Environmental Problems and Policy Measures in Rapidly Motorizing Countries 急激に自動車化する国々の 環境問題と対策

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Sungwon Lee (李 晟源)
Institute for Transport Policy Studies
(運輸政策研究所)



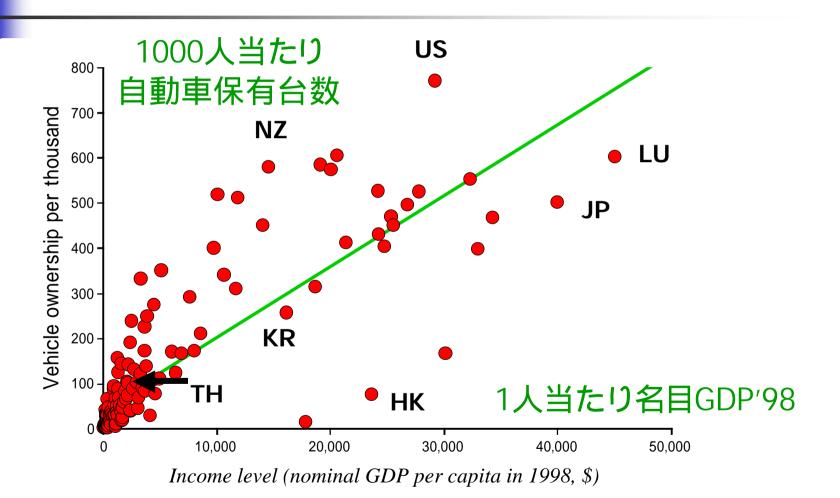
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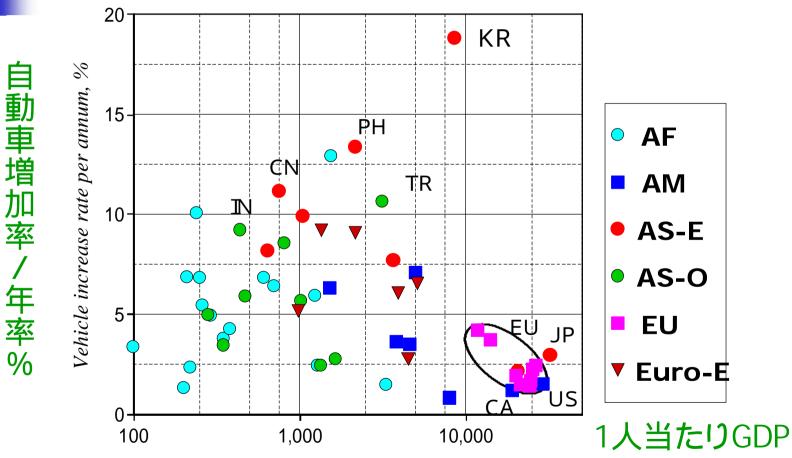
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- 1. 急激に自動車化する国々(RMC's)
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- 4. RMC'sの環境対策

1. Identification of rapidly motorizing countries (RMC's) 急激に自動車化する国々(RMC's)

The relationship between income level and vehicle ownership 所得水準と自動車保有率



Vehicle increase rate and income level 自動車増加率と所得水準

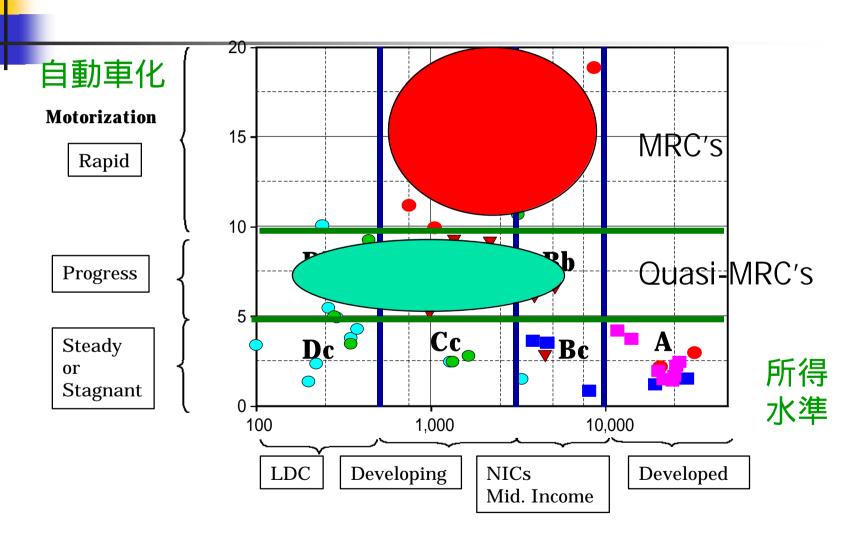


Income level (nominal GDP per capita in 1998, \$)

