

Mid-Long Term Strategy for the Building Sector

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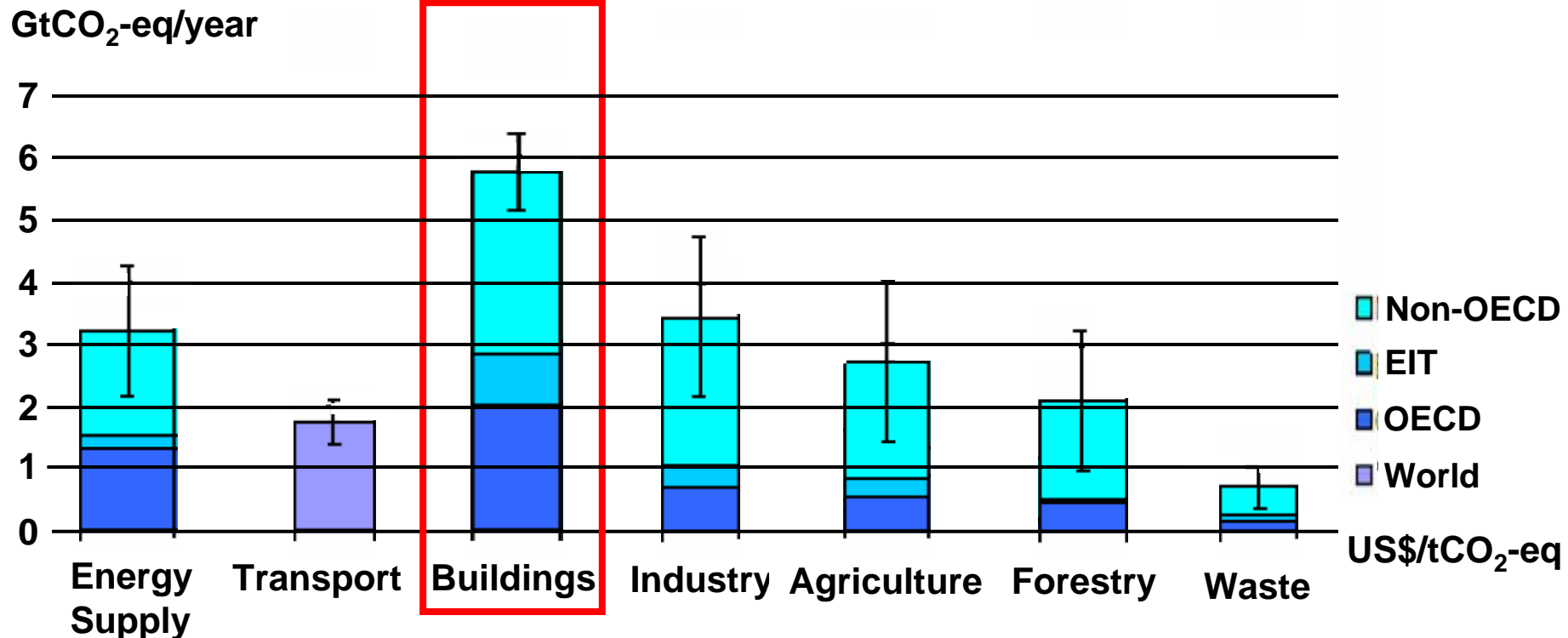
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Outline

1. Worldwide trends
2. Japan's mid-long term scenario for CO₂ emissions reduction
3. Strategy for even further CO₂ reduction

1.1 Huge potential for reducing CO₂ emissions in the building sector

Estimated mitigation potential in 2030 at sectoral level from bottom-up studies, compared with the respective baseline



CO₂ mitigation potential by sector

(On the assumption that marginal cost is < US\$50 to reduce 1 ton of CO₂ emissions)

(Source: IPCC 4th Assessment Report 2007)

1.2 G8 Summits and the IEA

1. The Gleneagles Summit (2005)

Statement concerning the improvement of building energy efficiency

⇒ Request to the IEA to promote studies on building energy efficiency



2. The Heiligendamm Summit (2007)

Three recommendations from the IEA concerning the building sector

(1) Building codes and standards (new buildings)



(2) Passive energy houses (3) Data collection (existing buildings)



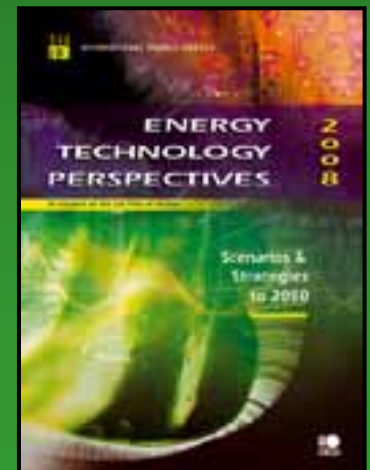
3. The Hokkaido Toyako Summit (2008)

