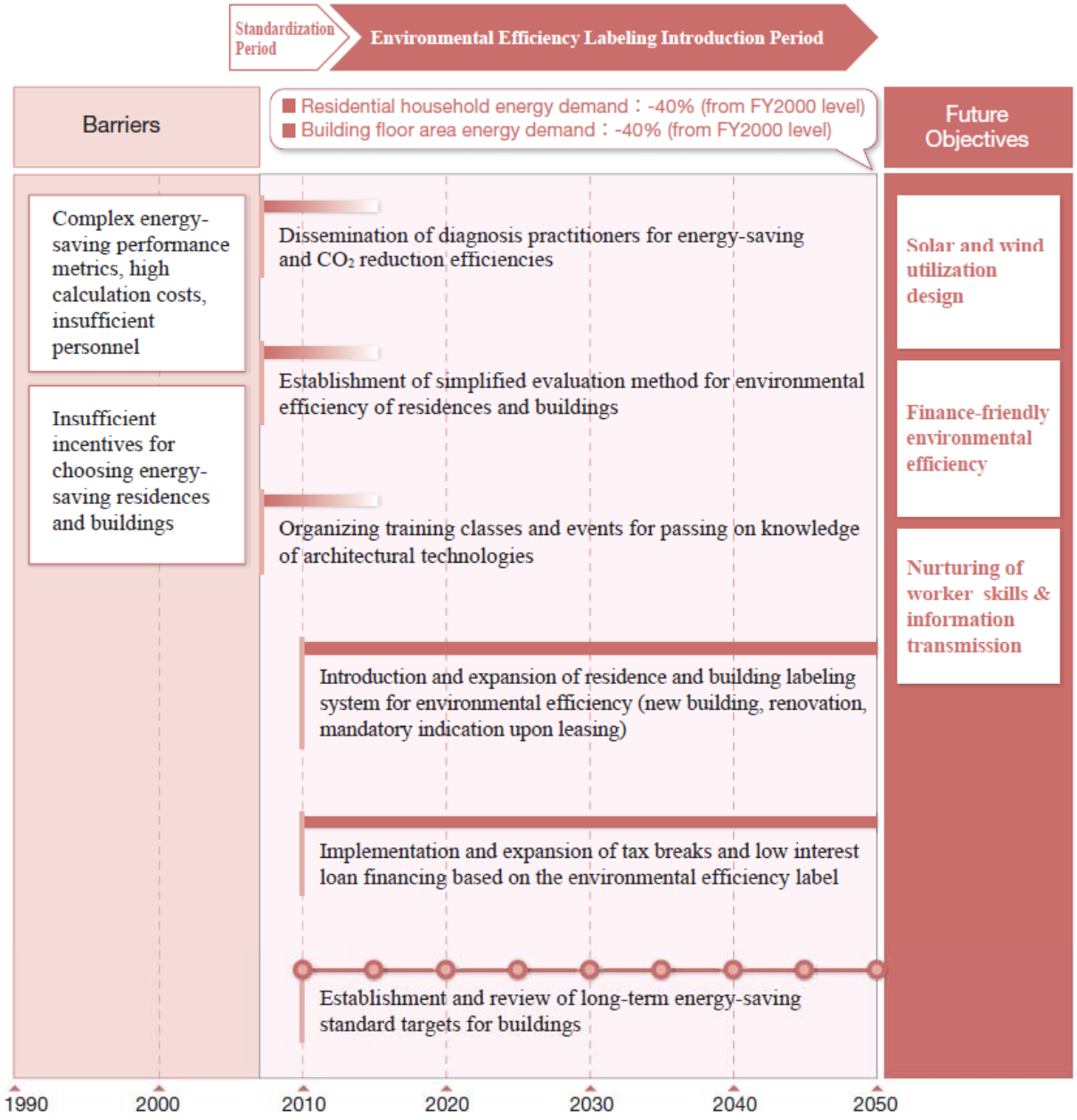
Standardization Period

Currently, at the time of purchasing or contract leasing of residences and buildings, since there is no requirement in general for the presentation of information regarding environmental efficiency, this has not been an item of importance. Also, even today, although it is possible to evaluate the environmental efficiency of residences and buildings, the number of people capable of performing these complex calculations have not been sufficient, hindering its widespread practice. Accordingly, the proposed strategy promotes the establishment of simplified evaluation method for building efficiency according to use in consultation with existing building evaluation methods (CASBEE, etc.) and evaluation methods implemented in Europe and other countries. At the same time, it continues to make progress on nurturing practitioners for the diagnosis of energy-saving efficiency and CO_2 reduction efficiency. Furthermore, lectures for craftsmen on building technology will be established in universities and other educational institutions, and by organizing in each region training classes and events intended for construction workers, foundations will be created for passing on the knowledge of energy-efficient building technologies and designs.

Environmental Efficiency Labeling Introduction Period

A labeling system for residences and buildings will be commenced based on the newly-developed evaluation methods. Long-term energy-saving target values (upward in incremental steps) will be set for each type of building usage. Certification and registration of labeling will be mandatory at the time of purchase for newly-built residences, at the time of renovation for existing buildings, and at certain intervals for leased and business buildings. Those failing to meet the lowest-rank standard will receive guidance to attain the acceptable standard values through the introduction of high-efficiency equipment, solar power generator, solar thermal equipment and so forth. In addition to the annual energy consumption of the average household and CO_2 emissions, the environmental efficiency labels will include the economic figures for the buildings such as the average annual energy cost, enabling comparisons of initial investments and running costs. Furthermore, through combination of tax breaks and low interest financing loans that correspond to the environmental efficiency label, incentives will be provided to owners and users of buildings to select residences or buildings on a long-term basis.

Action 1: Comfortable and Green Built Environment



Contribution of Building Owners

Selection of residential buildings with high environmental efficiency. Commission of low-carbon design to architects and construction companies.

Contribution of Architects, etc.

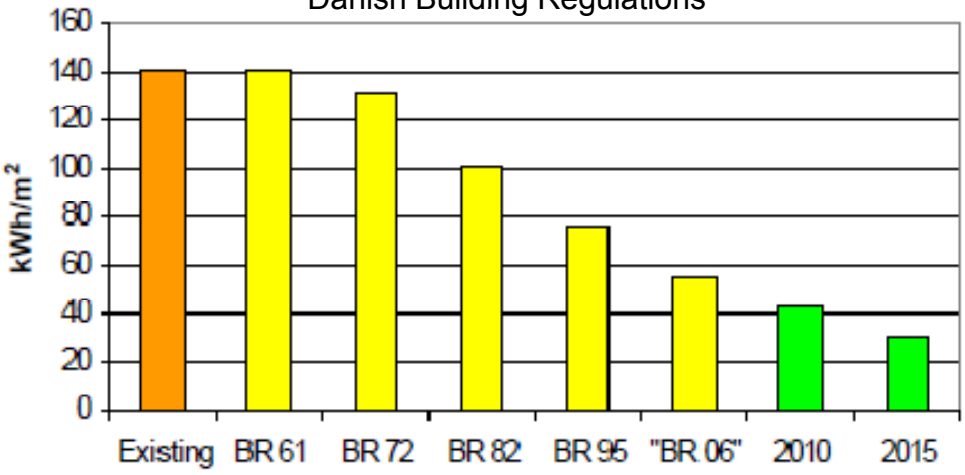
Development of low-carbon architectural design methods. Investing for technology development in insulation technologies, etc. Sustenance of regional worker skills.

Action 1: Examples of related actions/options

“Energimærke”of Denmark：Energy Labelling of Buildings

- A system requiring buildings to assess and reveal their energy reduction performance
- Buildings that fail to reach a certain standard will not receive permission for construction, sale, or lease; buildings that are especially energy efficient will receive low loan rates, tax breaks, and other incentives
- A special consultant will assess buildings. Provide consulting to improve energy efficiency performance.
- Strengthen in 2006. Aim for 25-30% improvement in energy efficiency in new buildings.
- Maintain reliability of assessment (publish a handbook, train consultants, maintain a standard of technology)
- Makes a great contribution to the improvement of energy efficiency in Denmark’s buildings

Net heating consumption in relation to Danish Building Regulations



Certification Scheme
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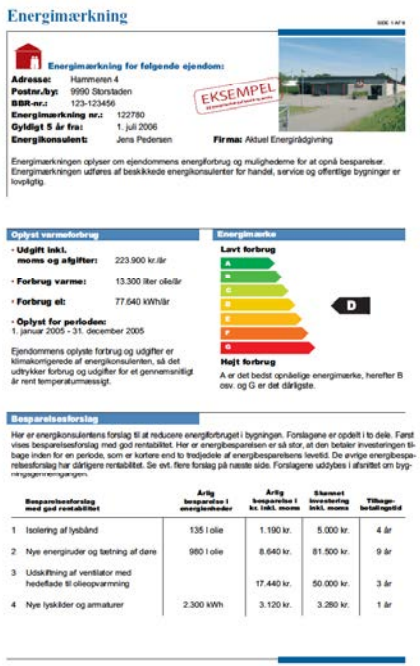


Ref: http://www.energistyrelsen.dk/sw12325.asp

Action 2: Anytime, Anywhere Appropriate Appliances

Future Objectives

Dissemination of Energy-saving and Control Technologies

As a result of technological competition for energy saving on home appliances and businesse quipment, the energy efficiency of all equipments is greatly improved, enabling efficient use of energy with minimal waste. Also, practical use of information communication technology (ICT) has made it possible for autonomous operation and control of equipments to automatically suspend the operation in spaces and periods of time when people are not present.

Service Consumption Lifestyle

Air-conditioning equipment and hot water heaters are leased rather than sold, with a charging system in response to the volume of usage. The charging system for electricity and gas is such that the leasing companies are charged, causing them to make efforts for reduction of energy costs by improving the efficiency of equipments through continual equipment repairs and exchange of parts as well as updating to the latest high-efficiency equipments. Furthermore, more effective use of resources is performed as post-use equipments are sent back to the leasing companies to make the collection process of unnecessary equipment easy.

Leading the world

Japan has the highest global technological levels, and this advancement elevates the appeal of the country throughout the world. These technologies are exported throughout the world, thus besides supporting Japan's economy they contribute to the creation of a low-carbon society.

Action 2: Anytime, Anywhere Appropriate Appliances

Implementation Barriers and Strategic Steps

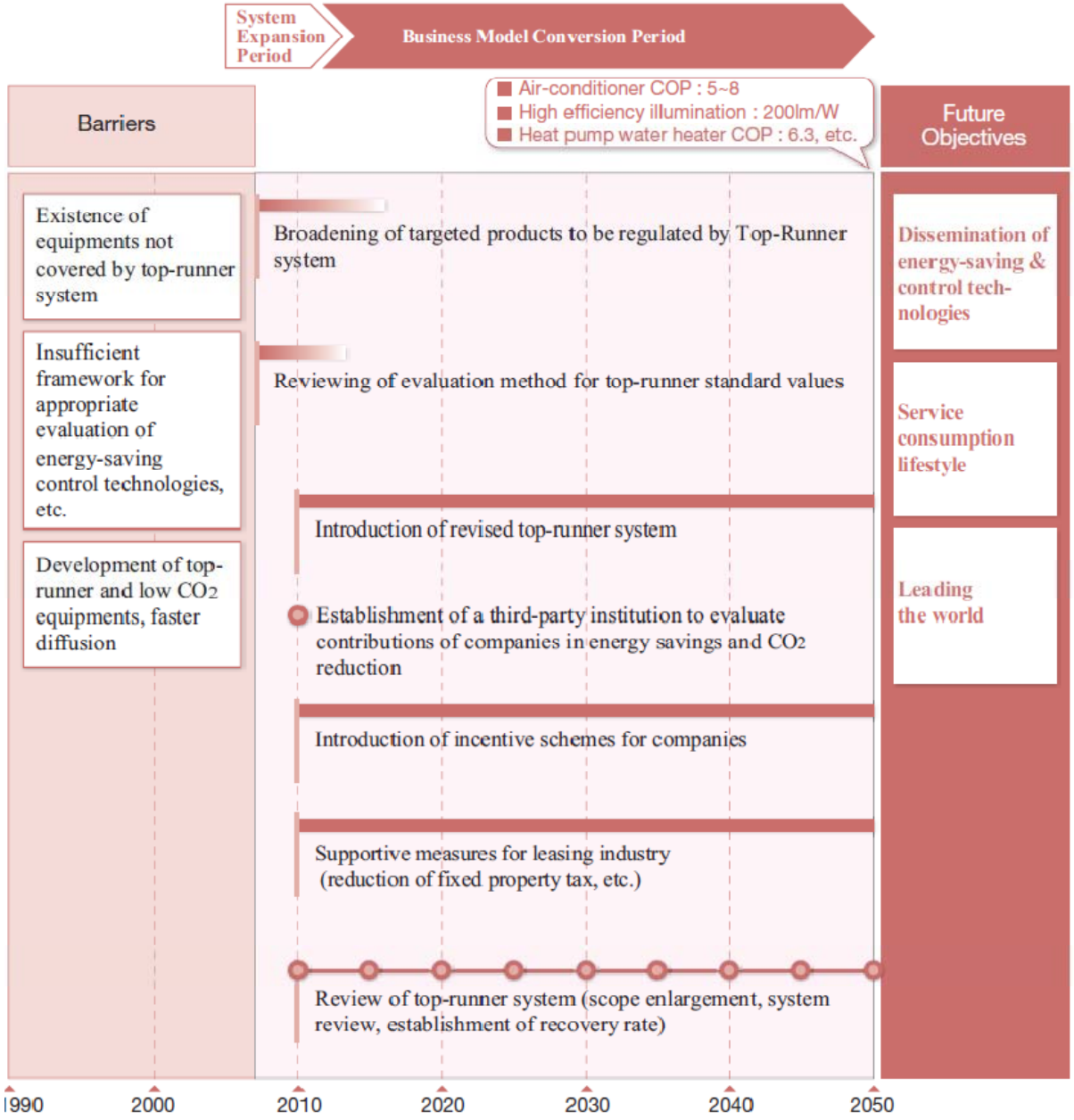
System Revision Period

The top-runner system has been a system with great results. Based on this experience, the scope for its application will be expanded with the focus on business affairs. Moreover, the evaluation method for the top-runner standard values will be reviewed so as to appropriately evaluate the energy-saving efficiency attained by autonomous control of air-conditioning and lighting equipments

Business Model Conversion Period

Under the revised top-runner system, efficiency improvement of each equipment item will be promoted. Simultaneously, in corporation with industry organizations, a third-party system will be established to evaluate the contribution level of each company for equipment efficiency, energy savings and CO_2 emission reduction, publicly announcing and recognizing those companies with superior contribution in each year. Moreover, strategic initiatives will be taken to make Japanese technologies and evaluation techniques into international standards. A shift from the retail style to the leasing business style will be encouraged by establishing lowest recovery rates and by incrementally tightening the standards. Furthermore, for leasing companies, supportive measures will be in place, including provision of incentives such as reduction of fixed property tax for the top-runner equipments and CO_2 emission reduction equipments (solar power generators, solar water heaters, etc.) that they own.

Action 2: Anytime, Anywhere Appropriate Appliances



Contribution of Product Users

Selection of equipment high in energy savings and low in CO_2 emission.

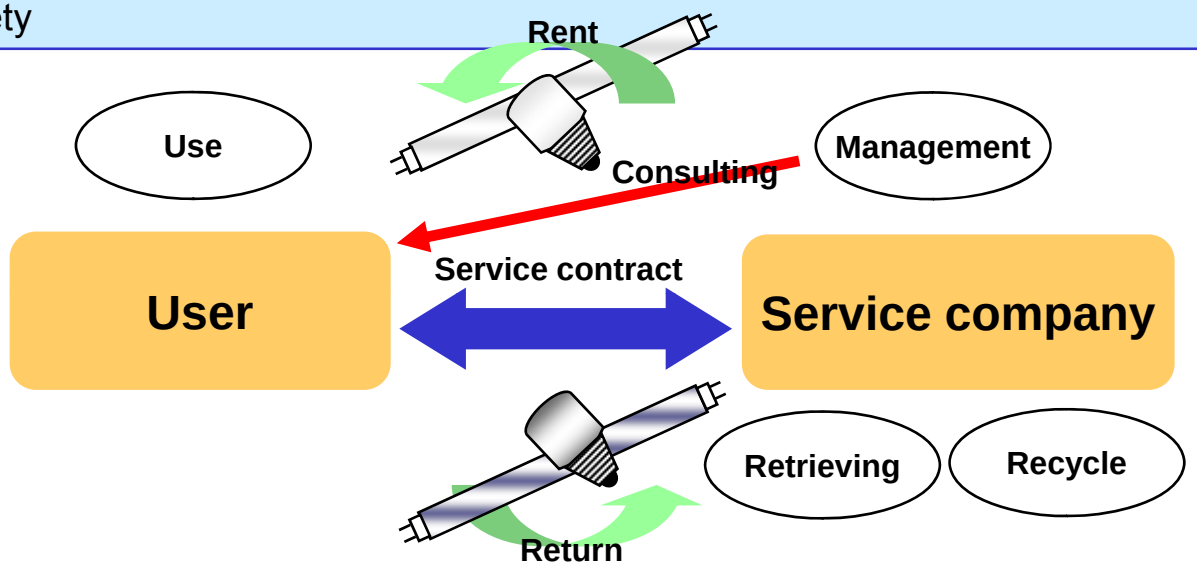
Contribution of Companies (manufacturers)

Positive performance of R&D on energy savings products. Appeals for environmental efficiency of their products.

