

# Cyber Security, Global Warming and Fiscal Policies for Sustainable Growth

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**IIMA, July 23 2024, 1400–1530**

# Contents

- 1, Vulnerability: Cyber Security
- 2, Inconsistency of various environmental policies and Global Warming
- 3, Digital Infrastructure in India and Fiscal Sustainability
- 4, Security in Asia–Pacific Islands

# Cyber Security

**Joint Research with OECD, M. Chida**

## **(1) Attackers Incentives**

**Make Money, Steal money and information**

**Destroy data and Steal data**

## **(2) Attackers are not arrested**

**International cooperation to find attackers**

**and punish attackers**

**Global cooperation is needed**

# Transmission of Cyber Attack

## 1, Through **Financial Institutions**

→ Threat to Financial Stability

→ Financial Contagion

## 2, Through the **Firm/Business**

→ Production Network

## 3, Through **the government sector**

→ central and local governments

# Contagion by Cyber Attack

## 1, Global companies

Sharing data and information

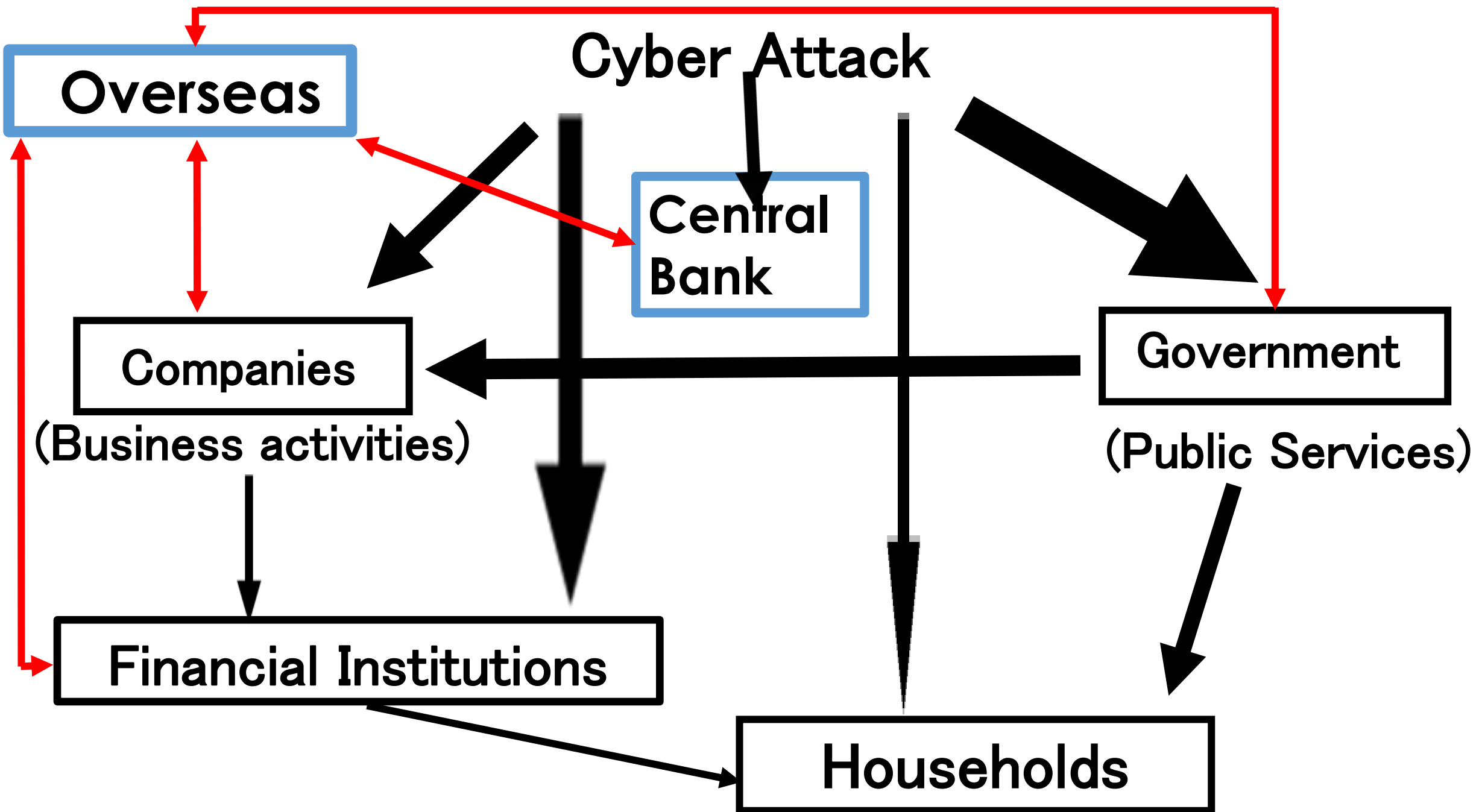
## 2, Data Integrity

Customer data and business data

## 3, Inter-connectivity of business

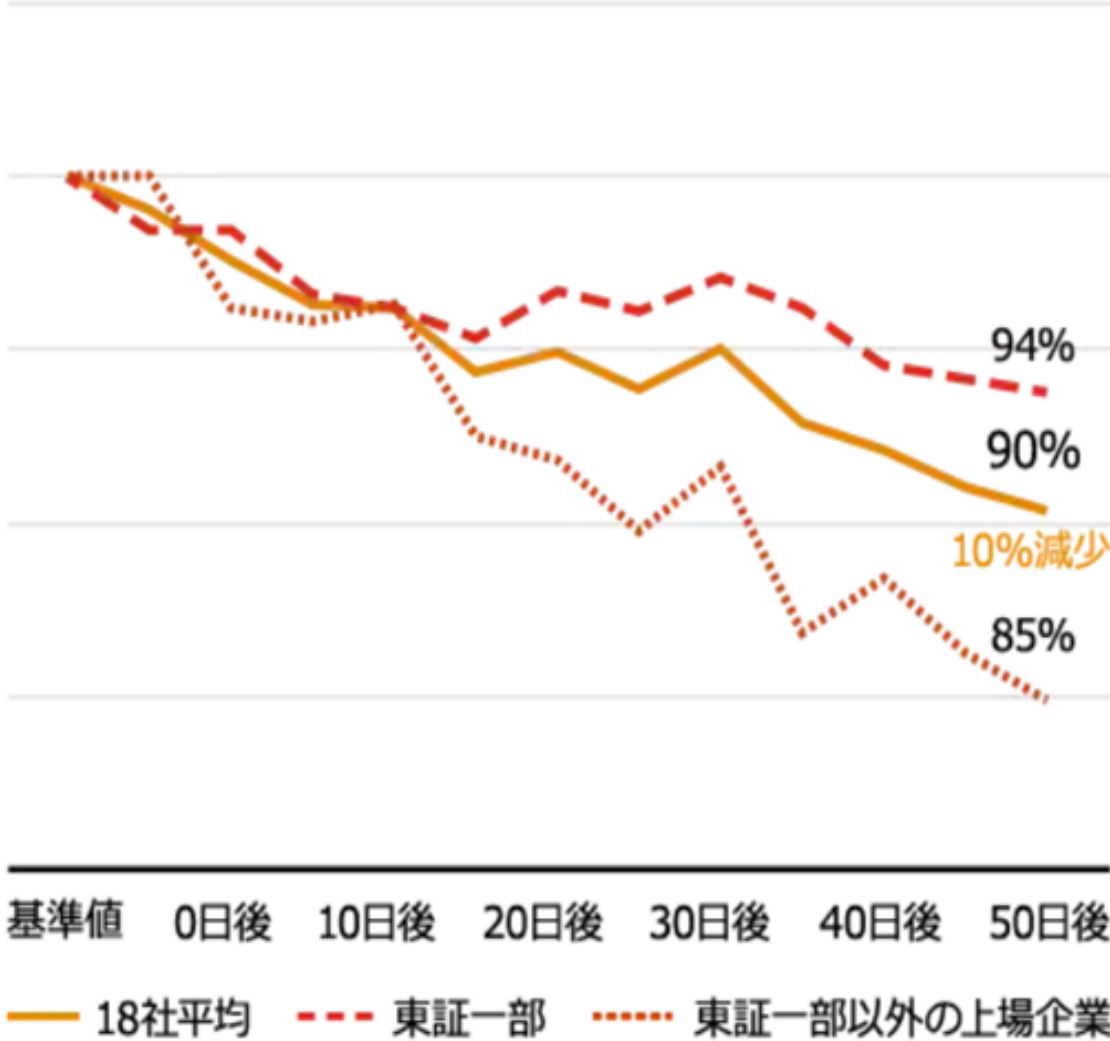
Business connectivity

Production Networks



# Impact of Cyber attack to the Reduction of Stock Prices in Japan

By Masayoshi Chida, OECD



# **Preparation by Company Level**

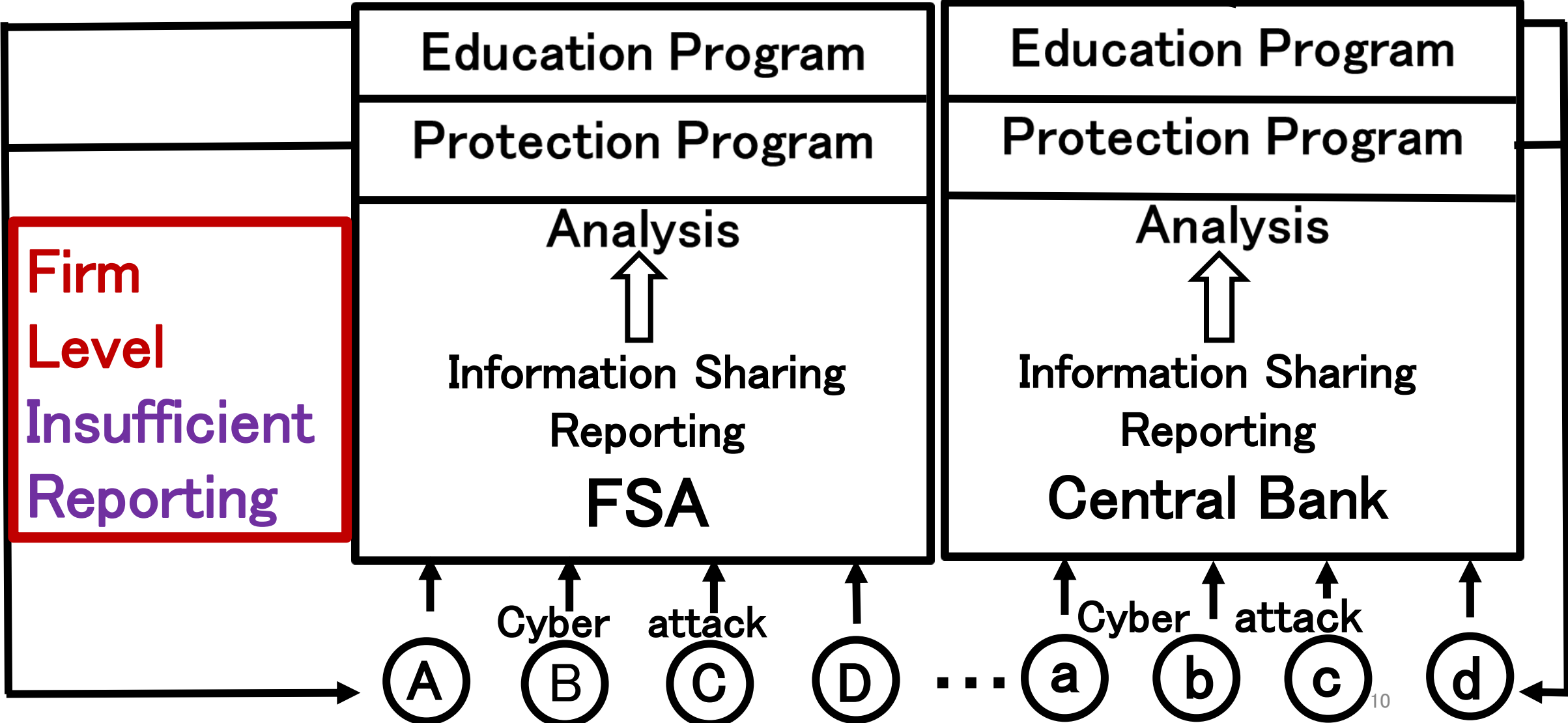
- 1, Risk Assessment**
- 2, Contagion Effects**
- 3, Track the Transmission channels**
- 4, Way to protect against Cyber Attacks**
- 5, Ex-post treatment**
- 6, Lack of Preparation and practices**
- 7, Difficulty of SMEs to prepare**



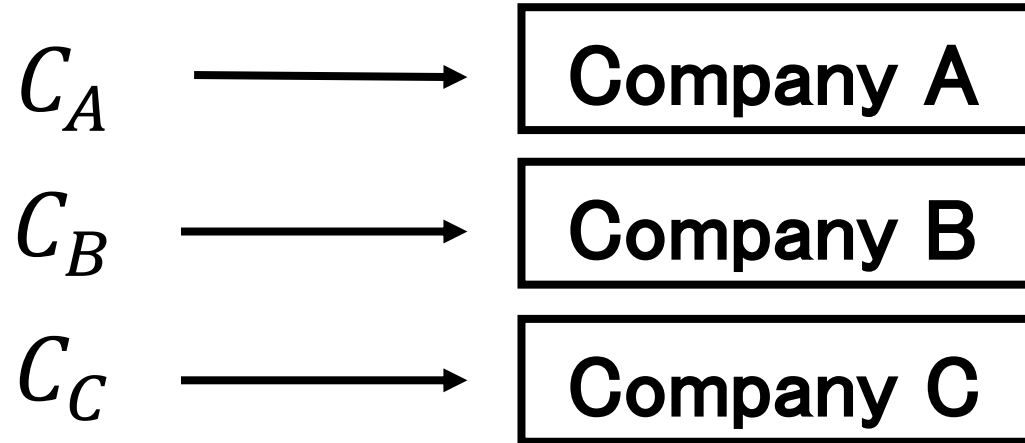
- 1, Huge costs by the private sector**
- 2, Monopolistic Profits by Suppliers**
- 3, Global Externalities**
- 4, Lack of Reporting**
- 5, International Cooperation needed**

OECD  
Global Organization

2023.9.19



● **Cyber Security by each company**



● **Individual costs  $\rightarrow$  Total costs**

$$\Sigma C_i = C_A + C_B + C_C + \cdot \cdot \cdot$$

● **Public Institution (Common Plat Form)**

$$Y = F(I_A, I_B, I_C, \cdot \cdot \cdot)$$

# Global Warming, Carbon tax and Carbon Pricing

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**Aashi Agarwal, Graduate Student at Harvard Kennedy School and  
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**KE Seetha Ram, Senior Consulting Specialist for Capacity Building  
and Training Projects, Asian Development Bank Institute; Visiting  
Professor, The University of Tokyo**

**Masayuki Yuyama, Senri University, Japan**

**Table 1. Evaluation methods provided by major ESG rating agencies**

ESG score	Evaluation criteria overview
