Asia-Pacific
Environmental Innovation Strategy Project

Strategic Database for Energy

APEIS-IEA Project

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Asia-Pacific
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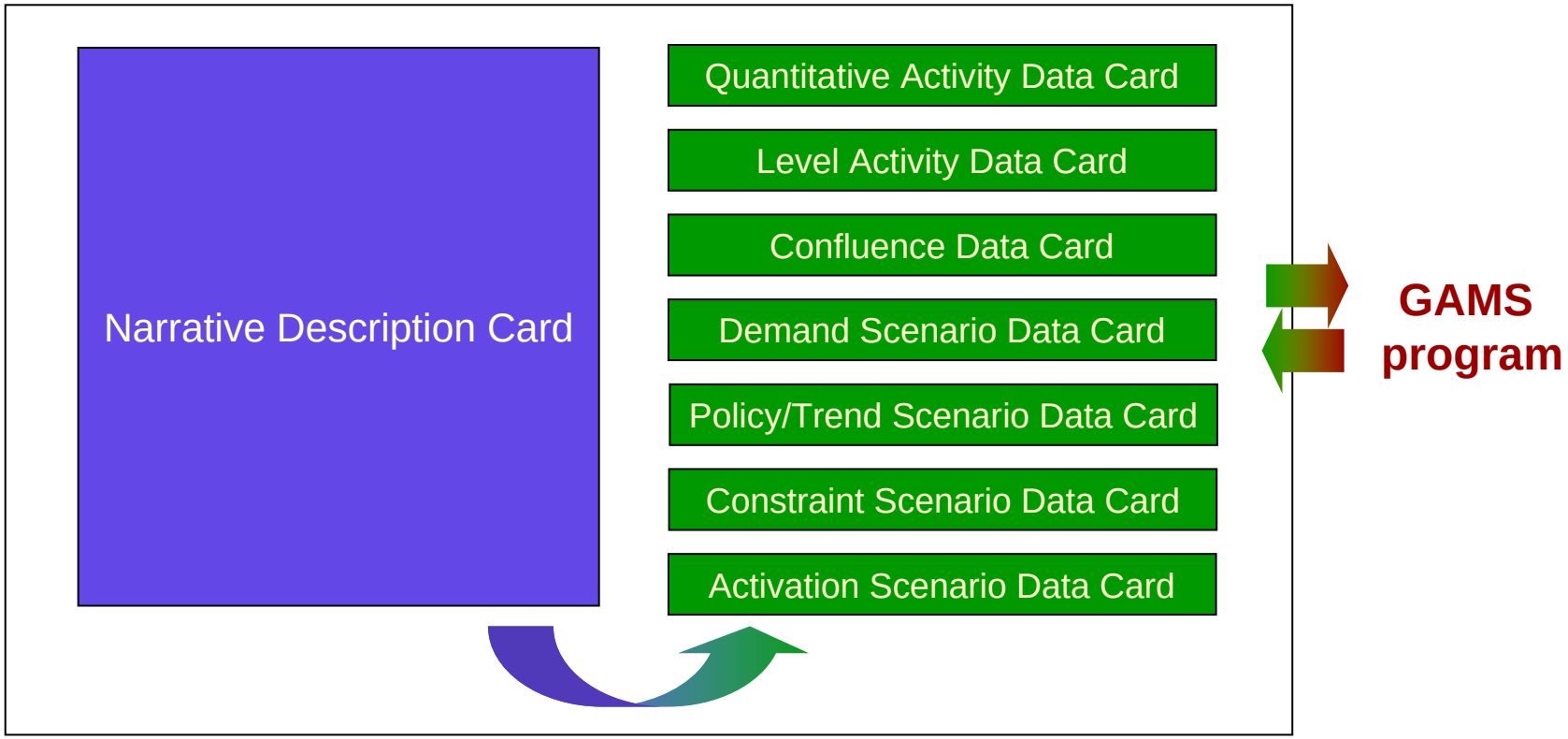
1. Procedure for estimating future environmental pressure with using SDB

Structure of SDB



Narrative Description Card

Narrative Description

Sales Campaign for Hybrid Vehicle

Hybrid type gasoline vehicle

The hybrid system proven in Toyota's "PRIUS", the world's first mass-produced hybrid car, achieves its highly efficient operation through sophisticated energy management of a gasoline engine and secondary battery.
When the car stops, the gasoline engine stops too, instead of just idling and wasting energy. During start-up and at low speed, gasoline engine efficiency is low, so the car runs on its electric motor, which draws electricity from the secondary battery. At faster speeds, the gasoline engine propels the vehicle. But the system gives priority to operating the engine only within its most efficient rpm range, so engine power may not be sufficient when the car accelerates. At such times, therefore, the motor provides assistance to make up for the shortage, drawing electricity from the secondary battery. If, on the other hand, the car cruises at a steady speed, the engine, which operates with priority placed on efficiency, may produce more energy than is needed. In this case, such excess energy is used to generate electricity, which is stored in the secondary battery. If the accelerator is let up on to slow down, the engine stops automatically to avoid wasting energy. And during deceleration through braking and other means, the car's forward momentum is used to generate electricity, which is stored in the secondary battery.
Price is 2,150,000 yen and higher by 300,000 yen than conventional type. Fuel efficiency is 30km/l……

