Governance on Green Energy and Carbon Reduction

Policy in Energy Saving and Business Opportunities

GHG Reduction: From Energy Saving to Wider and Stronger Mechanisms

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S. J. Chiang International Conference Hall,
Chung Hua Institute for Economic Research, Taipei
09:35~10:10, 21 January 2010

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1. Overview of Energy Saving Issues (1/4)

1.1 Nature of Energy Saving : Low-Hanging Fruits in GHG reduction measures, many with negative costs.

(1) High Priority Choices : As have been shown by many advanced countries and institutes in their GHG Roadmaps or Pathways (**Figs. 1, 2**).

(2) Large Reduction Potential: Especially in residential, commercial and transportation sectors. Even though with relatively low total GHG emissions, their potential for reduction is similar to that of industrial sector (e.g., in European Union, UK and Japan, **Tables 1~3**).

Global GHG abatement cost curve beyond business-as-usual – 2030

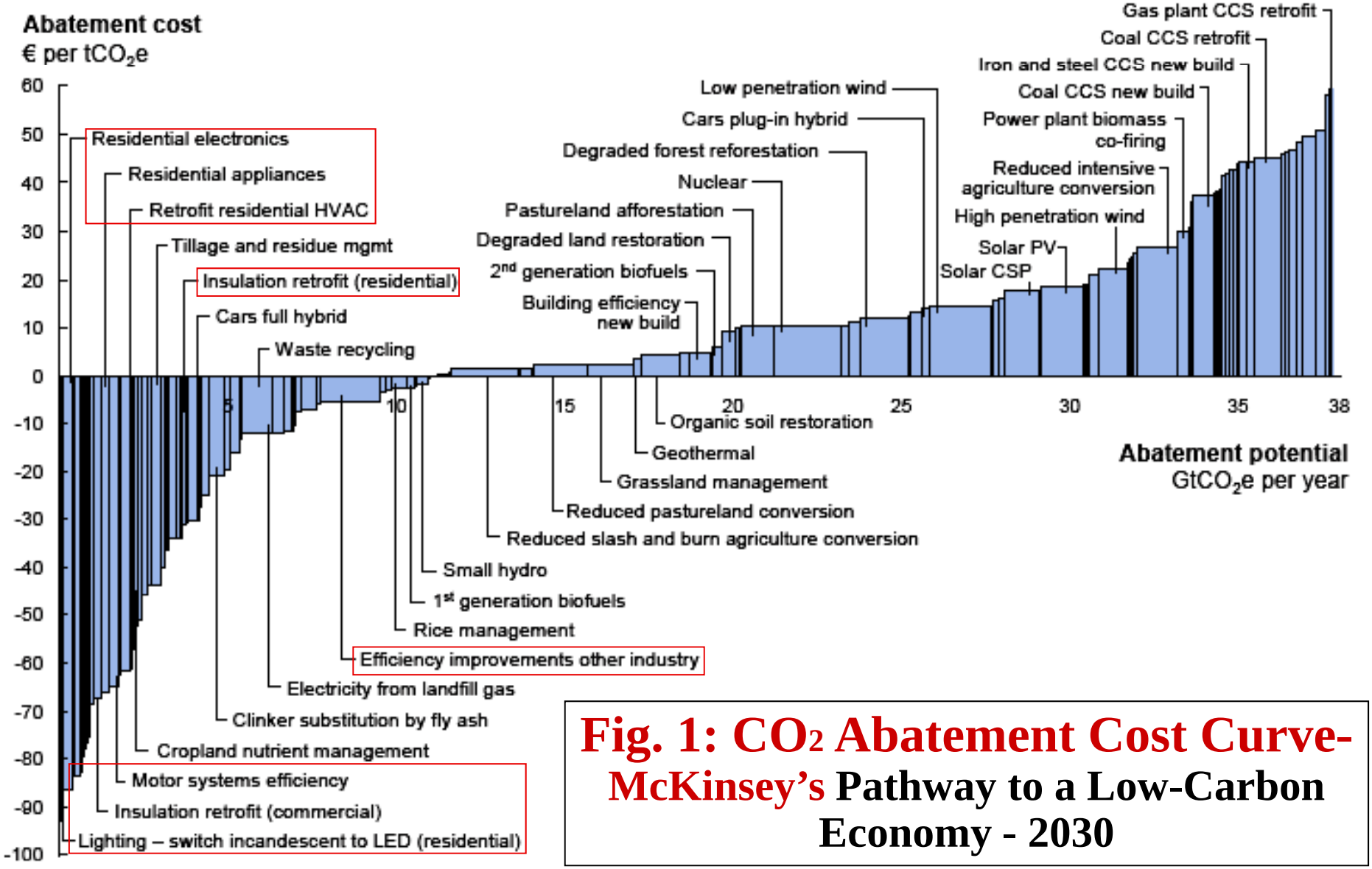


Fig. 1: CO_2 Abatement Cost Curve- McKinsey's Pathway to a Low-Carbon Economy - 2030

Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.0

Fig. 2 : Energy Saving Potential in UK Residential Sector

Figure 6.10 Residential sector MACC – technical potential in 2020

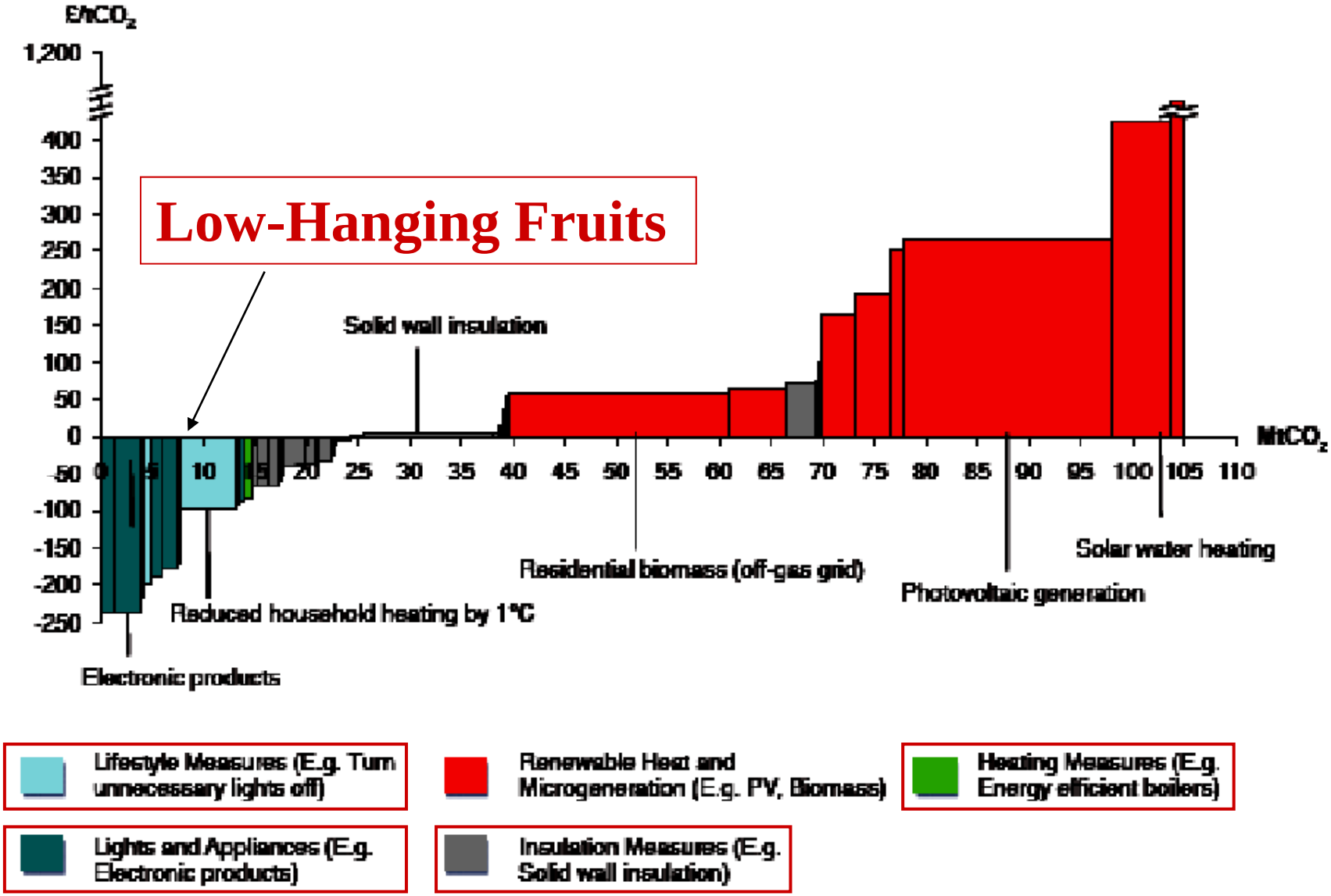


Table 1: Energy Saving Potential in UK

Emissions Reduction Potential from Energy Use in Buildings and Industry ($MtCO_2$)

	Technical Potential	Current Ambition	Extended Ambition	Stretch Ambition
Residential	105	13	29	32
Non-Residential Buildings	33	5	11	11
Industry	11	4	6	6
CHP	8	1	1	1
Total	**152**	**23**	**47**	**50**

Table 2: Energy Saving Potential in EU

Sector	Energy Consumption at 2020 (Million Ton Oil, BAU)	Potential for Energy Saving	
		%	Million Ton Oil
Residential	338	**27**	**91**
Commercial	211	**30**	**70**
Transportation	405	**26**	**105**
Industry	382	**25**	**96**

Source: Saving 20% by 2020-Action Plan for Energy Efficiency: Releasing the Potential (2006), http://ec.europa.eu/energy/action_plan_energy_efficiency/doc/memo_en.pdf

Table 3: Japanese Targets in GHG Reduction (Energy Saving)

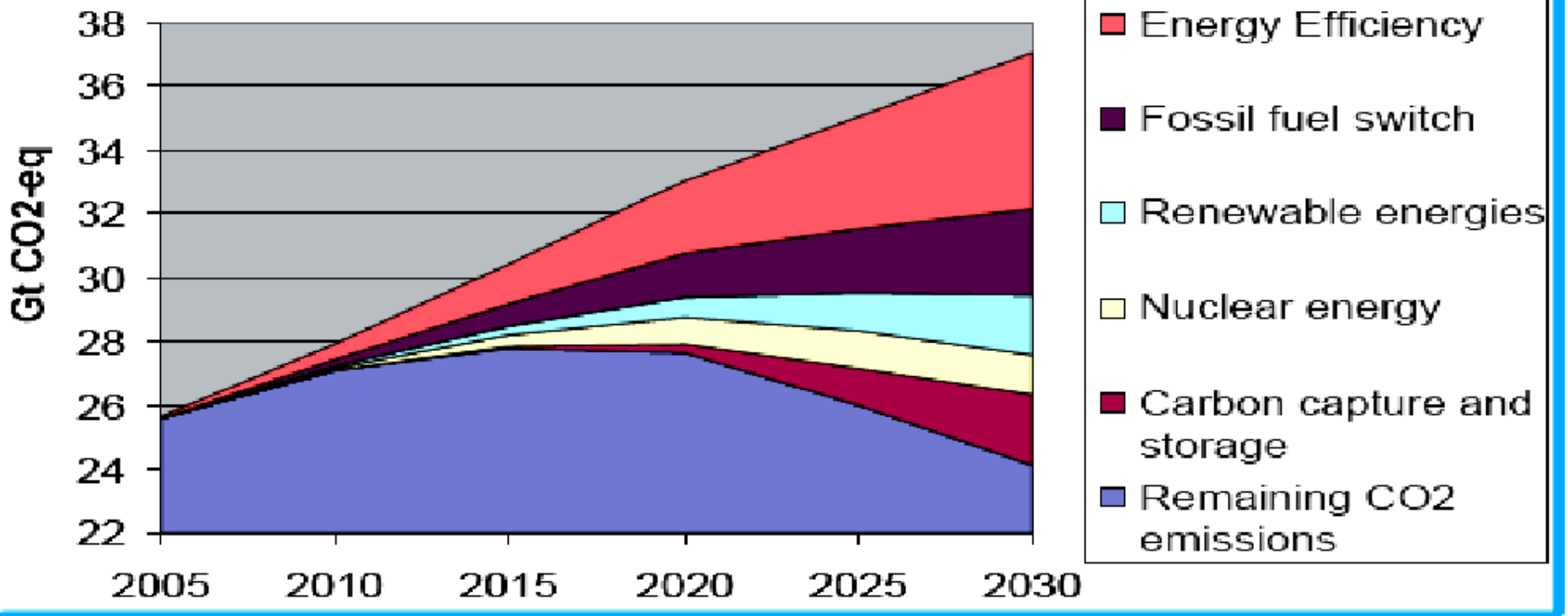
	Target for CO_2 Reduction (2008-2012, million ton CO_2)	% Reduction
Commercial	6,900	46.0
Residential	3,800	25.3
Industry	3,100	20.7
Transportation	700	4.7
Energy Transformation	500	3.3
Total	15,000	100.0