Bloomberg ESG Disclosure Scores FTSE Russell's ESG Ratings	Environmental aspects are evaluated based on the degree of disclosure. ESG risks are evaluated based on disclosure, commitment to policy formulation and improvement, etc. In terms of the environment, in addition to disclosure, they evaluate the existence of policies and commitments to improvement.
MSCI ESG Ratings	Evaluated based on 37 key ESG issues. The environment side is also evaluated by setting a key issue.
Sustainalytics' ESG Risk Ratings	Based on ESG measures, information disclosure, and the level of problems. The same is true in terms of the environment.
Thomson Reuters ESG Scores	10 items. For the Environment factor: resource use, emissions, and innovation; for the Society factor: employees, human rights, local communities, and product responsibility; and on Governance: management, shareholders, and CSR strategy. Regarding the environment, we evaluate it based on actual carbon emissions and whether or not there is a policy.

Asian Economic Papers, MIT Press, 2023 *uyama (2020), and each rating agency/evaluation organization's*

**Diversified ESG Evaluation by Rating Agencies and Net Carbon Tax to Regain Optimal Portfolio Allocation\***

**Naoyuki Yoshino**

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**Table 3: Carbon tax rates (in USD/tCO<sub>2</sub>e) 2023-24**

<b>Country</b>	<b>Carbon tax</b>
Bangladesh	0
India	0
Indonesia	2.1
Japan	1.91
Korea	0
Singapore	18.44 <sup>2</sup>
Thailand	5.5 <sup>3</sup>
United States	0

# Carbon Tax

## wide variety

### (Source: World Bank 2023)

#### Iceland

The Icelandic carbon tax was increased on January 1, 2023, to match the expected inflation rate (7.7%).

#### Indonesia

On February 22, 2023, the Ministry of Energy and Mineral Resources (MEMR) announced the launch of a mandatory, intensity-based ETS for the power sector. The system will initially cover 99 coal-fired power plants that account for 81.4% of the country's national power generation capacity. MEMR expects to see a reduction of 500,000 tCO<sub>2</sub> in the sector through the ETS over the course of 2023.

#### Japan

In February 2022, the government announced the upcoming Green Transformation (GX) League, a baseline-and-credit system for companies expected to become fully operational in April 2023. This will build upon existing carbon trading systems such as the Joint Crediting Mechanism and J-Credit scheme. Although participation in the GX League is voluntary, compliance once formally a participant is mandatory.

#### Norway

Norway increased the rates of its carbon tax by 28% for most fossil fuels in 2022 and 21% in 2023. Norway also introduced a tax on waste incineration at the rate of NOK 192 (USD 18.32)/tCO<sub>2</sub>, as well as on natural gas and liquified petroleum gas used in greenhouses, which were previously exempt from the carbon tax, at the rate of NOK 77 (USD 7.34)/tCO<sub>2</sub> in 2022. The tax rate on waste incineration was increased and differentiated in 2023.

