KU-JICA JOINT SYMPOSIUM ON HUMAN SECURITY ENGINEERING

HUMAN SECURITY AND RELATED CAPACITY DEVELOPMENT

MARCH 1–2, 2010

NIKKEI CONFERENCE ROOM, TOKYO, JAPAN

ORGANIZED BY:

Kyoto University

Japan International Cooperation Agency (JICA)

Kyoto University Global COE "Global Center for Education and Research on Human Security Engineering for Asian Megacities"

BACKGROUND AND SCOPE

The advance of globalization causes an increase in various cross-border dangers and exposes many people in developing countries to civil strife, disasters, poverty, and other humanitarian threats. The concept of human security places individual human beings at its core, seeking to defend them from fear and want: fear of things like conflict, terrorism, disaster, environmental destruction, and infectious disease, and want in the face of poverty and in social services and infrastructure. By building up people's abilities to address these issues themselves, this approach aims to build societies in which they can live with dignity. In order to defend the weakest members of society from these various threats, Japan International Cooperation Agency (JICA) will support efforts to bolster social and institutional capacity and to increase people's ability to deal with threats themselves under the policy of Japanese Official Development Assistance (ODA).

From a viewpoint of Human Security, it is definite that the various development issues in Asian Megacities are very urgent ones to be tackled with. Since those issues are closely connected with each other, it is required that a comprehensive approach shall be taken to combine and to collaborate with several academic and research fields. In a sense of this, the Global Center of Excellence Program (GCOE) entitled "Global Center for Education and Research on Human Security Engineering for Asian Megacities" implemented by Kyoto University (KU) is absolutely significant and timely.

The KU-JICA joint symposium aims to deepen the understanding of Human Security and its Capacity Development. In addition, the symposium can give an opportunity to exchange views about the current research activities in several overseas bases, namely Singapore, Thailand and Indonesia, concerned to Human Security Engineering.

URBAN HUMAN SECURITY ENGINEERING

"Urban Human Security Engineering" is defined as a system of technologies (techniques) for designing and managing cities that enable their inhabitants to live under better public health conditions, and live free from potential threats of large-scale disasters and environmental destruction. For establishing this discipline, four existing fields, i.e. urban governance, urban infrastructure management, health risk management, and disaster risk management, are integrated into one discipline.

OBJECTIVES

Key objectives of the conference are:

1. To deepen the understanding of Human Security and Development
2. To discuss Human Security and Related Capacity Development
3. To exchange views about the possible improvement of research and education activities in several overseas bases
4. To promote interaction between researchers and practitioners

Topics of interest in this KU-JICA Joint Symposium includes (but not limited to):

1. Urban Governance
2. Urban Infrastructure Asset Management
3. Environmental Accounting of Infrastructure Project
4. Urban Energy Security Engineering
5. Urban Food Security Engineering
6. Urban Transport and Logistics
7. Urban Disaster Prevention

ORGANISING BODIES

The conference is jointly organized by Japan International Cooperation Agency (JICA) and Global COE "Human Security Engineering for Asian Megacities", Kyoto University, Japan.

JICA was established as an independent administrative institution that aims to contribute to the promotion of international cooperation as well as the sound development of Japanese and global economy by supporting the socioeconomic development, recovery or economic stability of developing regions.

Kyoto University was founded in 1897, the second university to be established in Japan. Known for its pioneering spirits and academic freedom, the university has produced five Nobel laureates and two Fields medalists.

Global COE (Centers of Excellence) Program, which has been carried out by Japan's Ministry of Education, Culture, Sports, Science and technology (MEXT), will provide funding support of establishing education and research centers that perform at the apex of global excellence to elevate the international competitiveness of the Japanese universities. The program will strengthen and enhance the education and research functions of graduate schools, to foster highly creative young researchers who will go on to become world leaders in their respective fields through experiencing and practicing research of the highest world standard.

CONFERENCE GOVERNORS

Advisory Board
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- Yuzo ONISHI (Kyoto University)
- Yuzuru MATSUOKA (Kyoto University)
- Koki HIROTA (JICA)

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- Toshifumi MATSUOKA
- Junji KIYONO
- Kunitomo SUGIURA
- Hiroshi GOTOH
- Yasuto TACHIKAWA

PROGRAM

1st day (March 1) Conference Room

12:00–13:00 Registration

13:00–13:10 Opening Remarks
Hiroyasu OHTSU (Kyoto University)

13:10–13:55 Keynote Speech (1)
Development Assistance and Human Security
Kenzo OSHIMA (JICA)

13:55–14:40 Special Lecture (1)
The Risks and Potentials of Asian Megacities
Belinda Yuen (National University of Singapore / World Bank)

14:40–15:00 Coffee Break

15:00–15:45 Special Lecture (2)
Mega-city Management and Community-Based Hospital
Sawako TAKEUCHI (Kyoto University)

15:45–16:30 Special lecture (3)
How Can We Educate Engineers to Devote Themselves to Asian Development?
Satoshi FUJII (Kyoto University)

16:30–16:45 Closing Remarks
Koki HIROTA (JICA)