- Literature searching
- Interview with experts

Format
- Present: Free
- Future: Free form & Access

Task 1: Draw up environmental innovation strategies

Data Card

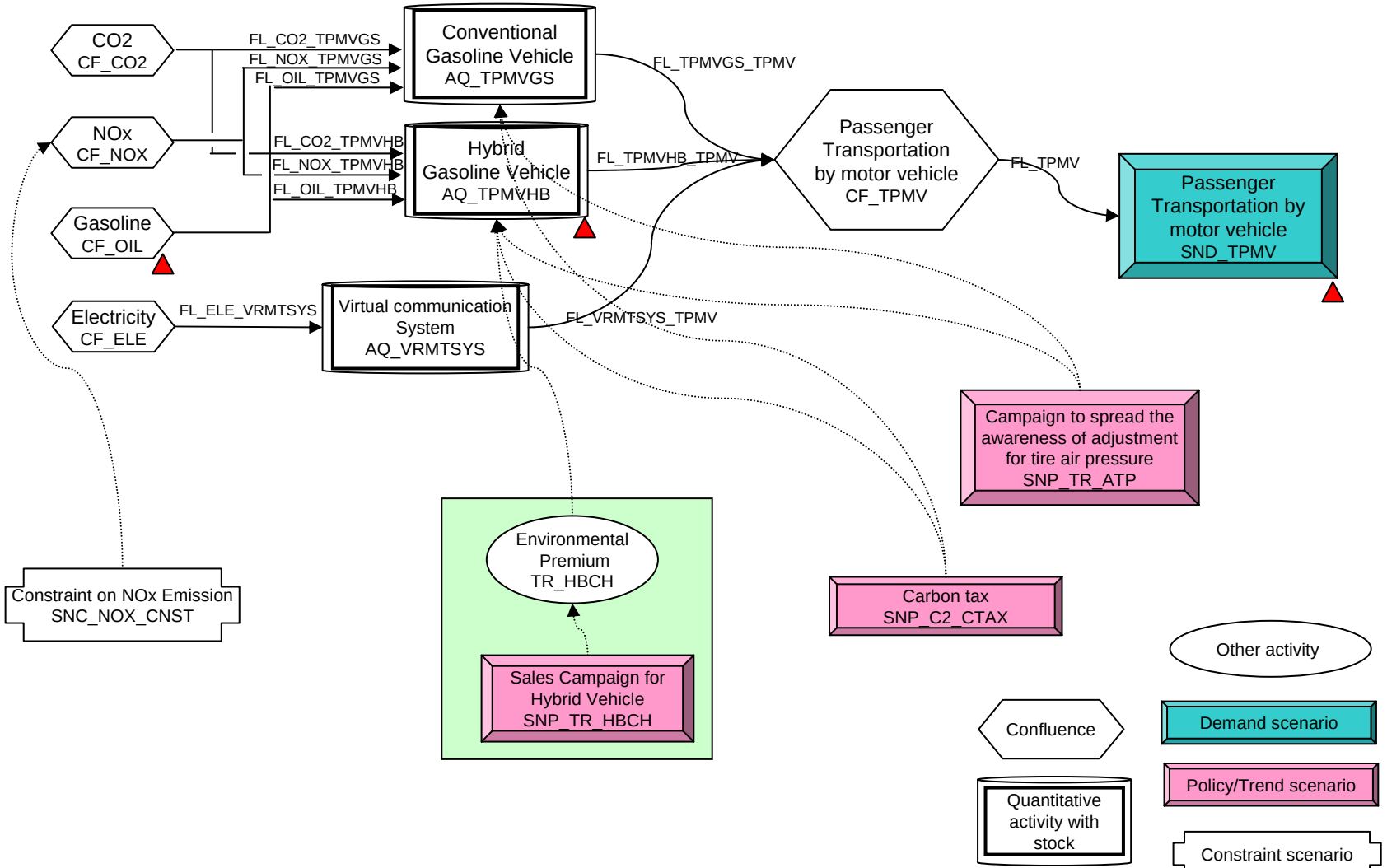
Narrative Description Card

- Quantitative Activity Data Card
- Level Activity Data Card
- Confluence Data Card
- Demand Scenario Data Card
- Policy/Trend Scenario Data Card
- Constraint Scenario Data Card
- Activation Scenario Data Card