The IEA study reports for the Summit

(1) Energy Technology Perspective 2008 (ETP2008)



(2) Worldwide Trends in Energy Use and Efficiency



1.3 Measures proposed in ETP2008 for the building sector (1/2)

1. Scenarios of ETP2008 up to 2050

- Baseline scenario: BAU (Business as Usual)
- ACT Map scenario: Technologies that already exist, or are in advance state of development
- BLUE Map scenario: Technologies still under development, whose progress and ultimate success are hard to predict

2. CO₂ emissions in 2050

- Baseline scenario: **Increased by 129%** (above the 2005 level)
- ACT Map scenario: **Reduced by 35%** (below the Baseline scenario)
- BLUE Map scenario: **Reduced by 43%** (below the Baseline scenario)
(65% reduction when the improvement of CO₂ emissions intensity in electricity generation is taken into account)

3. Additional Investment in Buildings

- ACT Map scenario: 2.6 trillion US\$
- BLUE Map scenario: 7.4 trillion US\$

1.3 Measures proposed in ETP2008 for the building sector (2/2)

4. Important measures

- 1) Measures for space and water heating (around two-thirds of final energy use)
- 2) Very significant fuel switching
(oil, coal, gas, traditional biomass → electrification, modern bioenergy, solar technologies)
- 3) Retrofit and early replacement of building shells to passive house standards
- 4) Policies to promote, demonstrate and rapidly deploy new and tighter standards
- 5) Efforts and co-ordination by policy makers, investors, developers, technology developers, manufacturers, equipment installers and customers