2nd day (March 2) Seminar Room 1

9:00–9:15	Opening Remarks Eiichi TANIGUCHI (Kyoto University)
9:15–10:15	Keynote Speech *Human Security and Human Development: Challenges and Opportunities Ahead* Gautam Ray (Ministry of Finance, Government of India / Kyoto University)
10:15–10:30	Coffee Break
10:30–12:00 Session 1	Reports on Research Activities in Singapore *Transport Logistics in Singapore –Development Issues and Research Initiatives–* Tien Fang Fwa (National University of Singapore) *Human Security for Urban Transport and Logistics* Eiichi TANIGUCHI (Kyoto University) *Traffic Safety Issues in Asian Megacities –Conflict Analysis for Motorcycle–* Nobuhiro UNO (Kyoto University)
12:00–13:00	Lunch
13:00–14:40 Session 2	Reports on Research Activities in Bangkok, Thailand *Activities of AIT-KU Joint Research Center for Human Security Engineering Bangkok, Thailand* Noppadol Phien–wej (Asian Institute of Technology) *Introduction of Geotechnical Infrastructure Asset Management in Thailand* Hiroyasu OHTSU (Kyoto University) *Maintenance Strategy for Concrete, Steel and Hybrid Infrastructures* Yoshinobu OSHIMA (Kyoto University) *Water Resources and Integrated River Basin Management on Human Security Engineering* Yasuto TACHIKAWA (Kyoto University)
14:40–14:55	Coffee Break
14:55–16:15 Session 3	Reports on Research Activities in Bandung, Indonesia *Urban Area Subsurface Problems Monitoring* Djoko Santoso (Institut Teknologi Bandung) *Urban Energy Supply –The case at Indonesia–* Toshifumi MATSUOKA (Kyoto University) *Research Activities in Indonesia –Collective Action upon Social Capital–* Kiyoshi KOBAYASHI (Kyoto University) *Modeling of Ground Profile in Padang by Using Microtremor Records* Junji KIYONO (Kyoto University)
16:15–16:30	Closing Remarks Kiyoshi KOBAYASHI (Kyoto University)

Opening Remarks

Hiroyasu Ohtsu

Kyoto University

KU-JICA Joint Symposium on Human Security Engineering
HUMAN SECURITY AND RELATED CAPACITY DEVELOPMENT, March 1-2, 2010

Opening Address

March 1, 2010

Hiroyasu Ohtsu
Professor, Kyoto University

1

Kyoto University Global COE (Center of Excellence) Program

"Human Security Engineering in Asian-Mega Cities"

5 years (2008-2012)

4 Disciplines on Kyoto Univ. GCOE Program,
"Human Security Engineering in Asia-Mega Cities"

- Urban Governance
- Urban Infrastructure Management
- Health Risk Management
- Disaster Risk Management

2

3

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- To promote interaction between researchers and practitioners

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Contents of the Symposium

1st day, March 1:

Keynote speech/Special lectures by distinguished speakers concerned to "Human Security" and/or "Human Security Engineering".

2nd day, March 2:

Exchange of views about the current research activities in three overseas bases, namely Singapore, Thailand and Indonesia, concerned to "Human Security Engineering".

Concluding Remarks

I am looking forward to active discussion on **"Human Security Engineering"** at this symposium.

And you will be able to get fruitful products through this symposium on **"Human Security Engineering"**

Singapore: Thank you for your attention

Thailand: **ขอบคุณครับ**

Indonesia: Terima kasih

Mega-city Management and Community-Based Hospital

Sawako Takeuchi

Kyoto University

GFDRR

Mega City Management and Community-Based Hospital

Professor, Kyoto University
Global Expert, The World Bank
(disaster risk management)

Dr. Sawako Takeuchi

1

Urbanization

- Some 90 percent of global urban growth takes place in developing countries and between the years 2000 and 2030, developing countries are projected to triple their entire built-up urban areas.
- This unprecedented urban expansion poses cities, nations and the international development community with a historic challenge.

2

Cities and dangers: Message from Haiti

Reconstruction cost over 1 trillion yens
Death toll: 300,000

3

GFDRR

POST DISASTER NEEDS ASSESMENT of damage and vulnerability by WB GFDRR

- Crisis (prevention and management) secretariat in PM's office
- Data sharing and coordination of different ministries
- Risk map
- Public infrastructure damage assessment for reconstruction

Key Priority gathering : **Data base facilities for data using various space-based tools**

US $ 50 million offered

4

Indicative targets of Haiti

- 70% of houses meet disaster safety standards
- 100% new schools and hospitals meet minimum standards.
- 75% of the basic utilities and transport infrastructure meet minimum disaster safety standards.

Hospitals were considered priority areas for electrilicity supply during Hyogo earthquake.

How can Hospital offer a much needed platform to support glass root activities of communities

5

Activities of international actors

6

UN ISDR： SAFE HOSPITAL

Resilient Hospital : Prevention is cost-effective

1. **Protecting doctors and staffs**
2. **Health services play a vital role in recovery, social cohesion. Care for aging people, the poor and patients.**
3. **Focal points of communities**

1. In the region of Pakistan worst affected by the 2005 South Asia Earthquake, 49% of health facilities were completely destroyed.
2. Public confidence in all levels of the United States government dropped. 140 elderly patients of hospitals and nursing homes died. aged care facilities were later accused of abandoning their elderly charges.

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Monitoring of health risks arising from climate changes

気候変動がもたらすぜい弱性、健康への影響はきわめて把握が難しい。

リスクは感染症や水質の変化、農産物の変化に表れる。マラリアなどの感染症のリスク、これらの影響は社会階層によって異なる。

- These are also diseases of children and of the poor. Indeed, when it comes to climate change, those whose health is most at risk are those who have contributed least to the problem. The poor, whether in rural or urban areas, have always suffered more from the consequences of a degraded environment. Lack of safe food and water has resulted in diarrheal diseases in children and malnutrition in the long term. Climate change now threatens to perpetuate these problems. Our fight for equity is at stake.
- Some diseases are highly sensitive to temperature。