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Country groupings : RMC's

急激に自動車化する国々



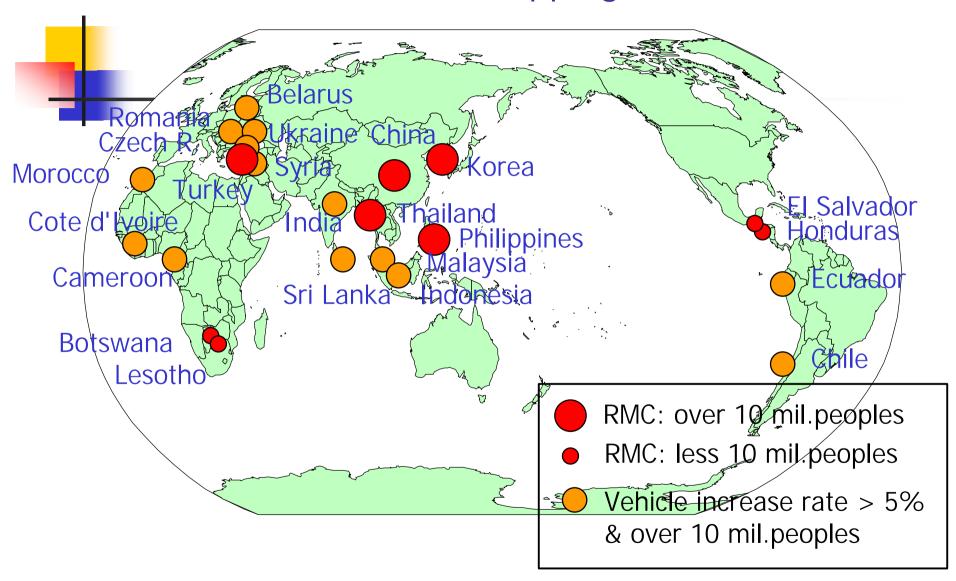
Identification of rapidly motorizing countries (RMC's)



Definition of RMC's 定義

- Having high vehicle ownership rate and other related conditions
 C1. Vehicle increase rate (10% or more per annum)
 C2-1. Newly industrializing and/or Middle income level
 C2-2. Faster developing
- 基準1.10%を超える自動車増加率
- 基準2-1. 新興工業国·中所得国
- 基準2-2. 高成長発展途上国
- C1 and (C2-1 or C2-2) MRC's

RMC's mapping



MRC's and their socio-economic characteristics 急激に自動車化する国々の特徴

- High Economic Growth Newly industrializing countries
 - Rapid concentration of urban population
 - Insufficient transport related infrastructure: rail and road
 - Huge social cost due to transport: congestion
 - Air pollution, noise and traffic accidents Regional environment
 - Moreover, CO2 emission Global environment
- 高度成長 新興工業国

急激な都市化

不十分な交通インフラ:鉄道・道路

交通混雑に伴う多大な社会的コスト

大気汚染・騒音・交通事故 局地的環境問題

CO2排出 地球環境問題

2. Transport and environment problems in RMC's

急激に自動車化する国々の交通・環境問題



1) Korea 韓国のケース

- Air quality standards are generally met in most major cities but there exists the possibility of underestimation due to measurement methodology
- Transport accounts for more than 90% of air pollutant emissions
- High traffic accident rate
- High level of congestion in major cities
- 大気の質水準はクリア 測定技術に問題の可能性あり
- 大気汚染の原因の90% 以上は交通に起因
- 高い交通事故率
- 主要都市の交通混雑