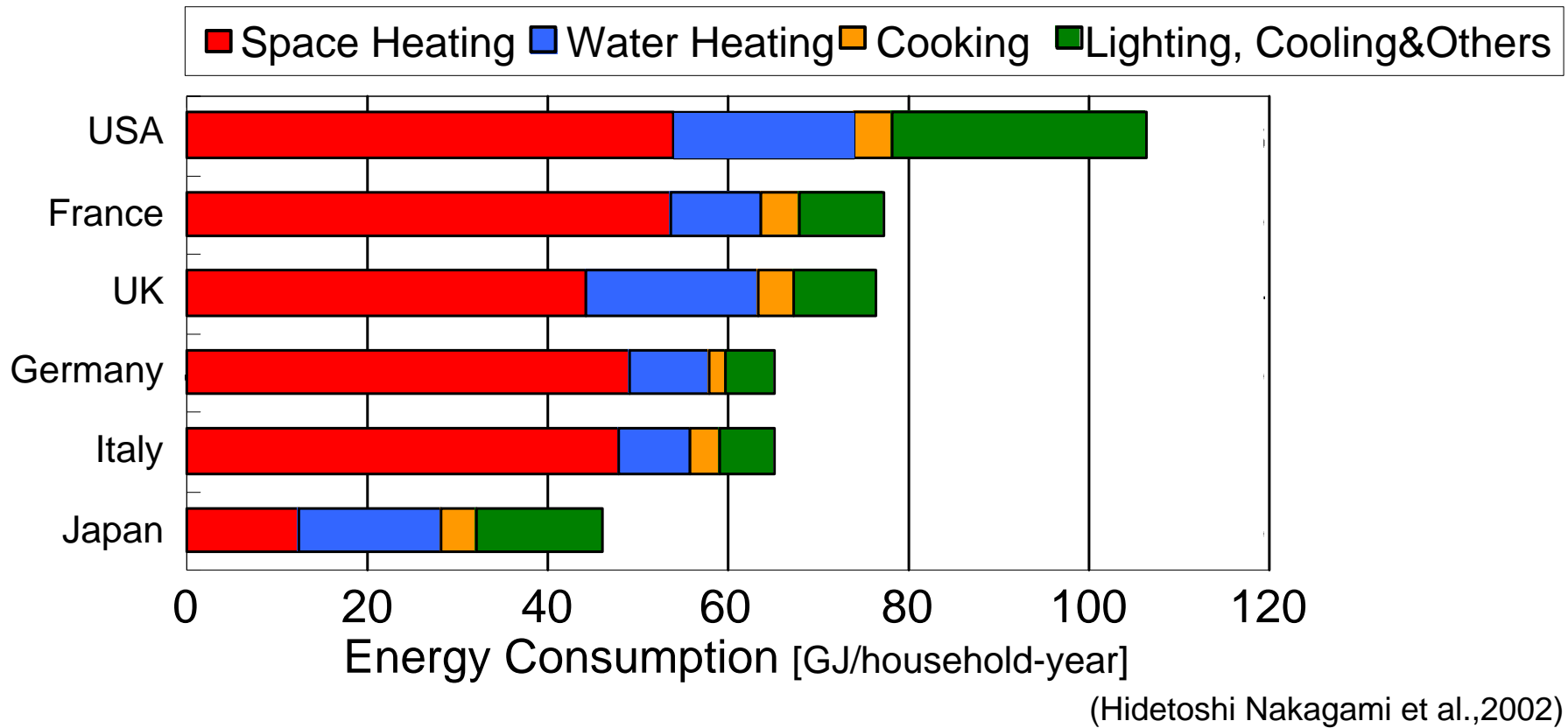
5. Key technologies

- 1) System integration of buildings and equipment
- 2) Building shell
- 3) Hot water heating
- 4) Cooling systems
- 5) Appliances
- 6) Lighting
- 7) Heat pumps
- 8) Solar thermal heating
- 9) Passive houses and zero-energy buildings
- 10) Bioenergy technologies

1.4 World trends in CO₂ emissions in the building sector

1. The amount of emissions: one-fourth of the world total
(5 GtCO₂ in 2004)
2. Growth rate: 1.7% per year in residential buildings
2.5% per year in commercial buildings (1971→2004)
3. Regional increase in CO₂ emissions:
 - 1) Residential buildings
 - Asia: Up 42% (largest regional increase)
 - Middle East, North Africa: 19%
 - 2) Commercial buildings
 - Asia: Up 30% (largest regional increase)
 - North America: 29%
 - OECD, Pacific: 18%

1.5 Directing our attention to fast-growing Asia



- ⇒ Low energy consumption for space heating in Japan
- ⇒ Improvement of thermal insulation performance has limited effect
- ⇒ Hot and humid climate, which is common in Asian countries
- ⇒ **Need for creating an Asian model for energy saving**

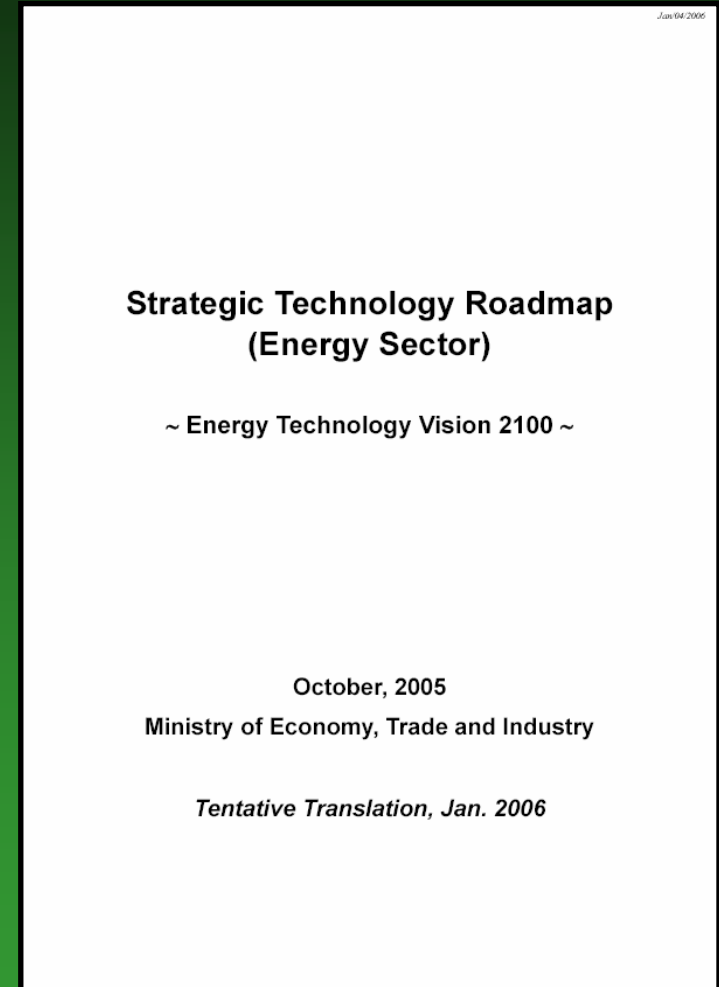
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3. Strategy for even further CO₂ reduction