Task 2: Translate narrative description to systematic and quantitative data

Item	Content	Format	Code	Value	Memo
Name of activity	Code of activity	(AN16)	AC*	AC_TPMVHB	Hybrid gasoline vehicle
Subject of activity	Code of subject	(AN16)	OBJCT	RES_TRMV	Family budget
Unit of activity	Code of unit	(AN16)	UNIT	KPKM	1000 person-km
Activity in reference year	Activity	(F)	QACT0	0	
Price per activity	Function of accompanying variables	(GAMS)	PACT	0	
Tax on activity	Function of accompanying variables	(GAMS)	TAX	0	
Start year of activity	Start year of activity	(I)	YSTAC	2008	
End year of activity	End year of activity	(I)	YENAC	9999	
Inflow/Outflow (1)					
Name	Code of flow	(AN16)	FL*	FL_TPMVHB_TPMV	Passenger transportation
Confluence of In/Outflow ahead	Code of confluence	(AN16)	CF*	CF_TPMV	
Input/Output	IN/OUT	(I/O)	FLDIR	O	Output
Conductance in Reference Year	Conductance	(F)	FLCD0	15	
Conductance	Function of accompanying variables	(GAMS)	CDCHG		
Tax on flow	Function of accompanying variables	(GAMS)	TAX		
Inflow/Outflow (2)					
Name	Code of flow	(AN16)	FL*	FL_OIL_TPMVHB	Gasoline (tax)
Confluence of In/Outflow ahead	Code of confluence	(AN16)	CF*	CF_OIL	
Input/Output	IN/OUT	(I/O)	FLDIR	I	Input
Conductance in Reference Year	Conductance	(F)	FLCD0	-0.48	(25km/L)
Conductance	Function of accompanying variables	(GAMS)	CDCHG	1+ TR_ATP	
Tax on flow	Function of accompanying variables	(GAMS)	TAX		

Combination of Data Card



Example of Data Card (1)

Activity Card – Hybrid gasoline Vehicle

Item	Content	Format	Code	Value	Memo
Name of activity	Code of activity	(AN16)	AQ*	AQ_TPMVHB	Hybrid gasoline vehicle
Subject of activity	Code of subject	(AN16)	OBJCT	RES_TRMV	Family budget
Unit of activity	Code of unit	(AN16)	UNIT	KPKM	1000 person-km
Activity in reference year	Activity	(F)	QACT0	0	
Price per activity	Function of accompanying variables	(GAMS)	PACT	0	
Tax on activity	Function of accompanying variables	(GAMS)	TAX	0	
Start year of activity	Start year of activity	(I)	YSTAC	2000	
End year of activity	End year of activity	(I)	YEDAC	9999	
Inflow/Outflow (1)					
Name	Code of flow	(AN16)	FL*	FL_TPMVHB _TPMV	Passenger transportation
Confluence of In/Outflow ahead	Code of confluence	(AN16)	CF*	CF_TPMV	
Input/Output	IN/OUT	(I/O)	FLDIR	O	Output
Conductance in Reference Year	Conductance	(F)	FLCD0	15	
Conductance	Function of accompanying variables	(GAMS)	CDCHG		
Tax on flow	Function of accompanying variables	(GAMS)	TAX		
Inflow/Outflow (2)					
Name	Code of flow	(AN16)	FL*	FL_OIL _TPMVHB	Gasoline (toe)
Confluence of In/Outflow ahead	Code of confluence	(AN16)	CF*	CF_OIL	
Input/Output	IN/OUT	(I/O)	FLDIR	I	Input
Conductance in Reference Year	Conductance	(F)	FLCD0	-0.48	(25km/L)
Conductance	Function of accompanying variables	(GAMS)	CDCHG	1+ TR_ATP	
Tax on flow	Function of accompanying variables	(GAMS)	TAX		

Example of Data Card (2)