Action 2: Examples of related actions/options

Panasonic *Akari Anshin Saabisu* [Lighting Relief Service] (Japan)

- Panasonic is developing a business to provide not “lights” but “lighting”
- Lights are the property of the service company (specified Matsushita Electricity agents), which takes responsibility for retrieving them when they are no longer needed
- The service company guarantees proper disposal of lights, and in doing so extends “piece of mind” to contracted (“user”) organizations
- In addition to light disposal, the company works toward a solution strategy while consulting about lighting equipment
- as a result, recycling is carried out as it should be (reuse rates: 99.9%)
- as of March 2006, 3600 offices were contracted with the company (an increase of 3.6x from the previous year)
- the company focuses on recycling, but through this also contributes greatly to energy savings and low carbon society



http://www.tbr.co.jp/pdf/report/mon_c004.pdf

http://denko.panasonic.biz/Ebox/akarianshin/akari_01.html

Action 3: Promoting Seasonal Local Food

Future Objectives

Raising of Low-Carbon Agriculture by Consumers

At the time of selecting foodstuffs in supermarkets and restaurants, the advertising of health related information and CO_2 emissions will increase the popularity of low-carbon agricultural produce. Specifically, consumers prefer seasonal produce and other vegetables grown using solar thermal or biomass even if they were grown in greenhouses, thus farmers make various innovations to ensure lower carbon emissions. Also, supermarkets and other stores support their efforts to promote low-carbon produce by introducing eco-points and similar other incentives.

Low-Carbonization of Production Process

While production and consumption of produce in season have become more prevalent, there has been a large decrease in greenhouse cultivation which consumes a large amount of energy. Even with its implementation, farmers actively utilize solar thermal, biomass and local small- and medium-sized hydroelectric power generation. As a result, per yield CO_2 emissions for vegetables and fruits have declined to less than half the current figures. Moreover, biofuels made from irregular agricultural produce and agricultural waste are used as fuels for agricultural machineries, contributing to the low-carbonization of production process for agricultural produce.

Agricultural Fields and Pastures without Greenhouse Gas Emission

Through engagement in new agricultural production methods, technological development, breed improvement and so forth, emissions of N_2O, CH_4, etc. from agricultural fields and pastures have declined greatly.

Action 3: Promoting Seasonal Local Food

Implementation Barriers and Strategic Steps

Verification Period

Farmers who desire certification in low-carbon agriculture will be recruited to participate in verification tests for agricultural produce labeling. In collaboration with participants in the verification tests, discussions will be held to improve the policy towards low-carbon agriculture, thereby accumulating the experience and knowledge of low-carbon agriculture. Simultaneously, low-carbon agriculture advisors with adequate experience in the field will be nurtured.

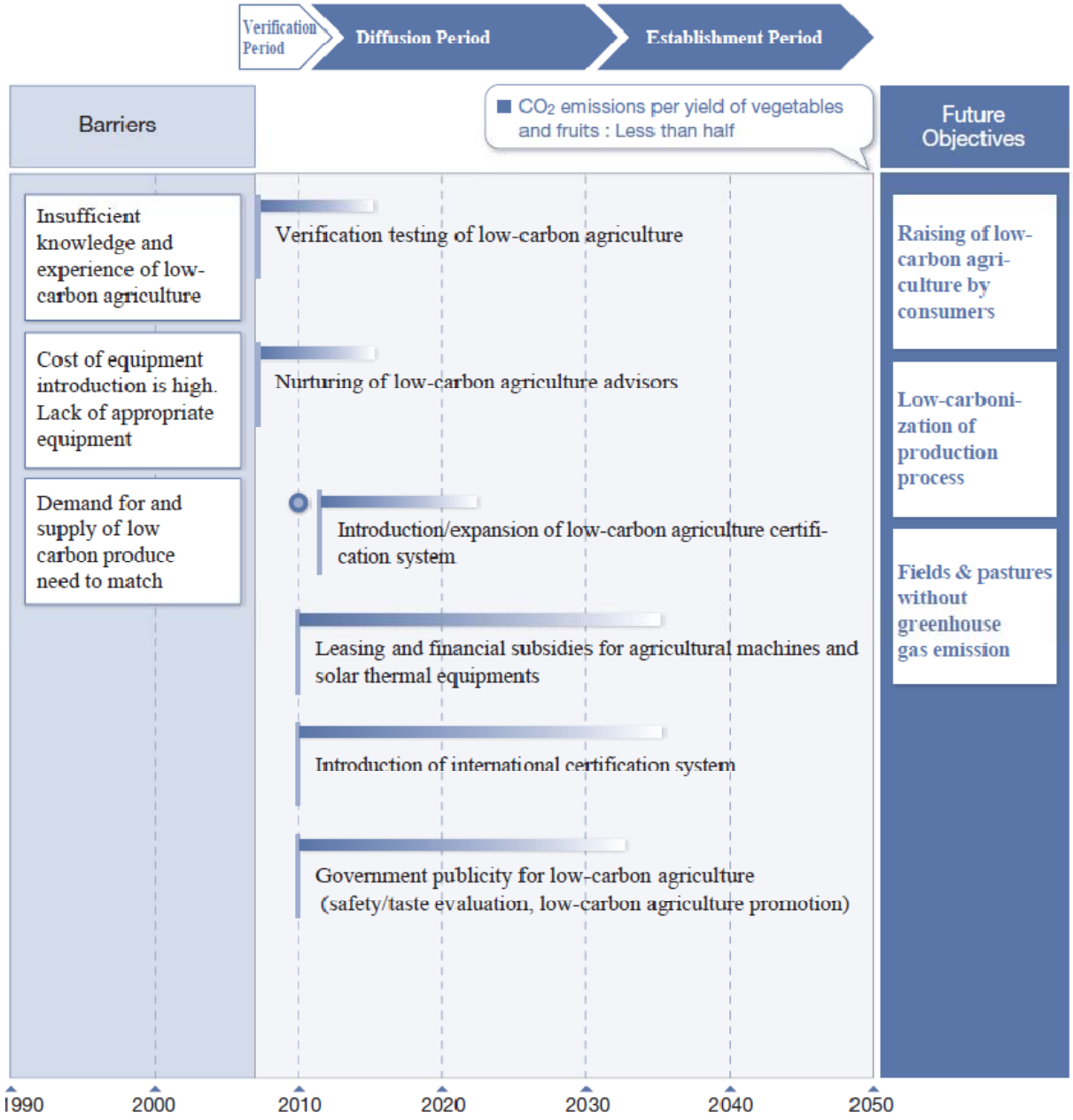
Diffusion Period

The target areas of agricultural produce labeling system and low-carbon agriculture certification system will be expanded to include the whole country. However, in some cases introduction of high-efficiency equipment, solar water heater, biomass boiler, etc. are necessary, thus for these equipments, the municipalities will establish systems for lending (leasing) and giving out subsidies. Also, in order to assure the acceptance of low-carbon agricultural produce by consumers, guarantee of taste and safety will be given to certified produce, in addition to active appeals made both within and outside Japan through government publicity. In addition, systems will be constructed so that certified results can be mutually confirmed with major trading partners of agricultural produce, broadly spreading the knowledge of low-carbon agriculture that Japan has so as to contribute to the realization of a low-carbon society.

Establishment Period

Low-carbon agriculture will become the standard method because consumers can easily select low-carbon produce, and because producers will have lower running cost with reduced usage of heavy oil and so forth. Thus, various government and municipal subsidies should be gradually reduced to promote independence.

Action 3: Promoting Seasonal Local Food



Contribution of Consumers

Selection of seasonal food products and low-carbon items based on environmental and safety information of food.

Contribution of Farmers

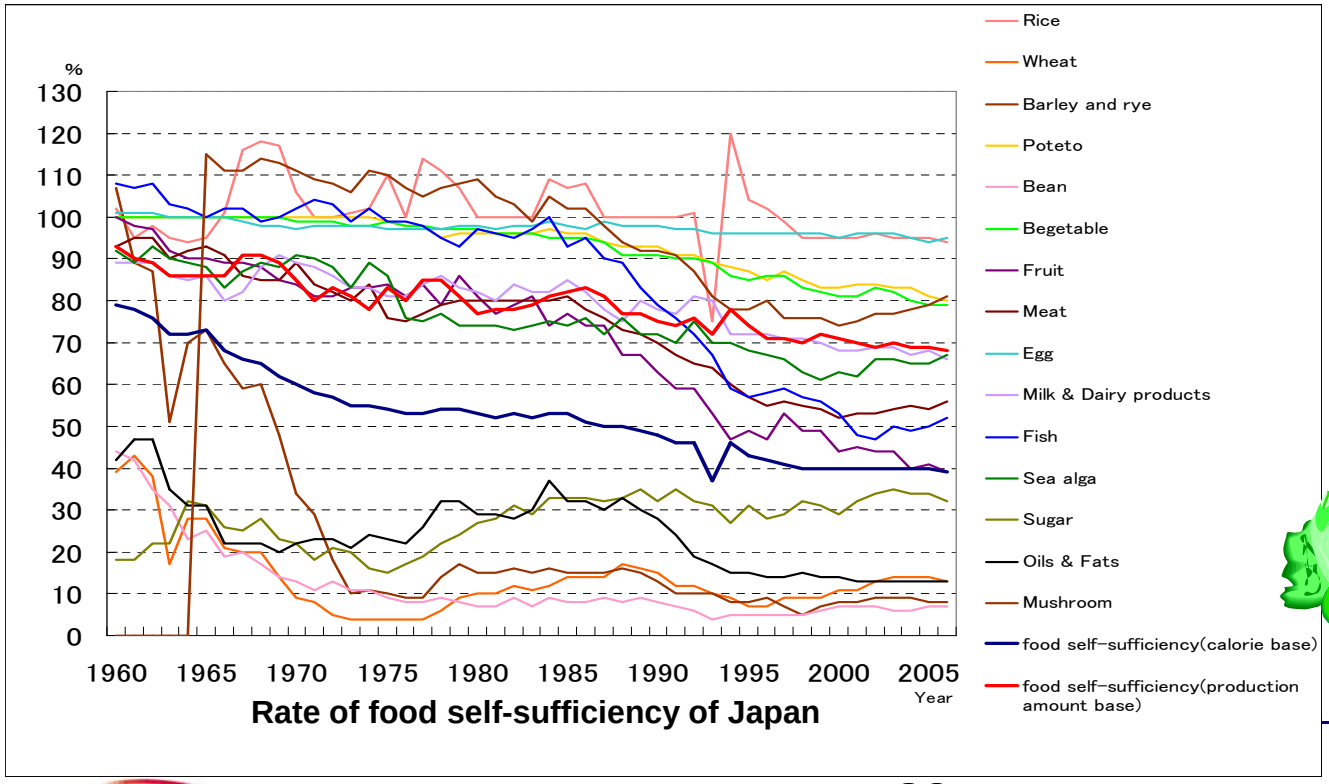
Seasonal item cultivation. Use of low-carbon energy in greenhouses as much as possible.

Action 3: Examples of related actions/options

Promoting local consumption of local produce（Japan：MAFF）

- A system for connecting the producers and consumers of agricultural goods through promotion of needs-based production and local consumption
- Will also promote an improvement in food self-sufficiency rates and a reduction in “food mileage”
- Annual sales for local markets were approximately 338.7 million yen in 2006
- Local agricultural products make up approximately 70% of handling at local markets, with a focus on fruits and vegetables

c.f. Slow Food (Italy), CSA (Community Supported Agriculture) (USA)



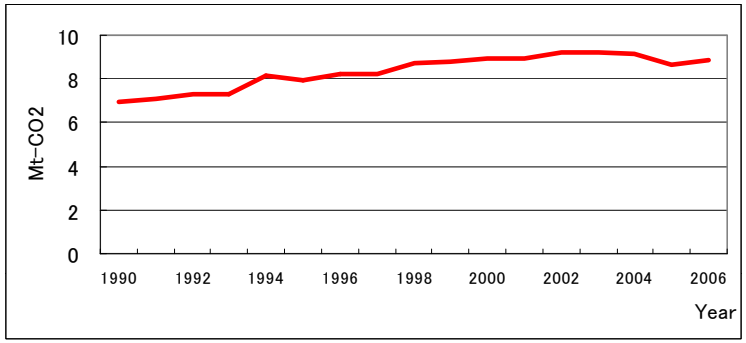
Rate of food self-sufficiency of Japan

Ref:http://www.maff.go.jp/e/index.html

Action 3: Examples of related actions/options

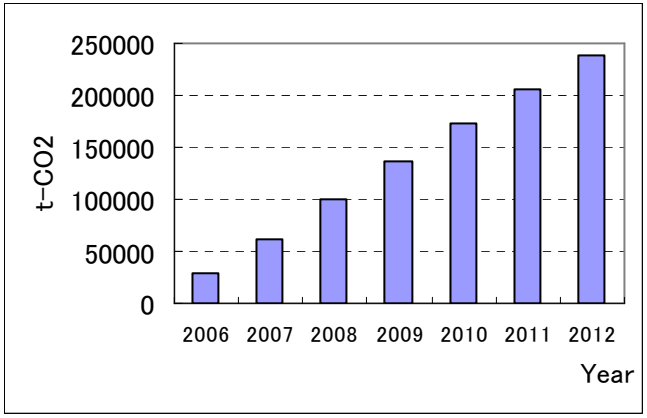
Promotion of energy reduction in agricultural production（Japan: MAFF）

- Implementation of plans to disseminate enhanced farm management policies, and acceleration of energy reduction in institutional horticulture and agricultural machinery in response to the steep price increases in crude oil prices
- Institutional horticulture and agricultural machinery: set 2005 as a standard for emissions and reduce annual emissions by approximately 174,000 CO_2t by 2010
- Development and dissemination of energy efficient agricultural machinery
- Examples of energy efficiency experiments in order to remove oil from agricultural production
  Use of wood pellets and hybrid heaters for institutional horticulture heating needs in Miyazaki Prefecture
  Coating green houses at the Okayama Prefecture Agricultural Center with resin sheets to improve heat retention

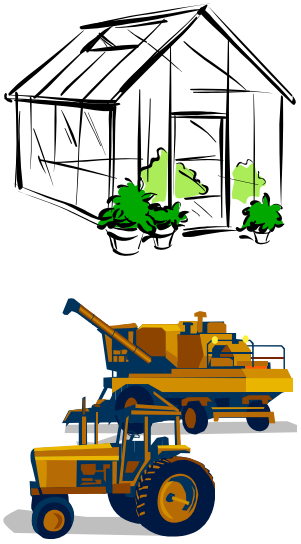


Amount of CO2 emission in agriculture and forestry industry production field

*not including emissions from rice fields, domestic animals, and soil



Amount of CO2 reduction expected with measure promotion



Ref:http://www.maff.go.jp/e/index.html

Action 4: Sustainable Building Materials

Future Objectives

Life Surrounded by Trees

In addition to low-rise residences, the popularity of wooden residence has spread widely to medium-rise residences as well. Building construction using lumber with high strength and fire resistance (such as large-section laminated lumber) has become popular even for schools, hospitals, other public buildings, low-rise large-scale stores and factories, with the percentage of wooden buildings exceeding 70%. Also, the use of wood for furniture and fittings has greatly increased, and wood is used for various applications including civil engineering, architectural foundations, guardrails and sound-proof walls.

Revival of Forestry Business

Due to the introduction of service road networks and usage of advanced machineries, labor productivity of forestry has increased by 5 times the 2000 average level. Also, due to the establishment of effective application technology for wood biomass, over 9,000,000 BDT (Bone Dry Tonne) of remaining materials in the forest are used annually. Log production volume has expanded to 50,000,000m^3, and timber self sufficiency has surpassed 65% to allow for increasing exportation of wood overseas (in 2006, the domestic log production volume was 17,480,000 m^3, with the timber self sufficiency of 20.3%, according to "2006 Chart of Lumber Demand and Supply" by the Forestry Agency). However, clear cutting is limited to old growth forests with declining growth rate. Together with proper reforestation done using low-cost afforestation technologies, sustainable forestry business is established.

Action 4: Sustainable Building Materials

Implementation Barriers and Strategic Steps

Competitiveness Recovery Period

In order to achieve maximum utilization of usable domestic lumber, existing standards and restrictions regarding wood products will be reviewed. For current forestry, from the profit perspective, the incentives for forest owners are extremely insufficient to implement thinning and clear cutting. One of the factors is that the unit of forestry business is too small to achieve efficient management of forests. Accordingly, low-cost log production will be realized through intensification of forest management (collaborative business implementation) and subsidies to promote mechanization of log production. At the same time, political measures will be taken to achieve expansion of forestry management units by promoting small-scale forest owners to either sell or commission their forests for a long term to forest entities (such as forest associations) which can properly manage their forests. Furthermore, the remaining materials in the forest are currently not fully utilized at all because of their high supply costs, high moisture content and irregular shapes. In order to increase their utilization, the government will implement supportive measures for the development and introduction of necessary equipments for collection of the remaining materials as well as for the transportation of the materials.