2.1 Mid-long term scenario for reducing CO₂ emissions

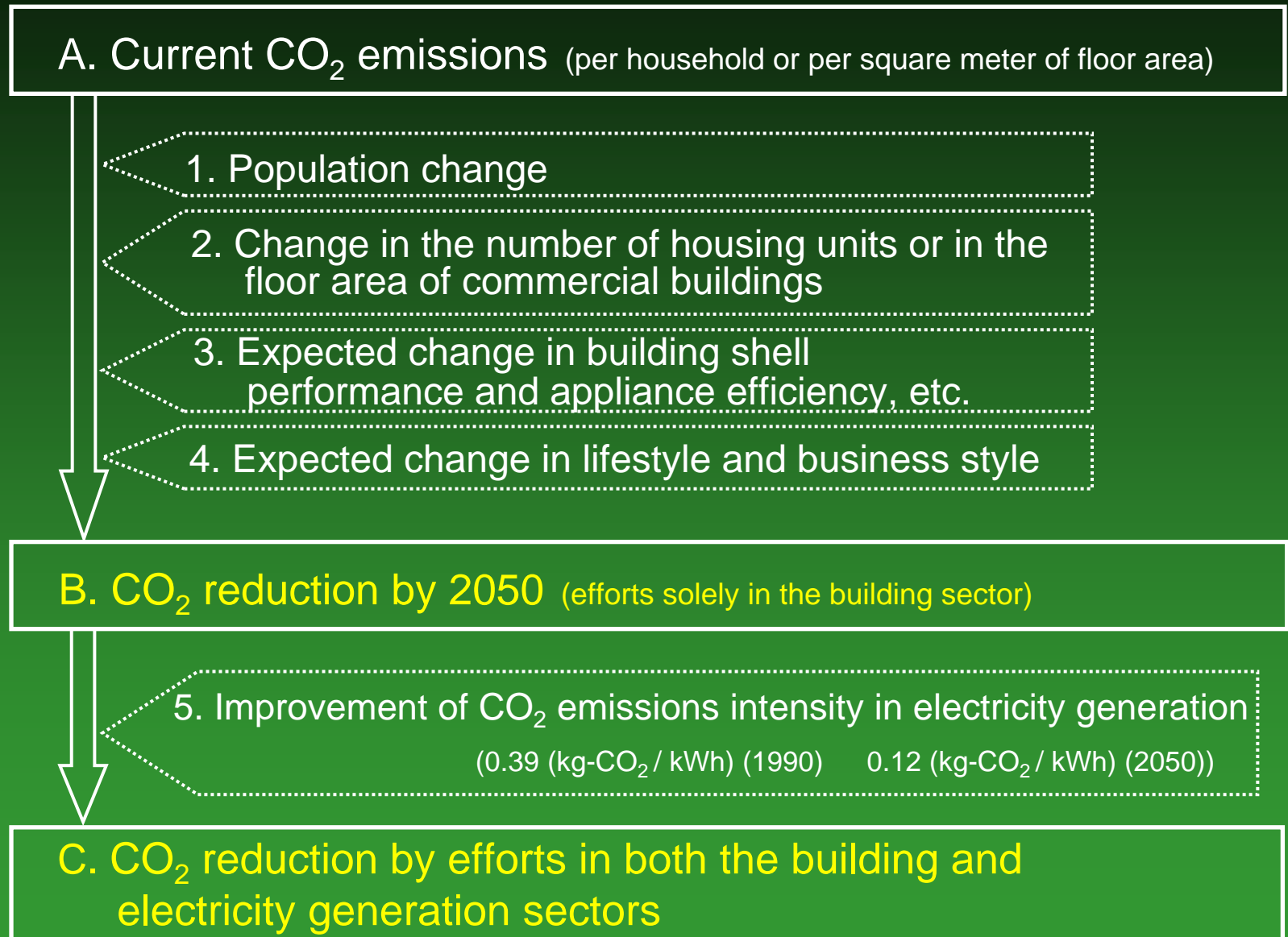
⇒ First, we project Japan's CO₂ emissions up to 2050, considering possible **social changes** (e.g., population change) and **technological improvements** that we can predict now.

⇒ Technological improvements are taken into account, based on reports such as **Strategic Technology Roadmap** (Energy Sector), published by METI in 2005.



(METI: the Ministry of Economy, Trade and Industry)