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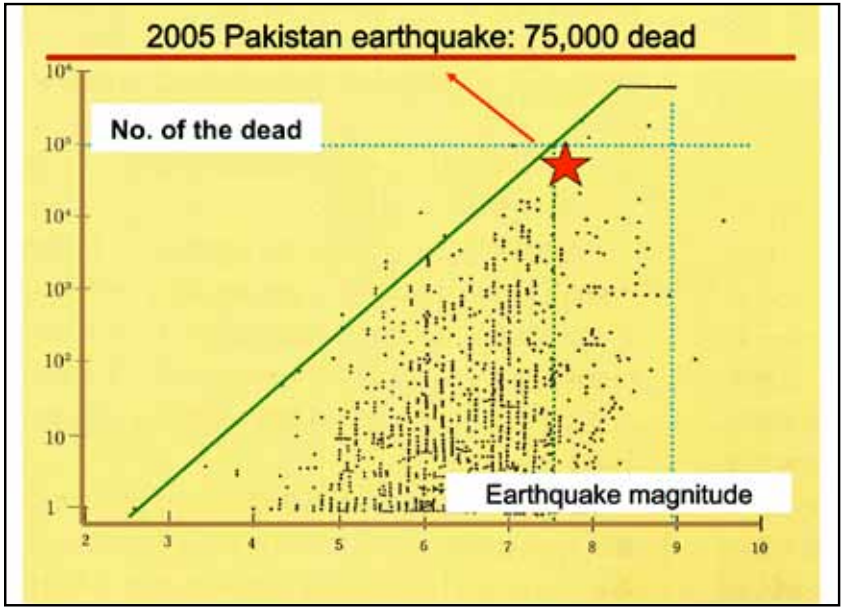

Vulnerability

- **Vulnerability consists of physical one and social one.**
- **Physical vulnerability is related to social infrastructure, while social vulnerability refers to disaster culture and accessibility to social services.**

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Key priorities for human engineering

How to monitor risks and vulnerability

1. Shared common approaches to risk profiling and mainstreaming of disaster risk reduction;
2. Analyses of the interlinkages of poverty, climate change and disaster risk reduction in view of developing tools for disaster risk reduction mainstreaming;
3. Performance indicators and reporting on national good practices in disaster risk reduction and share with other urban blocs.
4. Appeal to international actors

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Safety in Mega city and community based hospitals: Medi-Square as Proposal for new ODA

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Functions （1）

❒ Medi-square Concepts

Provide "media" & "medical" (human care) space to the urban areas. Common goods for safe and sustainable lives

❒Media

Information sharing mechanism by high performing computers to guarantee safe living conditions for the communities.

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Medi-square （2）

❒**System**

Part 1：Medical

Part 2：living environment

（Energy, water and waste management）

Part 3：Gathering information and creation of jobs

❒Operations

- **Semi- public body for urban management**
- **Mixture of charging system and public money**

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Roles of Community based hospitals

- Information and database center
- Disaster response (lifeline)
- Mitigation of social conflicts : aged people poverty, minorities
- Monitoring of vulnerability: environmental risks (water, air pollution etc)
- Education center for medical education

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Some technology application

- **Remote medicine**
- **Health care management in an environment of scarcity**
- **Public health and Preparedness**
- **Old style patient records (carte) to Digital Carte. Digital Carte(or e-carte) : computerized control of patient records.**
- **Linkage with Public transportation, other social infrastructure (urban planning)**

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Basic Solution of Development Support

1. ODA should be equipped with multi functions of disaster reduction. Human securities should be the most important function in ODA.
2. Long term strategies are necessary.
3. Community based hospital is a basic infrastructure.

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How Can We Educate Engineers to Devote Themselves to Asian Development?

Satoshi Fujii

Kyoto University

How can we educate engineers to devote themselves to Asian development?

Satoshi Fujii
Kyoto University,
Department of Urban Management

What is Civil Engineering?

- Civil engineering is engineering for civilization.
- Civilization ←→ Wild
- According to Yukichi Fukuzawa(福沢諭吉), all the courtiers are something between the ideal civilized country and the wild countries.

  .. Therefore ..
- Civil Engineering is social activity to make the society less wild (chaotic & less-ordered) and more civilized (well-ordered).

What is Civil Engineering?

- Needless to say, those in well-ordered society (i.e. civilized society) is happier than those in less-ordered society (i.e. wild society).

  (NOTE: well-ordered is NOT convenient & efficient)

  .. Therefore .
- Civil engineering is altruistic activity to try to make people happier.
- Civil Engineering is social activity to make the society less wild (chaotic & less-ordered) and more civilized (well-ordered).

Therefore .

- Civil Engineers should have public spirit that motivates them to contributes to public.
- This should be the core of the education for civil engineers.

e.g.) Kimitake, Furuichi (古市公威)
Hiroi, Isami(廣井勇)
Aoyama, Akira(青山士) etc.

A modern ordinal case from Indonesia□ ..

「ほんまにねぇ，インドネシア人は日本人と違うんですわぁ．」

大阪の阿倍野出身の中川さんは，綺麗な大阪弁で丁寧に教えてくれた．現地では，技術的な面はもちろんのこと･･･作業服の着方，線路横断時の左右確認，時間管理，休憩の仕方等，一つ一つを丁寧に教えていく．何も高度な土木技術を教えることだけが技術移転なのではない．こうした地道な指導の全てが技術移転なのだ．その結果，今では誰もが驚くほどに効率的な保線チーム（写真6）ができあがったのだという．･･･

そうした地道な努力を他の先進国はやっているんでしょうか，と色々な方に尋ねたところ，どうやらそうでは無いらしい．国によっては効率的に仕事をこなすために，自国から技術者や安い賃金で働くことができる労働者も一緒につれてくるケースが多いとのこと．言うまでもなく，そういうやり方ではその国はいつまでも自立できない．それを伺ったおり，地道な技術移転の努力があってはじめて，インドネシアが本当の意味での自立に近づいていくんですね，という旨のことを投げかけた時，中川さんは，次のように言われた．

「それ，分かっていただけて，ほんまにうれしいですわぁ．ほんまにねぇ，最終的には，インドネシアのスタッフみんなに自立してほしいんですわぁ．」

藤井　聡：海外で働く，ということ～東南アジアの日本人土木技術者を訪ねて～，土木学会誌，92 (10), pp. 60-63, 2007.

few comments□ .