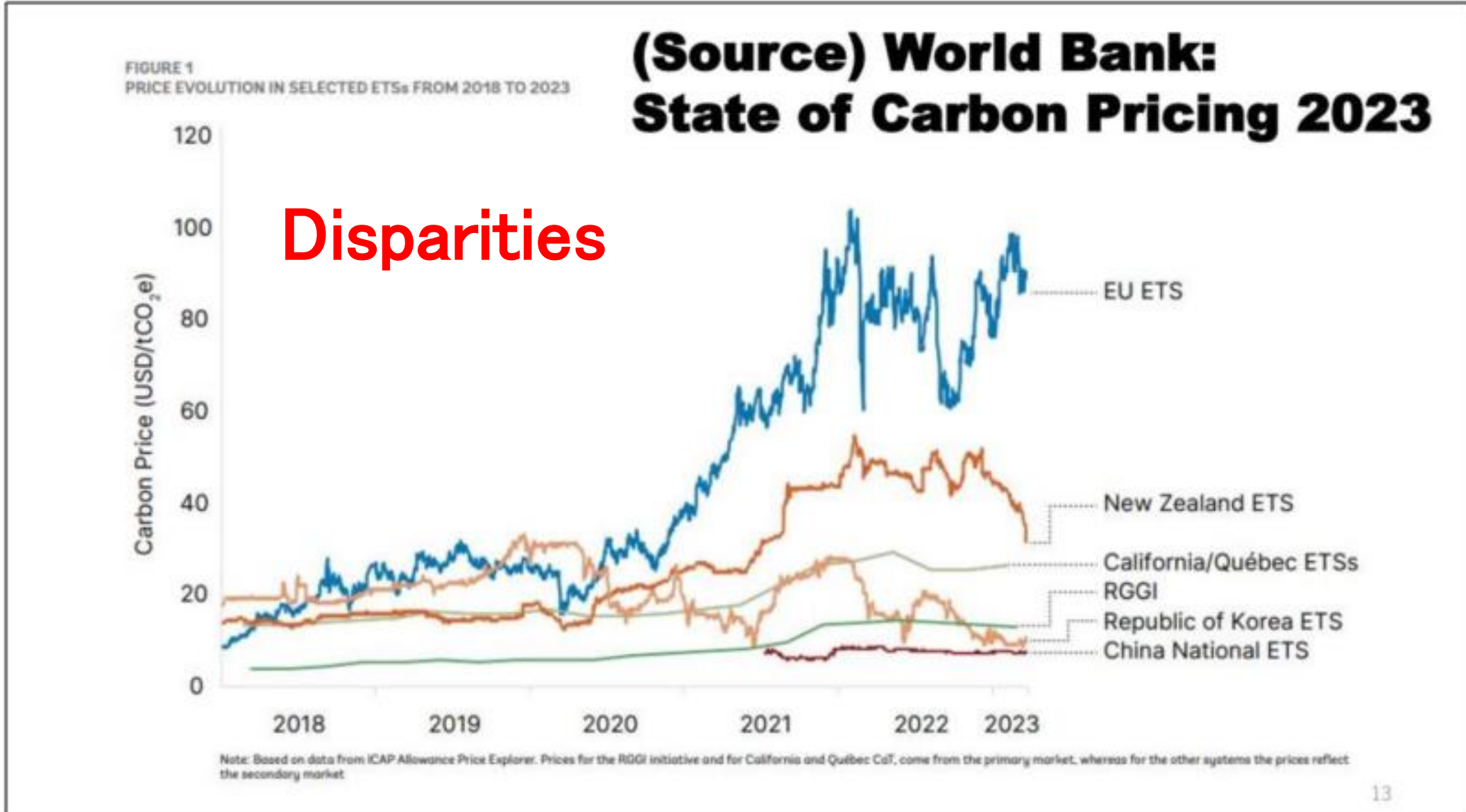
#### Portugal

The carbon tax rate was frozen at 2021 levels in response to extremely high energy prices. The price changes planned for the start of 2022 were delayed through the end of March 2023.

#### Republic of Korea

In November 2022, the government announced several near-term changes to the Korean ETS. These include increasing incentives to reduce emissions and facilitate low-carbon investment by issuing more free allowances to the most efficient covered entities; encouraging trading and mitigating price volatility by opening up the ETS to more financial firms and increasing the allowance holding limit; facilitating the conversion of international offset credits to Korean Credit Units; strengthening MRV; and increasing support for small businesses and new entrants.

Figure 2: Price evolution in selected ETSs from 2018 to 2023



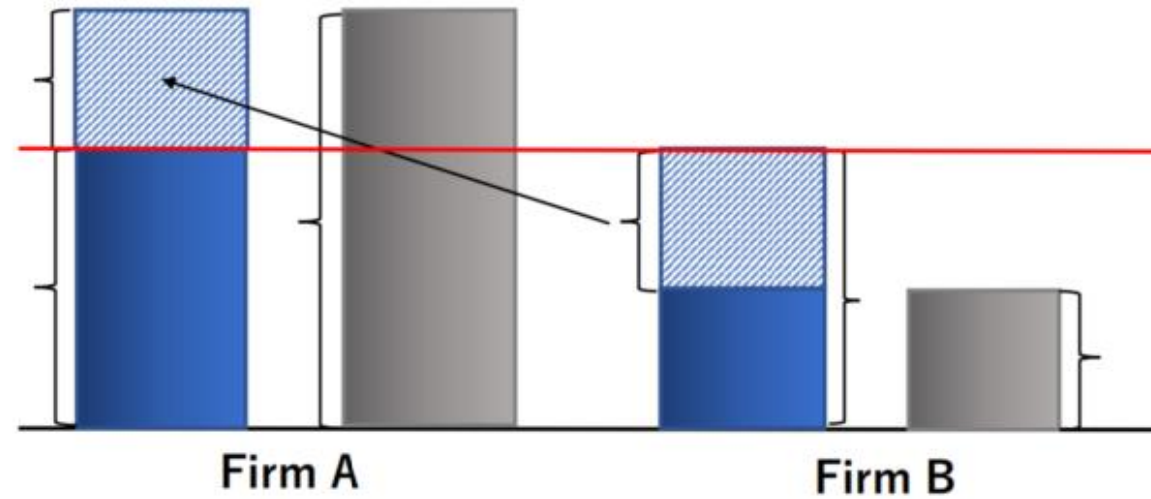


## Table 4: Carbon price (in USD/tCO<sub>2</sub>e)

Country	Carbon price
China	12.57
India	0 <sup>4</sup>
Indonesia	0.61
Japan	20.9 <sup>5</sup>
Korea	6.3
Kazakhstan	1.06
EU	61.3
Germany	48.37
United States	21.03 <sup>6</sup>

Source: OECD, World Bank Carbon Pricing Dash

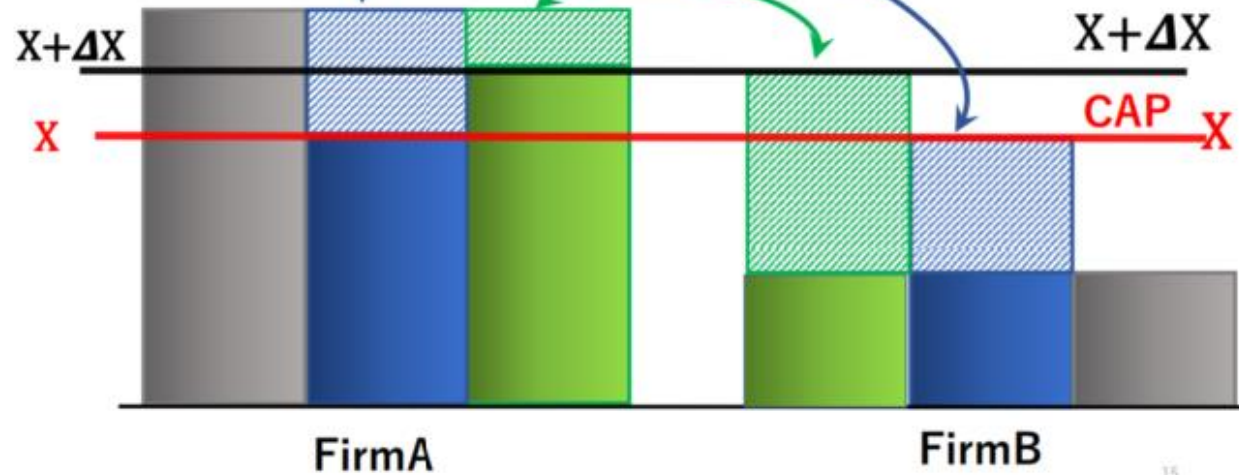
# Carbon Trading and Carbon Pricing



**Carbon Pricing**  
**Carbon Trading**

$$P^X = (d_0 - s_0) / (d_1 + s_1)$$

$$P^{\Delta X} = (d_0 - s_0 - 2\Delta X) / (d_1 + s_1)$$



June 2018

## Green Bond Principles

Voluntary Process Guidelines for Issuing Green Bonds

## International Capital Market Association

ICMA Paris Representative Office

62 rue la Boétie

75008 Paris

France

Tel: +33 1 70 17 64 70

[greenbonds@icmagroup.org](mailto:greenbonds@icmagroup.org)

## Green Bond Principles (GBP) 2018

(i) renewable energy	<b>Green Bond Ratings have to be based on GHG emissions</b>
(ii) energy efficiency	
(iii) pollution prevention and control	
(iv) environmentally sustainable management of living natural resources and land use	
(v) terrestrial and aquatic biodiversity conservation	
(vi) clean transportation	
(vii) sustainable water and wastewater management	
(viii) climate change adaptation	
(iX) eco-efficient and/or circular economy adapted products, production technologies and processes	
(X) green buildings which meet regional, national or internationally recognized standards or certifications.	

*Source: The Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds, ICMA, June 2018*

**Table 7: Green bonds as a percentage of overall bond market**

<b>Country</b>	<b>Green Bond Market as a % of Overall Bond Market</b>
China	1.17%
India	0.3% <sup>10</sup>
Indonesia	2% <sup>11</sup>
Philippines	2% <sup>12</sup>
Thailand	0.3%

Source: Author's calculations based on data from Green FDC, World Bank, Economic Times India, IFC, Gov Government of Thailand