2.2 Projection flow (for both residential and commercial buildings)

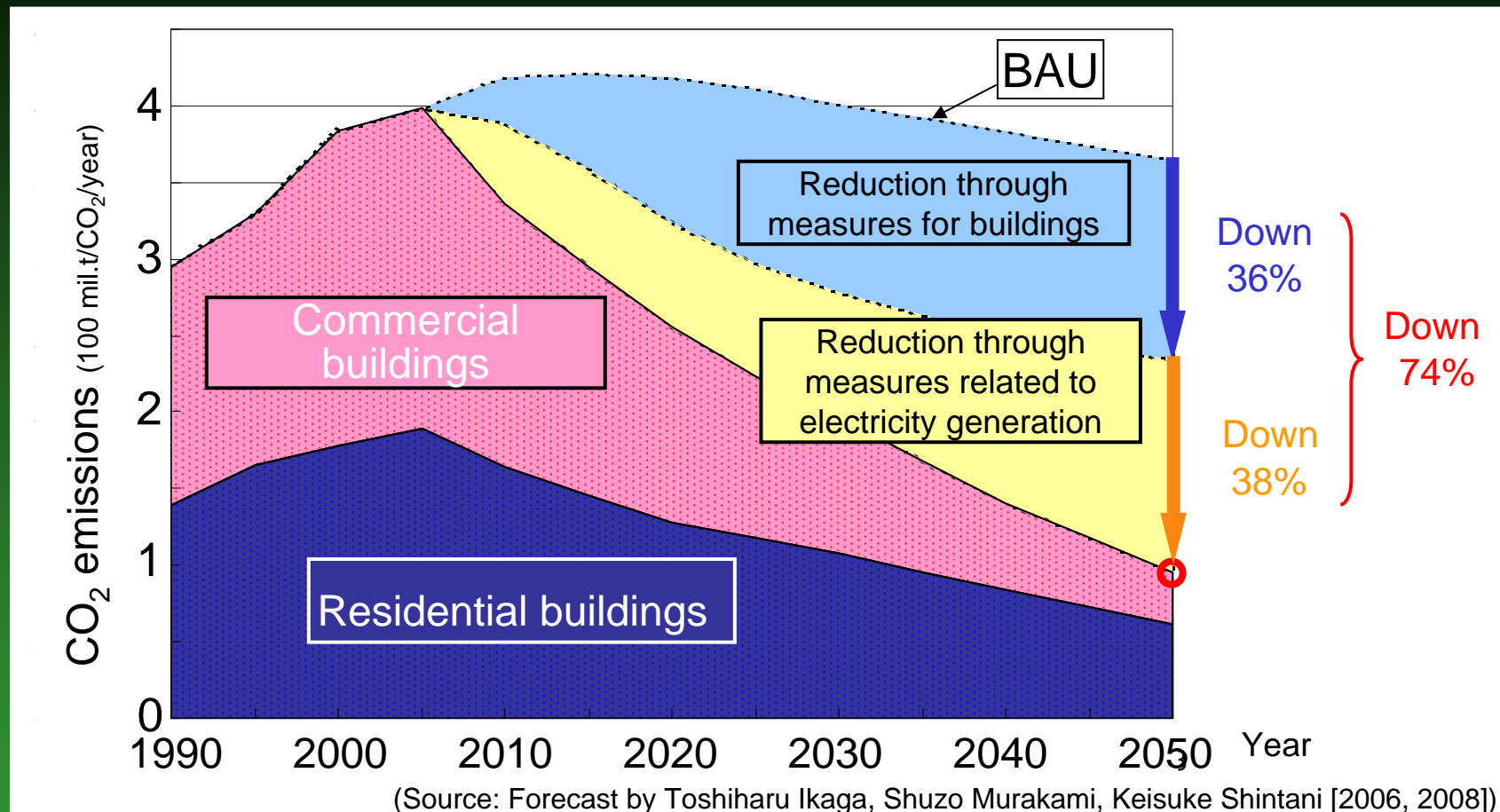


2.3 Energy conservation technologies incorporated into projection (in the case of residential buildings)

In reference to reports such as Strategic Technology Roadmap (Energy Sector), published by METI, etc.

Category	Specific technology
Building shell	Improvement of insulation in new and existing residential buildings
Equipment & appliances	Promotion of replacement of air conditioners by energy-efficient units
	Promotion of installation of heat-pump-type or latent-heat-recovery-type hot water supply systems
	Promotion of replacement of refrigerators and televisions by energy-efficient ones
	Promotion of wide use of solar hot water supply systems and photovoltaic power generation
Lifestyle	Familiarizing people with various energy-saving behaviors, etc.

2.4 Projected results: CO₂ emissions reduction in the mid-long term



- ⇒ 36% reduction through efforts in the building sector (compared with BAU)
- ⇒ 74% reduction through efforts in both the building and electricity generation sectors

(Compared with 1990, 21% reduction through measures in the building sector and 68% through measures in the building and electricity generation sectors)