- Such behavior by Mr. Nakagawa might be regarded as **□irrational□**in terms of national or company□s interests.
  (一見，中川さんのようなやり方は，国家的な外交戦略や自分自身の企業の収益だけを考えるなら得策ではないように見えるかも知れない．)
- Yet, it is actually □rational□for the company, since such education reduces budget for sally, and such international human relations is important social capital.
  (ところが実際には，企業側からしてみれば現地の技術者の育成は人件費の圧縮を意味し，個人的な信頼関係の育成は外交戦略の上から考えても強力な財産である．
- However, local workers have completely different feeling from such rational-discussion.
  (しかしながら，**現場の思いはそういった企業の論理や外交戦略といった次元を越えた所にある**．)

A modern ordinal case from Indonesia□ ..

現場の思いはそういった企業の論理や外交戦略といった次元を越えた所にある．中川さんをはじめ，現地に長く滞在している多くの方々が，その国に対する**「愛情」としか表現できないような思い**を抱いておられることがひしひしと伝わってくる。････前インドネシア駐在の奥原さん(日本交通技術（株）)は言う，**「やっぱり，インドネシアが好きですね．第二の故郷と言えばいいんでしょうか，もうそれは私の財産みたいなものです．それが海外で働くことで得られたことの中で，一番うれしかったことじゃないでしょうか」**．皆で雑談をしていたおりにこの奥原さん，**「日本に帰って，またインドネシアに帰ってくると，本当にほっとするんですよ」**とおっしゃった．その時，他の駐在員の皆さんも一様に，どっと笑いながら同意していた．

藤井　聡：海外で働く，ということ～東南アジアの日本人土木技術者を訪ねて～，土木学会誌，92 (10), pp. 60-63, 2007.

still□ ..

ただし，赴任国は第二の故郷であったとしても，やはり，第一の故郷は日本．祖国に対する思いは複雑で深い．インドネシア駐在歴13年の鉄建建設（株）のジャカルタ事務所長の大塚さんは，食事中にぽつりと言った．「なんていうんでしょうか，やっぱり，海外にいればいるほど，日本の事が好きになっていくんですよ」．それを聞きながら，現地の駐在員の方々も，そして海外留学経験を持つ我々も皆しみじみと同意した．言葉も文化も気候も風土も何もかも日本とは異なる異国での生活を通じてはじめて，自分でも気づかなかったほどに深い，心の芯のようなところに，祖国に対する何とも言えない感情が存在することに，皆，それぞれ気づくのである．海外赴任は，日本人にもう一つの故郷を与えてくれると共に，日本が自分自身にとって生まれ育った特別な国であることに気づかせてくれるのだ．

few comments□ .

- Japanese engineers who work for long years in foreign country, seem to have deep attachment (愛着) toward the country and altruistic motivation to contribute to the development of the country.
- This kind of feeling might be specific to Japanese (I am not sure), and this might be a weak point, but might be merit of Japanese civil engineers.
- How can the Japanese government can contributes to such innocent government.

Economic Nationalism

- The Japanese government seems to the policy based on economic nationalism. (i.e. economic theory that assumes that economic dynamics is derived by both market mechanism and nationalism)
- All the other competing countries such as USA, Germany, UK, China, Korea□ . implement their trading policy based on economic nationalism. (Economic nationalism is now strengthen in all over the world, such as Hamilton Project by Bush and Obama in USA)
- Yet□ ..Japanese government does not seem to behave in economic nationalism manner.
- **This would be serious problems for Japan.**

If□ .

- If we fail in development of nationalism in economics, **Japan will lose all the national power** including economic power□
- For example, Japan has strong nuclear industry, but Japan lost in competition in Vietnam, by Russia, because Japanese governmental support was less than that by Russian government.

  □ .and□ .
- Actually, Japanese engineers have felt that they have been lost by the other countries due to **lack of governmental support**.

Altruism & Nationalism

- Civil engineers are altruistic by definition.
- Economics should be nationalism.
- How can we harmonize this contradiction between these 2?

→ National government should try to seek mutual development (i.e. □win-win□relations between 2 countries).

→ We need to know that nationalism is not always egoistic, but could be reciprocity (互恵).

→ For the reciprocity, engineers need following 3 things;

1) engineering skill,
2) nationalism, and (willingness to devote themselves to Japan)
3) altruism (willingness to devote themselves to the other country)

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1) engineering skill,
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In Kyoto university, we will soon start **international course for civil engineers**.

In the international course, we try to educate civil engineers who can contributes to **reciprocity** among their countries and the other countries.

In my opinion, the education should be more than education of engineering skill, and should include education of **public spirits** that is not only for their own society/ coutry but also for the other societies/countries.