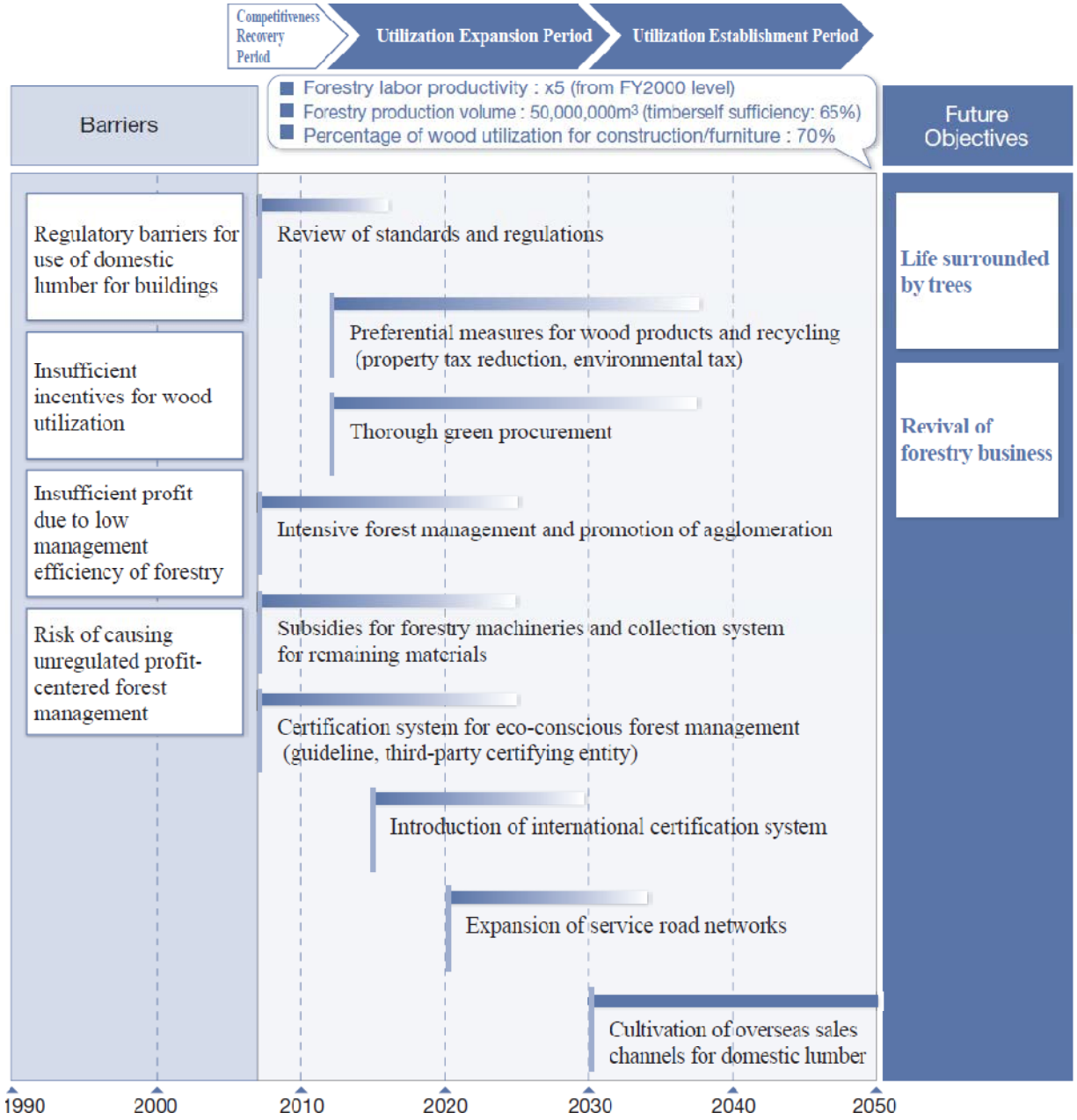
Utilization Expansion Period

Utilization of wood will be promoted by thorough procurement of natural resources for construction of public infrastructures. In addition, for the use of wood and their material cycles, property tax reduction measures and environmental taxes will be introduced to promote wood utilization further. On the other hand, for prevention of profit-centered unregulated logging due to the increase in demand for wood, forestry guidelines will be created, by which third-party organizations are designated to certify business entities that implement sustainable forest management and pro-environmental logging. Simultaneously, systems will be constructed so that certified results can be mutually confirmed with major trading partners of lumber, suppressing illegal logging and other activities overseas. Furthermore, development of new machineries will be necessary due to the increase in tree age and size, and consequently, it will be necessary to construct large-scale service road networks on which large trucks can drive.

Utilization Establishment Period

Various kinds of utilization have been established for Japanese cedar wood, and the percentages of wood utilization for buildings and furniture approach 70%. Together with this, the competitiveness of eco-conscious wood products reach a global level. From then on, support will be given to the forestry industry so that new channels for sale of national lumber can be cultivated abroad. By this time, demand for biomass resources will outgrow supply of remaining materials from the forests, thus it will be necessary to commence production of biomass resources with short harvest intervals.

Action 4: Sustainable Building Materials



Contribution of Forest Owner

Proper forest management, or sales/commissioning of their forests to a forest association.

Contribution of Forest Industry

Disclosure of CO_2 emissions of lumber to consumers. Establishment of construction technologies for medium-rise and large-scale wooden buildings.

Action 4: Examples of related actions/options

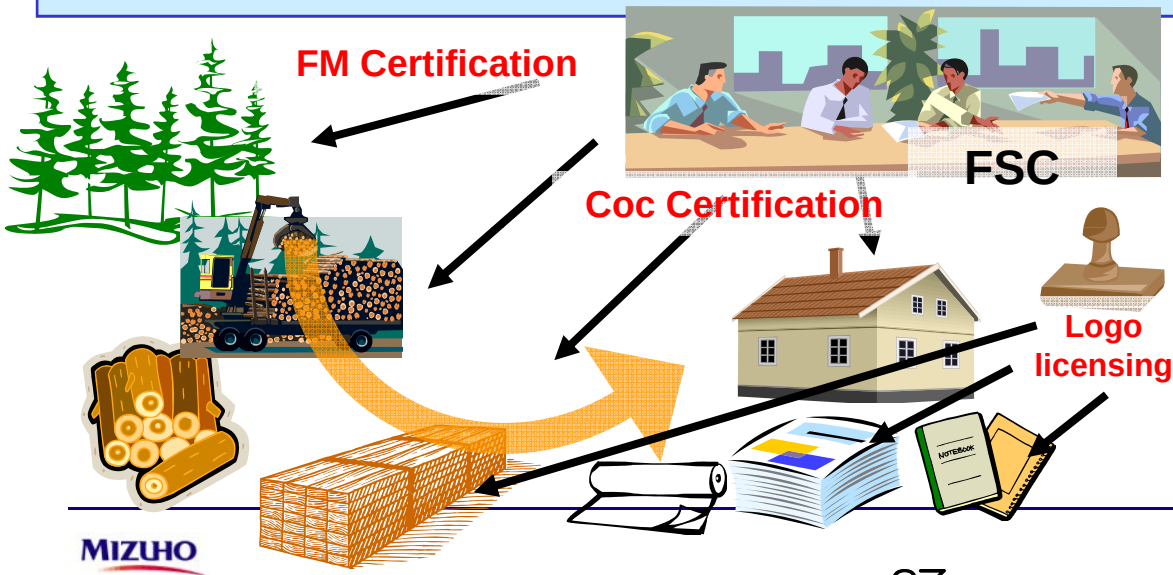
FSC（Forest Stewardship Council）

- An independent organization established for the promotion of maintenance of the world's forests in an environmentally-appropriate way, and in a way that advances societal benefit and ensures long-term economic feasibility
- Through certification of the below-mentioned points, the FSC intends to integrate all those involved in the forests, from forest managers to the consumers of wood products, and help to protect the world's forests in the process
- Are forests being maintained appropriately? assessment and certification (Forest Management; FM certification)

→79 countries are certified, in 9337 locations, for a total of 103,456,399ha

- Lumber and wood products from certified forests will be marked with a logo, ensuring that they come from certified forests (certification of production, processing, and shipment (Chain of Custody; CoC certification))

→8678 instances confirmed worldwide



Example of using logo marks (pamphlets, etc.)

Ref: http://www.fsc.org/

Future Objectives

Minimum 40% Efficiency Improvement

Through continual efforts of enterprises and social systems supporting them, the energy consumption per actual production volume in each industry has declined by a minimum of 40% in comparison to 2000 (equivalent to an annual reduction rate of 1% in each section).

Demand Pull by "Low-Carbon" Value Permeation

Consumers have come to prefer low-carbon products and services, and accordingly, companies are increasing their development investment in low-carbonization of their manufacturing technologies and services. In addition, since monetary investment on companies actively implementing low-carbonization is on the increase, low-carbonization of company activities has become an important element from the viewpoint of corporate competitiveness. Consequently, a number of revolutionary technologies have been put into practice, such as iron-making technologies that use hydrogen as the reducing agent.

Implementation Barriers and Strategic Steps

System Establishment Period

In order to objectively apprehend companies' efforts toward low-carbon targets, a system for publicizing the CO_2 emissions of each company and office in a unified (standardized) format will be established. Moreover, another system for publicizing these companies' efforts toward a sustainable society will be in place. To provide the companies with a third party certification for their emissions and efforts, a system for authorized CO_2 accounting will be introduced. On the other hand, the policy for implementing eco-conscious "socially-responsible investment behavior" will be clearly addressed to financial institutions. Those achieving a certain rate of loan assets for low-carbon businesses will be announced, thereby providing support for low-carbon businesses. Moreover, a system to concentrate money on companies with low-carbon management will be constructed by introducing preferential measures, such as tax reductions, for low-carbon investments and financial products.

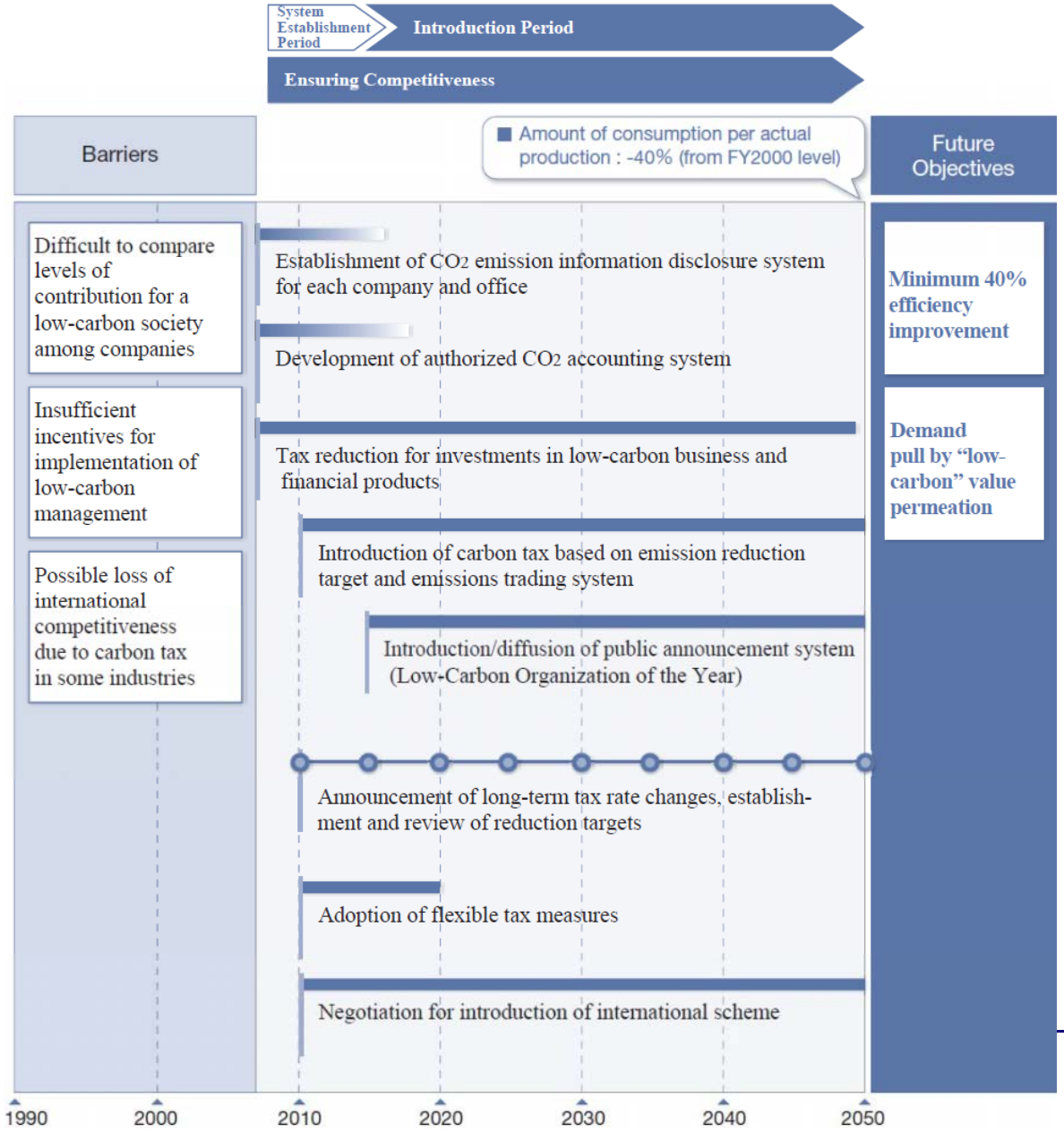
Introduction Period

Based on the CO_2 emission data of companies from "disclosure" schemes, systems for supporting companies that conduct low-carbon management will be introduced. To be specific, a carbon tax will be imposed on the emission of CO_2 caused by company activities. On the other hand, incentives (large scale tax reduction measures and technological development support for attaining CO_2 reduction targets) will be given to companies which have achieved the CO_2 reduction targets regarding which they had made an agreement with the government. CO_2 reduction targets are evaluated by third-party organizations, and the incentives including tax reduction measures and technology development subsidies will be differentiated depending on the degree of achievement. Also, in parallel with the introduction of environmental taxes, a system for emissions trading will be introduced so as to create a systems framework that can minimize the companies' CO_2 reduction cost and the risk of not achieving their targets. Regarding the rate of the carbon tax, although it will be gradually increased, the long-term changes in the tax rate will be made public so that companies can make long-term management plans and technology development investment plans while taking future tax rates into account. Furthermore, for companies with particularly advanced activities, large scale public acknowledgement such as "Low-Carbon Organization of the Year" will be given. Through these measures, companies will be encouraged to convert to low-carbon production technologies and services.

Ensuring Competitiveness

Regarding some industries easily exposed to international competition, the introduction of carbon tax and such measures could lower their international competitiveness. Also, the burdens placed on manufacturing companies could lead to an exodus of manufacturing industry to overseas. Accordingly, through international negotiation, government will work with each country in the world to adopt an international framework (sectoral approach, border tax, etc.) in order to prevent significant disadvantages to some industries. Although flexible tax measures will be adopted until a sufficient scheme is constructed, these special tax measures will be repealed by 2020.

Action 5: Environmentally Enlightened Business & Industry



Contribution of Consumers

Active utilization of environmental information disclosed by companies in product selection. Support companies implementing low-carbon business (investment/product selection).

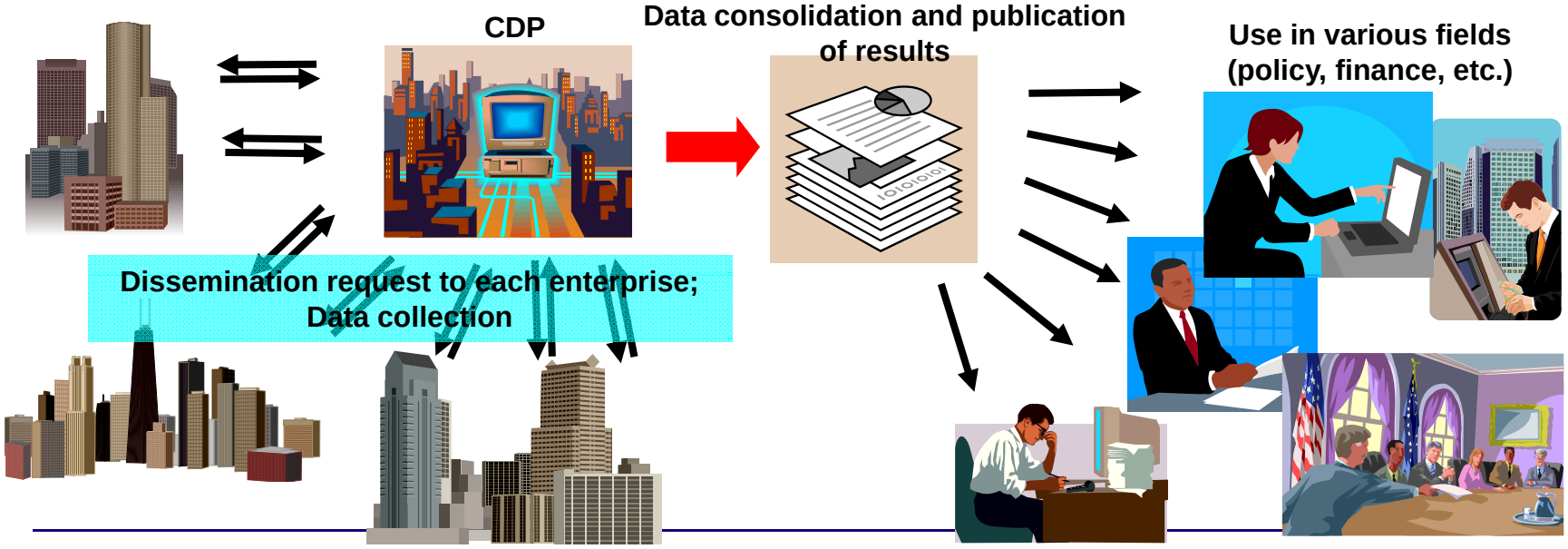
Contribution of companies

Perform thorough energy savings/CO_2 reduction in company activities. Procure energy and material that are as low-carbon emission as possible.