2.5 Comparison between Japan's scenario and ETP2008 scenario

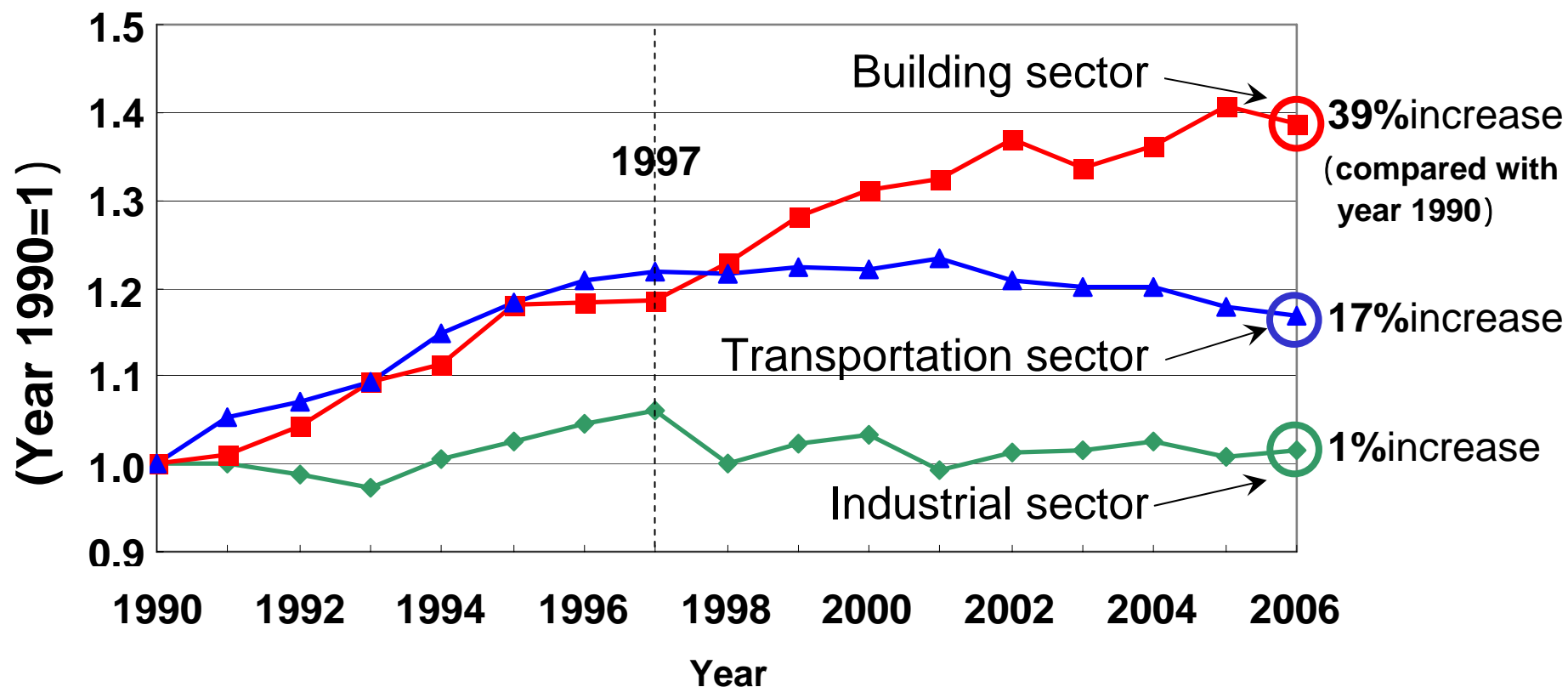
	Reduction rate (in 2050, compared with BAU)	
	Measures taken in the building sector	Measures taken in the building and electricity generation sectors
1) Ikaga, Murakami, Shintani model	36%	74%
2) ETP2008	35% (ACT scenario) ~ 43% (BLUE scenario)	65% (BLUE scenario)

Is this long-term scenario achievable?

(36% reduction in the building sector, and 74% when adding this to the efforts in the electricity generation sector)

- ⇒ What effect have energy-saving efforts had in the past 10 years, that is, since the adoption of the Kyoto Protocol in 1997?
- ⇒ Emissions by the building sector have increased markedly in comparison with the industrial and transportation sectors. (39% rise compared with 1990)
- ⇒ Measures currently used in the projection will not be powerful enough to achieve the reduction shown in the long-term scenario.
- ⇒ How can even more reduction be achieved?
What measures will enable further reduction?

Trends of energy consumption for building, industry and transportation sectors in Japan (based on consumption in 1990)



(Source: The Agency for Natural Resources and Energy, Energy Consumption Statistics)

Outline

1. Worldwide trends
2. Japan's mid-long term scenario for CO₂ emissions reduction
- 3. Strategy for even further CO₂ reduction**
 - 1) Technological innovation
 - 2) Innovation in policy and social system
 - 3) Lifestyle innovation

3.1 Strategy 1: Technological innovation

3.1.1 Basic strategies

1. Further promote the development of energy technologies at a faster rate than currently
2. Develop technologies that can be easily applied to existing buildings as well as to new ones
3. Develop integration technologies for building shells and equipment/appliances
4. Develop policy measures to facilitate the spread of new technologies