**ESG score/**  
**Green Bond Rating**

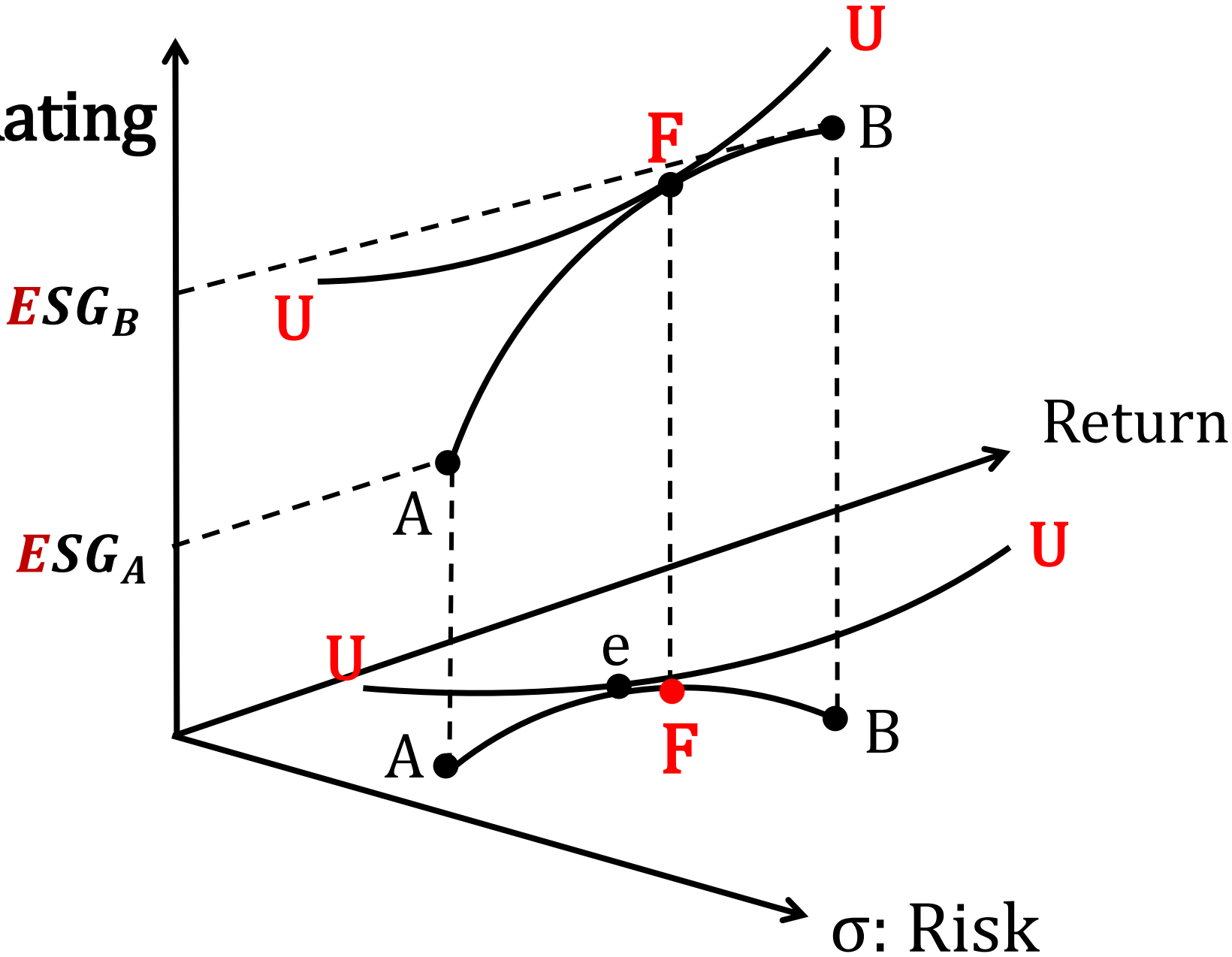
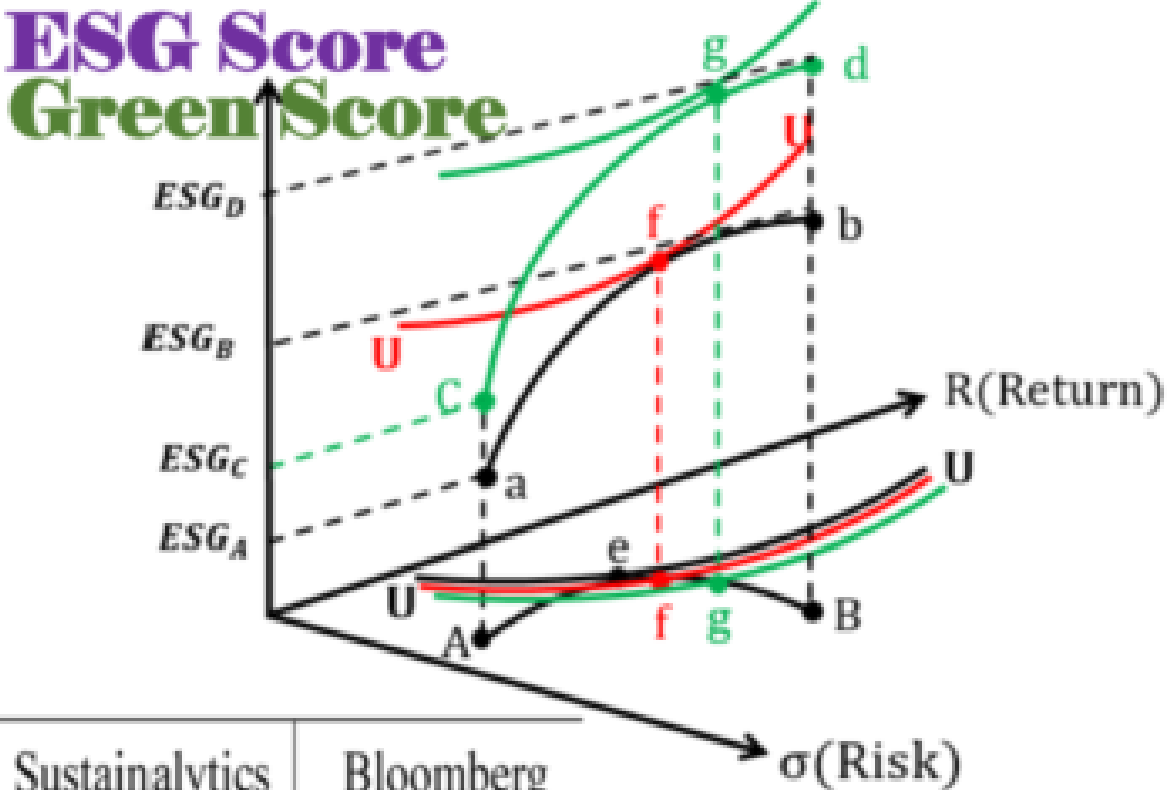


Figure 1: Different ESG scores by different rating agencies

Different ESG scores by different Rating agencies



ESG Score	RobecoSAM	Sustainalytics	Bloomberg
ESG score of company A	8.6	9.6	2.9
ESG score of company B	1.8	1.3	3.9
Value of $\alpha$ <b>Asset Allocation</b>	0.71	0.74	0.54

Table 2: Emperical analysis of the relationship between ESG scores and risk / return

**Empirical analysis of the relationship between ESG scores and risk/return**

**• Japan's Nikkel 225 as of December 30, 2021**

Dependent variable : Stock return 2021							
	ESG score						
	bld2021	ble2021	bls2021	blg2021	blep2021	blsp2021	blgp2021
ESG score	0.004*	0.003**	0.002	0.003	-0.000	-0.001	0.001
	(0.051)	(0.046)	(0.330)	(0.161)	(0.939)	(0.577)	(0.264)
Control variabls							
Total asset	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.796)	(0.932)	(0.831)	(0.758)	(0.700)	(0.718)	(0.795)
ROA	0.008	0.008	0.008	0.007	0.008	0.008	0.008
	(0.211)	(0.186)	(0.223)	(0.244)	(0.213)	(0.220)	(0.244)
Equity ratio	-0.003**	-0.003**	-0.003*	-0.002*	-0.003*	-0.003*	-0.003*
	(0.047)	(0.031)	(0.058)	(0.100)	(0.056)	(0.068)	(0.059)
Constant	0.028	0.138*	0.188**	-0.033	0.280***	0.298***	0.223***
	(0.821)	(0.079)	(0.020)	(0.871)	(0.007)	(0.000)	(0.007)
Observations	223	223	223	223	195	195	195
Dependent variable : Stock volatility 2021							
	ESG score						
	bld2021	ble2021	bls2021	blg2021	blep2021	blsp2021	blgp2021
ESG score	-6.984*	-3.473	-4.302	-6.426	-3.192	-1.689	-2.223
	(0.074)	(0.115)	(0.269)	(0.124)	(0.102)	(0.361)	(0.252)
Control variabls							
Total asset	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.540)	(0.648)	(0.553)	(0.489)	(0.721)	(0.647)	(0.767)
ROA	32.320***	31.726***	32.584***	33.244***	31.574***	31.209***	32.519***
	(0.003)	(0.004)	(0.003)	(0.002)	(0.008)	(0.009)	(0.006)
Equity ratio	6.510**	6.861***	6.334**	5.668**	6.276**	7.118**	6.667**
	(0.011)	(0.008)	(0.013)	(0.028)	(0.032)	(0.016)	(0.023)
Constant	327.761	128.131	91.275	511.782	209.148	54.832	78.085
	(0.131)	(0.352)	(0.517)	(0.151)	(0.256)	(0.706)	(0.597)
Observations	223	223	223	223	195	195	195