Action 5: Examples of related actions/options

CDP（The Carbon Disclosure Project）

- An NPO that promotes an enduring relationship between shareholders and corporations by working to provide a response to the effects of climate change on companies' worth and activities
- Publication and maintenance of a database of information pertaining to operational risk and opportunities for operations resulting from climate change and greenhouse gas emissions
- 2007 survey of 2400 major global corporations
- The various data collected will be put to work in fields ranging from policy making to consulting, corporate accounting, and market surveys
- Investments into CDP-participating organizations amount to 41 trillion dollars



Ref: http://www.cdproject.net/index.asp

Action 6: Swift and Smooth Logistics

Future Objectives

Thorough Removal of Waste by SCM

The idea and practice of "supply chain management" are widely accepted to optimize the overall business processes, where the flow of commodities from source of supply to final demand (consumption) including procurement of materials and parts, inbound logistics, production, outbound logistics and sales is captured as a "supply chain". In SCM, information is shared and managed jointly among companies participating in supply chains using advanced information communication technology. Through this, supply and demand are synchronized to promote reduction of inventory of goods and goods-in-process and swift flow of materials. As a result, production of unnecessary items are limited, thereby making industries more efficient.

Enhancement of Infrastructure for Railroad and Marine Logistics and Realization of Seamless Logistics Networks

Large-scale cargo logistic networks by ships and railroad between major centers are fully developed, and systems and infrastructures are constructed to enable smooth cargo transfer between different transportation modes at major unloading sites. As a result, long-distance logistics networks with low-carbon emissions and high efficiency are in place.

Local Logistics by High-efficiency Vehicles

Local logistics are based on motorized and hybrid cargo vehicles. Within central areas of urban cities, trolleys are also actively employed for collection and distribution of goods.

Action 6: Swift and Smooth Logistics

Implementation Barriers and Strategic Steps

SCM Promotion Period

For realization of overall optimization of business process following the introduction of SCM, it is necessary for all related companies to share necessary information. However, in some cases, due the cost of system introduction and resistance against the presentation of internal company information to other companies, only a limited number of companies participate to result in insufficient optimization. Therefore, cases of SCM will be evaluated in an investment-versus-result format, and superior cases will be announced. At the same time, the introduction of systems for sharing SCM on a network will be supported to decentralize and lower the investment expenses in order to enable participation of small- and medium-sized businesses. Furthermore, by implementing strategic approaches for rending the Japan-borne intra-and inter-business standards of electronic information into international standards, system cost will be reduced, further promoting their diffusion.

Infrastructure Preparation Period

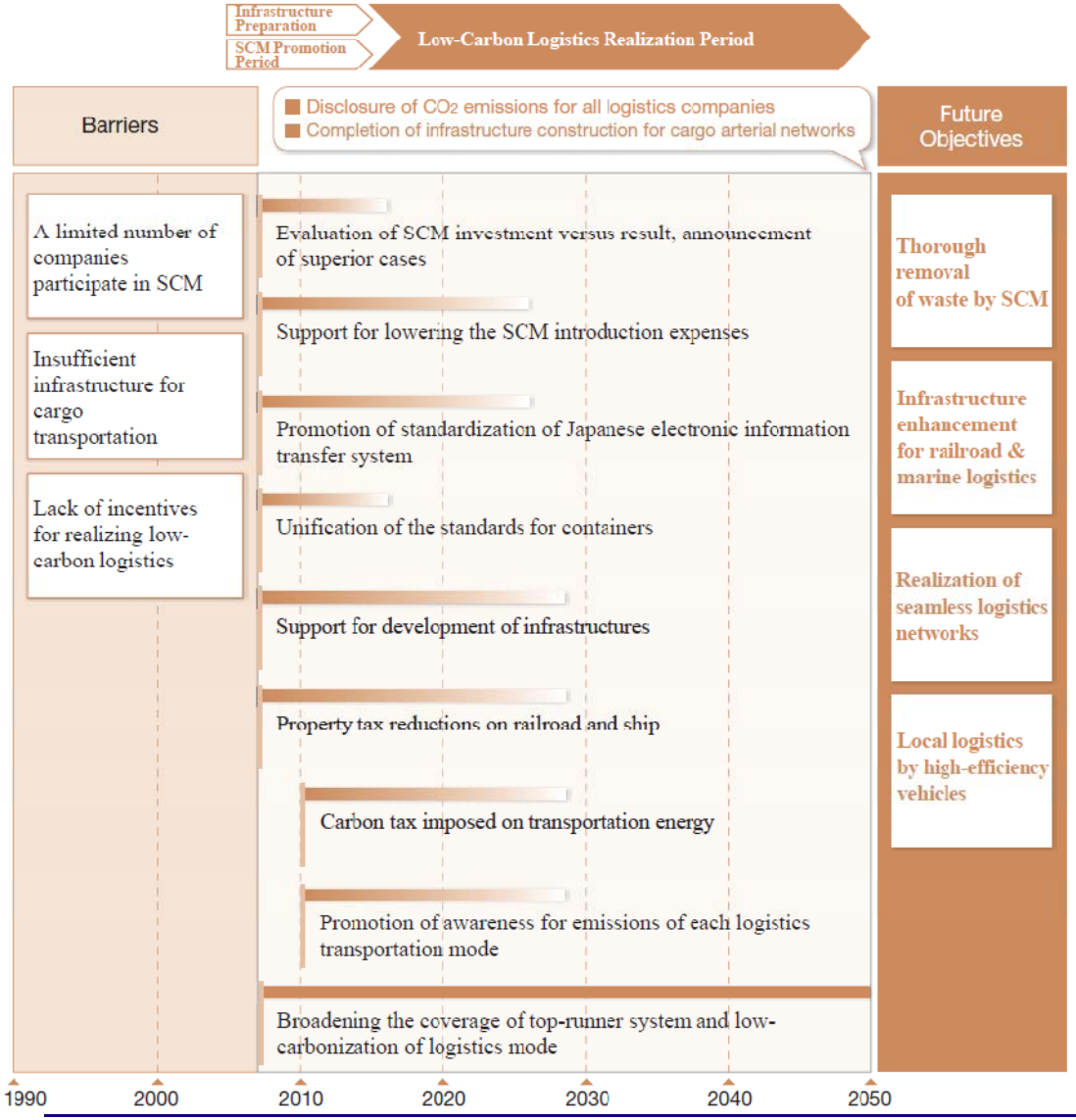
Various systems will be introduced to remove barriers among multiple transportation means, such as development and unification of new railroad containers with identical dimensions as the international standard (ship containers). At the same time, public subsidies will be given for construction of necessary infrastructures such as expansion of freight railways and terminals, purchasing of carrier trucks and expansion of container yard for empty containers at ports. Also, various tax reductions will be performed on railroad and shipping real estate tax among others. These measures will encourage infrastructure construction of arterial networks for cargos.

Low-Carbon Logistics Realization Period

By broadening the scope of target for Top-Runner Law to include not only all automobile vehicles but also other transportation modes, the efficiency of all logistics transport modes will be continuously improved. Moreover, in order to enhance the competitiveness of low-carbon logistic modes, imposed taxation will be proportionate to the percentage of carbon content of the transportation energy used. As well, by supporting diffusion of a real-time browsing system for vacancy conditions, CO_2 emissions, cost, lead-time, etc., of each available logistics mode, and by promoting widespread use of labeling systems such as Eco Rail Mark, "visualization" of greenhouse gas emissions caused by cargo transport will be advanced further, thereby providing cargo owners with an environment in which they can easily obtain information for selecting an appropriate logistics modes and companies.

Ref:

Action 6: Swift and Smooth Logistics



Contribution of Manufacturing and Logistics Industries

Active introduction of SCM to strengthen partnerships with other related companies. Presentation of all necessary information for overall optimization.

Contribution of Cargo Owners

Selection of transportation means with as low CO_2 emissions as possible.

Action 6: Examples of related actions/options

Collaboration between apparel companies and department stores (SCM of differing industries) (Japan)

- A system in which both industries work together to share information about demand, production, and sales estimations to increase mutual profitability by reducing “blemished stock” from returns and “missed sales opportunities” from shortages
- The negative cycle of the current system (refer to figure below, left)

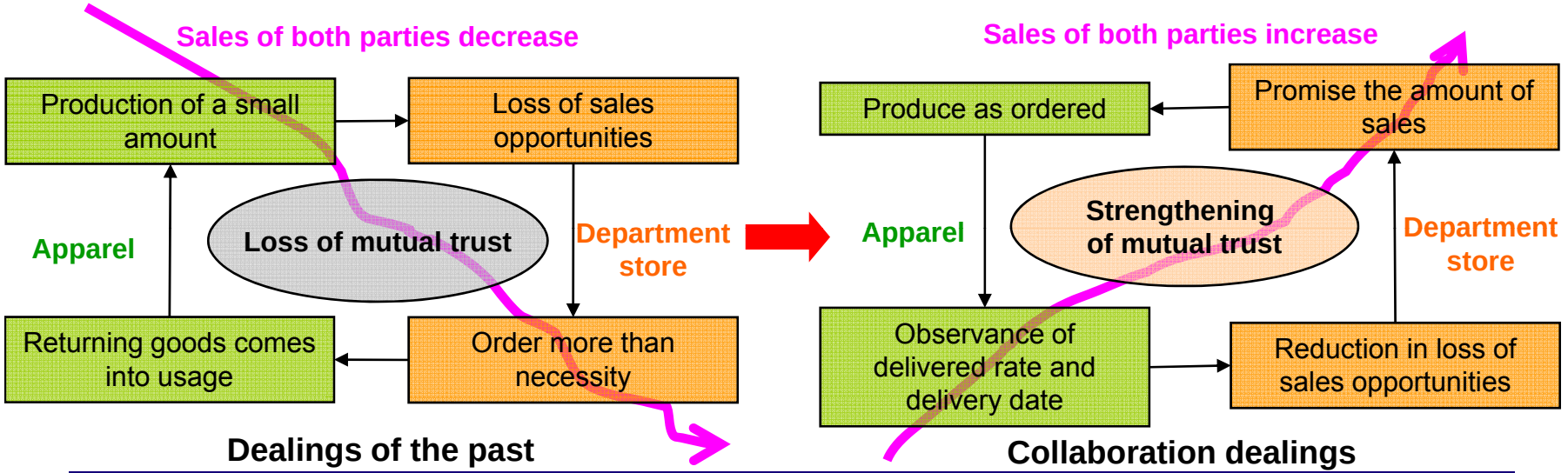
→a positive cycle from collaboration (figure below, right)

- With the current system, department stores lose an estimated 26% of clothing sales (approx. 880 billion yen in 2002) due to “missed opportunity”

→this is estimated to be reduced by 62% (approx. 550 billion yen) after reform of the system

- Department stores share data and collaborate with the apparel industry to perform market analysis

→develop products suitable for their markets



Ref: http://www.jri.co.jp/consul/report/pdf/report080218_shimomura.pdf

http://www.retech.jp/PDF/RT-200502.15/p10-11.pdf

Action 7:Pedestrian Friendly City Design

Future Objectives

Public Transport Linking Central Urban Areas

Facilities with high frequency of usage are located within central urban areas, while others with low frequency of usage are located somewhat away from those areas, assuring convenient city structures in each region. In addition, the central areas of all regions are connected with each other by public transportation networks, allowing for convenient use of public transportation.

Safe Walking Areas

Areas open to pedestrians and cyclists throughout the day are established in many sections of cities and suburbs. Since through traffic of cars and trucks are prohibited within these areas, persons in wheelchair and "senior car" (electric assistant scooter) can safely and comfortably travel.

Lightweight Electric Passenger Vehicles

Automobile vehicles are primarily driven in areas with relatively low-density land use, being used in combination with public transportation, park-and-ride, shared-taxi, carsharing and other approaches. Moreover, the standard types of vehicles are motor driven cars with batteries or fuel cells. The energy storage devices (secondary batteries, hydrogen storage devices) for these electric vehicles are highly advanced. This, together with the lightening of car bodies realized by the development of high-tensile steel, has greatly improved the operational energy efficiency of these cars. Many of the battery-car users perform quick charging at home, but there are some users who frequently use an exchange service for pre-charged car batteries for convenience.

Action 7:Pedestrian Friendly City Design

Implementation Barriers and Strategic Steps

Planning Period

In order to make citizens understand the public nature of land and to carry out city planning that is based on a medium to long term perspective, in cooperation with the citizens, the government needs to establish a plan for land use and transportation with a clear statement about the shift towards concentrated land use appropriate for a low-carbon society and declining population. In addition, through establishing it as the master plan for city planning and as a comprehensive plan, improvements on land use and transportation infrastructure, that reflect low-carbon perspective, will be made. Moreover, in order to promote the widespread use of motor driven cars, researches will be performed to develop energy storage devices (high-efficiency secondary batteries, hydrogen storage devices, etc.) and lighter car bodies as well as to improve the efficiency of public transportation.

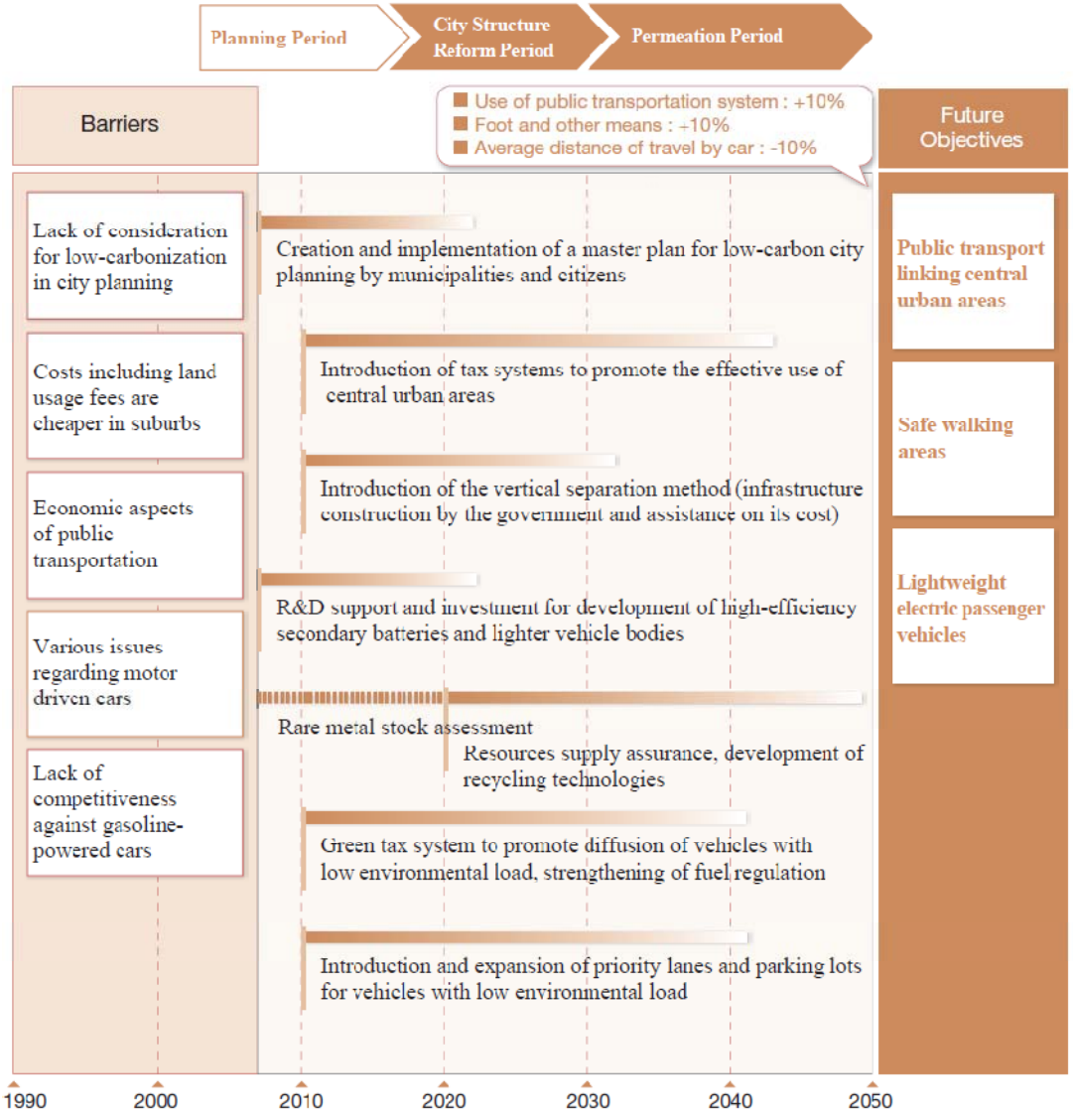
City Structure Reform Period

Special tax reduction measures will be introduced to central urban areas to induce effective land use and to accumulate facilities with high frequency of usage in areas within close proximity of public transportation. In addition, by adopting the vertical separation method that separates construction and maintenance of infrastructure from its operation, financial support will be distributed to many regional cities to promote introduction of commercial Light Rail Transit (LRT) and so forth. Moreover, for transportation by car, incentives for low-carbonization will be given to car owners in various aspects including the introduction of the green tax system, that promotes selection of vehicles with low environmental load throughout their lifecycle, as well as the establishment of priority lanes and parking spaces for these cars. For widely popular motor driven cars, strategies will be formed to ensure the supply of necessary amount of rare metals for secondary batteries, fuel cells and motors, while simultaneously conducting researches for alternative materials.