3.1.2 Proposed technology developments to be promoted

Category	Specific technology	CO ₂ reduction effect	
		Japan	World
Energy technologies on supply side	Photovoltaic power generation		
Energy technologies on demand side	Solar battery panels integrated into building products	-	-
	High-efficiency lighting		
	High-efficiency heat pumps		
	Stationary fuel cells		-
	Energy-saving home electronics and communications equipment	/	-
	Energy-efficient housing (insulation, heat-insulating glass, zero energy housing, zero energy offices)		
	Integrated design method for building shells, equipment and appliances	-	-
Social system technologies	Area Energy Network (HEMS / BEMS / Local-level EMS, etc.)		-
	CASBEE (building performance assessment tool), etc.	-	-
Other technologies	Ultra-durable housing (reduction of waste, etc.)		-

CO₂ emissions reduction effect in Japan: : 30 mil. tons or more, : 10 mil. tons or more, : Less than 10 mil. tons, - : Under investigation

CO₂ emissions reduction effect around the world: : 1 bil. tons or more, : 0.3 bil. tons or more, : Less than 0.3 bil. tons

(Source: Council for Science and Technology Policy, Technology Innovation Plan for Environmental Energy [May, 2008] and other reports)

3.2 Strategy 2: Innovation in policy and social system

3.2.1 Basic strategies

1. Strengthening regulations
 - Cap-and-trade program that sets emissions quotas per household and per building
2. Provide wide range of policy measures that are attractive to users from the viewpoint of cost performance
3. Provide information to society and raise public awareness in order to inspire people to change their lifestyle
4. Measures for existing buildings

3.2.2 Specific strategies of innovation in policy and social system (1/3)

Policy instruments: 1) Regulation 2) Inspiring incentives through financial support 3) Campaign for raising public awareness

1) Limitation of regulatory methods

- Authorities will probably not adopt rigid regulatory methods for the general public, to whom those methods would be difficult to apply.
- It is necessary to consider the adoption of rigid regulatory methods that go beyond present customary practices.
- ⇒ Ultimate regulatory solution when carbon emissions do not decrease: **cap-and-trade program that sets emissions quotas per household and per building**
- The essential prerequisite is to gain public acceptance.
- Implementing database of energy-efficiency indicators as part of the program design
- One option is to start this program on a **voluntary basis**.
- Test the program in designated areas as a trial.

3.2.2 Specific strategies of innovation in policy and social system (2/3)

2) Inspiring incentives through further financial support

- Without substantial support, it is hard to expect cooperation from consumers.
- Increase support and promote inexpensive energy-efficient products for the purpose of overcoming this barrier
- Dissemination of information regarding **Energy Benefits** and **Non-Energy Benefits**, which are the outcome of energy conservation

3) Provide information to society and raise public awareness

- Toward lifestyle innovation (which will be discussed later)

3.2.2 Specific strategies of innovation in policy and social system (3/3)

4) High-priority issue to consider: measures for existing buildings

- Existing buildings generally have low energy performance, but it is difficult to take measures because they are private assets.
- Huge potential for energy saving
- The need for the development of effective measures is extremely high.
- Measures that are easy to apply:
 - 1) high-efficiency lighting
 - 2) high-efficiency heat pump
 - 3) photovoltaic power generation
 - 4) solar heating and cooling systems
 - 5) solar hot water system, etc.