## Carbon Taxes:

To address the distortions created by inconsistent ESG scoring, we propose the implementation of a net carbon tax system. This approach would provide a more objective and standardized measure of a company's environmental impact, which could be directly incorporated into investment decision-making processes. Mathematically, the net carbon tax would be calculated as follows:

$$\text{Net Carbon Tax} = \text{Carbon Tax} - \text{Greenness Efforts}$$

This equation will help us calculate the net carbon emissions of each company after accounting for its greenness efforts such as planting trees or setting up solar power panels on their factories. This net carbon tax would then be incorporated into rate of return calculations as follows:

$$\text{Company A's return after carbon tax: } \underline{R_A} = R_A - (\text{Carbon Tax TA})$$

$$\text{Risks After Carbon Tax: } \underline{\sigma_A}$$

$$\text{Company B's return after carbon tax: } \underline{R_B} = R_B - (\text{Carbon Tax TB})$$

$$\text{Risk After Carbon Tax: } \underline{\sigma_B}$$

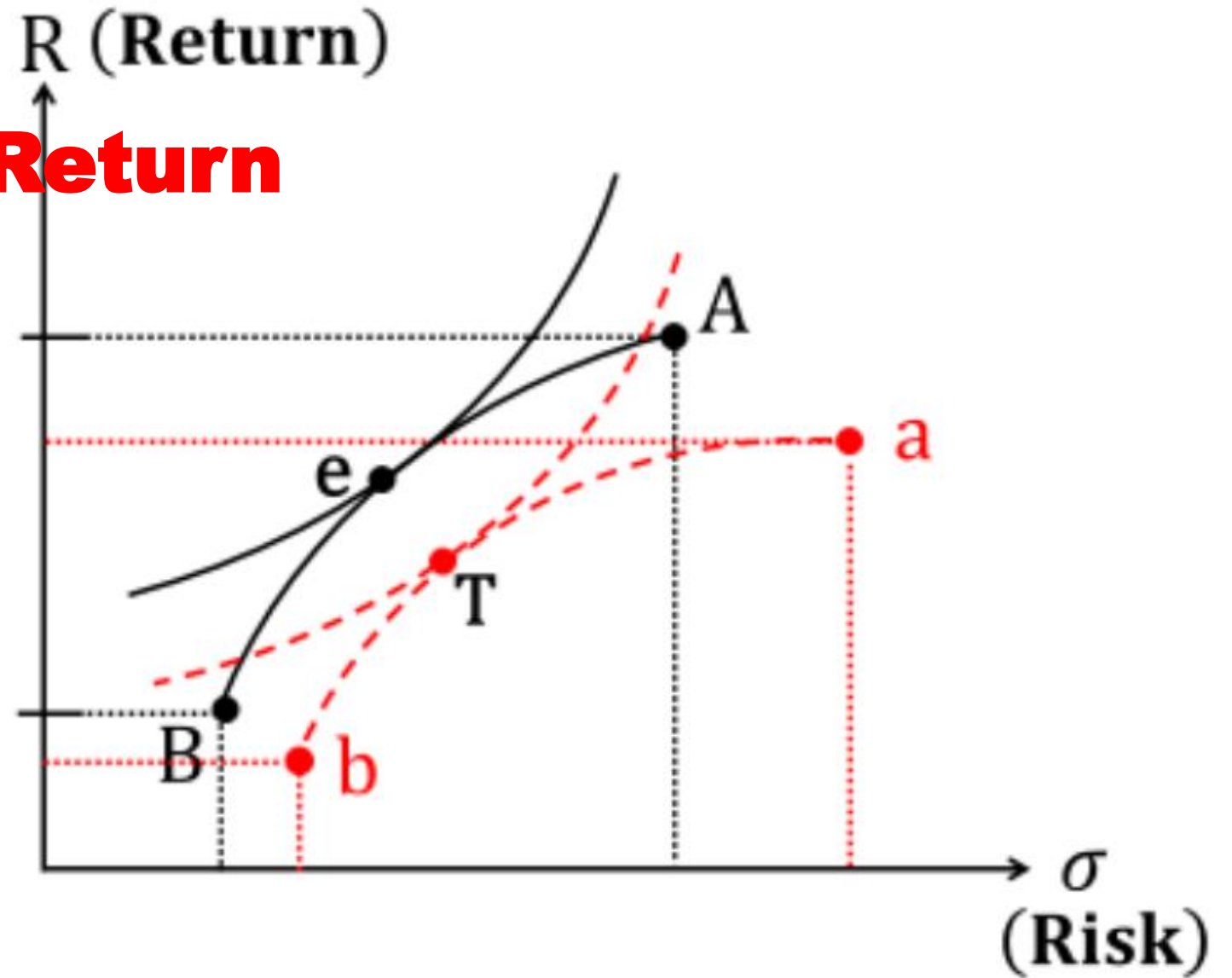


# Carbon TAX

After Tax: Rate of Return

After Tax: Risks

# Carbon Pricing



ESG Rating	Carbon Tax	Green Bond Rating	Carbon Pricing
$\theta \times (\text{CO}_2)$	$t \times (\text{CO}_2)$	$\theta \times (\text{CO}_2)$	$P = \frac{(d_0 - S_0) - 2\Delta X}{(d_1 + S_1)}$ $P = \alpha \times 0.8(\text{CO}_2)$

**Measure: The Amount of CO<sub>2</sub> Emissions (CO<sub>2</sub>)**

**Table 6: Examples of credit scoring, GHG tax, and green bonds based on GHG emissions**

	Country	Company Name	Scope 1 GHG emissions	Emissions per million USD revenue/ sales/ income	Green bond rating	Credit rating	Carbon tax
Pharmaceuticals	Japan	Daiichi Sankyo Co Ltd	86	11	AAA	AAA	t*86
		Takeda Pharmaceutical Co Ltd	316	12	AAA	AAA	t*316
		Chugai Pharmaceutical Co Ltd	48	7	AAA	AAA	t*48
	India	Sun Pharma	67	13	AAA	AAA	t*67
		Dr Reddy's Lab	302	101	A	A	t*302
		Cipla	38	14	AAA	AAA	t*38
	US	Johnson & Johnson	320	4	AAA	AAA	t*320
		Eli Lilly & Co	182	5	AAA	AAA	t*182
		Merck & Co	1,236	21	AAA	AAA	t*1236

# Sustainable Growth: Infrastructure

## Case Study of India's Infrastructure

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Former Dean & CEO, Asian Development Bank Institute  
(ADBI)

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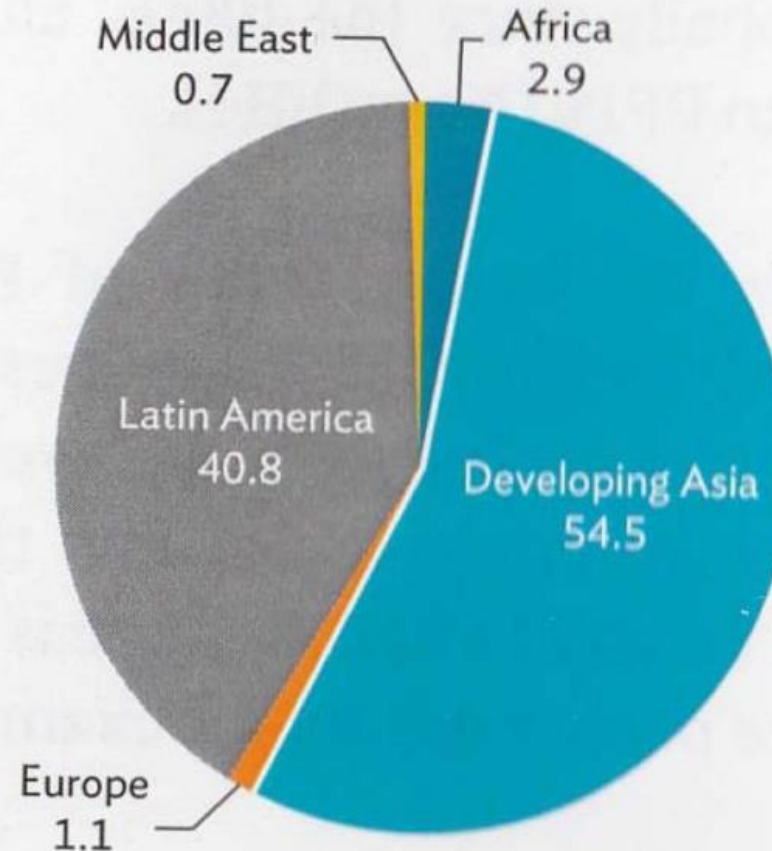
# PPP = Public Private Partnerships

Realizing The  
Potential of  
Public Private  
Partnerships  
to Advance  
Asia's  
Infrastructure  
Development

Akash Deep  
Jungwook  
Kim  
Minsoo Lee

ADB (2019)

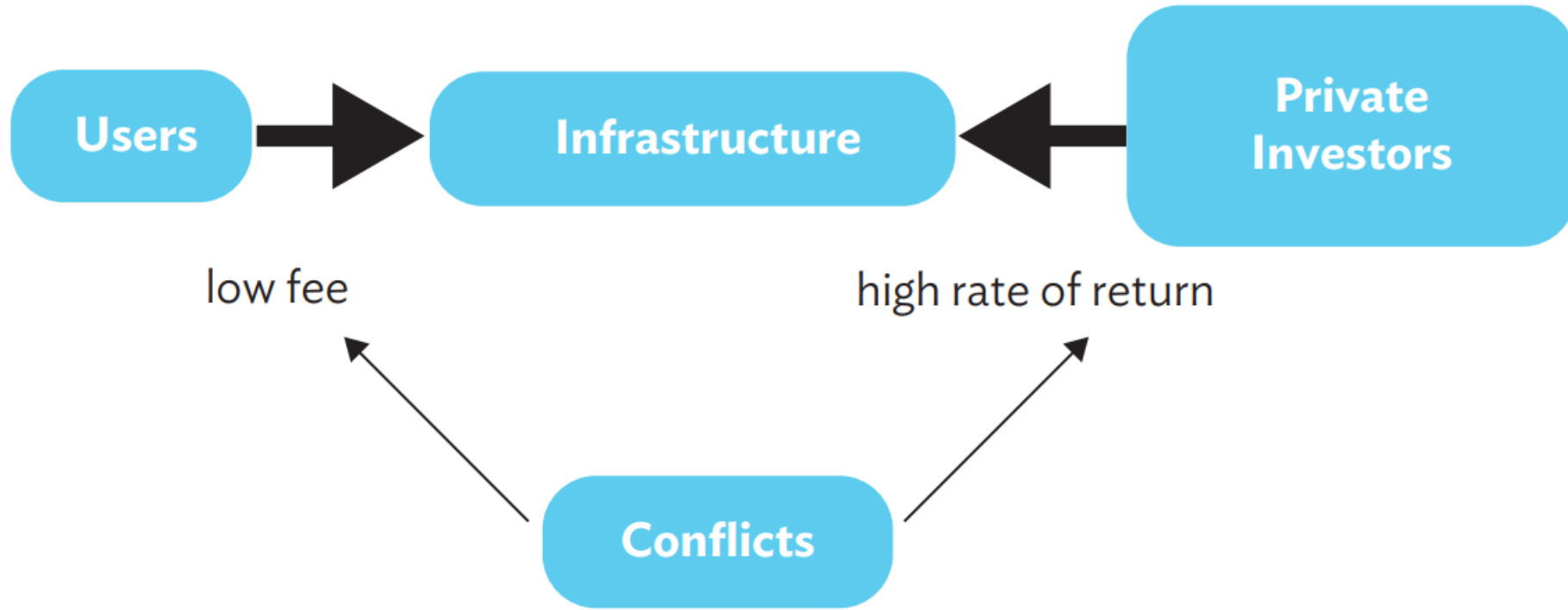
Cancelled PPP Projects by Region, 1991–2015  
(% share to total cancelled projects)