→For the reciprocity, engineers need following 3 things;

1) engineering skill,
2) nationalism, and (willingness to devote themselves to Japan)
3) altruism (willingness to devote themselves to the other country)

Opening Remarks
Perspectives for Safe, Seured and Healthy cities

Eiichi Taniguchi

Kyoto University

Perspectives for safe, secured and healthy cities

Eiichi Taniguchi
Kyoto University

Critical issues in urban areas in 21st century

- Rapid change of society of less younger people and more aged people
- Threat by natural disasters and new infectious disease
- Global problems caused by resource development, decrease of population and the environment

Critical issues in urban areas in 21st century

- Social infrastructures, urban amenity as well as transport and logistics problems
- People's behaviour and stress in information based society
- Environmental issues regarding global climate change

Solutions

- Decrease of human capacity
- Multi-layered and complicated issues generated by the change of local society and environment

- To create "safe, secured and healthy cities of people, society and environment," initiating multi-disciplinary studies and capacity development are required


Kyoto University Global COE “Human Security Engineering”
• Global COE programme on Human Security Engineering for Asian Mega-cities
6 overseas bases
International collaborative research in Asia
• New research and education unit for safe, secured and healthy cities（安寧の都市）
Faculty of Engineering and Medicine

Human Security and Human Development: Challenges and Opportunities Ahead

Gautam Ray

Ministry of Finance, Government of India / Kyoto University

Human Security and Human Development: Challenges and Opportunities Ahead

Keynote Address for KU-JICA Joint Symposium on Human Security Engineering, Nikkei Conference Room, Tokyo

2nd March 2010

Gautam Ray

Professor, Graduate School of Management, Kyoto University
And
Additional Director-General, Ministry of Finance, Government of India

1

Plan

- Definition & Scope of Human Security
- Broader Notion vs. Narrow Notion
- Why broader notion is useful and necessary?
- Conceptual Linkages between Human Security and Human Development
- Disconnects between them
- Policy Dilemmas
  - Human Security vs. Economic Security
- 3 Case Studies
- Abstraction of General Policy Principals
- Concluding observations

2

Scope of Human Security

- Definition:
  - Human (in)security (HS)
    ≡A set of Attributes (multidimensional) that threaten or, are perceived to threaten individual's life & well-being
  - Attributes include:
    - Economic (in)security (freedom from want)
    - Political and personal security
    - Sudden harmful disruptions

3

Scope of Human Security (continued)

- HDR, UNDP, 1994 definition equates freedom from want with "safety from chronic threats such as hunger, disease, and repression" that poor face in their daily lives.
- Canadian School of thought insists on a narrow definition on Human Security.
  - HS≡ "Complex of interrelated threats associated with civil war, genocide, and displacement of population"

4

Scope of Human Security (continued)

- Japanese School of thought insists on the broader notion of UNDP to include threats arising out of chronic poverty, incapacitating ailments, poor public health/hygiene, political and social conflicts, terrorism, and natural disasters.
- Former Prime Minster Obuchi Keizo's definition (Pragraph 5)

5

Ogata-Sen Report

- In their report *Human Security Now*, 2003 CHS focused on

Agenda for operationalising Broader HS Paradigm:
- "Vital Core" needs (absolute needs, basic capabilities and fundamental human rights)
- protection from threats to such core needs through capacity building.

- This agenda now guides Japanese ODA policy and JICA projects.

6

Why UN-Japanese Paradigm of HS?

- It has important policy implications for meeting the structural risks in today's globalised economy.

  - "downturn with security" alongside "growth with equity" (*a la Prof.Sen)*

  For Example, economic stimulus package to counteract downturn stoked inflation in India
- Policy prescription from HS point of view: supply food grains at cheap price, if necessary, by additional resource mobilization through progressively higher tax levy on the rich.

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Economic Security and Violence

- Correlationship clear
- No empirically established cause and effect relationships
- Difficult because of reverse or circular cause and effect relationship
- Mutually reinforcing feedback mechanism? May be in Rwanda/Angola/Sierra Leone.
- Implications of such dynamic complementarities between economic insecurity and violence can be disastrous.

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Broader Notion Better

Because:

1) Policy analysis on the basis of narrow concept of HS may be analytically defective.
2) Policy prescription based on such defective analysis may be ineffective to address violent conflicts in situations where such conflicts and economic insecurity are interrelated.
3) Since in poorer countries they are in fact interrelated (Canadian School admits it in their HS Report, 2005), Narrow notion of HS is inappropriate for such countries.

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Democracy vs. Human Security

- Human Security audit is easier in Democratic countries because of existence of civil societies, human right activists, free press and independent judiciary.
- In countries which have kind of Right to Information Act that India has, information from Public Authorities can be gathered by any citizen or groups through its legal institutional framework. Such information empowers human security agenda
- The challenge of protecting Human Security needs in countries where democratic institution are weak.

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Challenge in Democratic Countries

- Passionate human right(HR) activists sometimes turn a blind eye to social gains from economic developmental(ED) programs.
- Similarly a government desperate to outcompete other governments in attracting industrial projects may ignore human security imperatives.
- Because of such competition, costs of human insecurities are not internalized by project authorities.
- Challenge is not to sacrifice ED programs and address HS concerns of the vulnerable
- Challenge is to make HR radicals realize that without ED, HS is threatened for a larger segment of the poor.

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Challenge (continued)

- In ED programs without HS concern

Result:

Rich gains at the cost of poor ⇒ increased inequalities ⇒ Social tension and conflict

- Finding an optical mix between ED and HS perspectives in Development Projects is the Real Challenge.

12

Three (3) Indian Case Studies Exemplifying this Challenge

- Paragraph 13: SINGUR:RatanTata's 'Nano'Project)
  NANDIGRAM:Chemical Hub Project
  SARDAR SAROVAR DAM Project

13

What do they demonstrate?

- How inadequate attention to HS perspectives can bedevil industrial and infrastructural projects leading to Negative-sum Outcome
- How democratic institutions can resolve such conflicts, or prisoner-dilemma like situation.

14

Four (4) Axioms

1. Human Development in general and economic development projects in particular do not by themselves guarantee protection of vital human security needs of the most vulnerable.