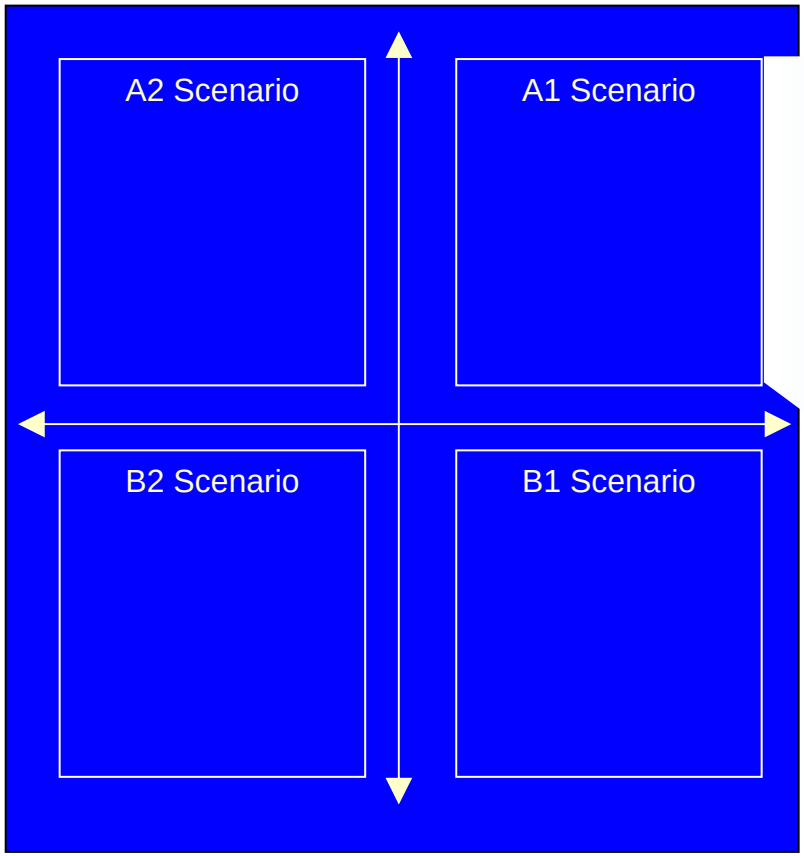
Confluence Card – Gasoline

Item	Content	Format	Code	Value	Memo
Name	Code of confluence	(AN16)	CF*	CF_OIL	
Subject of activity	Code of subject	(AN16)	OBJCT		
Unit of flow	Unit of flow	(AN16)		TOE	toe
Flow price in reference year	Price per flow	(F)	PCNF0		
Condition of balance	YES/NO	(Y/N)		N	
Maximum allowable preference	Change rate of maximum allowable preference	(GAMS)	MXSCG		
Gush price	Function of accompanying variables	(GAMS)	PUPWL	0.11+0.02* (TIME-2000)	JPY/toe

Demand scenario data card: Passenger transportation by motor vehicle

Item	Content	Format	Code	Value	Memo
Name of scenario	Code of scenario	(AN16)	SND*	SND_TMPV	
Flag of activation	YES/ NO	(Y/N)	SNACT	Y	
Code of demand type	Code of confluence	(AN16)	SNCNF	CF_TMPV	
Demand quantity (1)	(Year, Value)	(I, F)	QSND	(2000, xxxxx)	
Demand quantity (2)	(Year, Value)	(I, F)	QSND	(2020, xxxx)	
Demand quantity (3)	(Year, Value)	(I, F)	QSND	(2050, xxxx)	

Design of scenario



Storyline

Japanese case

A1 scenario (global market-based scenario)

In the A1 scenario, the Japanese economy shifts toward a market-based economic system that attaches greater importance to the economic rationale for survival under a global market economy. In terms of investments, those that target increased production are focused on, with the aim of producing solid economic growth. Also, employment opportunities will increase for the elderly, women, and foreign nationals—in other words, there will be more equal opportunities—indicating a shift toward merit-based employment regardless of age or gender in such a competitive business world.
In terms of lifestyles, active consumer spending based on high purchasing power will be brought about. Time saved by outsourcing housekeeping tasks resulting from a focus on economic efficiency will be spent on recreation and education.
Moreover, the population and capital will be centralized into a megalopolis. Transportation networks will be developed featuring railways and automobiles in the central area, and automobiles in the suburbs. …..

Socio-Economic Scenario

			2010			
			A1	A2	B1	B2
General	Economic growth rate	(%/year)	2.1	0.9	1.6	0.5
	Population	(million)	127	126.3	128.4	127.6
Industrial	Crude steel	(10,000 t)	8,887	9,860	9,120	9,119
	Cement	(10,000 t)	8,398	8,194	8,264	7,727
	Ethylene	(10,000 t)	668	701	640	645
	Paper and paperboards	(10,000 t)	3,052	3,311	3,010	3,004
	Share of tertiary industry	(%)	65.9	64.1	65.4	64.8
Residential	Households	(million)	49.6	49	49.4	48.8
	Heating service per household	(2000 = 100)	100	92	97	89
	Cooling service per household	(2000 = 100)	145	137	145	133
	Information appliances per household	(2000 = 100)	128	116	122	116
	Fuel cell cogeneration	(million kW)	0	0	1	0
Commercial	Floor space	(million m^2)	1,804	1,710	1,796	1,702
	Fuel cell cogeneration	(million kW)	0	0	1	0
Transportation	Passenger transportation	(mil. pass.-km)	1,387	1,343	1,367	1,323
	Fuel cell vehicles	(%)	0	0	0	0
	Freight transportation	(million t-km)	593	544	559	506
Power generation	Nuclear power plants	(MW)	53,248	57,546	49,580	44,917

Task 3: Draw up storylines and develop socio-economic scenario

Socio-Economic Scenarios in passenger transportation sectors

A1

- Market economy-based system that emphasizes economical rationale.
- High economic growth
  → Increase of passenger transportation
- Remarkable technology innovation
  → H2 fuel cell vehicle
  H2 produced from fossil fuel

A2

- Economic development along the same lines as existing social system
- Suburban sprawl
  → Increase of passenger vehicle trans.
- Stagnation of technological innovation
- Without consumer 's awareness regarding environmental issues