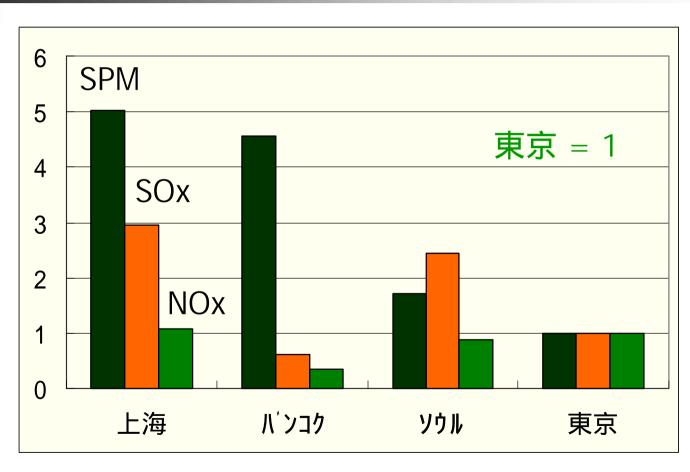


2) Thailand タイ国のケース

- Transport accounts for 20%-30% of greenhouse gas emissions
- SPM concentration level exceeds WHO guideline by a factor of two in Bangkok
- High urban congestion and traffic fatality rate
- A neglected public transport system
- 温室効果ガス排出の20-30% は交通に起因
- 世界保健機構規準を超える大気中浮遊粒子物質量
- 高い交通混雑と交通死亡率
- 公共交通システムの欠落

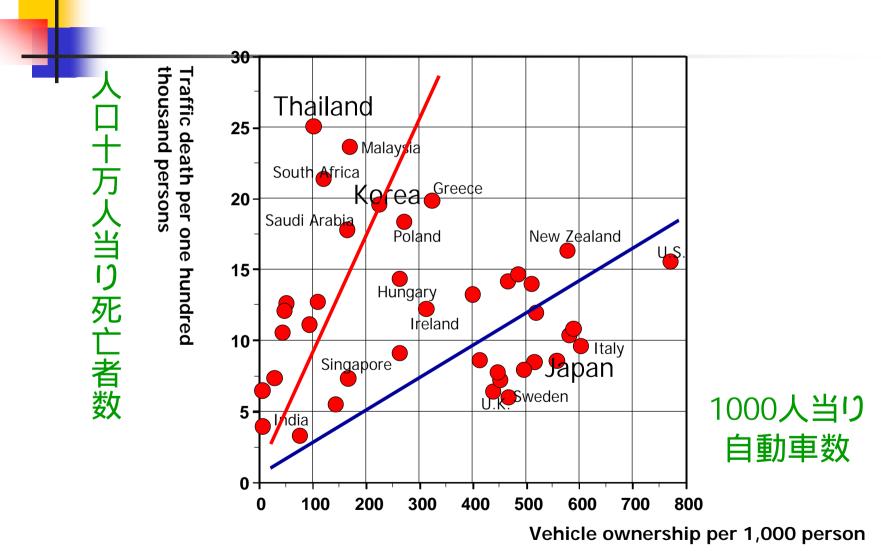


Air pollution level comparison 大気汚染物質の都市別比較



Vehicle ownership and traffic death rate

自動車保有率と死亡事故率



3. Future forecast 将来予測



- Estimation of future vehicle ownership
 - The most fundamental indicator for the prediction of the future status and problems
- Quasi-logistic estimation model
 - A variation of sigmoid growth function
 - Operational form has log-linear functional form
 - Income and operating cost are included
- < 自動車保有率推計 > ロジステック類型推定モデル
 - ·S字型成長関数
 - ・対数線形に展開してパラメータ推定
 - ・説明変数: 所得及び自動車維持コスト

3.1 Estimating model 推定モデル

Quasi-Logistic Model for Vehicle Ownership Estimation

保有率

保有率飽和水準

$$P = \frac{S}{1 + e^{-a}Y^{-b_1}C^{-b_2}T^{-b_3}}$$
 Y:所得水準 C:維持コスト

T:タイムトレンド

where

P = vehicle ownership rate per capita

s = saturation point of vehicle ownership

Y = per capita income level represented by per capita GNP at 1995 constant U.S. dollar terms

C = cost of motoring represented by vehicle purchase price (1995 constant price) plus one year average fueling cost

T = time trend, base year is set as 1

3: coefficients to be estimated

、 _{1.2.3}: 推定パラメータ

3.2 Estimation results and scenario analysis: Korea

韓国のケース: 推定結果と分析シナリオ

Estimated coefficients of the model パラメータ推定値

	Coefficient	Standard deviation	t - value
	-6.4827	9.8451	-0.65
1	2.5301*	0.4180	6.05
2	-1.8720*	0.6971	-2.69
3	-0.2793*	0.0988	-2.83
\mathbb{R}^2	0.993		
Adjusted R ²	0.991		