Source: METI, Japan, Presentation at Taiwan Industries Federation (2007)

1. Overview of Energy Saving Issues (2/4)

1.2 Other Energy-Related Areas: Global measures include fossil fuel switch, renewable energies, nuclear energy, carbon capture and storage (CCS) (**Fig. 3**).

Fig. 3: Technologies that could reduce global CO2 emissions from energy combustion



1. Overview of Energy Saving Issues (3/4)

1.3 Mechanisms to Promote Energy Saving : From both supply and consumer ends :

(1)**Enhance Incentives**

(A) Financial Tools (energy taxes, aids)

(B) Carbon Credits

(C) Public Image: for enterprises (e.g. contests and awards, cross company cooperation)

(2)**Reduce Barriers**

(A)Education

(B)Technical Assistance, Carbon Credits

(C)Energy Efficiency Labels (disclosure)

(D)Carbon Footprints Labels (disclosure)

1.2 Mechanisms to Promote Energy Saving-2

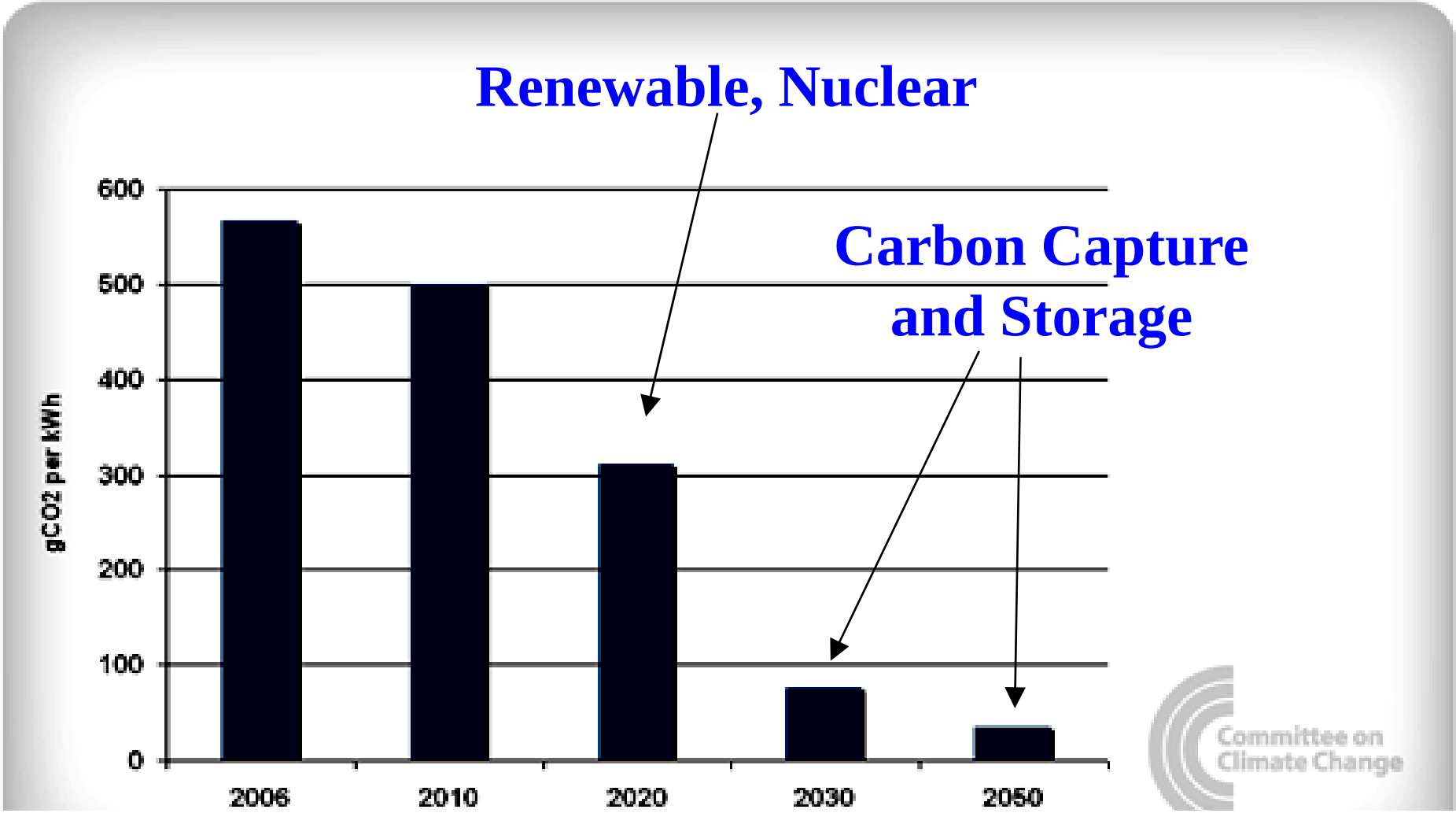
(3)**Enforce by Policies and Laws** :Current trends include:

(A) Benchmarks as Responsibilities : CO_2 intensity benchmarks have been assigned as responsibilities for **industries with carbon leakage risks*** in EU. These benchmarks may extended to non-Annex-I countries as voluntary targets (e.g. Sectoral Approach for steel industry).