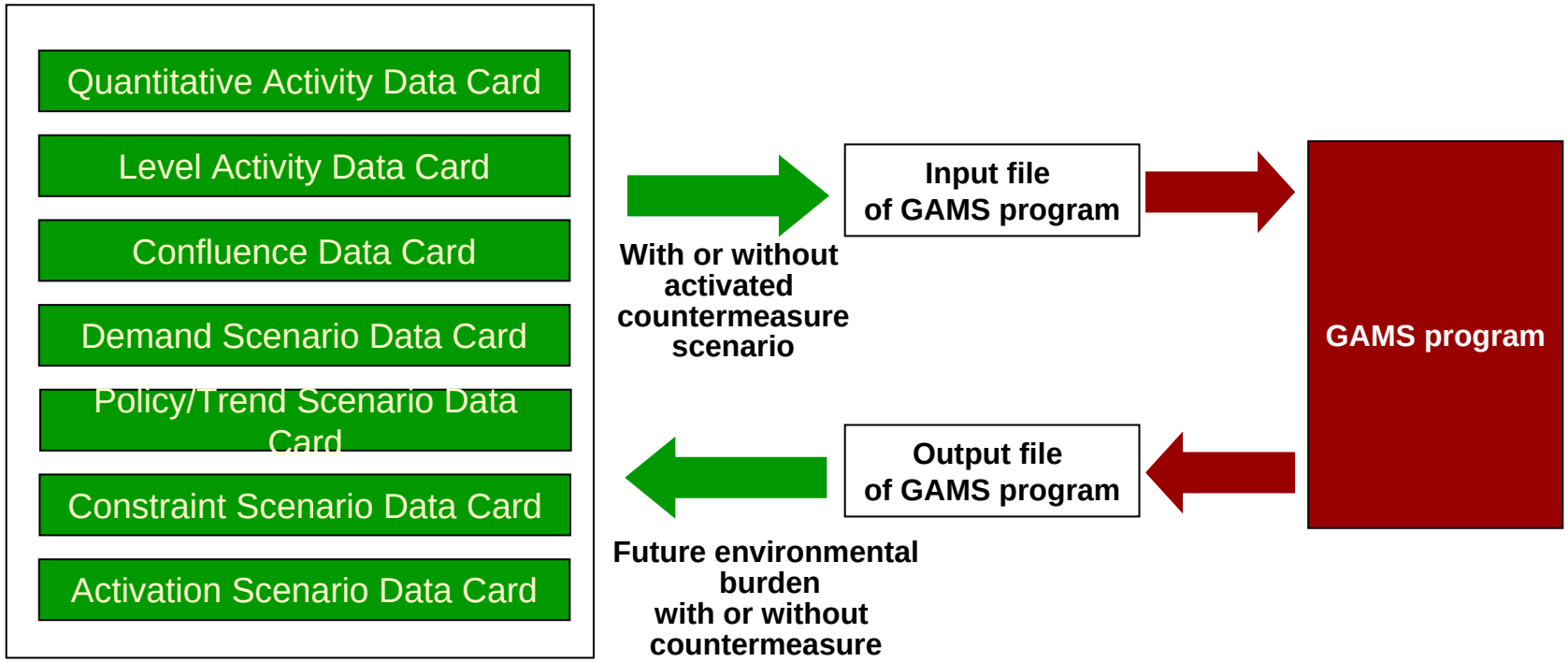
B1

- To achieve both economic development and dematerialization through tech. innovation
- Compact Cities
  → Increase of public transportation
- Remarkable technology innovation
  → Bio-ethanol
  → H2 fuel cell vehicle
  H2 produced from NG and renewables

B2

- Regions coexist symbiotically with inde-pendent and sustainable production area.
  → Virtual communication system (Cyber office)
- Shift to environmentally harmonious lifestyle
  → Bikeway
  → Eco-drive license
- Decease of transportation distance by car
  → Advanced car sharing system

Simulation



Task 4: Simulate future environmental pressures and analyze effect of strategies

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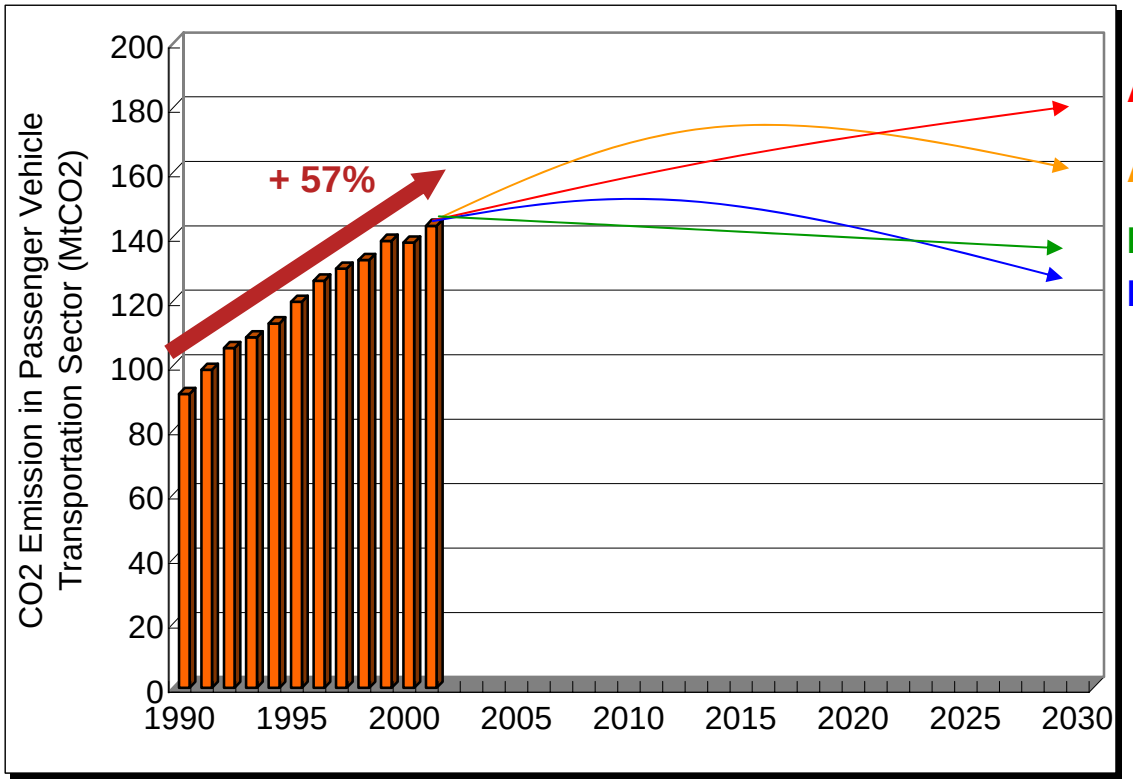
2. Estimating future environmental pressure with using SDB in passenger transportation sector