   The normative policy prescription that follows from this axiom is that human security threats of development projects must be assessed through human security audit among the most vulnerable section of the population.
2. In the case of conflict of human security interests between two groups arising out of a development project, the public policy should be more sensitive towards the security needs of the more vulnerable group much on the lines of the Rawlsian paradigm.

15

Four (4) Axioms (continued)

3. Democratic resistance even by a minority segment of the affected population should be respected and given due cognizance at the time of development of project plans.
4. Democratization of social, political, and economic institutions empower people to defend against threats to their human security needs. The normative policy prescription arising out of this generalization is that democratic institutions such as free press, independent judiciary and civil societies have to be promoted and developed in all societies.

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Opportunities

- HS Paradigm throws open enormous opportunities BECAUSE
  - (a) its interdisciplinary framework enables study/research/analysis of real life social, political, and economic problems.
  - (b) it calls for empowering people through our growing knowledge capital, technological innovations and policy interventions.

But what about limitations of human agency? Does it recognize that our grandchildren may well be amongst the poor and vulnerable threatened with HS concerns?

17

CONCLUSION

- CAN HUMAN SECURITY NEEDS OF THE VULNERABLE BE PROTECTED THROUGH HUMAN AGENCY?

HOPE: May be through the MISSION MODE OF JICA and through many such small but significant steps such as THIS SYMPOSIUM.

18

MANUSCRIPT

Human Security and Human Development:

Challenges and Opportunities Ahead

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Human security, or lack of it, has multidimensional attributes concerning threats to peoples' life and well being. As opposed to traditional state-centric notion of security, human security paradigm is individual or people-centric. In recent years the discourse on human security has been gaining momentum along two new dimensions, freedom from want and freedom from fear, ever since the United Nations Human Development Report, 1994 broadened the traditional domain of "civil war, genocide, and displacement of people"[1] to include in the discourse "chronic threats such as hunger, disease, and repression as well as protection from sudden and harmful disruptions in the patterns of daily life-whether in homes, in jobs or in communities" (Human Development Report 1994, UNDP).

2. Seven specific attributes of human security are listed in the Report. They are: economic security, food security, health security, environmental security, personal security, communal security, and political security. The Report advocates that the instruments for protecting people vulnerable to such threats should include public policy instruments focused on basic needs, productive and remunerative employment, human rights, preventive international diplomacy, and reform of global institutions.

3. The Japanese vision of human security, much on the same line as that of UN, is succinctly put by the former Prime Minister of Japan Obuchi Keizo in his keynote address in the conference "Intellectual Dialogue on Building Asia's Tomorrow" held

[1] The Canadian school of thought, as articulated in Human Security Report, 2005, insists that human security should be confined only to these traditional threats for both pragmatic and methodological reasons. The broader concept advocated in Human Development Report 1994 has limited utility for policy analysis according to this school.

in 1998 in Tokyo. According to him, human security is "the keyword to comprehensively seizing all of the menaces that threaten the survival, daily life, and dignity of human beings and to strengthening the efforts to confront these threats." To pursue this vision of improving human security environment across the world, Japanese government played a key role in establishing Commission on Human rights (CHS) co-chaired by Ms. Sadako Ogata, former head of UNHCR and currently the President of Japan International Cooperation Agency (JICA), and Prof. Amartya Sen .

4. CHS in its final report *Human Security Now* submitted in 2003 emphasized the need to protect 'vital core' (absolute needs, basic capabilities, and fundamental human rights) of all human lives from critical and pervasive threats by building on people's capabilities and strengths (capacity building) to meet those threats. Capacity building of the poor and vulnerable has accordingly become a thrust area in Japanese Government's Official Development Assistance (ODA) policy[2] and also in its bilateral and multilateral engagements.

5. The theoretical underpinning in the broader UN-Japanese vision of human security can be found in Abraham Maslow's theory of human motivation. In the pyramidal hierarchy of five broad human needs, economic security, food security and personal security formed the bottom of the pyramid as they were the foundation on which other higher needs of an individual grow. In the human security paradigm, just as in Maslow's framework, an individual cannot develop motivation to aspire for higher levels of human development and achieving his/her true human potential unless these core needs are secured. In other words, human security is the foundation for human development.

6. Any policy instrument aiming to promote human security is likely to be ineffective and inadequate if it ignores this critical link of human security with human development. For example, in cases of violent conflicts among poor peoples, a policy response to contain such violence that does not address the basic economic and food security needs of peoples is likely to be ineffective. Structural violence, that is violence built into the structure of the system, has to be addressed not only for

[2] For details, see 'Section 2, Human Security and ODA' in ODA Annual Report 2000, Ministry of Foreign Affairs of Japan

"comprehensively seizing all of the menaces that threaten the survival, daily life, and dignity of human beings", but also for "strengthening the efforts to confront these threats".

7. To be sure, there is no empirically established cause and effect relationship between economic insecurity and violent strife. But it is easy to see that they exist together in many developing countries - one possibly feeding on the other in mutually reinforcing feedback mechanism. And such dynamic complementarities between them severely threaten human security.

8. The conceptual linkages between human security and human development have been extensively discussed in the literature[3]. While human security is about defending people's vital or core needs, human development is about expanding set of choices or freedom. Human security can thus be seen as the nucleus of human development around which people can build on their capacity to develop themselves.

9. Failure to protect human security for a group of people results in failure in their human development. At the same time failure in human development increases the risk of failure in human security mainly because capacity building of the vulnerable is not possible without their human development. Therefore a circular cause and effect relationship gives rise to the possibility of vicious cycle dynamics in the case of sustained failure in human security over a period time. This is the logic and importance of having human security perspectives in human development discourse and vice-versa.