(B) Tight GHG Reduction Load for Other Industries : Other industries in EU will face more GHG load, e.g. auctioning up to 100% in 2~3 steps before 2027. UK is planning to reduce its power sector's CO_2 emission factor by 90% or more by 2050 (**Fig. 4**).

*According to EU Energy and Climate Package (2008), they are mainly energy-intensive or trade-intensive industries.

Fig. 3：UK Roadmap to 2050 for Power Sector-<50g CO_2/KWh (Users will pay the price, e.g. UK households need to pay ~12,000 NT$/year for developing renewable energies).



*Currently~ **430~530g CO_2/KWh**, http://www.realtimecarbon.org/

1. Overview of Energy Saving Issues (4/4)

1.4 Wider and Stronger Mechanisms (focus of this presentation) : Can be developed with the following rules :

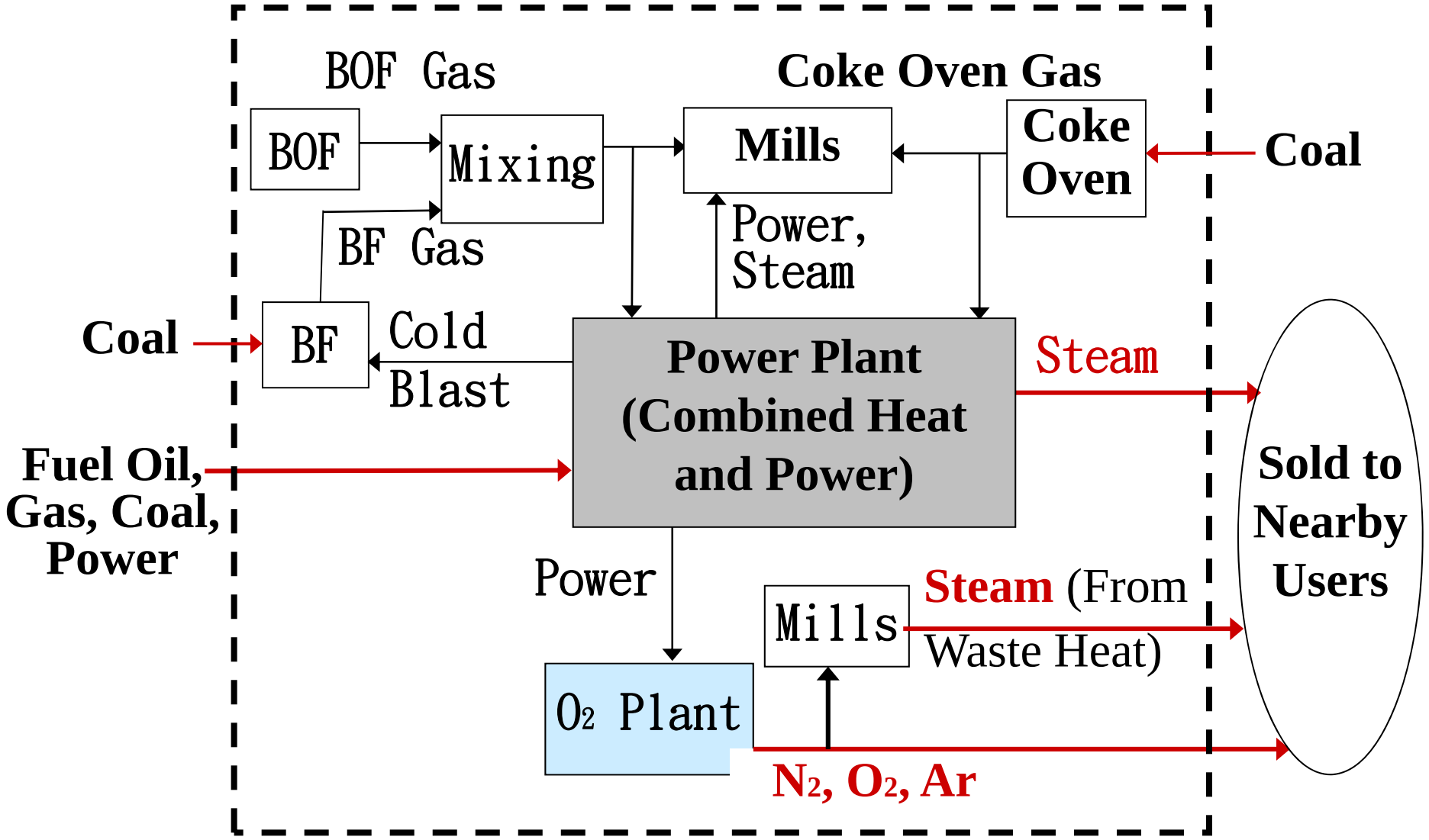
(A) Try to cover full scope of **cooperative reduction** such as CDM, VCS, domestic offset (an example at China Steel Corp. is shown in **Fig. 5**).

(B) Engage **consumers** and **market forces** better

(B) **Effective** and **fair** to both Annex I and non-Annex I countries (cover GHG reduction, climate adaptation, international trade and etc).

(C) With **simple** and **convincible** arguments and mechanisms (easier to gather consensus and wide supports).

Fig. 5: Cooperative Reduction of GHG
-- An Energy Synergy Case at China Steel Corp.