**Relied only  
on User Fees**

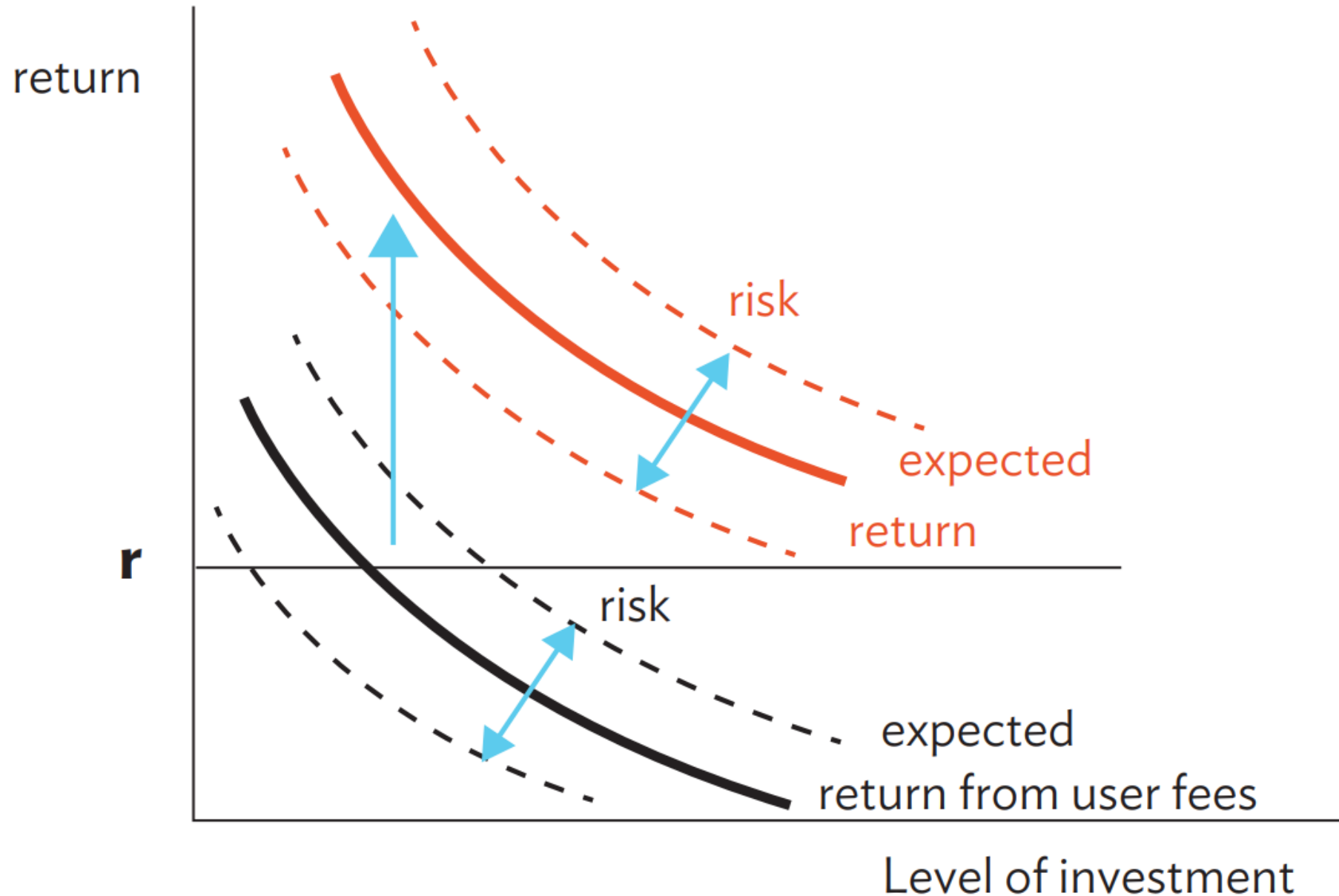
**No Spillover  
TAX Returns**

**Figure 5.6: Conflict of Interest between Users and Investors**



**Yoshino, N., S. Lakhia, and J. T. Yap. (2021). “Financing Sustainable Infrastructure Investment in ASEAN+3”. in Guinigundo, D., Kawai, M., Park, C. Y., Rajan, R. S. Redefining Strategic Routes to Financial Resilience in ASEAN+3. Manila, Philippines, ADB.**

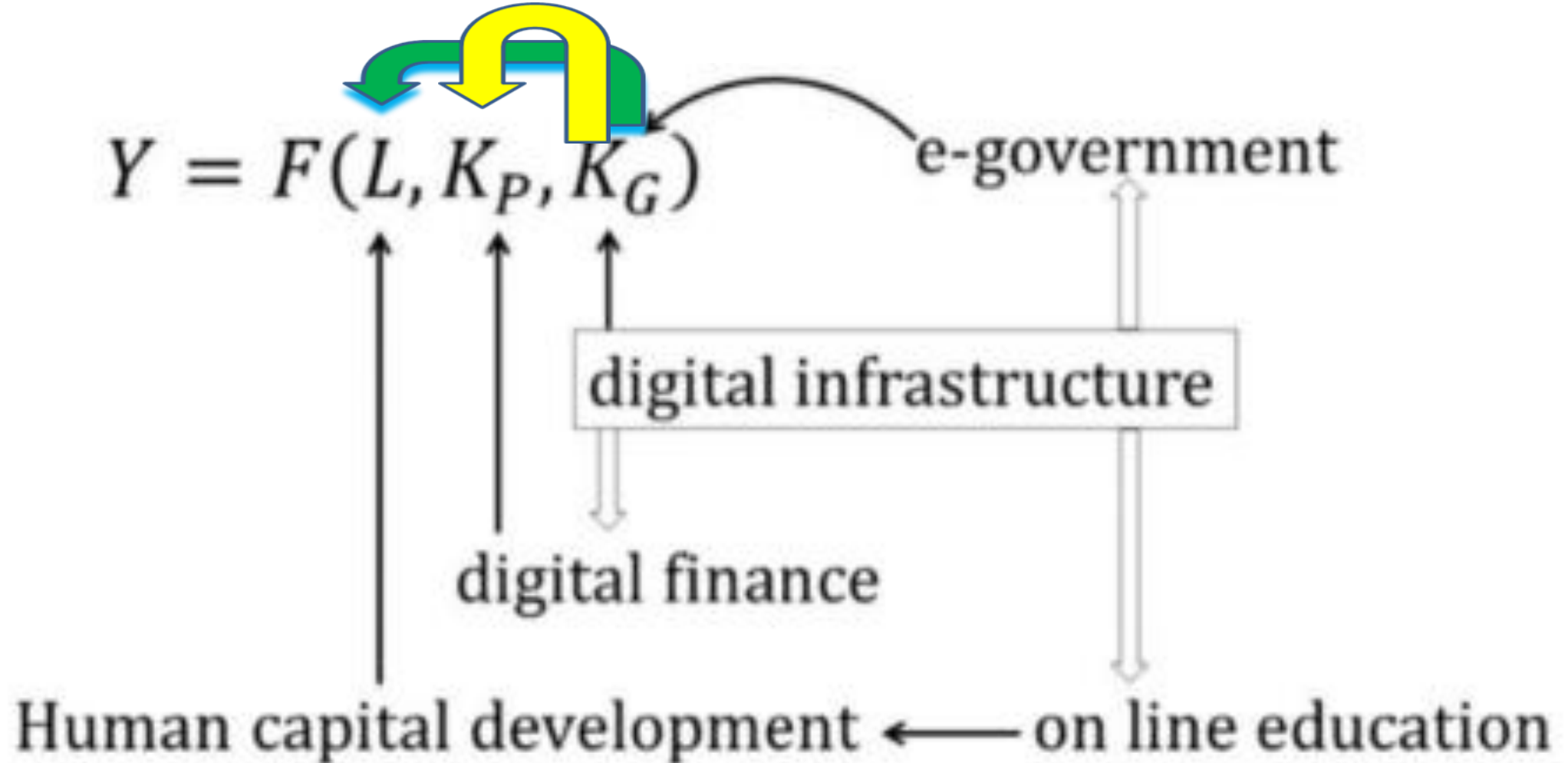
**Figure 5.2: Expected Rate of Return and Risk Profile of Project Bonds versus Benchmark Yield**