^{*} Indicates coefficient significant at 5% level

All coefficients except the intercept are significant at 5% level

They are also of expected signs

推定パラメータの符号条件、統計的有意性は満たされている。





Vehicle ownership forecast: Base case 標準ケース予測結果

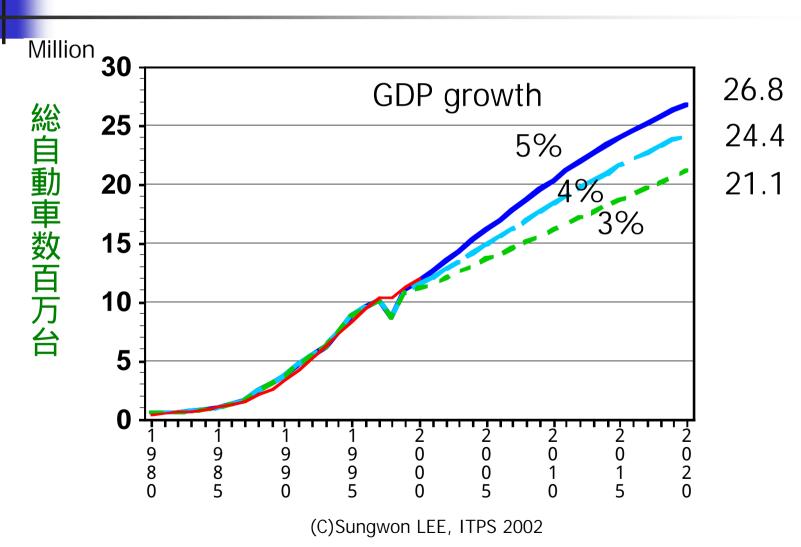
GNP 4%, growth & fuel price 2% increase per annum

GDP4% 成長・燃料価格2%上昇

	2000	2010	2020	'20/00
Population	47,223	50,184	51,807	1.1
(1,000)				
Per capita GNP	11.9	17.6	26.0	2.2
(1,000 1995 U.S. \$)				
Vehicle ownership per	243	365	470	1.9
1,000				
Total vehicle numbers	11.5	18.3	24.4	2.1
(Million)				