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2. Rationale for Cooperative Reduction (1/4)

2.1 Cooperative Reduction Hierarchy : The differences among CDM, VCS and Domestic Offset can be shown in the following and **Fig. 6**:

(A) **CDM (Clean Development Mechanism)**：To fulfill binding responsibilities of Annex I countries (due to Kyoto Protocol) by helping non-Annex-I countries financially or technically.

(B) **VCS (Voluntary Carbon System)** : Similar to CDM, but only for voluntary organizations or individuals and at lower prices.

(C) **Domestic Offset** : To realize more GHG reduction in the territory, used as domestic trading credits.

2.2 Cooperative Projects-2 :

(2) **Criteria and Barriers** : Depending on the nature of mechanisms :

(A) **CDM**：Most difficult (**High-Hanging Fruits**)

-Stringent methodologies and additionality rules

-UNFCCC approval and transfer of credits

(B) **VCS** :

-Similar methodologies as CDM, but additionality criteria are less stringent

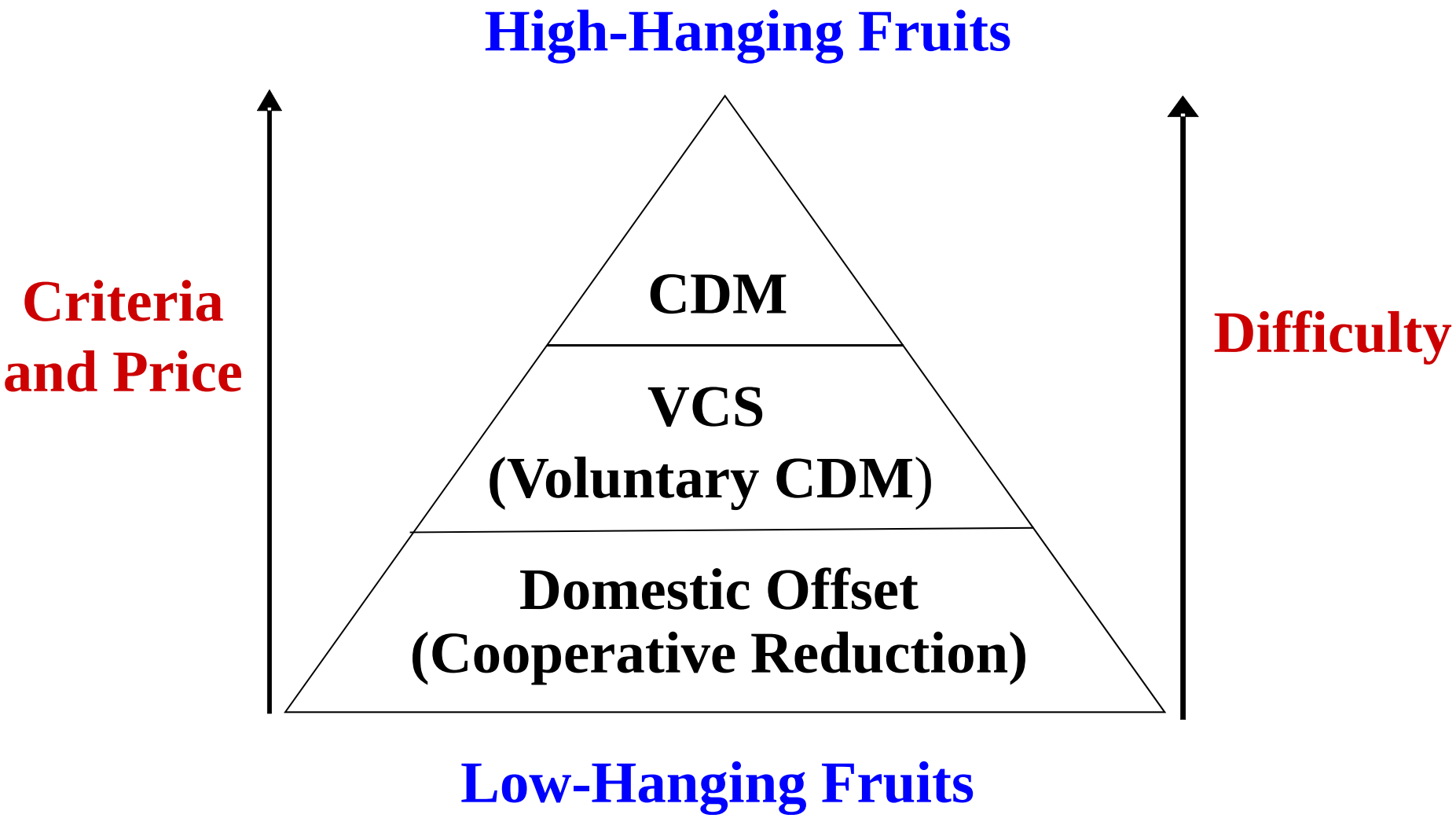
-Double verification and validation

(C) **Domestic Offset** : Least stringent and difficult (**Low-Hanging Fruits**)

-Basic additionality rules only, proven reduction

-verification and validation

Fig. 4：Hierarchy of Cooperative Reduction (CDM are "High-Hanging Fruits", only for Annex-I Countries to Pick)



2. Rationale for Cooperative Reduction (2/4)

2.2 Current Situation in Taiwan :

(1) **CDM** : Not possible for Taiwan to sell CDM credits (CERs) under present political situation. When Korea and Singapore become CER buyers, Taiwan may not be able to buy CERs either (VCS is more likely).

(2) **VCS** : Right now it is the only possible mechanism for Taiwanese entities to sell carbon credits in international markets. There are much potential in Taiwan, yet very poorly cultivated due to unfavorable national policies.

(3) **Domestic Offset** : High potential in Taiwan, but also little cultivated.

2. Rationale for Cooperative Reduction (3/4)

2.3 Future Directions for Taiwan :

(1) **CDM** : Clarify if there is any possible way for Taiwan entities to join as a buyer when Korea and Singapore start to do so in future.

(2) VCS : Promote with wise, favorable policies and measures to boost the VCS credit sales from Taiwan. Large sold VCS credits means cooperative GHG reduction in Taiwan is blooming.