# Spillover Effects of Digital Infrastructure

→ Education, New Business Activities

New Employment, Increase of Sales



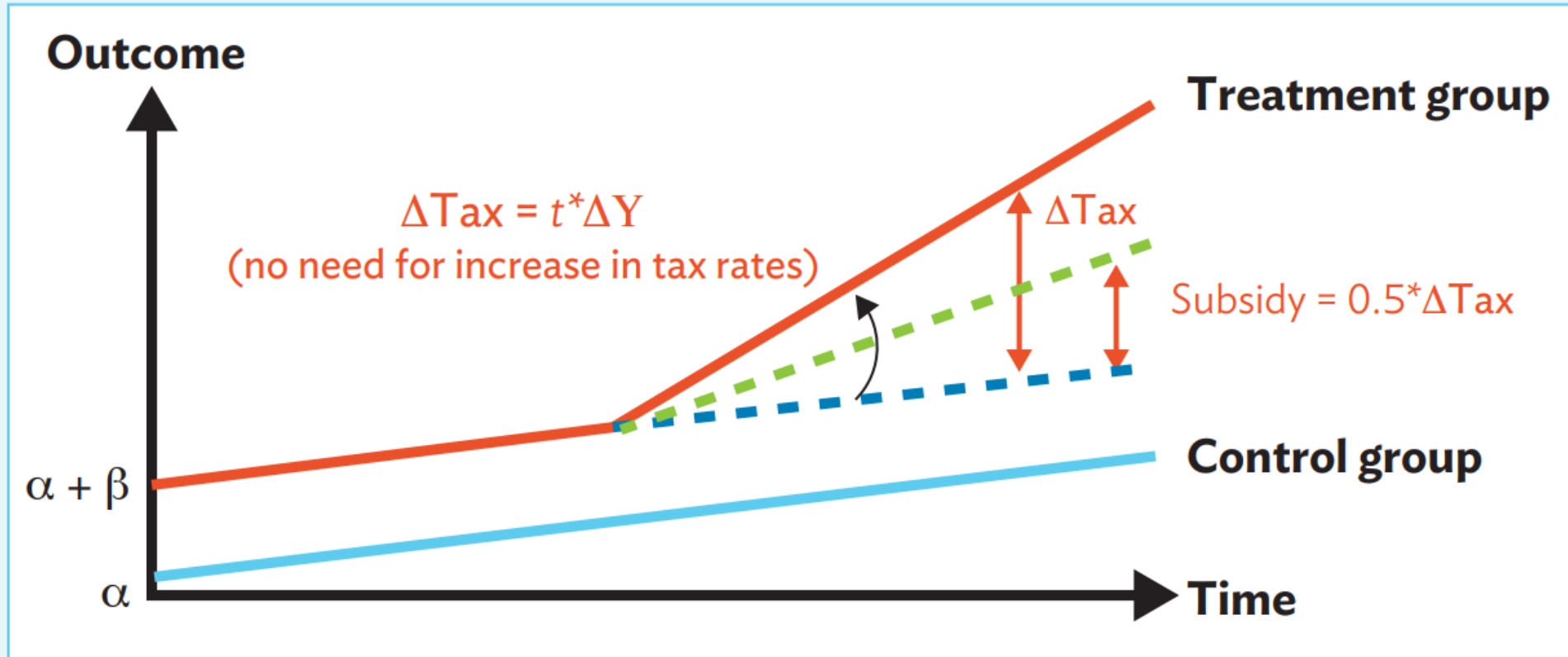


**Table 3.2. Estimates of spillover effects on increased output in Japan**

	<b>1956-60</b>	<b>1961-65</b>	<b>1966-70</b>	<b>1971-75</b>	<b>1976-80</b>	<b>1981-85</b>
Direct effect of infrastructure investment	0.696	0.737	0.638	0.508	0.359	0.275
Spillover effect through private capital (Kp)	0.452	0.557	0.493	0.389	0.270	0.203
Spillover effect through employment (L)	1.071	0.973	0.814	0.639	0.448	0.350
Spillover effects of infrastructure investment (percentage)	68.644	67.481	67.210	66.907	66.691	66.777
	<b>1986-90</b>	<b>1991-95</b>	<b>1996-2000</b>	<b>2001-05</b>	<b>2006-10</b>	
Direct effect of infrastructure investment	0.215	0.181	0.135	0.114	0.108	
Spillover effect through private capital (Kp)	0.174	0.146	0.110	0.091	0.085	
Spillover effect through employment (L)	0.247	0.208	0.154	0.132	0.125	
Spillover effects of infrastructure investment (percentage)	66.222	66.200	66.094	66.122	66.139	

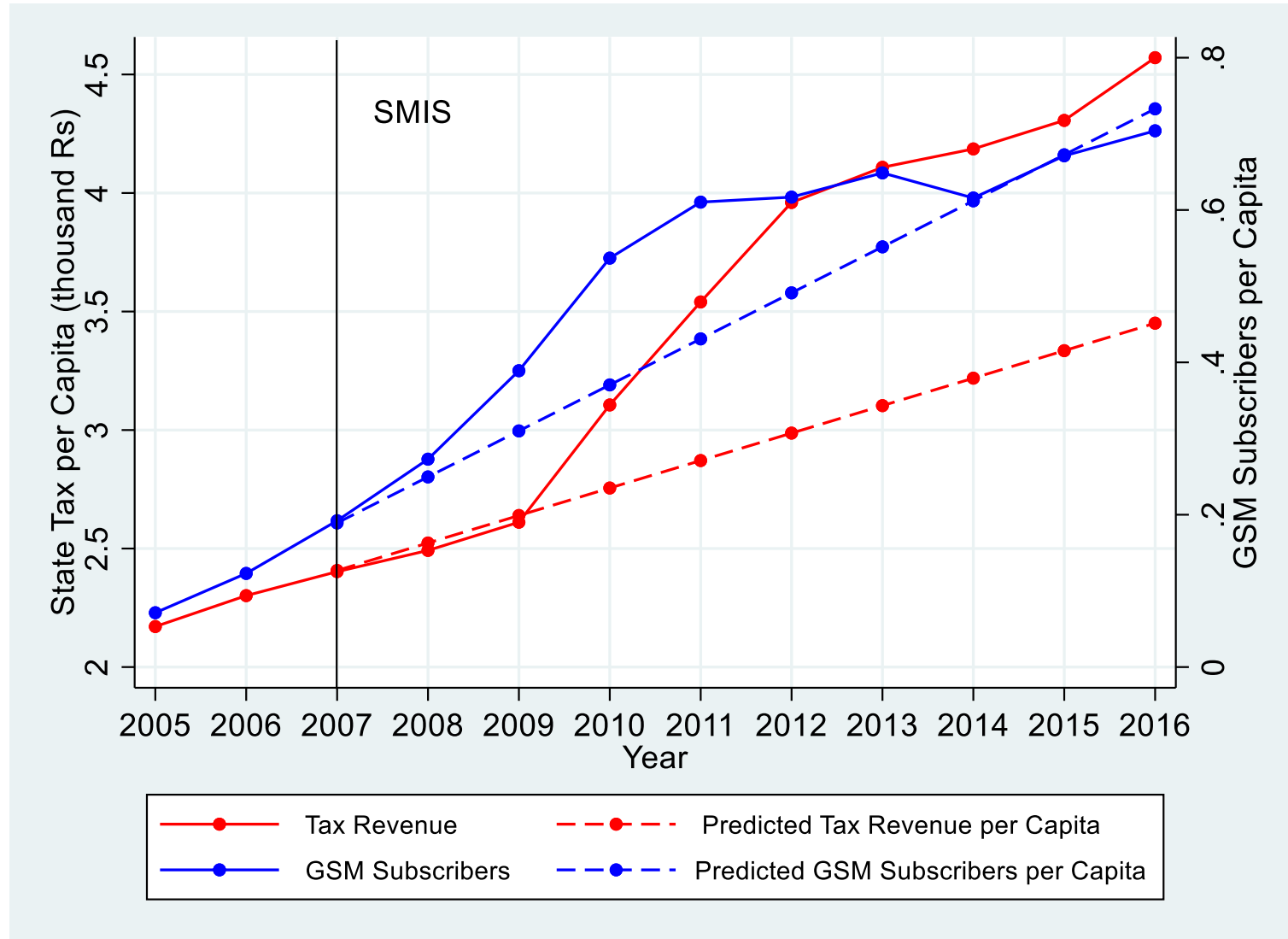
Source: (Nakahigashi and Yoshino, 2016<sup>[3]</sup>).

## Diagram of Spillover Tax Revenues



Source: Yoshino, Abidhadjaev, and Nakahigashi (2019).

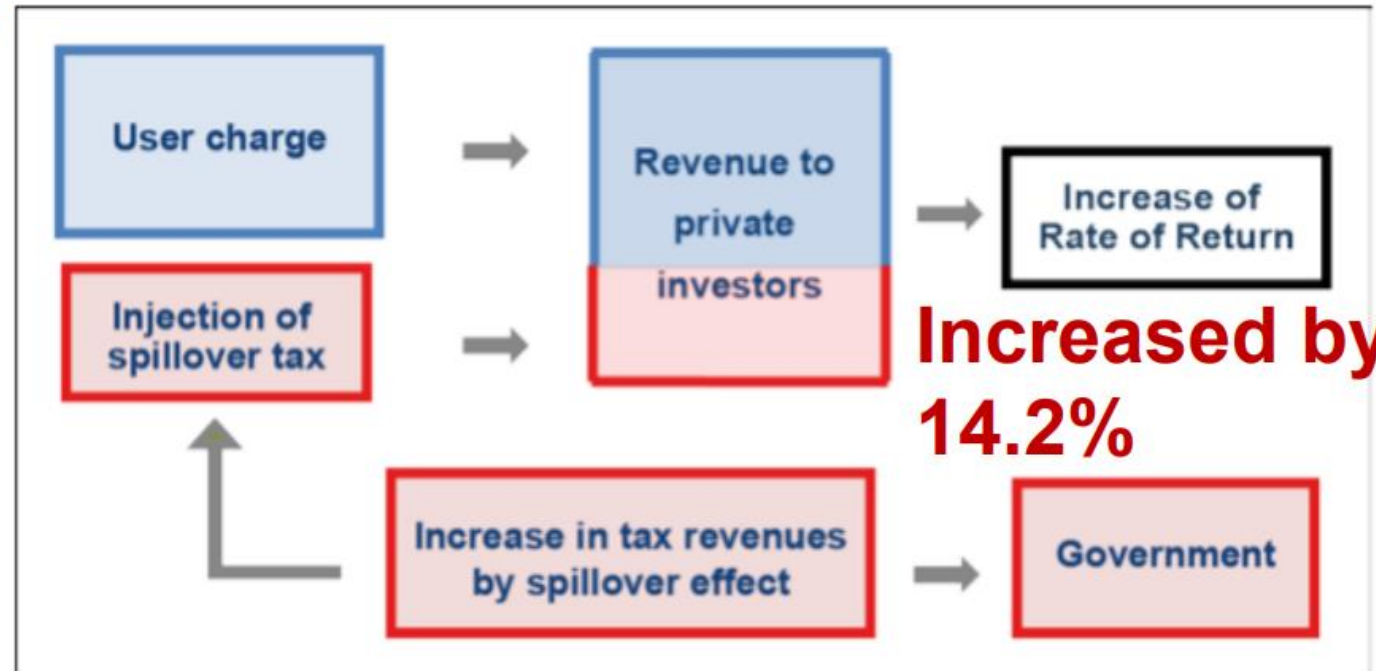
# Indian GSM (Global System for Mobile Communications)