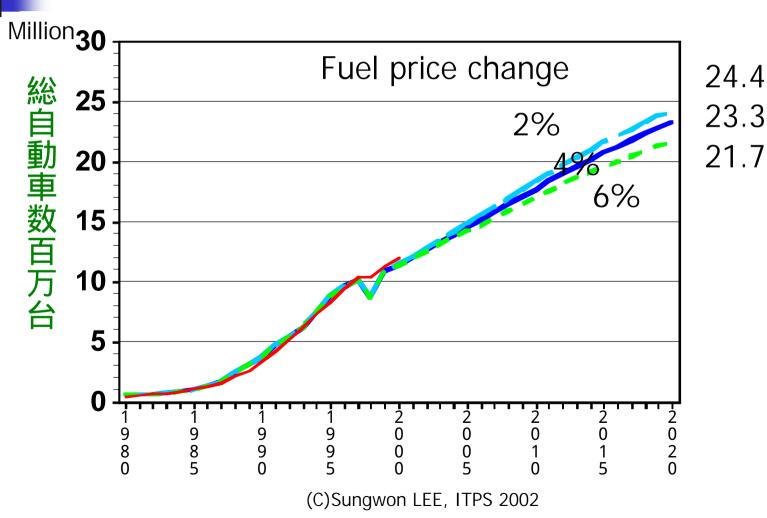


Scenario analysis by income GDP成長率シナリオの予測への影響



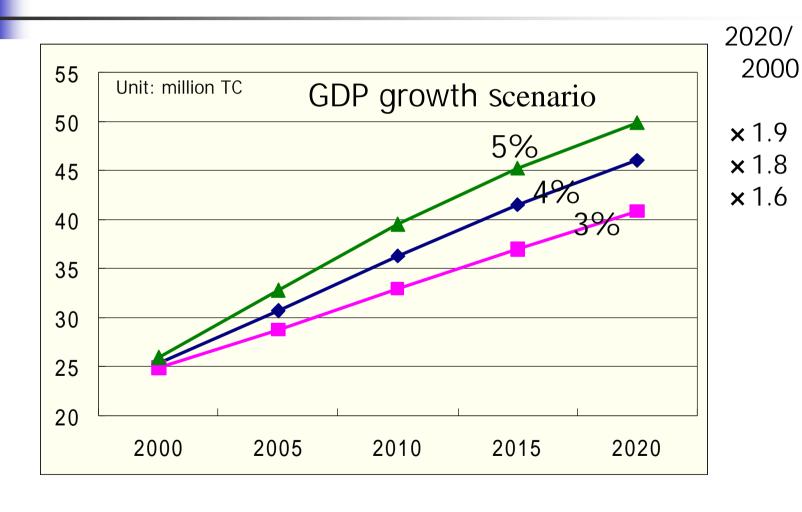


Scenario analysis by fuel price 燃料価格シナリオの予測への影響



韓国

GHG forecasts: Carbon emission in the transport sector 交通部門炭素排出量の予測





3.3 Estimation results and scenario analysis: Thailand

タイ国のケース:推定結果と分析シナリオ

Estimated coefficients of the model パラメータ推定値

	Coefficient	Standard deviation	t - value
	-15.3984*	1.6169	-9.52
1	1.7518*	0.2409	7.27
3	0.0657	0.1023	0.64
\mathbb{R}^2	0.952		
Adjusted R ²	0.946		

^{*} Indicates coefficient significant at 5% level

All coefficients except trend are significant at 5% level

They are also of expected signs





Vehicle ownership forecast: Base case タイ国標準ケース予測結果

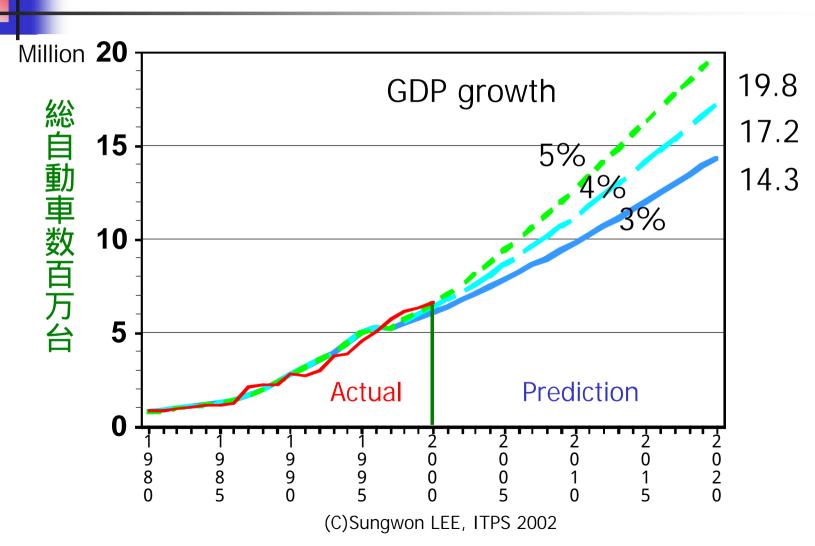
GNP 4%, per annum growth case

GDP4% 成長

	2000	2010	2020	['] 20/00
Population	62,084	68,322	73,387	1.2
(1,000)				
Per capita GNP	3.2	4.7	7.0	2.2
(1,000 1995 U.S. \$)				
Vehicle ownership	107	164	270	2.5
per 1,000				
Total vehicle	6.6	11.2	17.2	2.6
numbers				
(Million)				