Permeation Period

In some areas, the possibility for realizing a low-carbon community will become clear, and its charm will attract people to move into the areas when they need to rebuild their houses, thereby forming concentrated residential areas. Regarding means of personal transportation, reduction in size and weight of the devices will improve further, expanding the market shares of such intra-urban transportation means as electric cars, electric wheelchairs, electric assisted bicycles and i-REAL.

Action 7:Pedestrian Friendly City Design



Contribution of Citizens

Participation in the planning and execution of a medium to long term plans for land use and transportation that are appropriate for a low-carbon society.

Contribution of Retailers

Active participation in reforming and process of shifting to central urban areas.

Ref:

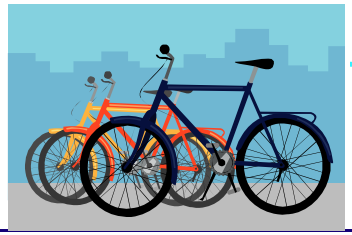
Action 7: Examples of related actions/options

Compact City (The City of Freiburg :Germany)

- Concentration of urban functions
- Establishment of pedestrian-only routes, implementation of transit malls
- Regulations on personal vehicle use (restrictions on entering the city center, promotion of park-and-ride)
- Promotion of bicycle use (establish and enrich bicycle-only routes and parking)
- Enrichment of public transportation (bus, LRT, train, etc.) and improve usability (efficient arrangement of stations and bus stops, offering commuter pass ticket discounts, etc.)

→Between 1982 and 1999

- The contribution of cycling to the city's volume of traffic increased from 15 to 28 percent
- Public transportation increased from 11 to 18 percent
- Distances driven by motor vehicles decreased from 38 to 30 percent.
- Freiburg has the lowest motor vehicle density in Germany today, with 423 motor vehicles per 1,000 people. c.f. London (UK) Portland (USA) Toyama (Japan)



Ref: http://www.freiburg.de/servlet/PB/menu/1140679_l2/index.html

Action 8:Low-Carbon Electricity

Future Objectives

Low Loss and Low Environmental Impact

In both coal-fired and natural gas power generations, combined cycles of ultra-supercritical turbines have become standard, achieving efficiency of over 55% in all power plants. There are also large-scale, advanced power plants that have achieved more than 60% efficiency. In addition, carbon capture and storage (CCS) equipments are installed to prevent as much CO_2 discharge into the outside air as possible. As such, the efficient systems for converting primary energy into secondary energy have become widely diffused.

Grid network for Enhanced Utilization of Renewable Energy

Together with large-scale solar power generators and wind power generators, output power leveling equipments such as batteries and hydrogen generators are installed to control their influences on the power system to a certain degree.

Appropriate Utilization of Nuclear Energy

Nuclear power plants are established based on agreements made between the government, electric companies and the citizens while taking into account the likely changes in the demand for and supply of electricity as well as development of other power-generating technologies. With mandatory requirement for total disclosure of safety-related information, appropriate waste management is carried out. Taking into account the perspective for the prevention of international nuclear proliferation, maintenance and operation are performed at the appropriate levels.

Energy Transport Network without Loss

For the central transmission grid within a jurisdiction area, ultra-high voltage transmission grid capable of transmitting 1 million volts is laid out. For transmission lines among electric power companies and between nuclear power generation facilities and places of high demand, extra-high voltage direct-current transmission is employed to reduce as much transmission loss as possible.

Action 8:Low-Carbon Electricity

Implementation Barriers and Strategic Steps

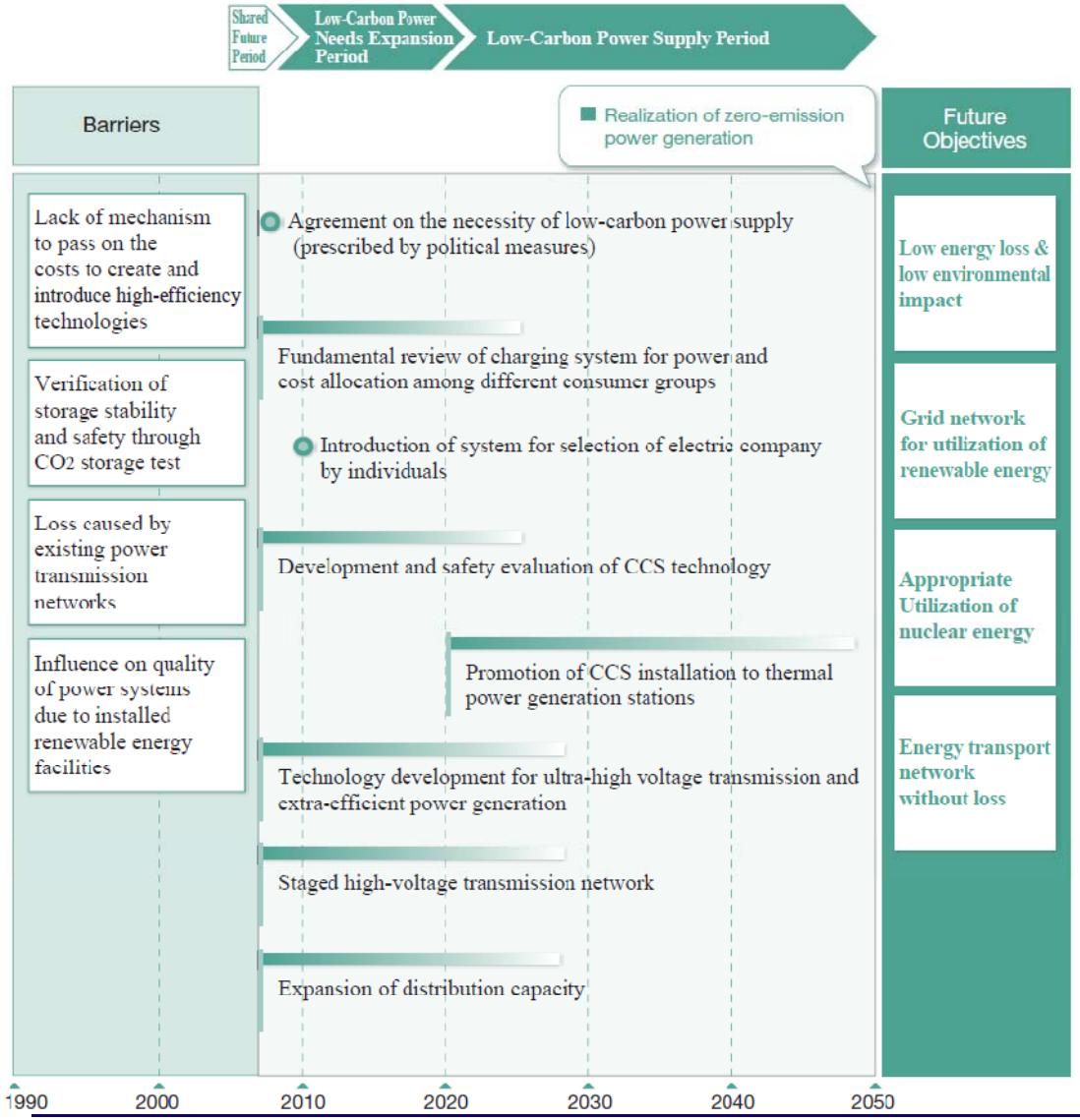
Shared Future Vision Period

Through partnerships among the government, electric companies and consumers, a system for having discussion on and sharing perspectives about the appropriate power supply over a medium-to-long term will be constructed. Based on these discussions, industries, academic sector, the government and the civilian sector will, in a collaboration with each other, promote the development of various technologies (ultra-supercritical turbines, ultra-high voltage electricity supply technology, CCS with low loss, technologies for management of electricity quality and so forth) that are essential for realizing the future objectives. Simultaneously, supply of low-carbon electricity will be prescribed by some political measures such as guidelines and incentives to actors other than the pre existing electric companies for entry and cooperation. Regarding nuclear power generation, the operation and maintenance practice in cooperation with safety-assurance organizations and under the watch of appropriate information disclosure system will be strengthened. Moreover, efforts will be made to achieve proper awareness of nuclear power generation among the general public through communication with non specialists. Furthermore, concerning the burden share of maintenance fees for quality electricity caused by introduction of renewable energy, the fee charging system for electricity will be reviewed thoroughly so as to pass on the maintenance fees to consumers while minimizing its influence on those with low income.

Low-Carbon Power Needs Expansion Period

To enable individuals to directly select an electric company, revisions will be made in the regulatory regime. At the same time, taxation systems related to electricity will be modified to become pro-environment. Through this, needs for low-carbon electricity among consumers will increase, resulting in added values of low-carbon power plants and transmission loss reduction. Technological developments will take place to realize practical applications of the CCS technology, ultra-high efficiency power generating technology and ultra-high voltage transmission technology roughly during this period. Based on long term guidelines, at the timing of upgrading infrastructure equipments of the power systems, electric companies will make progress on conversion to transmission lines with low loss, introduction of long distance direct current power lines as well as on capacity expansion of the transmission systems, thereby creating electricity distribution networks that are with low energy loss and can readily accept renewable energies.

Action 8:Low-Carbon Electricity



Contribution of Power Companies

Stable nuclear power management and thorough information disclosure regarding the upper limit of renewable energy introduction.

Contribution of Power Consumers

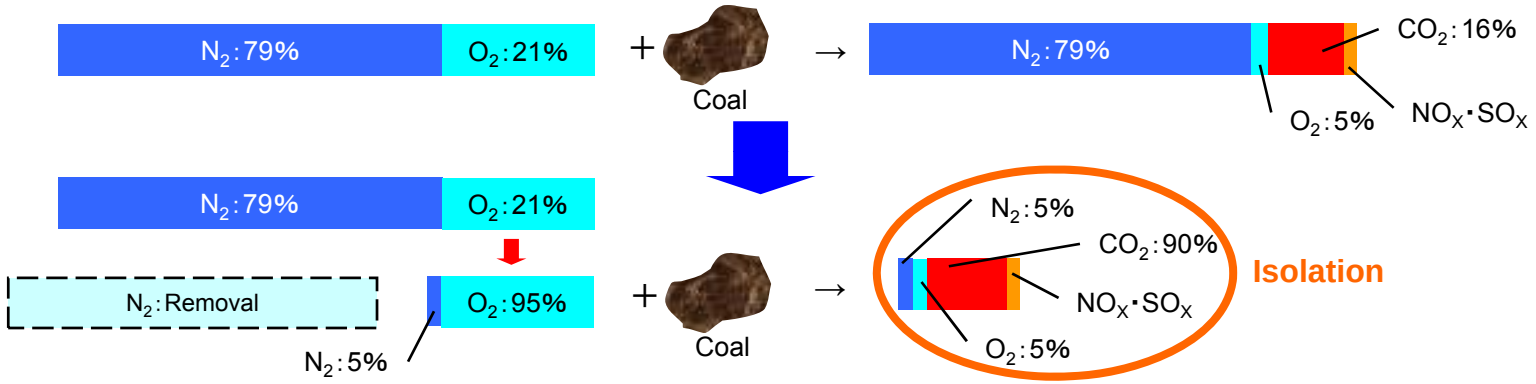
Selection of low-carbon electricity.

Action 8: Examples of related actions/options

Project to prove CCS Technology with coal heating power (IHI, electrical power resources development (JPOWER), Mitsui & Co., LTD.)

- The first project in the world to run an experiment to prove an integrated CCS technology (CO2 separation, recovery, transport, and storage) system by introducing oxygen-burning technology at a coal-burning electrical power plant (260 million AUS dollars (approx. 20 billion yen) estimated cost)
- Construction at the Callide Power Station A (generating capacity 30MW), 450 kilometers from Brisbane in Queensland, Australia, will be the site of renovation beginning in the first half of 2008
- The oxygen burning technology-enabled zero-emissions electricity production proving experiment is scheduled to begin at the end of 2010
- CO_2 will be collected deep in the earth west of the plant
- Because concentrated oxygen, from which the nitrogen has been removed, is used to burn the coal, it is simple to separate and collect CO2 from emitted gases
- Applicable at existing large-scale coal-burning power plants, the project aims to reduce CO2 emissions by more than 90%

Image of oxygen combustion technology



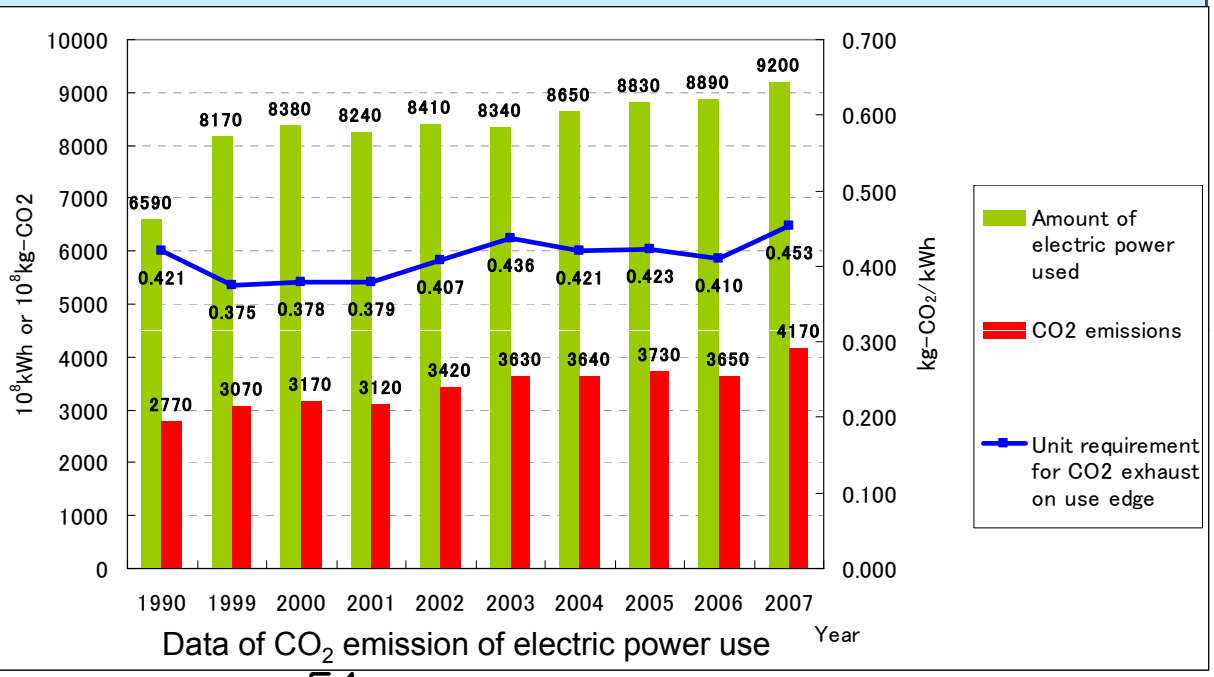
Ref: http://www.jpower.co.jp/news_release/news080331-1.html

http://www.mitsui.co.jp/release/2008/__icsFiles/afieldfile/2008/04/02/ja_080331_01.pdf

Action 8: Examples of related actions/options

Power industry initiatives aiming toward the realization of a low-carbon society (Japan: FEPC)

- Aim to reduce CO_2 emissions per unit activity of source to an average of 20% the 1990 values (0.34kg-CO2/kWh) between 2008 and 2012
- Expand nuclear power installation and usage, a non-CO_2-producing energy source
- Expand comparatively low-CO_2 emitting LNG-burning electrical power generation
- Develop and disseminate renewable energy sources such as hydro, geothermal, solar, wind, and biomass
- Introduce LNG combined-cycle technology and high-efficiency coal combustion methods to improve the efficiency of electrical generation via combustion
- Improve the efficiency of electrical transmission and decrease losses



Data of CO_2 emission of electric power use

Ref: http://www.fepc.or.jp/future/warming/index.html

Action 9:Local Renewable Resources for Local Demand

Future Objectives

Life Supported by the Sun

Low cost photovoltaic systems are installed in all residences and buildings. Since they are designed not to spoil the aesthetic aspect, it is possible to install them on various parts of buildings including the roof, walls and windows. In many cases, photovoltaic are installed in not only residences and buildings but also in fallow lands for the purpose of selling the generated power.

Regional Symbol Wind Power

On land, installation of large scale windmills have become common practice at locations with favorable wind conditions including the coastlines, plateaus, arable lands, and grazing lands. Having been introduced with serious consideration for the eco-system, in some regions they have become regional symbols. On the oceans, large scale ocean wind farms comprising relatively large windmills are in place, converting the generated energy into a storable and transportable form such as hydrogen which then is collected regularly.

Local Production and Consumption of Renewable Energy

Solar power generators and wind power generators are equipped with energy storage devices, enabling stable electricity supply. A part of generated electricity is used for the hydrogen production, which in turn is supplied to fuel cells in residences and offices and even to fuel cell vehicles. Also, beyond individual energy storage systems, some regions have their own electricity supply systems that adjust demand and supply of electricity within the regions by joint utilization of solar, wind, biomass, hydrogen, geothermal power generations as well as small and medium scale hydropower. As a result, the volume of power generation from renewable energy has reached approximately 15%-20% of total electricity demand.