CO2 emission is estimated by SDB



A1

Gasoline Hybrid Vehicle

Fuel cell Vehicle Fueled by H2 from Oil

A2

Bikeway

B2

Eco-drive License

B1

Virtual Communication System

Advanced Car Sharing System

Gasoline Hybrid Vehicle

Fuel Cell Vehicle Fueled by H2 from NG

Bio-Ethanol

Advanced Eco-driving Navigation

Advanced Eco-driving Navigation System

from TOYOTA Website

from TOYOTA Website

I. Information about "Eco-drive"

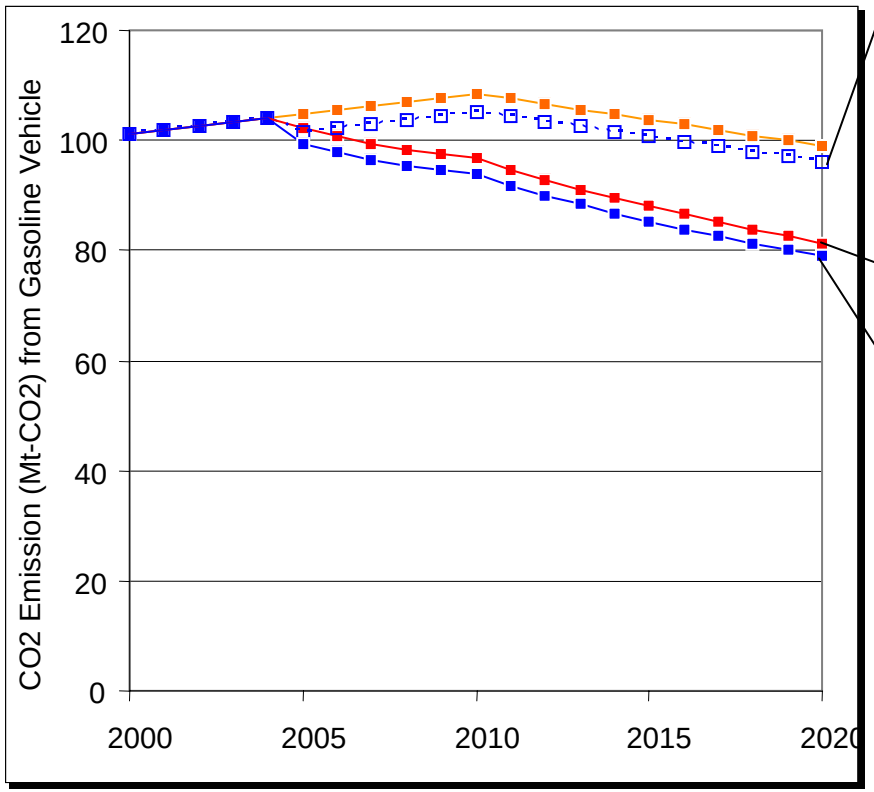
Idling Stop !
Now your car is stopping.
Try idling stop.
One minute idling stop per day can save * yen, *** L of gasoline consumption and decrease CO2 emission in a year.**

II. Information about "High Efficiency Vehicle

Recommend Best Efficiency Car
Best efficiency car is *** of **** company as of March 13, 2004.**
To buy a new car, you can save * yen, ***L of gasoline consumption and decrease CO2 emission in a year.**

** Research of Japan's Ministry of the Environment in 2003 shows that eco-driving navigation system decreases CO2 emission by 5%.*

Advanced Eco-driving Navigation System



Introduction of Eco-driving Navigation System that provides information about Eco-drive.

- Eco-driving saves energy consumption of conventional vehicle.
- Incentive for introduction of high efficiency vehicle decrease.
- High efficiency vehicle does not selected.