10. Few will dispute that in today's world economic insecurity constitutes one of the greatest threats to peoples across the world. Threats to secured sources of livelihood are widespread particularly after the recent economic downturn in most economies of the world. To arrest the downturn and stimulate such economies stimulus packages have been injected in many countries including India. Such policy responses have worked in arresting downturn, but have stoked inflationary pressures in some countries. Indian economy, for example, grew at 7.9% in three months upto September 30, 2009, but wholesale food prices rose at the fastest pace in eleven

[3] See Tadjbaksh and Chenoy (2007), chapter4 for a summary of the relation between human security and human development.

years hurting the poor immensely. An index of food articles compiled by Ministry of Commerce, Government of India rose by 19.95% in the week that ended on December 5, 2009 compared to a year earlier. An appropriate policy response-consistent with the human security imperative of "downturn with security"[4] is to have the stimulus package in conjunction with measures to making food grains available at cheaper prices by removing the supply chain bottlenecks or, if necessary, by raising taxes on better-off sections of the society.

11. Undoubtedly, the operational imperative in this broader paradigm of security is quite challenging. It requires periodic human security audit on two fronts: whether human security environment is under any threat, and whether the capacity of the most vulnerable population to defend themselves in the potential or sudden threat is being strengthened through their human development. This is an important human security agenda that emerges out of the Ogata-Sen Report.

12. Needless to say, human security audit[5] is a great challenge especially in locations where democratic institutions have not taken strong roots. Where they have taken roots human security agenda faces a different type of challenge. In democracies like India many passionate human right activists swayed by their emotional one-track perspective often turn a blind eye to the regional developmental needs and opportunities thrown open by the forces of globalisation. Similarly development zealots often fail to see that the human security perspectives in development are both necessary and important for sustainable development. A middle ground has to be found in such countries. From the points of view of equity, justice and fair play, development projects must take into account and internalize the cost of providing basic human security needs to the poor and vulnerable who will be affected by such projects .A balanced and nuanced audit of mutually reinforcing human security and development needs is the most onerous challenge for human security auditors in these countries.

[4] The phrase "downturn with security" was coined by Prof. Amartya Sen in his keynote address in an International Symposium on Human Security held in Tokyo on July 28,2000

[5] Prof. Kanti Bajpai is reportedly engaged in drawing up a human security index based on audit of eleven specific threats, national threat as well as human security threat attributes, conducted through a public opinion survey(not yet published) among 10,000 people in India on how insecure Indians feel. Bajpai,2000 throws light on conceptual issues on human security including human security audit.

13. Democratic institutions in countries like India have often exposed the schism between these two conflicting imperatives, one coming entirely from human security perspectives and the other from the need for rapid economic development. Three recent Indian cases, mentioned in the following paragraphs, illustrate how this conflict was resolved in one way or the other with the help of political institutions and movements. Two of them, Singur and Nandigram projects, pertain to the state (province) of West Bengal, and the other is Sardar Sarovar Dam project in the states of Madhya Pradesh and Gujarat.

(1) The Sardar Sarovar Dam project is a multipurpose hydro-electric power cum irrigation project over the river Narmada. According to project authorities, it was estimated to irrigate drought prone areas of 1.8 million hectares (4.45m acres) in Gujarat and 75,000 hectares (185,000 acres) in Rajasthan; have an installed power generation capacity of 1450 megawatts; provide domestic water to over 2.35 million people in 8235 villages and 135 towns in Gujarat, and prevent flooding downstream As per the original plans, the dam was supposed to have a height of 136.5 m. The development project ran into trouble over the resettlement or rehabilitation of 250,000 people, most of whom were tribal population

A critical factor of assessing the human security risks associated with the project is the proposed height of the dam. The larger the height, the larger the area it will flood during monsoon depending on the quantum of rainfall. Human security perspectives including the risks of flooding the catchment areas and consequential displacement of families settled in the areas were not given adequate attention by project authorities. No complementary rehabilitation plan alongside the construction plan was drawn up.

Narmada Bachao Andolan (Save Narmada Movement) led by a group of human right activists and intellectuals in India resisted construction of the dam and the movement drew support from international human rights activists and NGOs. Peaceful agitations and Gandhian-style satyagrahas including fasts were organised to protest against the entire Narmada Development plan. Fasts were organized near World Bank headquarters in Washington D.C. as the Bank was providing a loan of US$550 million for the project. The World

Bank withdrew from the project as it saw that human security perspectives got a short shrift from the project authorities.

The matter finally went to the Indian Supreme Court which in its ruling dated October 18, 2000 passed by a 2:1 majority allowed the construction of dam up to the height of 90 meter and further construction of 5-meter incremental height subject to fulfilment of strict conditions ensuring human security concerns including delivery of complementary relief and rehabilitation package alongside construction. The construction work for incremental height can start only after receiving green signal from the Relief and Rehabilitation Subgroup of the Narmada Control Authority which was entrusted by the Court with the responsibility of protecting the needs of the displaced population. [Narmada Bachao Andolan vs. Union of India (WRIT PETITION (C) NO. 319 OF 1994)].

The construction of the dam is now complete as human right activists continue to protest against inadequate relief and rehabilitation measures for the displaced population.