3.3 Strategy 3: Lifestyle innovation

3.3.1 Basic strategies

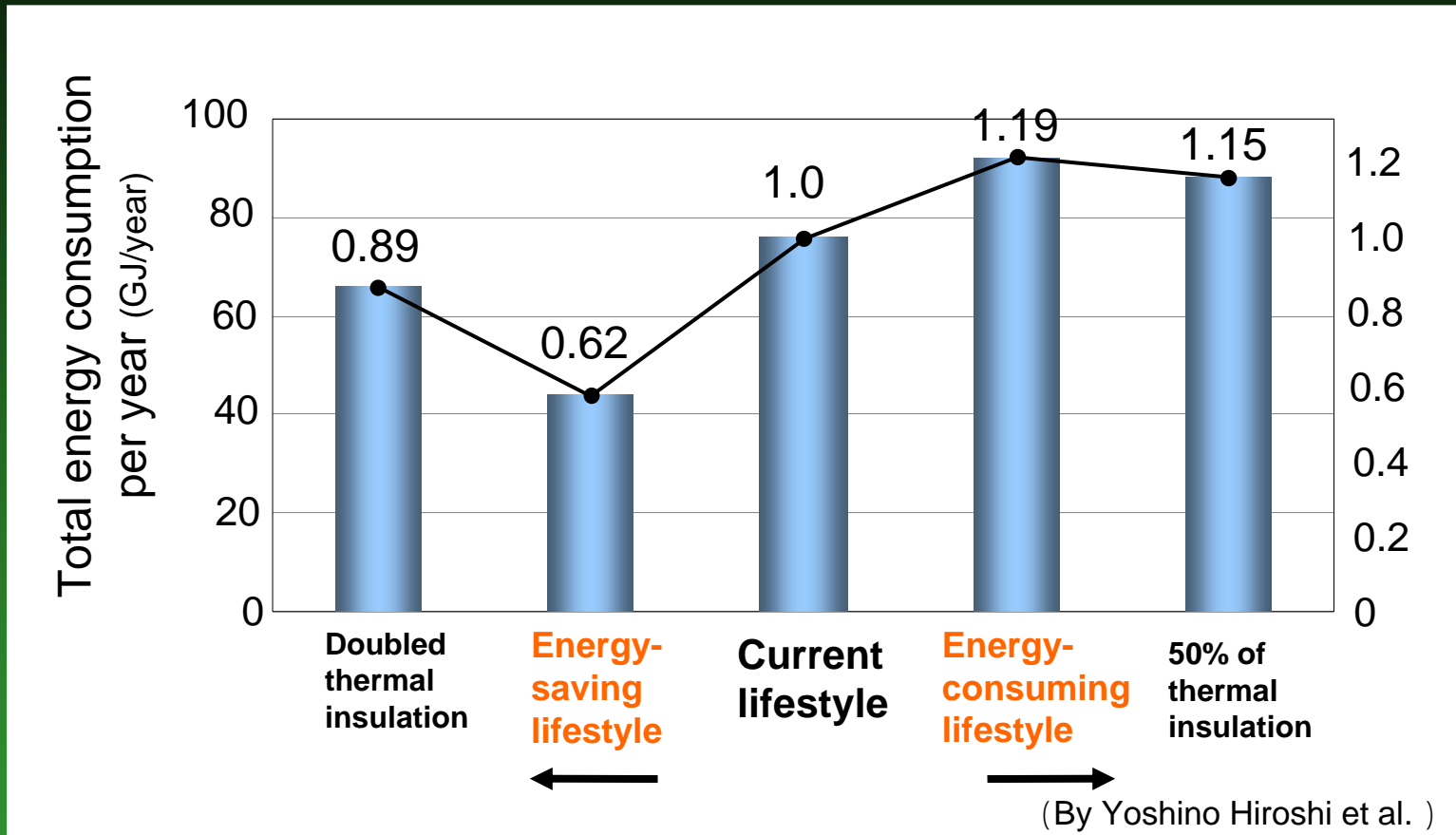
1. Disclose energy consumption levels of every consumer (name and shame)
2. Visualize building performance in an easy-to-understand form by using CASBEE

CASBEE: Comprehensive Assessment System for Building Environmental Efficiency

3.3.2 Specific strategies of lifestyle innovation

1. As a starting point, every consumer needs to be aware of how much energy they themselves consume.
 - Develop legal system to permit disclosure of energy consumption levels (name and shame)
 - Assess and label building performance and disclose the results of CASBEE
2. Consumer behavior patterns and incentives
 - How to encourage energy-saving behaviors in consumers in both residential and commercial buildings
 - Disseminate information about the impact of energy-efficient lifestyle so as to increase incentives
3. Strengthen ethical incentives and economic incentives
 - Provide information about a wide range of benefits that energy conservation efforts can provide.
 - Dissemination of Energy Benefits and Non-Energy Benefits that can inspire both of the above mentioned incentives

3.3.3 Reduction of energy consumption through lifestyle change (based on simulations)



If people use all equipment and appliances in energy-saving ways:

⇒ Energy savings of approximately 40% can be realized.

⇒ Savings will be greater than when insulation performance is doubled.

Concluding Remarks (1/2)

1. Projection of CO₂ reduction by 2050, supported by technological progress and social-system changes (compared with BAU)

⇒ 36% reduction (efforts solely in the building sector)

⇒ 74% reduction (efforts in both the building and electricity generation sectors)

2. Promotion of innovation in three areas to reduce carbon emissions even more:

1) Technologies 2) Policy and social system 3) Lifestyle

Concluding Remarks (2/2)

3. Basic strategies that should be promoted

1) Technologies

Further promote the development of energy technologies at a faster rate than currently

Develop technologies that can be easily applied to existing buildings as well as to new ones

2) Policy and social system

Cap-and-trade program that sets emissions quotas per household and per building

Provide wide range of policy measures that are attractive to users from the viewpoint of cost performance

3) Lifestyle

Disclosure of energy consumption levels of energy consumer,
“Visualization” of building performance assessed by CASBEE