(3) **Domestic Offset** : Promote it with suitable criteria to help realize the potential. Large offset credits granted in Taiwan means additional GHG reduction is blooming. This is beneficial to both the entities involved and Taiwan government.

2. Rationale for Cooperative Reduction (4/4)

2.4 Novel CO_2 Storage Measures : Artificial Reef and Fish Farm is worth attention:

(1) **Made of Industrial By-Products** : Mainly of steelmaking slag or the like that contains several nutrients good for sea water quality and algae growth and fish farming.

(2) **Dissolve and Fix CO_2 from Air** : Through the food chains in sea world and can supply seafood to human beings (just like livestock farming on land).

(3) **Low Impact and Risks** : Since it's an imitation of Mother Nature's activities that have been on Earth for millions of years (**Figs. 7~9**).

Fig. 7：Food Chains in Sea World

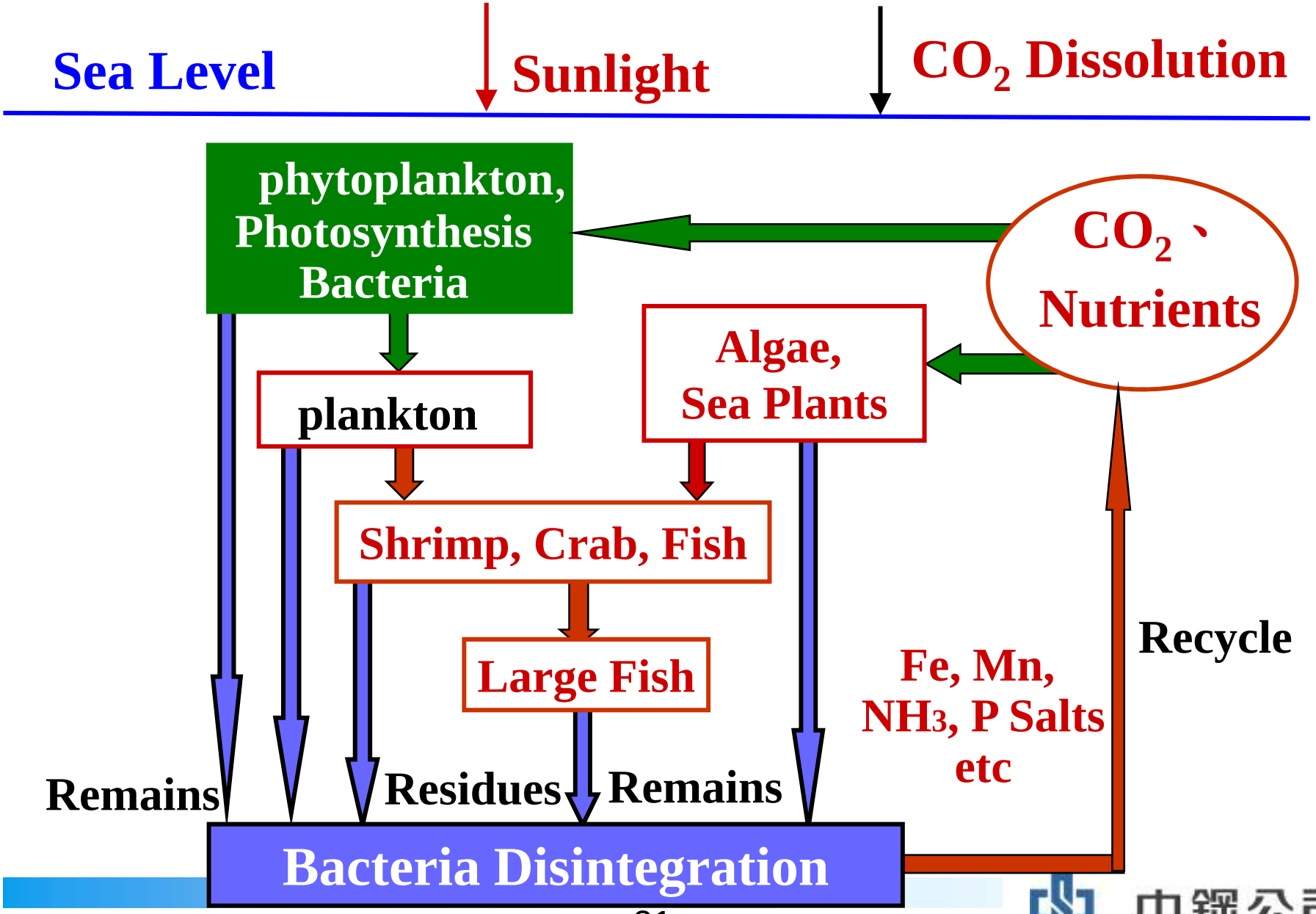


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Fig. 8：Steel Slag in Artificial Reef

