Japan as Forerunner of Emerging Issues

~What can Japan do?~

Hiroshi Komiyama

Chairman of the Institute,
Mitsubishi Research Institute, Inc., Japan

President emeritus, University of Tokyo
Expansion in 20\textsuperscript{th} century and the finite earth

**World population**

![Graph showing world population growth from 1900 to 2000 with a significant increase by 2000.](image)

- **World population**: The graph illustrates the exponential growth of world population from 1900 to 2000, highlighting a 3.5X increase.

**Crop production**

![Graph showing crop production growth from 1900 to 2000 with a significant increase by 2000.](image)

- **Crop production**: The graph demonstrates the marked increase in crop production from 1900 to 2000, with a 7.5X rise.

**Energy consumption**

![Graph showing energy consumption growth from 1900 to 2000 with a significant increase by 2000.](image)

- **Energy consumption**: The chart reveals the substantial growth in energy consumption from 1900 to 2000, noting a 20X increase.

**Atmospheric CO\textsubscript{2}**

![Graph showing atmospheric CO\textsubscript{2} concentration from 1900 to 2000 with a significant increase by 2000.](image)

- **Atmospheric CO\textsubscript{2}**: The graph indicates the rising trend of atmospheric CO\textsubscript{2} concentration from 1900 to 2000, showing a significant increase.

*Source: "課題先進国日本" P59, P61, P62*
2050 will be the crucial time of the human civilization, due to the shrinking earth, aging society and exploding knowledge.

2050 will come soon.

We need a concurrent approach to accelerate the process.
Vision 2050

Improve energy efficiency by three times

Double the use of non-fossil energy

Establish recycling system of materials
to solve the crisis of global warming, environmental issues and natural resources depletion.
Vision 2050

We can achieve a sustainable civilization. Vision 2050 is a roadmap to get there.
Saturation of artifacts is the key concept

Number of automobile ownership (2007)

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of automobiles (million)</th>
<th>No. of automobiles per population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>58</td>
<td>0.45</td>
</tr>
<tr>
<td>USA</td>
<td>138</td>
<td>0.45</td>
</tr>
<tr>
<td>Britain</td>
<td>31</td>
<td>0.51</td>
</tr>
<tr>
<td>France</td>
<td>31</td>
<td>0.50</td>
</tr>
<tr>
<td>Germany</td>
<td>41</td>
<td>0.49</td>
</tr>
<tr>
<td>China</td>
<td>32</td>
<td>0.02</td>
</tr>
<tr>
<td>India</td>
<td>13</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Source: Japan Automobile Manufacturers Association, Ministry of Internal Affairs & Communications
Saturation of artifacts in Japan
Number of houses and households (8 million vacancy)

Saturation will come in 2 ~ 10 years in China

Production of cement per person

Source: Production of Cement: UN Statistical year book
Population: UNSD Demographic Statistics
Automobiles in China will saturate within 5~10 years

Sales per person

Year

Automobile sales: automobile industry handbook (Japanese)
"U.S. Automobile Production Figures" from Wikipedia etc.
Population: UNSD Demographic Statistics
Energy efficiency is secondly important!

Automobile energy consumption to 1/10 at 2050

Data Source: Yahoo! Japan Autos

- US/European Cars
- Japanese Cars

Hybrid Cars
Electric & Fuel cells Cars

Vehicle Weight [kg]
Fuel Consumption [L/km]
Investment for energy efficiency can be refunded!
Technology transfer can reduce emission

Energy efficiency improvement by 3 times is feasible.

Source: Japan Cement Association
22\textsuperscript{nd} century will be bright!

Energy Scenario and CO\textsubscript{2}

\begin{itemize}
\item[a)] 1990
\begin{itemize}
\item 6.0G C-ton
\item CO\textsubscript{2} 369 ppm
\end{itemize}
\end{itemize}

\begin{itemize}
\item[b)] 2050 BAU case
\begin{itemize}
\item 22.0G C-ton
\item CO\textsubscript{2} 600 ppm
\end{itemize}
\end{itemize}

\begin{itemize}
\item[c)] Vision 2050
\begin{itemize}
\item 4.5G C-ton
\item CO\textsubscript{2} 460 ppm
\end{itemize}
\end{itemize}

\begin{itemize}
\item[d)] After 22\textsuperscript{nd} Century
\begin{itemize}
\item CO\textsubscript{2} 280 ppm
\end{itemize}
\end{itemize}

Data: from “Vision 2050”
Growth is rights but Efficiency is duties!