# Policy Implications **Digital Infrastructure** **India's case**

- One way to ensure that private sector remains attracted to infrastructure development is to provide a steady stream of income for them. We argue that that could be achieved by sharing the spillover effects of ICT infrastructure on taxes obtained by the government with the investors/operators of the infrastructure
- The amount of tax revenues to be shared by the gov't with the investors can be calculated using

Based on our estimation, if 50 % of increased tax revenues were returned to mobile operators, **the rate of return will rise about 14.2%**



# India: Umitab Kant and President Ramachandran : 2020



**Pronab Sen**  
Chair, Standing  
Committee on Statistics

Pronab Sen is the former Country Director for the India Programme of the International Growth Centre (IGC). Pronab received his Ph.D. in Economics from the Johns Hopkins



## G20-India, 2023 New Delhi

Business (<https://www.cityairnews.com/sections/business>)

### BIF Broadband India Forum Hosts Professor N Yoshino for a Roundtable discussion on Spillover effects of Digital Infrastructure and Financing



Broadband India Forum (BIF), an independent policy forum and knowledge-based think-tank organised a Round Table Discussion with Prof. N Yoshino, Adjunct Professor at GRIPS and Professor Emeritus (Economics) at Keio University, and former Dean/CEO of the Asian Development Bank Institute championing G20 goals on “The Spill over Effects of Digital Infrastructure and Financing” to address the challenges of attracting private investment in ICT infrastructure development.



# Comparison of Various Fiscal Policies

published in the Singapore Economic Review, 2024

	Period after policy implication	Government consumption	One-time transfer	Public Investment	R&D expenditure
Young Population ( $\phi = 0.85$ )	short-term ( $k = 5$ )	0.366	0.024	0.203	0.979
	long-term ( $k = 20$ )	0.171	0.011	0.589	2.359
Old Population ( $\phi = 0.55$ )	short-term ( $k = 5$ )	0.342	0.094	0.170	0.830
	long-term ( $k = 20$ )	0.247	0.068	0.509	2.149





# Compact-Mandated Palau Economic Advisory Group Launched

9/15/2022

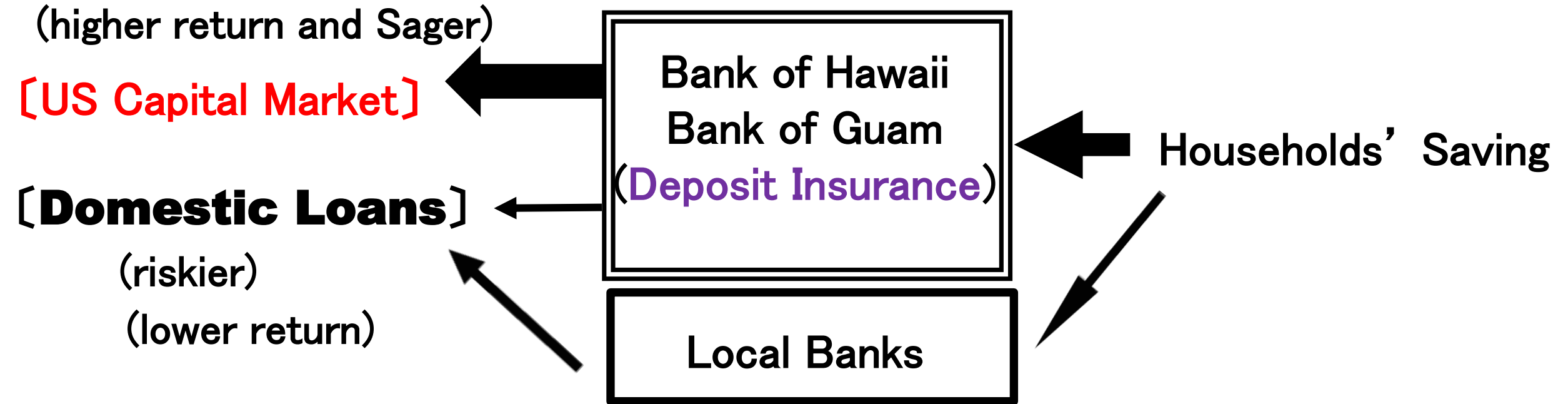
Last edited 9/16/2022

[hua@ios.doi.gov](mailto:hua@ios.doi.gov)  
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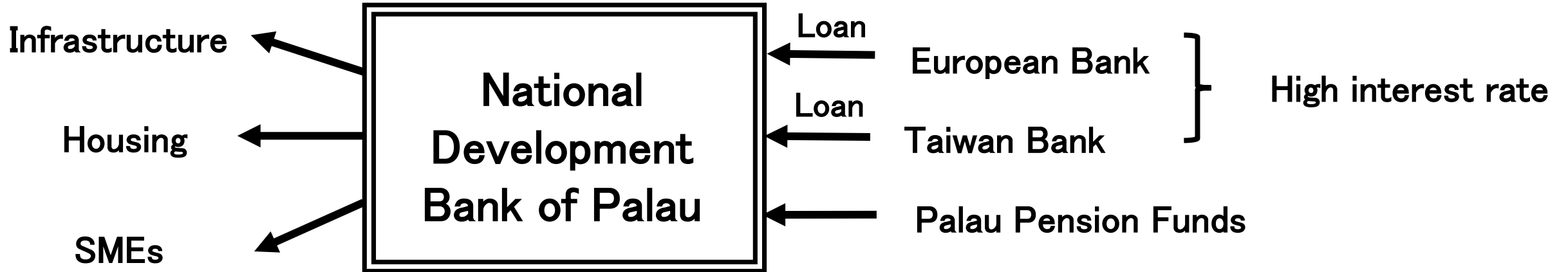
Pictured from left to right in Palau in August 2022: Dr. Peter Watson; Minister Kaleb Udui; Dr. James K. Galbraith; H.E. President Surangel Whipps, Jr.; Andrew McLean, Charge d'affaires, a.i., U.S. Embassy Koror; Dr. Denise Eby Konan; Dr. Naoyuki Yoshino.

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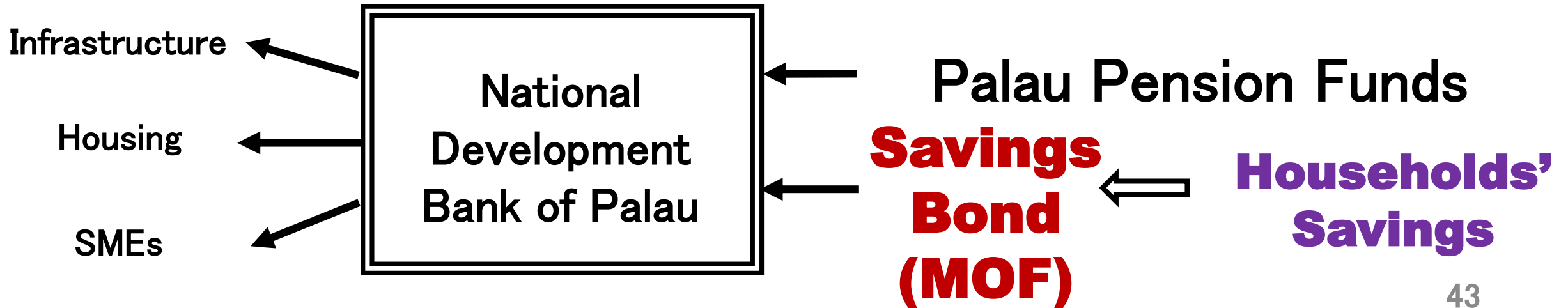


**Traditional Money Flow in Palau through banks**

# Current Money Flow in Palau by NDBBP



## Palau's Savings Bond: Proposal





# Nikkei News Paper

## July, 2024

### パライオの国債発行システム

## 日本のフィンテック受注

太平洋島しょ国、パライオの国債発行・管理システムの新興  
フィンテック企業ソラミツ（東京・渋谷）が6月  
下旬に受注した。2024年度中に運用を始める  
方針だ。日本政府の支援も受ける金融インフラの

整備は、太平洋島しょ国との関係を強める中国へのけん制にもつながる。

ブロックチェーン（分散型台帳）開発のソラミツは、カンボジアの中央銀行とアジア初の中央デジタル通貨（CBDC）

「ハコン」を共同開発した実績がある。

パライオには機関投資家向けを含めて国債を発行して資金調達する仕組みがない。個人向け国債の発行や償還、利払いなどを管理するシステムを開発する。こうしたシステムをブロックチェーンで構築するのは珍しい。

従来の一般的なシステムだとサイバー対策の費用がかさむが、ブロックチェーンは取引データを改ざんされにくい。

ソラミツの今回の受注額は数億円程度で、この技術を使わない場合に比べシステム構築費を半分以下に抑えられるという。

日本政府も金融システムの輸出を後押しする。ソラミツが受注したパライオの案件は経済産業省が補助事業に選定した。