Action 9:Local Renewable Resources for Local Demand

Implementation Barriers and Strategic Steps

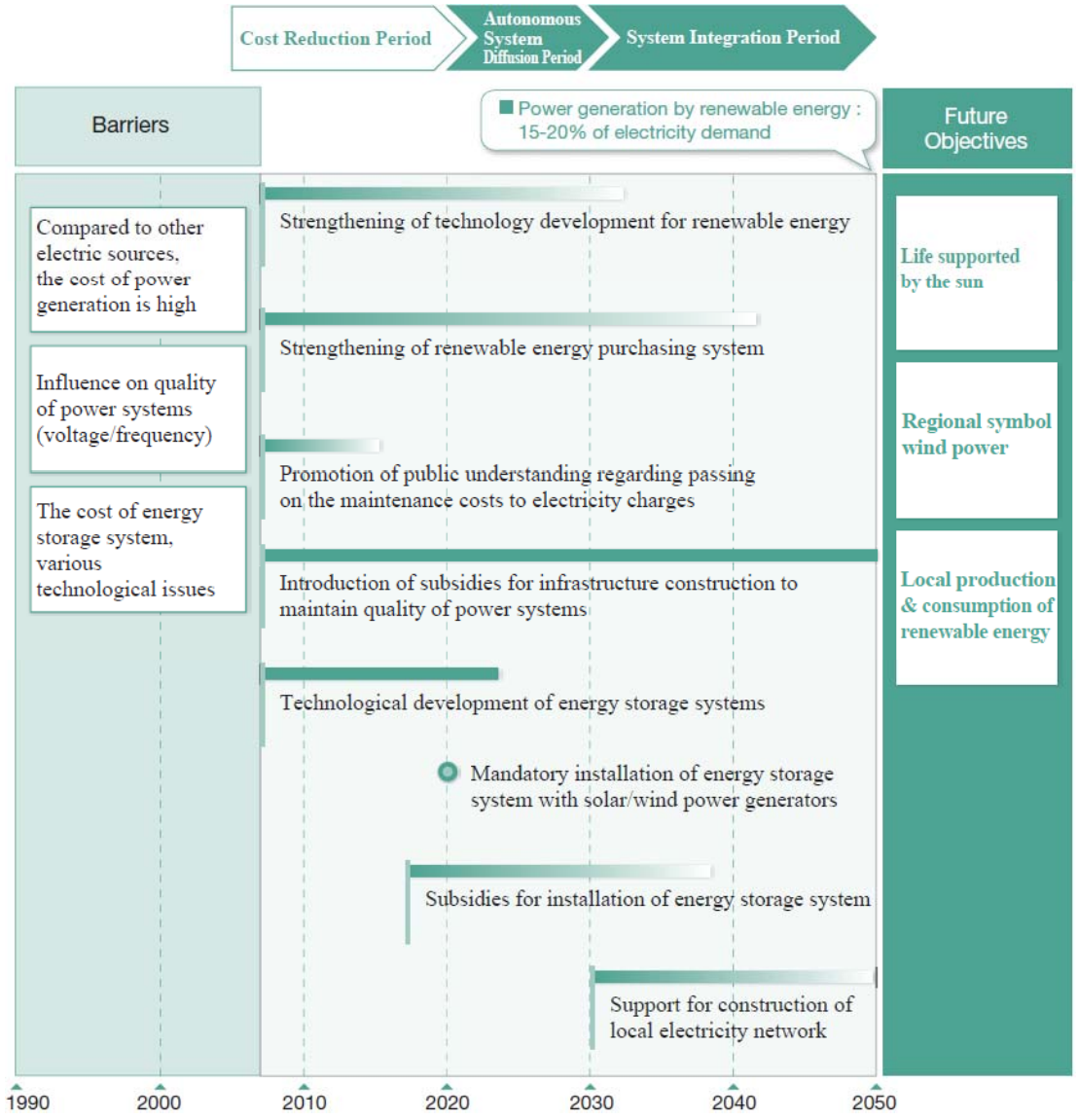
Cost Reduction Period

For the diffusion of renewable energy including solar power generation and wind power generation, various kinds of technology development programs will be reinforced in order to address the greatest immediate challenge of cost reduction. Also, for cost reduction to realize, scale merits of mass diffusion is also effective. To support this end, electric companies' purchasing price for generated electricity (or excess electricity) from renewable source will be increased. Installation will be supported further by ensuring the purchasing price at the time of installation for a fixed period (e.g., 15-25 years). Even though the purchasing price will be reduced annually due to reduction of various system costs, reductions will be performed following a clear announcement of long-term changes in the purchasing price so that renewable energy generation companies can make safe capital investment. On the other hand, the large scale introduction of renewable energy may possibly cause influence on voltage and frequency of power systems. Thus, technology development for storing energy will be promoted to support the establishment of electricity storage technology and hydrogen production technology that are low in cost, small in size and high in quality. Furthermore, certain amount of subsidies will be given to electric companies when they enhance electric lines and make other capital investments to improve quality of power systems. At the same time, publicity activities will be performed to promote public understanding of passing on the additional maintenance costs of high quality electricity to consumers through electricity charges.

Autonomous and grid-independent System Diffusion Period

For new installation of solar power generators and wind power generators, while making it mandatory to install them in combination with energy storage systems, subsidies will be given for installation of the energy storage systems. By doing so, diffusion of autonomous and grid-independent system for renewable energy generation will be promoted while minimizing its influence on existent power systems.

Action 9:Local Renewable Resources for Local Demand



Contribution at Home and Buildings

Active introduction of renewable energy (e.g., solar power generation).

Contribution of Power Companies

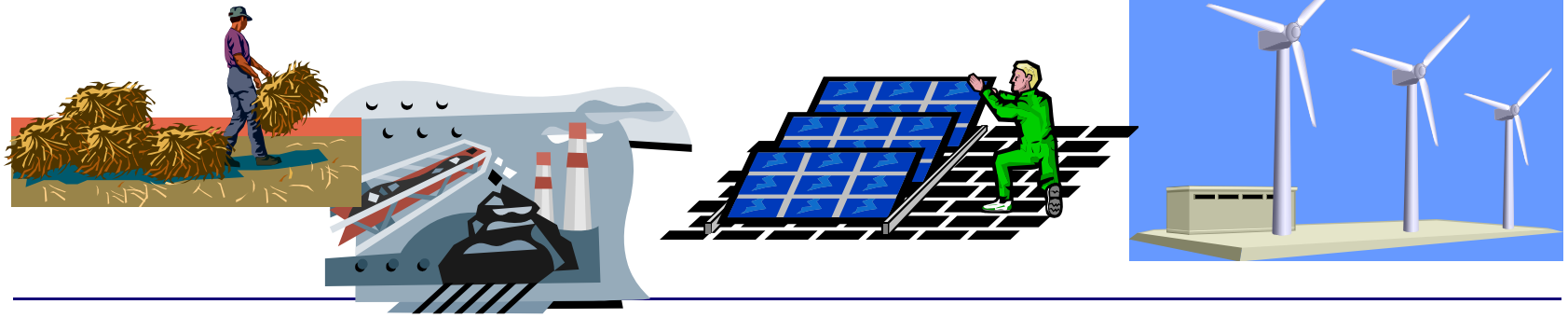
Taking into account the possible expansion of renewable energy when enhancing electric power systems.

Action 9: Examples of related actions/options

Samsø's Renewable Energy (Denmark)

- Under the "Denmark Natural Energy Island" national plan, the country aims to run on 100% natural energy within 10 years of 1998
- Electrical power already comes from 100% natural sources
- The country has 11, 1MW windmills operating on land, and 10, 2.3MW units operating in the ocean (all owned by citizens of Denmark). The sea-based units produce enough power to sell some to the mainland, the proceeds from which a portion is invested into energy development in Denmark.
- Many organizations are involved in the project, and the participation of stakeholders is seen as very important. Workshops and other education-promotion activities, as well as consultations, are plentiful.
- Heating comes from woodchip burning and solar-thermal collection plants, as well as plants that use straw. As of now, 200 locations have installed solar thermal heating systems.

c.f. Feed-in Tariff（Germany）



Ref:http://www.isep.or.jp/kako/samsoe.html
http://www.energiakademiet.dk/default_uk.asp

Action 10:Next Generation Fuels

Future Objectives : Hydrogen

Dominance of Low-Carbon Hydrogen

In addition to by-product hydrogen generated by industrial processes, hydrogen is produced at reforming plants with CCS and by electrolysis at ocean wind farms. The production methods that do not cause greenhouse gas emissions have become dominant. In addition, the hydrogen produced is transported mainly through pipelines to be used for logistics, power supply adjustment and fuel for fuel cells.

Implementation Barriers and Strategic Steps : Hydrogen

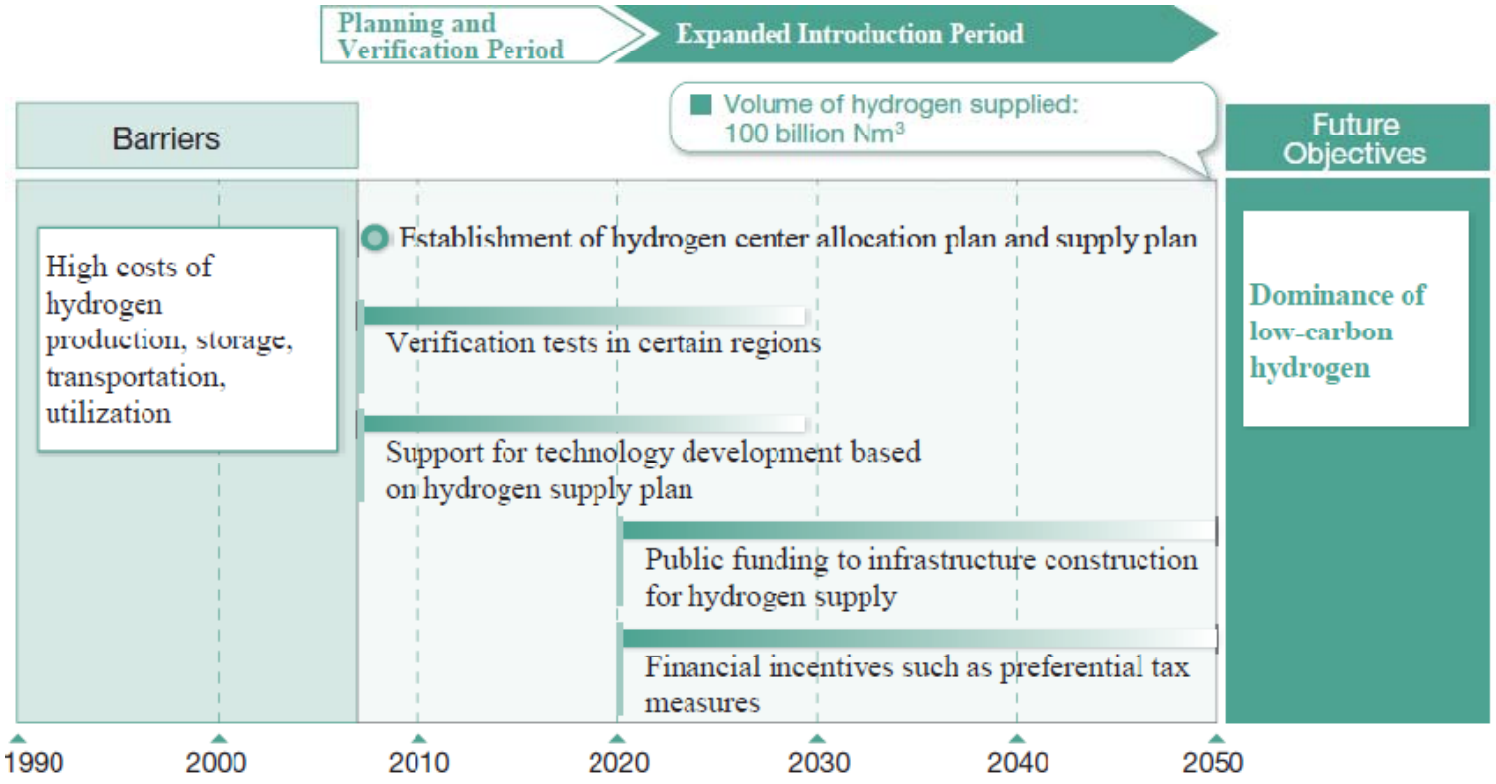
Planning and Verification Period

With future hydrogen demand in mind, plans will be made for hydrogen supply and production center allocations, taking into account the regions with high demand so that the necessary infrastructures can be minimized. First, some areas in which the use of hydrogen is relatively easier will be chosen; they need to have pre existing hydrogen production facilities, such as by-product hydrogen source from some existing plants. Within these limited areas, necessary infrastructures for hydrogen transportation and storage will be constructed, and supply of hydrogen will be commenced. As one of the supply destinations, fuel cell buses will be in operation around these regions. Simultaneously, hydrogen utilization technologies will be improved further to achieve lower cost and higher efficiency. Furthermore, based on the hydrogen supply plan, support will be given to the development of technologies that are necessary from a long-term perspective, including hydrogen production from renewable energy, hydrogen storage and transportation technologies.

Expanded Introduction Period

At the same time as expanding the hydrogen-supply areas based on the hydrogen production center allocation plan, support will be given to encourage the connectivity among these areas. For example, public funding will be provided for preparation of infrastructures for arterial hydrogen transport pipelines between a hydrogen production center and large consumption areas. On the other hand, low-carbon hydrogen production will be made dominant by introducing financial incentives such as preferential tax measures according to the emission units of hydrogen produced.

Action 10:Next Generation Fuels



Action 10:Next Generation Fuels

Future Objectives : Biofuel

Stable Supply of Biofuels

Biomass production and utilization plans suitable for each region are created, and food, lumber, animal feed and so forth are produced according to the plans. At the same time, the waste-type biomass generated within each region is also utilized to the full extent. Although shortfall within Japan is covered by importation from overseas, an international agreement on the management of biomass resources is concluded to ensure pro-environmental production method and low environmental load. In cases where liquid fuels are desired, as in fuels for logistics, liquid fuels derived from biomass are used on a priority basis. Moreover, the market share of bioenergy for heat and electricity is on the increase.

Implementation Barriers and Strategic Steps : Biofuel

Utilization Expansion, Cost Reduction Period

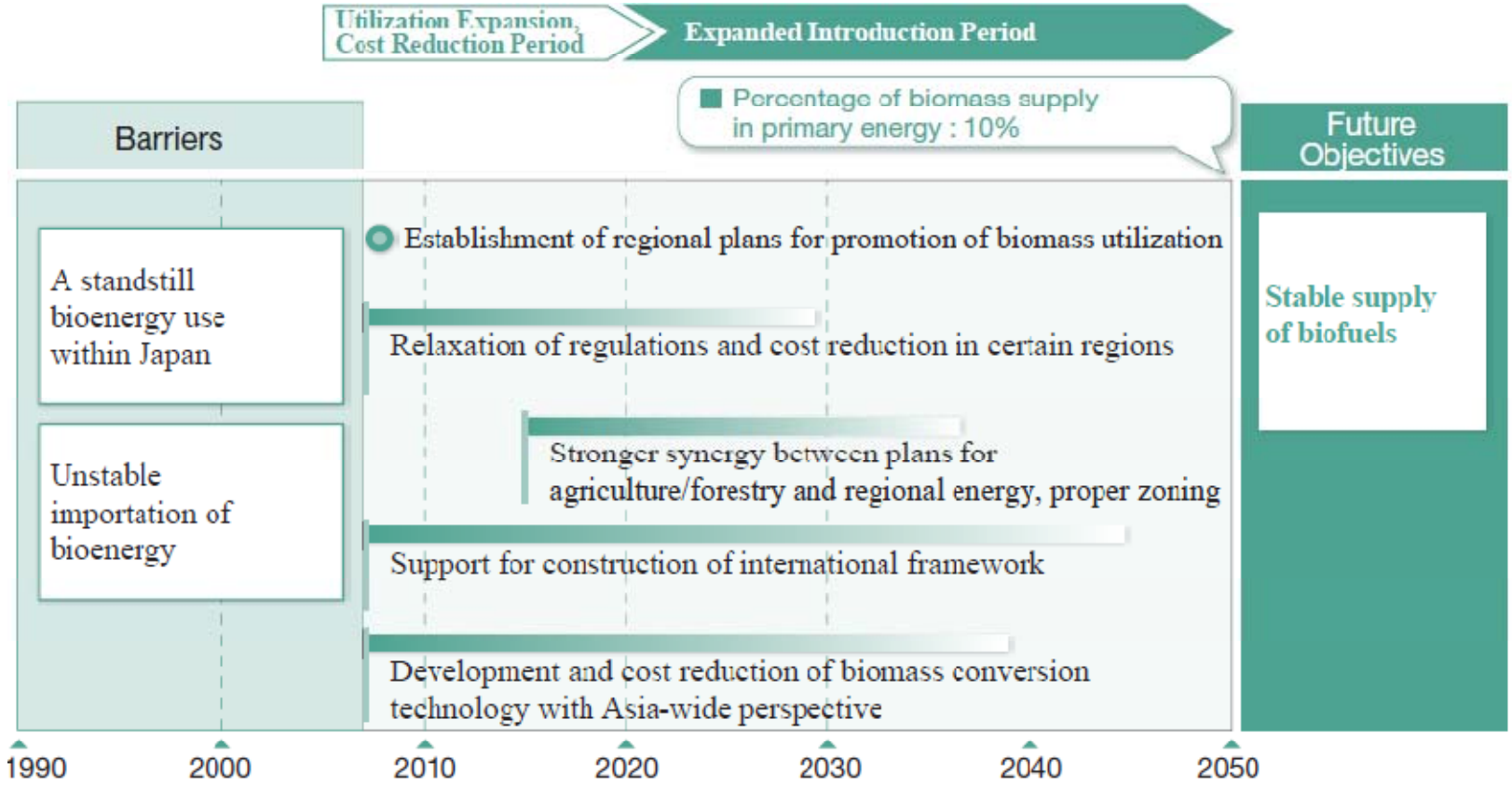
Although expansion of biomass utilization is sought in many regions, the high costs of collecting and transporting the materials and energy conversion make it difficult. To add to that, the existing restrictions hinder the utilization of low quality bioenergy and energy production by mixed processing of biomass. Along with lowering of the costs and relaxing of the regulations, it is necessary to assure that energy is supplied in a sustainable way by the use of Life Cycle Assessment (LCA) methods and so forth.