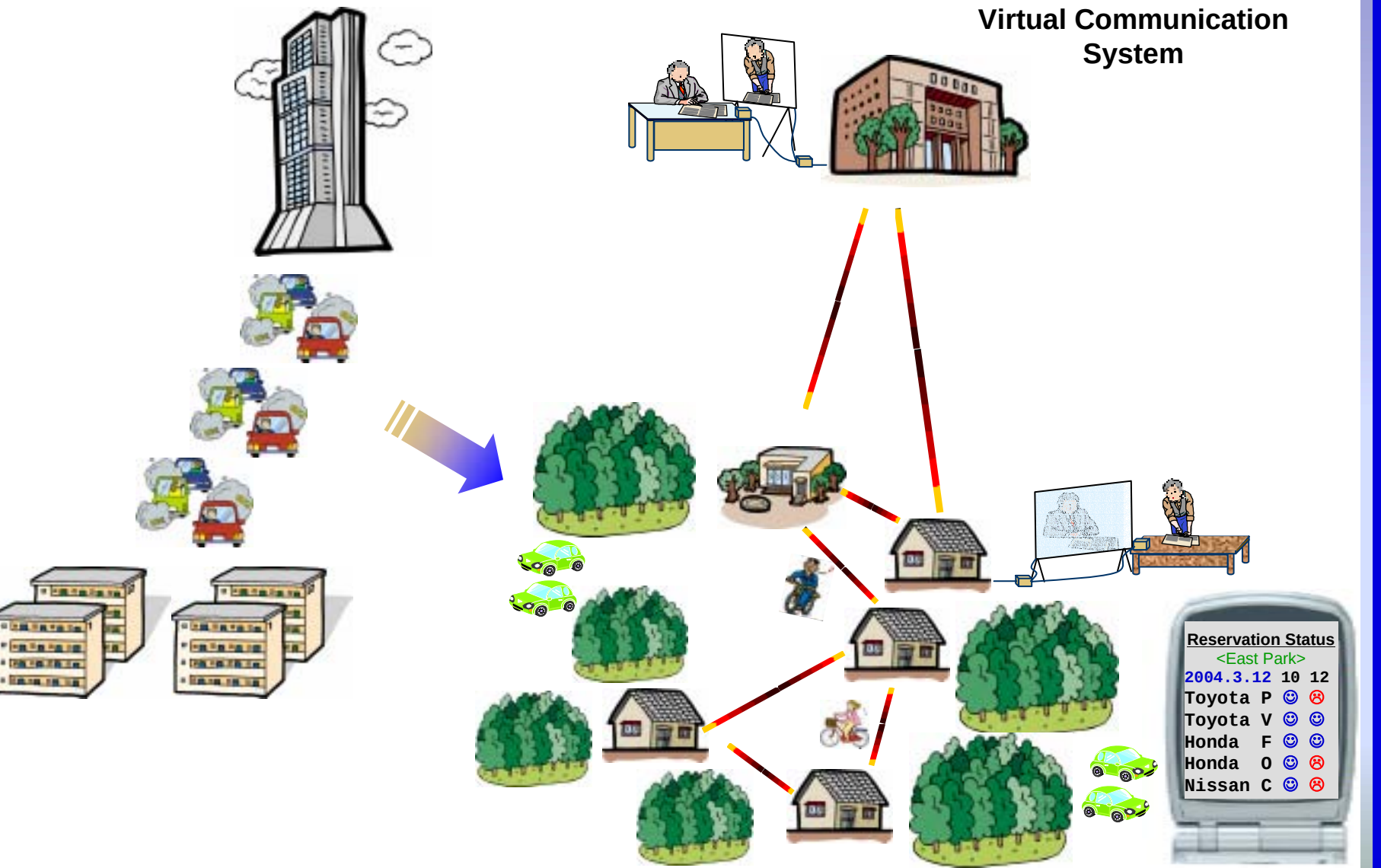
• High efficiency vehicle is introduced by carbon tax

Introduction of Eco-driving Navigation System that provides information about both Eco-drive and high efficiency vehicle.