<table>
<thead>
<tr>
<th>Year</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td>1.7</td>
<td>17.5</td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>2050</td>
<td></td>
<td>5.8</td>
</tr>
</tbody>
</table>

Compiled data created by The University of Tokyo
Challenge25 Campaign
—Team Komiyama’s proposal—

Daily life 12%
Making things 3%
Nuclear energy etc. 5%
Forest etc. 5%
CDM 5%
Energy consumption by final use in Japan

- Making things
- Home
- Office
- Transportation
- Daily life

Theoretical limit of transportation is zero!
Energy consumption in houses and offices

Houses
- Air-conditioner: 28%
- Water heating: 30%
- Others: 24%
- Kitchen: 8%
- Lighting: 10%

Offices
- 50%: Air-conditioner
- 20%: Lighting

Theoretical limit of air-conditioning is zero!
**Technology innovation in Japan**

**Water Heater**

<table>
<thead>
<tr>
<th>US (majority)</th>
<th>Japan (majority)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank storage 40%</td>
<td>Heat-to-use 80%</td>
</tr>
<tr>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Heat-pump (ecocute)</td>
<td>Fuel cell (enefarm)</td>
</tr>
<tr>
<td>$50% \times 4 = 200%$</td>
<td>36% elec. + 50% hot water</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Komiyama ecohouse: Yes, we can!

- Heat-pump water heater
- Insulation: $K=1.6 \text{ W/m}^2\text{K}$
- New air-conditioner
- New refrigerator & lightings
- Hybrid car: 22.6 km/l
- Solar panel: 3.6 kW

81% reduction
Investment refunded in 12 years
### Self-Sufficiency in Japan at 2050

Komiyama’s Proposal

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY</td>
<td>70%</td>
</tr>
<tr>
<td>MINERAL</td>
<td>70%</td>
</tr>
<tr>
<td>FOOD</td>
<td>70%</td>
</tr>
<tr>
<td>WATER</td>
<td>100%</td>
</tr>
</tbody>
</table>

Japanese goal as well as 21st model of humanity

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30% of town water leaks in the world!

Filtration membrane: Japanese companies account for 50% in the world.
Preventing water leak: Japanese technology is the best in the world.

Source: Ministry of Economy, Trade and Industry
Japan’s experience with Sumida river

1967

present

環境省 図で見る環境白書 昭和57年

東京屋形船案内
http://www.t-yakata.com/tyh_dkship.htm
Japan’s experience with Yokkaichi

1950’s present

©Yokkaichi City
Japan’s experience with Kitakyushu

Source: Japan as a forerunner for addressing emerging problems in the world P27
Coexistence of Economy and Environment

Genkai nuclear power plant

Mt Fuji and Metropolis of Tokyo

Source: Nikkei Inc.
Emission of Sulfur from Thermal Power Plants

<table>
<thead>
<tr>
<th>Country</th>
<th>1999 Year</th>
<th>2002 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>4.8</td>
<td>3.7</td>
</tr>
<tr>
<td>U.K.</td>
<td>3.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Germany</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>France</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>2.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Canada</td>
<td>4.0</td>
<td>3.9</td>
</tr>
<tr>
<td>Japan</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Data Source: Tokyo Electric Power Company, web-site
Paradigm in 21\textsuperscript{st} century

Shrinking earth

- Financial crisis
- Pandemic ...

Infinite earth

- Climate change
- Depleting resource
- Pollution
- Food, water

Aging society

- Longevity
- Small birth rate
- Saturating demand
- Pension
- Medicine
- Care
- Work sharing
- Barrier free ...

Exploding knowledge

Source: Japan as a forerunner for addressing emerging problems in the world P134

National census 2005, Ministry of Internal Affairs and Communications
Green, silver & golden growth

Shrinking earth
- Eco house
- Eco appliance
- Eco car
- Solar panel
- Wind mill

Aging society
- Barrier free building
- Health monitoring
- Safe mobility
- Senses supporting
- Life supporting

Exploding knowledge
- Structuring knowledge
- Structured knowledge-base
- Education
- Lifelong learning
- Value creation

Ⓒ Hiroshi Komiyama
Patterns for Losing Functional Health
—follow-up survey of 6000 aged people—

female

Akiyama et al. (2008) アメリカ老年学会2008年年次大会

出典) Akiyama et al. (2008) アメリカ老年学会2008年年次大会
Patterns for Losing Functional Health
—follow-up survey of 6000 aged people—

male

self-support

death

age

gradual decline (70%)

resilient (11%)

early decline (19%)

Akiyama et al. (2008) アメリカ老年学会2008年年次大会
Change of Cognitive Ability

Source: Cornelius and Caspi (1987, p150)
Successful Aged Society

Participation in the society with pride is the key.

Infrastructure for encouraging participation is needed.

Devices supporting weakened abilities have to be developed.

Japan is the closest country to the success!
Platinum society is a vision of 21\textsuperscript{st} century

ecological

participated by all including seniors

lifelong growing

abundant in job opportunities

sustainable society shining brightly

created by green, silver, gold and various innovations
Layered Structure of Platinum Network

Aomori Pref., Aomori

Akita Pref.

Fukuoka Pref.

Akita prefectural univ.

North Japan New Energy Research Center, Hirosaki Univ.

Kita Kyushu

Miyagi Pref.

Wakayama Pref.

Ibaragi Pref.

Kashiwa

Kashiwa Campus, Tokyo Univ.

Network of Cities

Network of Universities

Network of Sister-Cities

Platinum society study group, MRI

FDC, LCS, ICAS

ICAS, Ibaragi Univ.

Asia Low Carbon Center

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Foreign countries will join us!

Join in the quest for a platinum society

Thank you