Expanded Introduction Period

The synergy between a region's agricultural and forestry plan and energy demand/supply plan will be strengthened. Through zoning with consideration for land application, the self-sufficiency for food, lumber and energy of the region will be increased, thereby introducing an additional value of local sustainability to the products. Development and cost reduction of biomass-conversion technologies should be performed on a perspective that includes biomass utilization in not only Japan but entire Asia. Although shortfall within Japan is covered by importation from overseas, support will be given for construction of an international framework to properly evaluate the environmental load during the production processes.

Ref:

Action 10:Next Generation Fuels

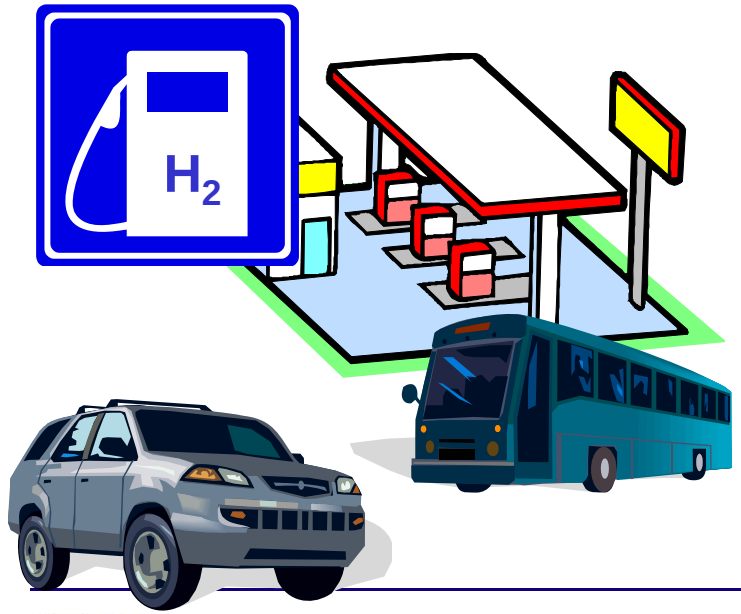


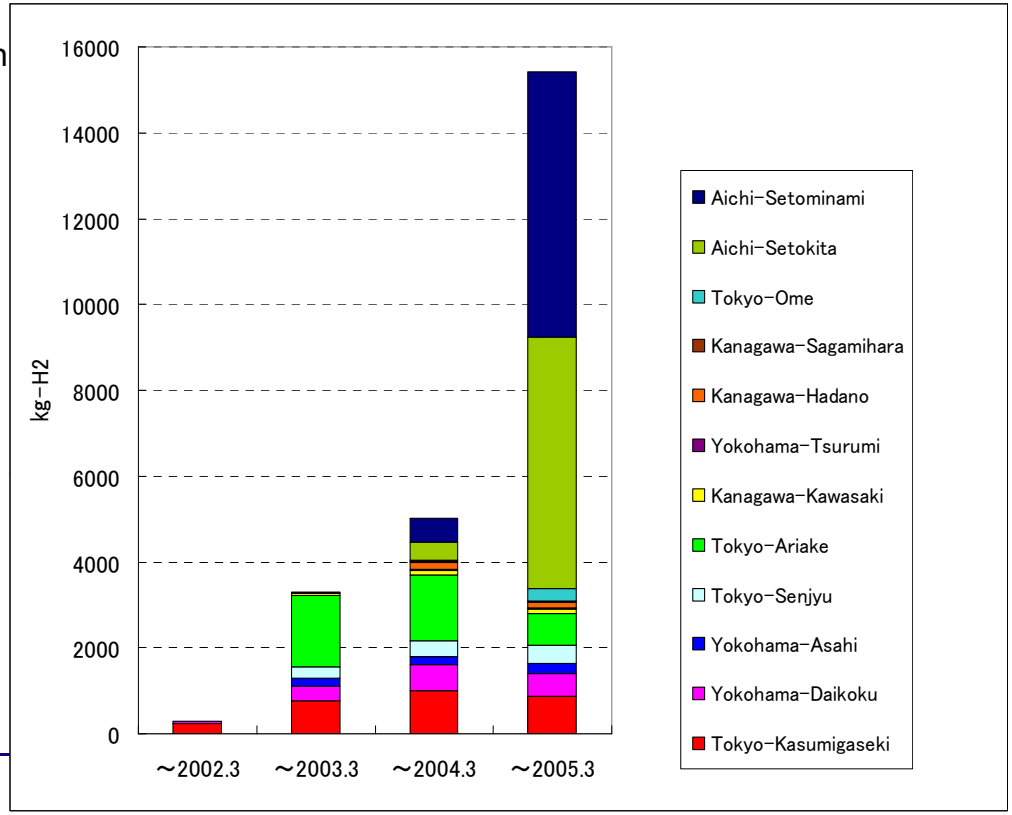
Action 10: Examples of related actions/options

JHFC (hydrogen fuel cell project) (Japan: METI)

- A project organized from the “fuel cell vehicle research” and “hydrogen infrastructure research” projects, subsidized by the Japanese Ministry of Economy, Trade, and Industry
- Goal: to gather and communalize data on energy efficiency, safety, environmental characteristics, fuel cell vehicle (FCV) performance under current usage legislation, and hydrogen extraction techniques from various precursors; and to determine paths to full-blown production and dissemination

Operation results of hydrogen supply station
(amount of hydrogen supply)





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Ref: http://www.jhfc.jp/e/

Action 10: Examples of related actions/options

Biomass cellulose disassembly (Japan: RITE)

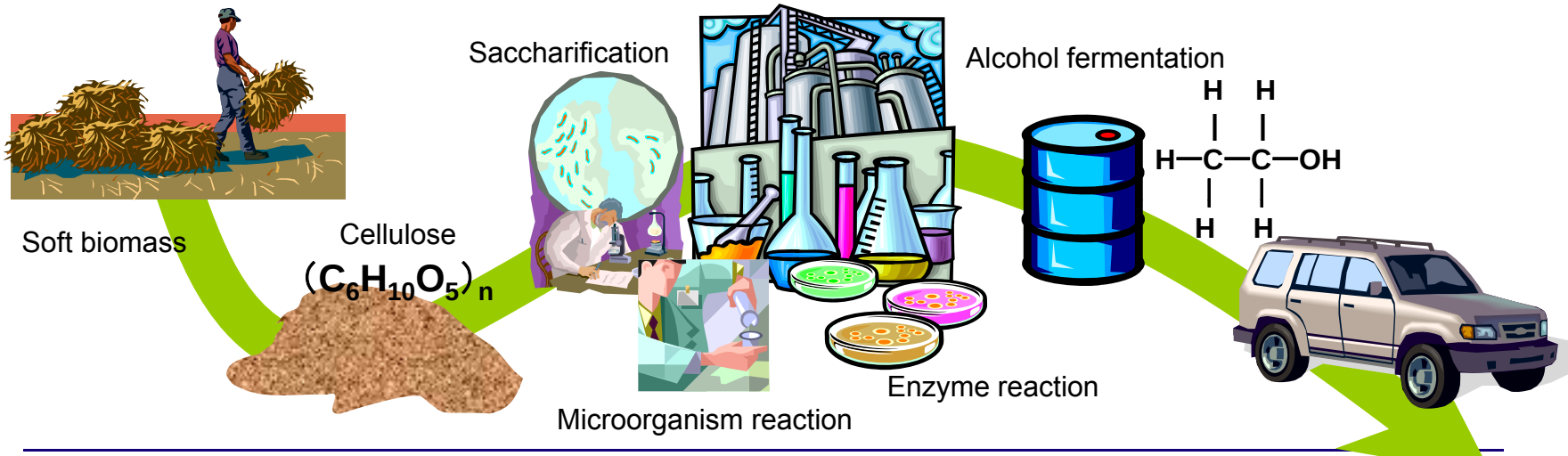
・Because current methods of converting biomass into fuel rely on the sugars and starches of precursors such as corn and sugarcane, production competes with food security

→Because demand is so great, we must develop technology that utilizes the non-edible cellulosic portions of biomass

・Research into cellulose disassembly from comparatively low-lignin-content “soft biomass” (switchgrass and other crops, stems and leaves from corn and rice and other agricultural plant waste, etc.)

・Research and development of technology that effectively utilizes microbes and enzymes to saccharify cellulosic biomass; research into technology for fuel production

Example: Honda’s collaborative research into bioethanol conversion technology (in April 2007, Honda built a pilot plant in their research facility and the practice run of a Flexible Fuel Vehicle used bioethanol to drive is planned.



Ref: http://www.rite.or.jp/Japanese/labo/biseibutsu/01/01_top.html

Action11:Labeling to Encourage Smart and Rational Choices

Future Objectives

Visualization of Energy-saving Efficiency

For residences and offices, digital meters (smart meters) for electricity and gas usage are introduced widely, enabling accurate and real-time calculation of energy consumption and CO_2 emissions for usage of each device. In addition, all newly-built houses and offices come with LCS navigation system. Besides performing automatic control of air-conditioning and lighting equipments, this system displays obtained information in a user-friendly way, providing advices for enhanced energy savings and CO_2 reduction in accordance with the activity pattern and lifestyle of each consumer. Many of these systems are provided in combination with various services including functions for assuring security and comfort of the elderly and monitoring functions for security at homes and offices.

Visualization of Environmental Information of Products

At the time of purchasing a product, consumers can retrieve easy-to-read information regarding each product's environmental efficiency (such as lifecycle environmental load) and various merits of selecting the product by scanning its tag using a mobile terminal. Moreover, for electric appliances, their operational conditions are sent to their manufacturers via a network so that the owners can receive appropriate directions (advices for repairs, upgrading, disposal methods, etc.) from the manufacturers.

Action11:Labeling to Encourage Smart and Rational Choices

Implementation Barriers and Strategic Steps

Foundation Preparation Period

In order to achieve widespread installation of smart meters that form the foundation for the LCS navigation system, a clear diffusion target (such as installation to all residences and offices within 5 years, etc.) will be established, followed by publicity campaigns to consumers and financial support for introduction costs to electricity companies. On the other hand, in collaboration with retailers including convenience stores, supermarkets, co-ops and electronic stores, displaying of lifecycle environmental load information (carbon labeling) will be done on those products for which information can be easily obtained (such as products designed by the retailers). At the same time, manufacturers willing to participate in these systems will be recruited widely to steadily increase the range of products for displaying environmental information, thereby progressing the accumulation of necessary data and know-how for labeling. For the system planning, standards for the calculation method for environmental load and the details of labeling display will be created. Furthermore, a carbon labeling certification system operated by a third party will be in place to ensure that the consumers can compare environmental loads of multiple products with unified indices.

System Introduction and Integration Period

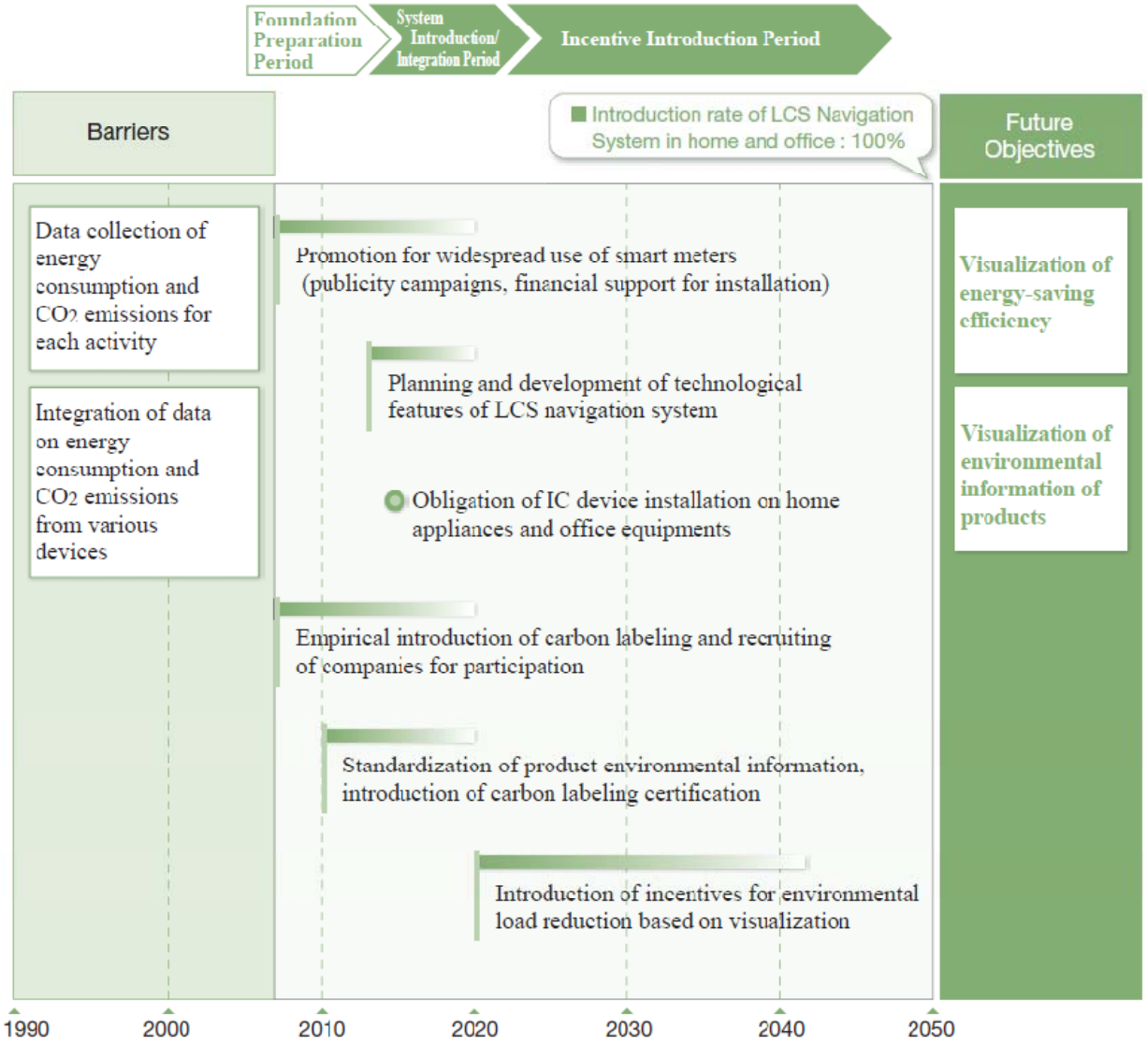
For development of the LCS navigation system that integrates and displays various information, it is crucial to thoroughly comprehend the needs of the users from the developmental stage. Thus, potential system users will be selected for hearing sessions to grasp their needs. Based on these needs, discussion sessions for a number of developers, experts and users will be held. Based on the specifications determined in these sessions, system developers will be recruited openly. While giving incentives for developing the system to the system developers by grasping the needs of users and ensuring a certain level of demand, efforts will be made to pursue the realization of system designs with desired functions, price, and entertainment features. Furthermore, for home electronics and office equipments, manufacturers will be obligated to equip their products with an information communication function to transmit environmental information, and the unification of systems will be promoted so that information of all equipments will be available on the LCS navigation system.

Incentive Introduction Period

Through utilization of the carbon labeling system and LCS navigation system, the government and companies will introduce incentive systems for reduction of environmental load of individuals and businesses. The resulting enhancement in environmental awareness among individuals and businesses will then permeate low-carbon lifestyles and business-styles.

Ref:

Action11:Labeling to Encourage Smart and Rational Choices



Contribution of System Users

Active introduction of LCS navigation system, practicing low-carbon lifestyle.