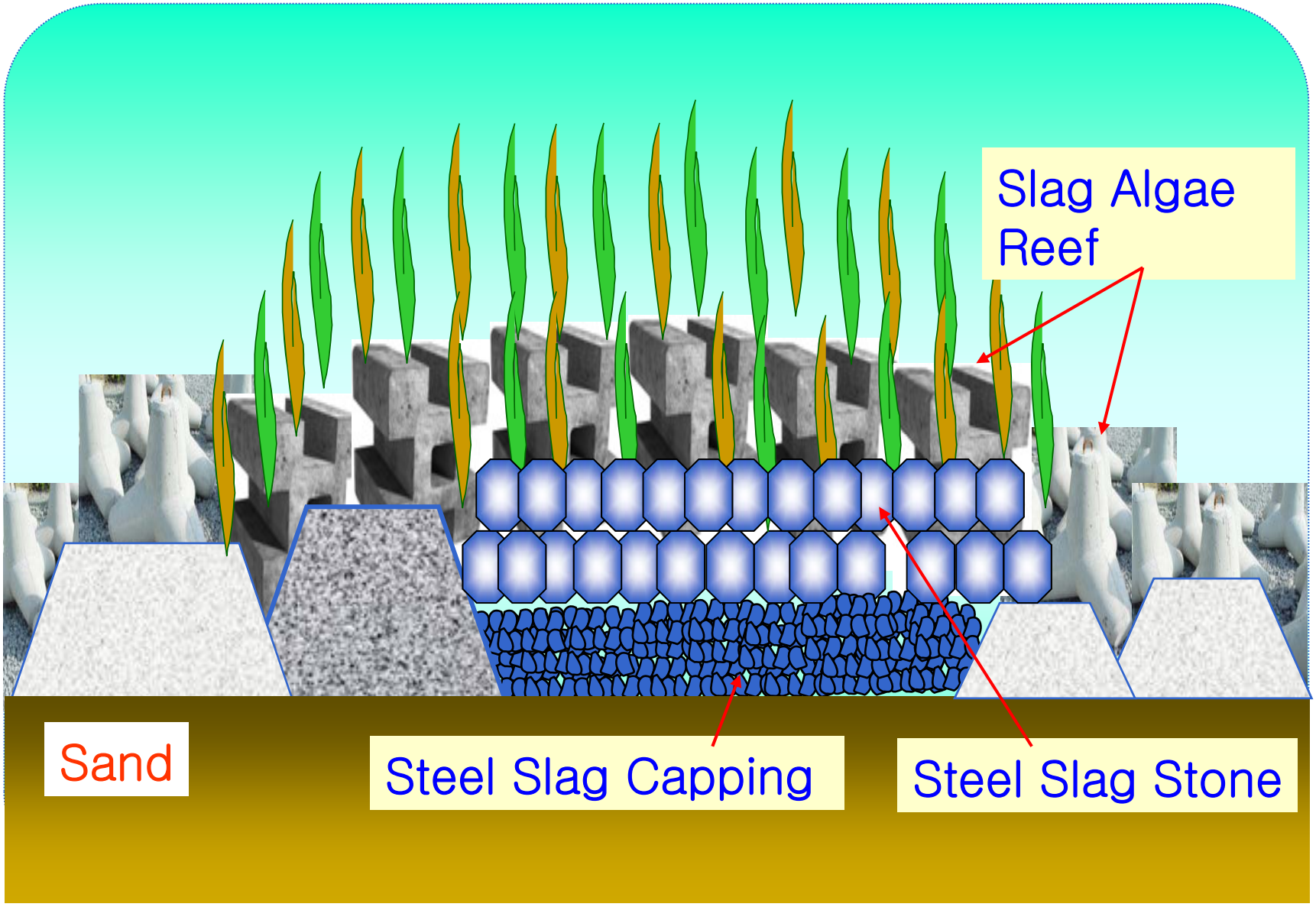

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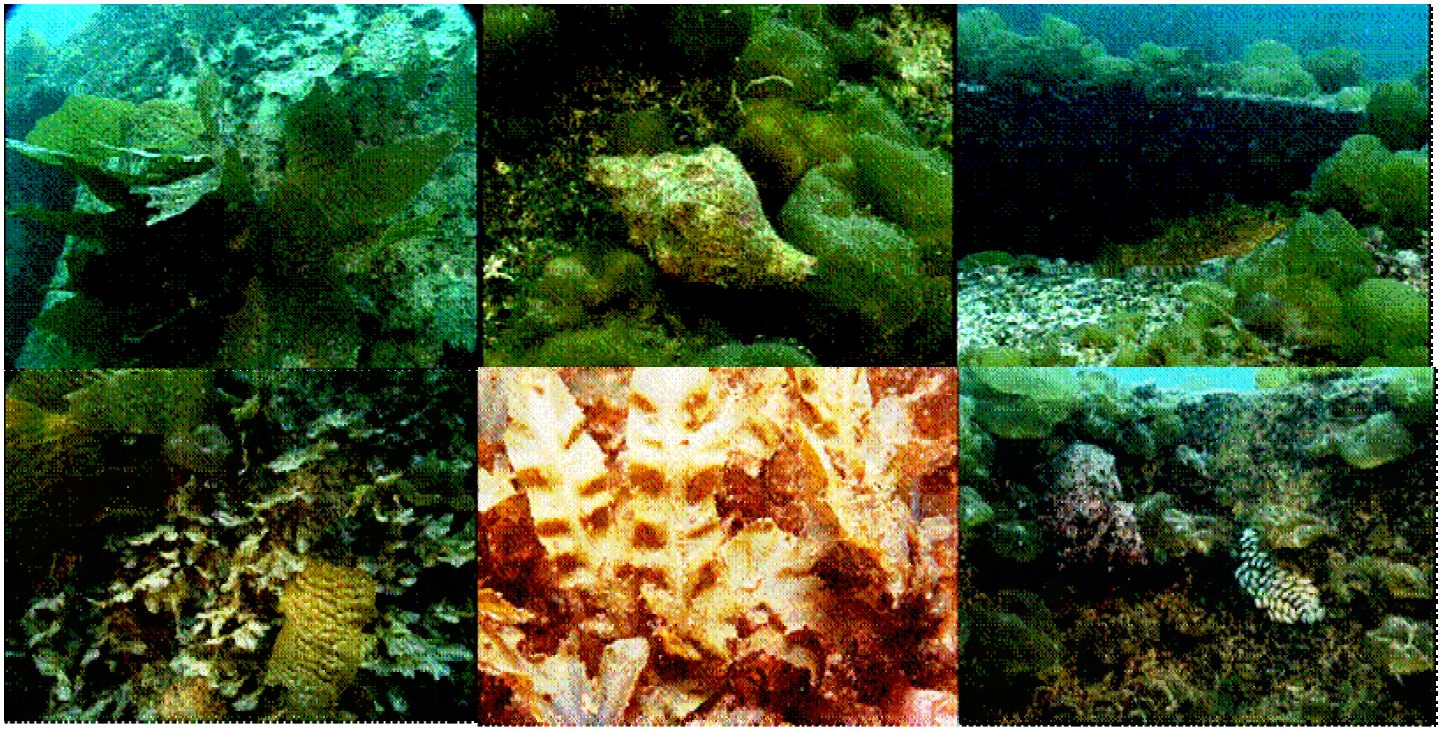
Fig. 9 : Field Test of Slag Fish Reef

Habitats After 5 Months

- Concrete Fish Reef
- Slag Fish Reef



Items	Concrete Fish Reef	Slag Concrete Fish Reef	Remark
No. of Individuals	147 indv./m^3	272 indv./m^3	1.9 times
Weight	353 g/m^2	605 g/m^3	1.7 times
No. of species	6 spc./m^3	8 spc./m^3	1.3 times

3. Rationale for Individual Efforts (1/5)

3.1 Q and A's

Q1: Who are responsible for excessive GHG emissions? why ?