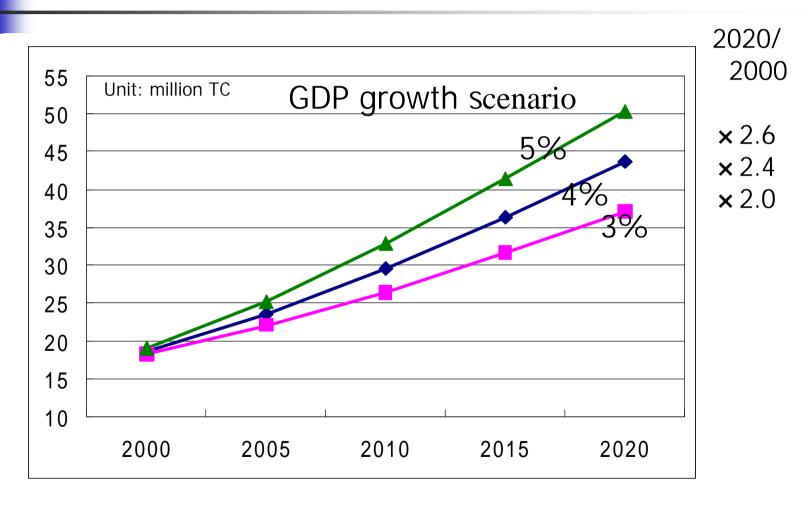


Scenario analysis by income GDP成長率シナリオの予測への影響



GHG forecasts: Carbon emission in the transport sector

交通部門炭素排出量の予測

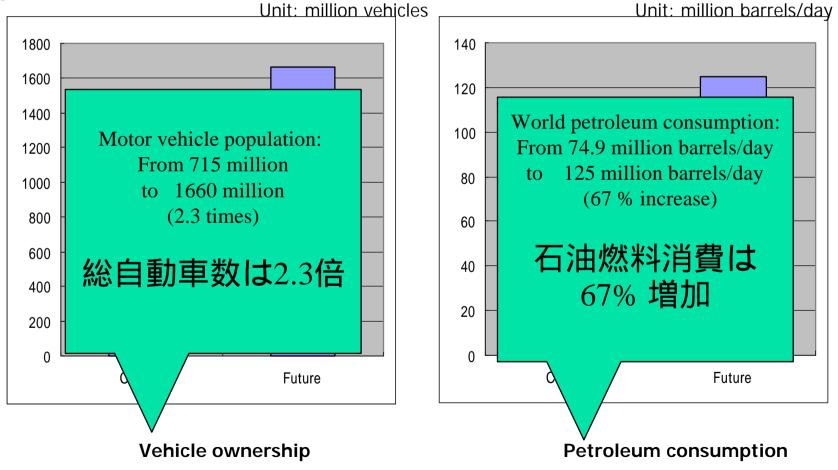




- What would happen if all other developing countries achieve the motorization level that is equivalent to current South Korea's in the near future?
 - * It has been assumed that other things are unchanged except the ownership rate in the calculation
- ・近年の韓国の自動車化発展途上国で同様の自動車化を仮定世界全体で何が起きるか(自動車保有率の変化のみを仮定)

World motorization scenario 世界の自動車化シナリオ







4. Mitigation policies RMC'sの環境対策



4.1 Mitigation policies

交通部門の環境対策

- Environmental policies in the transport sector can be classified into several groups
- Command and control
- Economic incentives
- Infrastructure for sustainable transport
- Demand reduction
- Education and information
- Others

■ 対策分野

規制・管理 経済的インセンティブ インフラ整備と持続可 能な交通 需要抑制 教育・情報 その他

Policy classification 対策分野と手段



分野

手段

Classification	Policy Measures	
Command and control	Vehicle emission standards	
	Fuel efficiency standards	
	Fuels policy – substance control	
	Alternative fuels	
	Technological improvements	
	Inspection and maintenance	
Economic incentives	Travel demand managements	
	 Fuel and road pricing 	
	 Parking policy 	
	 Public transport promotion 	
	Alternative fuels promotion by economic	
	incentives	
Infrastructures	Environmentally friendly infrastructure	
	- Rail and water related facilities	
	- Bicycle roads	
	- Infrastructure for intermodal	
	transport	
Demand reduction	Land use planning	
	Telecommuting and teleconferencing	
Education, information and others	Educational campaigns	
	Information provision	
	Traffic flow managements	



RMC policy case RMC国々の対策例

: Korea 韓国のケース

- Strict emission standards
 - Comparable to those of the U.S. and Japan's
 - Effective I/M program
- TDM
 - Fuel pricing
 - Parking policy
 - Public transport promotion
- Modal shift for freight transport
- Fuel policy

■ 排ガス直接規制

- 米・日等と同水準
- 効果的な車検制度
- TDM
 - 燃料価格
 - 駐車対策
 - 公共交通の推進
- 物流のモーダルシフト
- 燃料対策

4.2 Summary and concluding remarks 提言とまとめ

- Rapid motorization in the newly industrializing countries and some middle income countries would create severe problems in energy and the environment MRC諸国のエネルギー・環境問題の重要性
- Infrastructures for sustainable transport and technological improvements 持続可能な交通のためのインフラと技術改善
 - Mass transit and facilities for non-motorized transport
 - Conditions for advanced regulation and technology
- Fuels policy, tightening emission standards 燃料対策・排出規制強化
- TDM policies for congestion and environmental impact mitigation 混雑緩和及び環境対策としてのTDM
- Needs for international cooperation

国際協力の必要性

- Technology transfer and experiences from others (C)Sungwon LEE, ITPS 2002



Thank you ありがとうございました