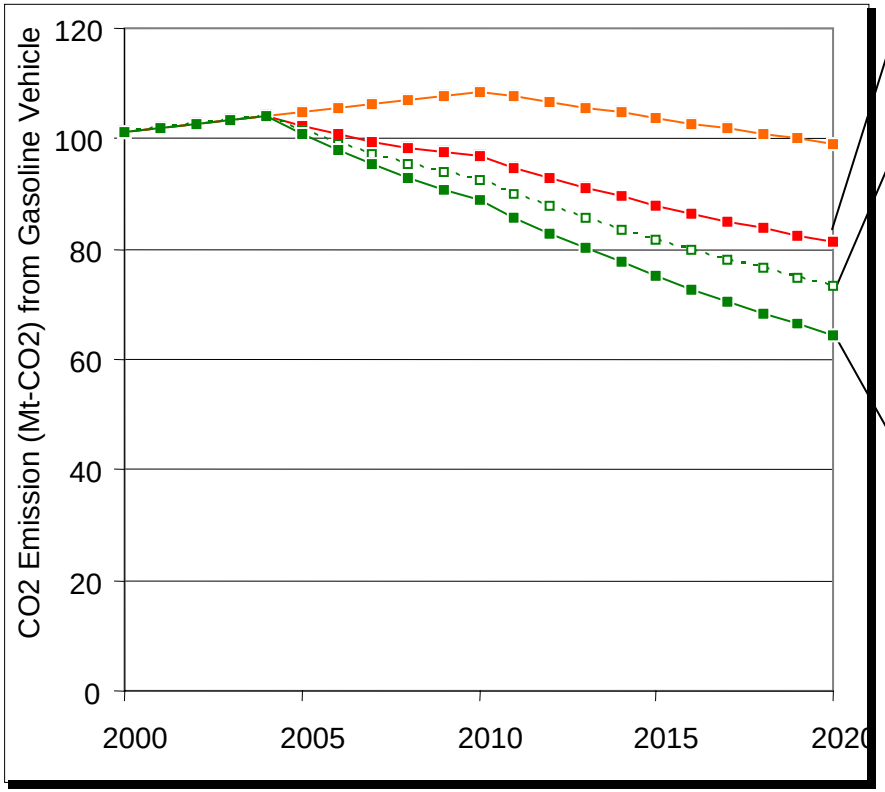
- Provision of Information about high efficiency vehicle makes high efficiency vehicle selected.

Eco-driving navigation system that provides information about both Eco-drive and high efficiency vehicle contributes to CO2 reduction

Virtual Communication System
Advanced Car Sharing System



Virtual Communication System
Advanced Car Sharing System



- **High efficiency gasoline engine vehicle is introduced by carbon tax**

- **Introduction of Virtual communication system**

- Virtual communication system decreases transportation quantity of gasoline vehicle.
- Incentive for introduction of high efficiency vehicle decreases.
- High efficiency vehicle does not selected.

- **Introduction of both virtual communication system and advanced car sharing system**

- Car sharing system increases transportation quantity per car.
- Incentive for introduction of high efficiency vehicle increases.
- Hybrid vehicles are selected.

Introduction of both virtual communication system and advanced car sharing system contributes to CO2 reduction.

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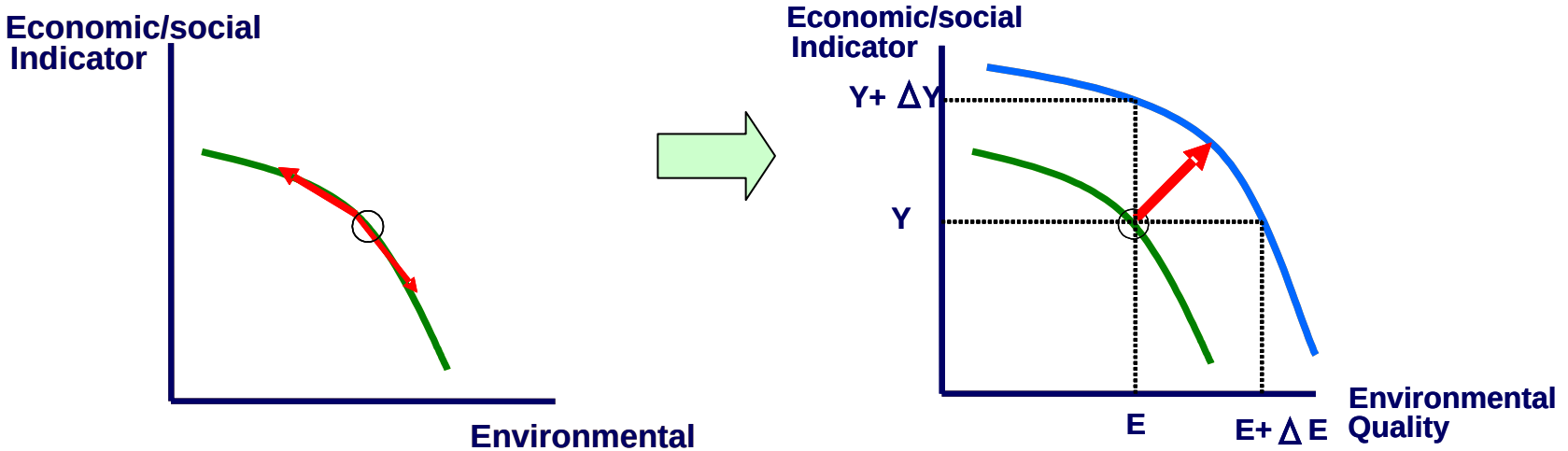
Final note

Final note

- If we take stopgap measures for reduction of environmental pressure with using technologies on the present socio-economic system, large effect can not be achieved on the neither economy side nor environment side.
- It is necessary for breakthrough that technological innovation and social innovation should be combined.
- Eco-driving navigation system, virtual communication system and advanced car sharing system are examples of technology that induce social innovation.
- SDB is the excellent tool for quest of technological and social innovation. We will analyze idea of innovation strategy with using SDB and show effective Asian environmental innovation strategies.



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