Contribution of System Developers

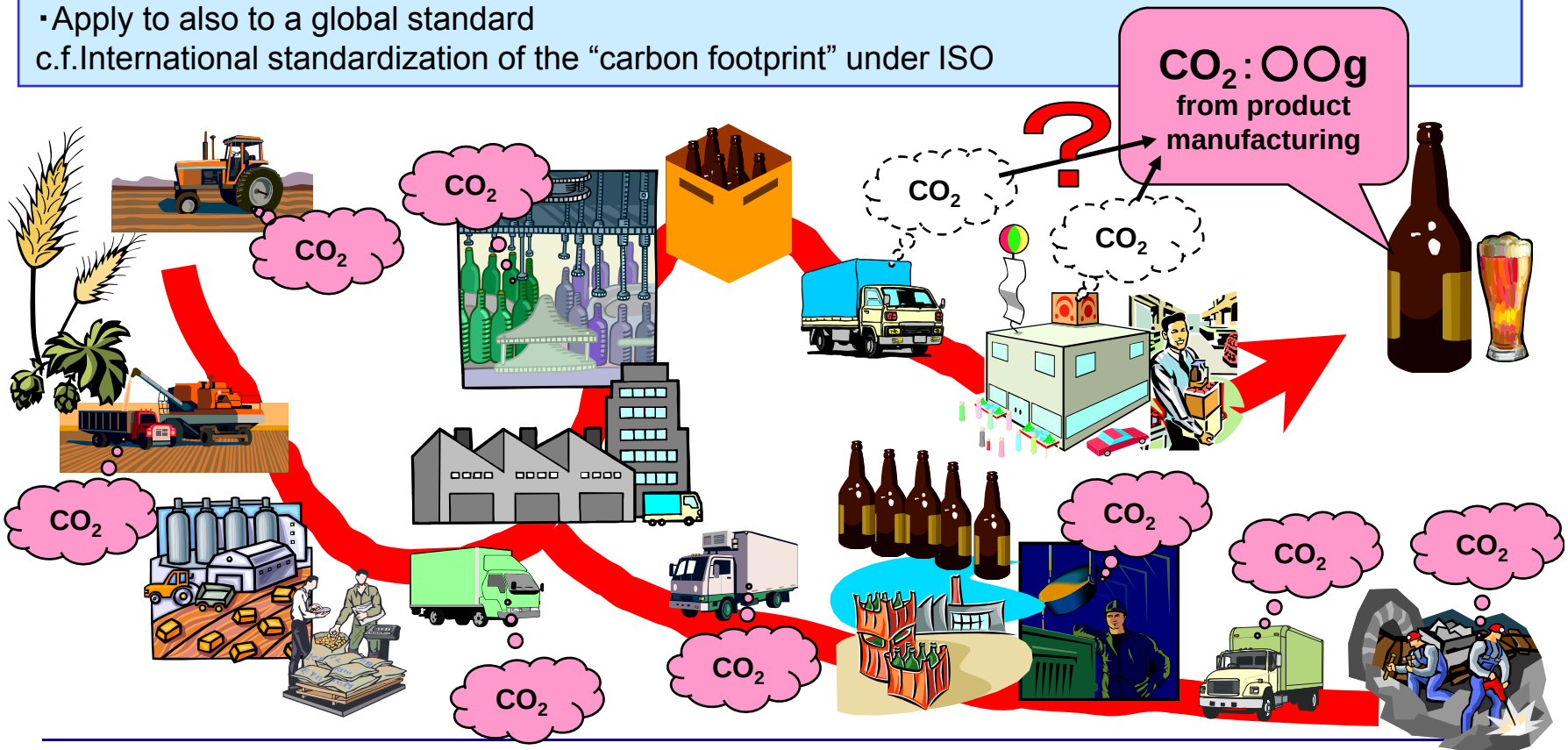
Develop a product that matches users' demand.

Action 11: Examples of related actions/options

Systemization of Carbon Footprint (UK: BSI, Carbon Trust, Defra)

- Development of a technique by which companies can estimate the GHG impact of a their products, including an extensive range of products and services applicable to the supply chain
- Three guidelines are currently under consideration which would revise the current British Standard PAS2050 in an effort to create a carbon footprint program. These should be decided on by the end of October.
- Apply to also to a global standard

c.f.International standardization of the “carbon footprint” under ISO

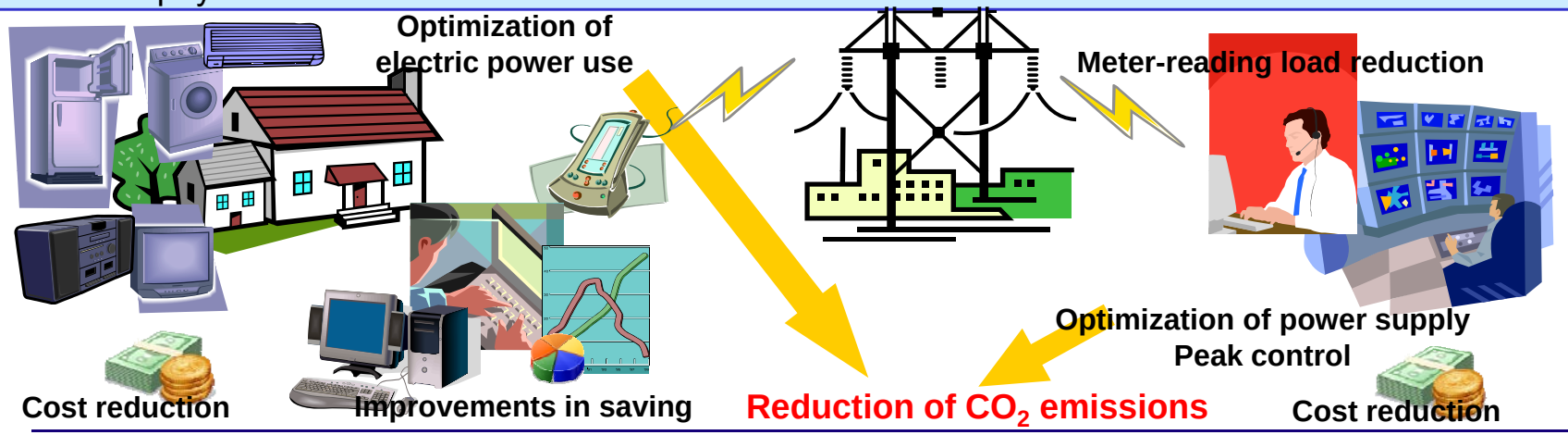


Ref: http://www.bsi-global.com/en/Standards-and-Publications/How-we-can-help-you/Professional-Standards-Service/PAS-2050/

Action 11: Examples of related actions/options

Smart Meter (Center Point Energy : USA)

- Center Point Energy is a company providing electrical power to the capital of Texas, and gas to neighboring states. Their combined gas and electric customers total 5 million (approx. 2 million electric, 3 million gas).
- Approx. 10,000 customers received Smart Meters for a pilot program (with permission from the appropriate regulatory agency)
- Development of the program includes developing the below in a customer portal (a website providing information and services to customers)
  - Meter maintenance (for the power company): Connection/cessation of power, remote meter reading, control of in-home appliances (cutting power in case of rationing)
  - Checking amount of power used, comparing costs: Customers may review the past 12 months and check power usage per week or per day, as well as comparing rates with other retailers.
  - Usage analysis: Assessment of air conditioning costs (comparison with outside air; monthly comparisons possible) automatic control of air conditioning temperature settings according to how much a customer wants to pay



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Ref: http://www.centerpointenergy.com/home
http://www.meti.go.jp/committee/materials/downloadfiles/g71101c04j.pdf

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Action 12:Low-Carbon Society Leader ship

Future Objectives

Nurturing of Specialists

With the number of researchers and specialists of global warming who belong to a university, graduate school or research institute reaching nearly ten thousand, understanding about countermeasure technologies against global warming have advanced. Moreover, "low-carbon advisors" are professionally active in the society; they have extensive knowledge about global warming and provide multifaceted advices to reduce CO_2 emissions at home and in business activities. The number of persons with this certification exceeds fifty thousand.

Sharing of Knowledge and Information

The basic knowledge of global warming and its various countermeasures are disseminated to persons of all generations through environmental education at school, training sessions at companies and so forth. In addition, all types of media including TV broadcasting and newspapers always provide new information such as findings gained through the latest researches. Other than that, by organizing various environmental events and online information exchanges regarding practice of eco-life, information and knowledge for establishing a low carbon lifestyle and business-style are being shared to a greater extent.

Permeation of Low-Carbon Lifestyle and Business-style

It has become natural for even the general public to have correct science-based awareness about global warming and to practice a low-carbon lifestyle or business-style based on that knowledge. Furthermore, an increasing number of people are making voluntary actions to realize a low-carbon society, actively participating in city planning and local administration of their own and neighborhood regions.

Action 12:Low-Carbon Society Leader ship

Implementation Barriers and Strategic Steps

Education Style Establishment Period

Educational materials and curricula will be created to match the age of learners. Morecver, to cause child-to-parent and child-to-sibling spill-over effect of dissemination of environmental awareness, educational programs that require participation of parents and children will be developed. On the other hand, to improve the knowledge level among teachers, a subject related to environmental problems will be added to the employment examination for teachers, in addition to organizing environmental training sessions for teachers. To construct the certification system for low-carbon society advisors, experts will be gathered for discussions. In cooperation with NGOs and companies, provision of proper information to the general public will be achieved through holding of environmental events and training sessions as well as construction of websites for providing and exchanging information.

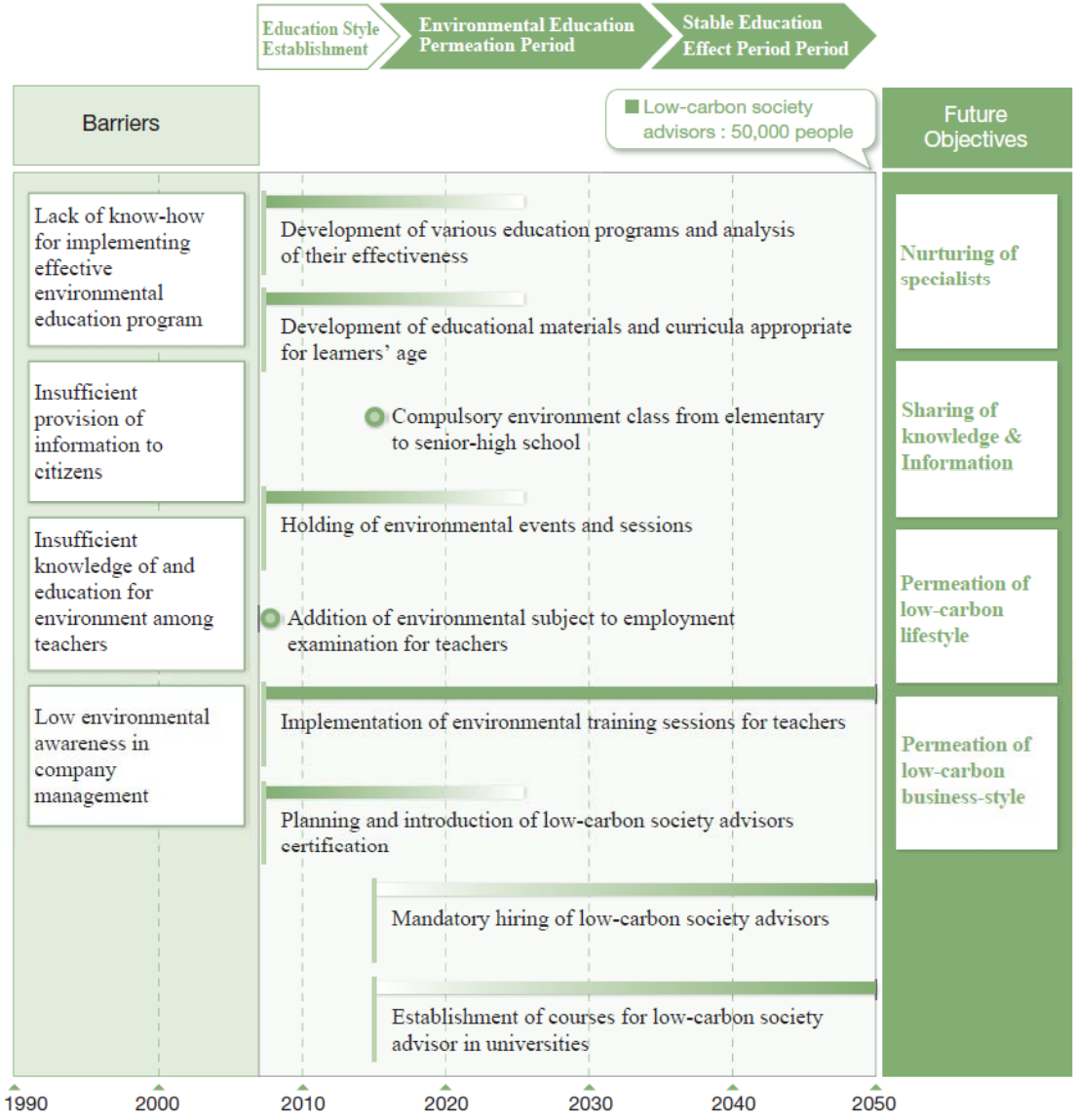
Environmental Education Permeation Period

In educational institutions from elementary, junior-high to senior-high schools, environmental education will become a compulsory subject, implementing various educational programs. Along with the introduction of certification system for low-carbon society advisors, special courses for obtaining the certification will be established in universities and graduate schools. Furthermore, for companies, hiring of a certain number of low-carbon society advisor certification holders will be mandatory, and directions will be given to make all the employees attend sessions by low-carbon advisors regularly.

Stable Education Effect Period

The need for countermeasures against environmental problems will permeate to the citizens, and when introducing a new countermeasure, effective and appropriate education and publicity activities will be performed. Educational materials will be continuously revised based on new findings. Furthermore, in order to assure continuous interest of the citizens in environmental problems, opportunities will be provided for them to have discussions on environmental education, environmental administration and so forth.

Action 12:Low-Carbon Society Leader ship



Contribution of Schools, Companies and NGOs

Transmission of information based on the latest scientific findings. Innovations to assure continued interest in environmental problems.

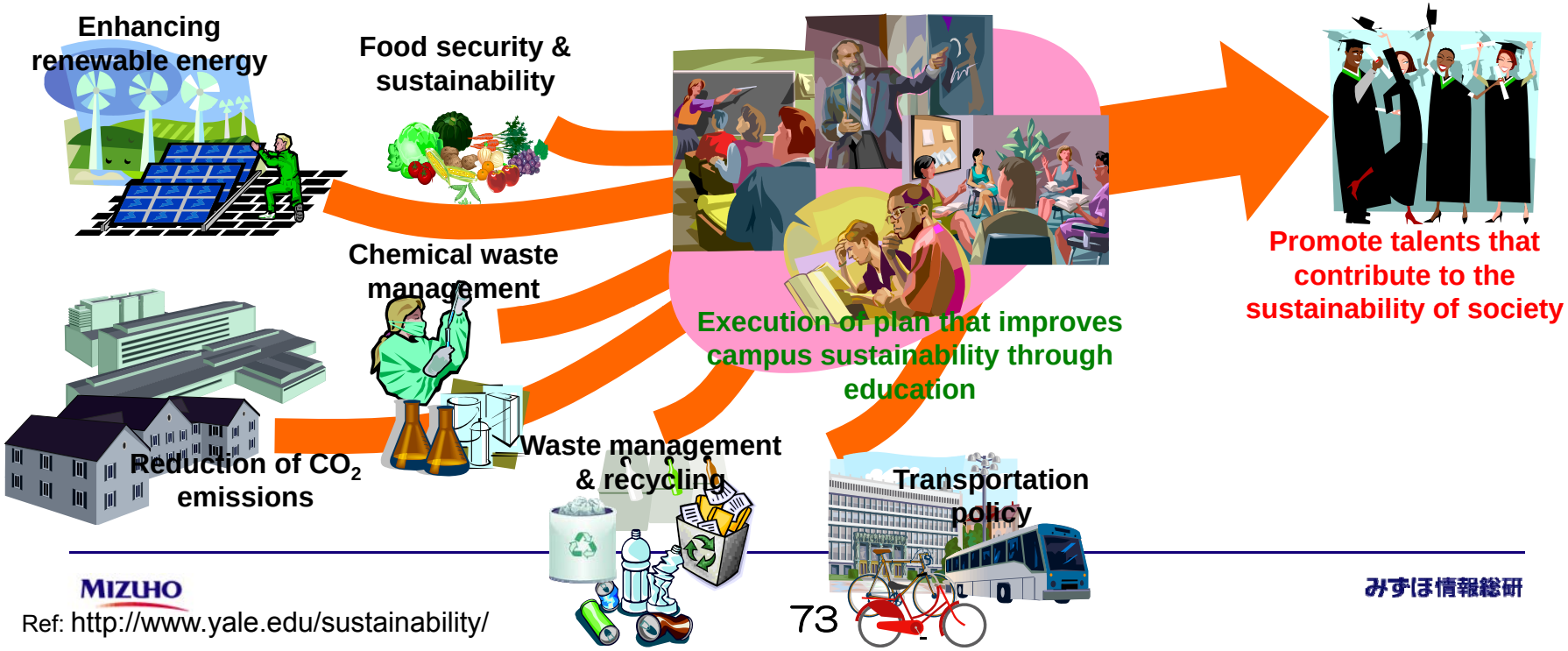
Contribution of Citizens

Continuous interest in and sharing of information on environmental problems. Voluntary participation in creation of a low carbon society.

Action 12: Examples of related actions/options

Yale University's sustainable campus (USA)

- Yale has in place programs to reduce its environmental burden, consume local goods, and promote lateral societal improvement in order to promote the sustainability of its campus.
- Establishment of special offices and promotion of a school-wide program
- Implementation of programs unified with training the leaders of the future
- Goal of −10% of 1990 levels of CO2 emissions on campus
- Programs being carried out that relate to low carbon society: direct implementation of renewable energy, use of carbon offsets, adjustment of waste disposal policies, examination with the town of local traffic policies, and others
- Network with other universities implementing advanced programs



Ref: http://www.yale.edu/sustainability/