A1: (1) Consumer that consume too much industrial goods with high C-footprints, just like power users are responsible for the GHG emission of power generation (**User Pays Principle**).

(2) If consumers do not need industrial goods for their diet, clothing, accommodation, transportation, education, recreation and etc., there won't be so much GHG emissions (e.g. **during 2008 financial crisis period**).

3.1 Q and A's-2

Q2: How to measure C-responsibility of consumers?

A2: Estimate the total C-footprint from consumer's activities, not only for energy use, bat also for all the major activities involving GHG emissions.

Q3: Who are the most powerful drivers for GHG reduction? why?

A3: Consumers, because they can choose to have low-C consumption. The global supply chains will have to adjust accordingly, otherwise they will face a shrinking market or out of business.

Q4: Who are the key stakeholders in climate damages?

A4: Again, the consumers or general public at risks.

3.1 Q and A's-3

Q5: Why consumers have not played a stronger role ?

A5: Because they were not properly informed, e.g. consumers don't realize their C-footprints, nor how to play a key role in their C-footprint reduction while not losing much living quality.

Q6: How to engage consumers more effectively ?

A6: 1. Study the issue further, establish proper database and systems needed for subsequent promotion. Model cases could be very helpful.

2. Communicate starting with the academia sector and environmental groups, then to the media, the general public and finally governments.

3. Rationale for Individual Efforts (2/5)

3.2 Carbon Responsibility and Liability : Need new definitions under "**User Pays Principle**":

(A) National C Responsibility = National C Inventory + C Footprints for Imports - C Footprints for Exports

(B) Carbon Responsibility Per Capita = National C Responsibility ÷ National Population

(C) Carbon Liabilities* : Countries bearing high carbon responsibilities per capita are with high carbon liabilities (under "**Equal Human Right Principle**").

(D) Carbon Credits : Countries with low C responsibilities per capita are with carbon credits.

(* This liability is based on current and future GHG emissions, and is different from **historical carbon liability** of Annex I Countries)

3.2 Carbon Responsibility and Liability-2 :

(E) Possible Impact : National Carbon Responsibility per capita may change in the following way, **Table 4:**

Country	Current (Ton CO_2/capita)	Under New Definition (Ton CO_2/capita)
US*	~20	↑↑
China	~5	↓
Korea	~10	↓
Singapore	-	↓
Taiwan	~12	↓

*How to convince US and other countries to accept this fair Carbon Responsibility could be an issue.

3. Rationale for Individual Efforts (3/5)

3.3 Carbon Justice: Based on "**Equal Human Right**" principle, countries or people having high carbon liabilities should pay the price, e.g. :

(1)International

(A) Funds from Liable Countries : To pay for their high carbon responsibilities.

(B) Funds to Areas/Countries with Carbon Credits: To compensate for their low GHG emissions, or needs resulting from climate damages.

(C) Global Carbon Tax : Can also be designed under "**Fair Market**" and "**User Pays**" Principles.

3.3 Carbon Justice-2:

(2)Domestic

(A) **Carbon Tax**： Additional carbon tax can be considered on a unbiased basis for consumer goods with high carbon footprints if needed (not to interfere with fair market competition in both Annex-I and non-Annex I countries).

(B) **User Pays** : Consumers who choose to buy goods with high carbon footprints should pay additional costs (just like buyers of cars with high carbon footprints).

(C) **Use of Tax Revenue** : Can be used as funds for domestic or international carbon-related issues.

3. Rationale for Individual Efforts (4/5)

3.4 Stronger GHG Reduction Mechanism :

(1) **Key Drivers** : Consumers.

(2) **Indicators** : (A) Footprint of consumer goods

(B) Personal carbon footprints

(3) **Tools** : (A) C-labels of consumer goods.

(B) C-Tax on goods of high carbon footprints.

(C) C-footprints calculators

(D) Policy tools

(4) **Current Key Issue** : Lobbying for wider and stronger consensus, database, standards and model cases.

3. Rationale for Individual Efforts (5/5)

3.5 Possible Effect : When consumers have consensus on this issue, it may induce other changes such as :

(1) **Reduce Consumer Demand** : But this is healthy since it is due to more efficient and/or prolonged use of goods (less wasting).

(2) **Enhance Benchmark Approach** : The sectoral approach could be expanded to the whole supply chain to lower the C footprint of consumer goods.

(3) **Boost Carbon Trading** : More entities will have to buy C-credits to reduce the C-footprints of their products.

(4) **Help Resolve International Disagreement** : Since it is more fair than artificial rules and targets.

4. Summary

(1) Energy saving is a cost-effective area well accepted for GHG reduction. It's measures have been adopted by advanced countries and institutes in their planned GHG reduction roadmaps or pathways. Current mechanisms to promote energy saving include enhance incentives, reduce barriers, enforce by policies and laws.

(2) To promote cooperative efforts and utilize market forces (by awaken customers for low-carbon consumption) can help realize GHG reduction in all countries. They deserve more studies and promotion.

(3) In this report, the author tried to elaborate preliminary ideas and reasoning, hoping to contribute to the development of wider and stronger mechanisms for GHG reduction both in Taiwan and worldwide

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