(2) Incidents of violent conflicts in 2007 in Nandigram over agricultural land acquisition for green field industrial projects in India provide a starker example of how difficult it may be for a policy maker to reconcile conflicting human security and human development perspectives in a development project. This was a chemical hub project in Nandigram, a village in East Midnapore district of West Bengal on the bank of river Haldia. It won the approval of Government of India as a Special economic Zone project after obtaining clearances from environmental and other regulatory authorities required as per law. The project was located in the vicinity of the Haldia port. It had close backward and forward linkages because of the nearby Haldia township where a big refinery plant of Indian Oil Corporation, Mitsubishi chemicals plant producing PTA and a modern petrochemical unit Haldia Petrochemicals are located. Haldia township generated considerable complementarities in terms of availability of human and material resources.

However, a considerable part of the agricultural land proposed to be taken over by the project authorities was fertile enough for multiple crop cultivation. Besides, a significantly large number of villagers are from a minority community to whom living their communal life in the locality around the place of prayer constitutes a vital core of their human existence. The prospect of getting uprooted constituted a grave threat not only to their personal and economic security but also their cultural, religious, and communal identity.

From the perspective of economic development, the chemical hub project and its location made perfect sense. The net economic surplus from the proposed chemical hub project would have been much greater than that generated from present economic activities. Yet it did not pass the human security audit of the villagers of Nandigram. They resisted fiercely. The resistance became so powerful that no government officials or even the police could enter the area to discharge their routine administrative duties. Women and children were in the frontline of the resistance brigade. On the fateful day March 14, 2007, in a violent clash between villagers and police, fourteen people died. Hundreds of villagers in and around Nandigram had to flee from their home creating a classical human security crisis situation. The state government had to yield. It declared that there will be no land acquisition in Nandigram. An alternative site in Nayachar, a nearby island, has been identified by the state government for the chemical hub.

(3) The Singur project in West Bengal was Mr. Ratan Tata's dream US$ 2,200 car(Nano) project which was passionately promoted by the Chief Minister of West Bengal. West Bengal government acquired in public interest nearly 1000 acres of agricultural land for the project. Most land owners and farmers were reconciled with the acquisition and a small number of land owners/farmers did not want to part with their land. Initially the movement spearheaded by the principal opposition party in the state did not get sufficient traction, but the momentum was picked up after Nandigram violence on March 14, 2007. With the success of Nandigram movement, Singur movement got further intensified even as Tatas completed construction of the plant, installed the machineries, and about to start production. Looking at the deteriorating human security

situation after a Japanese engineer was threatened as he was entering the plant, the Tatas withdrew the plant from Singur in October 2009 and relocated it in Gujarat.

From the economic development perspective, Singur-Nandigram will go down as dark chapters in the history of regional development in the state of West Bengal. More important than lost employment opportunities the region also lost the momentum and expectation of industrial growth built up around the state government's pro-active role in industrializing the state. As a result the government is not in a position to fulfil its pledge in 2006 election that it will mitigate unemployment problem in the state through its industrial policy.

From Human Security perspective, however, Singur-Nandigram heralded beginning of a new hope. Post Nandigram a political environment has been created in India where farmers can no longer be coerced into selling their land in the name of public interest. Potential conflicts in other land acquisition projects in India could be avoided as government of India drafted a new legislation for land acquisition. In this proposed legislation lands for industrial projects have to be acquired by private companies themselves and states cannot acquire such lands in the name of public interest[6].

13. These three recent cases in Indian contexts provide good examples of how inadequate attention to human security perspectives in economic development projects can bedevil such projects to the detriment of all. They also demonstrate how democratic institutions such as courts of law, civil societies, international organizations, and Parliament can come into act to protect the core or vital security need of the vulnerable.

14. Can we abstract some generalised principles of public policy response in such situations? The problem is that such policy responses may not be appropriate in all contexts. Yet it may be useful to extract some general normative principles of development policy that may come handy for policy makers while handling such development projects in future.

[6] A.V.Banerjee et.al (2007) discuss

why government should be involved in acquisition of lands for industrial purposes.

First, human Development in general and economic development projects in particular do not by themselves guarantee protection of vital human security needs of the most vulnerable.

The normative policy prescription that follows from this axiom is that human security threats of development projects should to be assessed through human security audit among the most vulnerable section of the population.

Second, in the case of conflict of human security interests between two groups arising out of a development project, the public policy should be more sensitive towards the security needs of the more vulnerable group much on the lines of the Rawlsian paradigm.

Third, democratic resistance even by a minority segment of the most affected population should be respected and given due cognizance at the time of developing project plans.

Fourth, democratization of social, political, and economic institutions empower people to defend against threats to their human security needs. The normative policy prescription arising out of this generalization is that democratic institutions such as free press, independent judiciary and civil societies have to be promoted, developed, and strengthened in all societies.

15. To conclude, human security paradigm because of its inter-disciplinary approach throws open enormous opportunities to address real life problems of people and those concerning public policy issues. It highlights the need for policy makers to be sensitive to the core or vital needs of our peoples, and to the need for empowering them to defend against adverse structural economic, social and political forces on which they have no control. Ultimately, peace rests on justice. The call for justice in human security paradigm is its strength.

16. Survival and flourishing of democratic institutions and fall of despotic and totalitarian regimes across the world have also created tremendous opportunities to promote human security. Most importantly, to address human security concerns we now have a set of powerful instruments at our command: growing knowledge capital, newer technology, and transnational institutions and regional fora which can provide

institutional support to transmit such knowledge and technology to those who need them most.

17. An important question is how these powerful aids and instruments can be brought to bear upon human agency to help them empower people who are vulnerable to chronic threats such as hunger, debilitating diseases, unemployment or unproductive employment and structural violence in a given socio-political-economic milieu. This is the core issue confronting and challenging human security discourses today.

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Traffic Safety Issues in Asian Megacities –Conflict Analysis for Motorcycle–

Nobuhiro Uno

Kyoto University

Traffic Safety Issues in Asian Megacities - Conflict Analysis for Motorcycle -

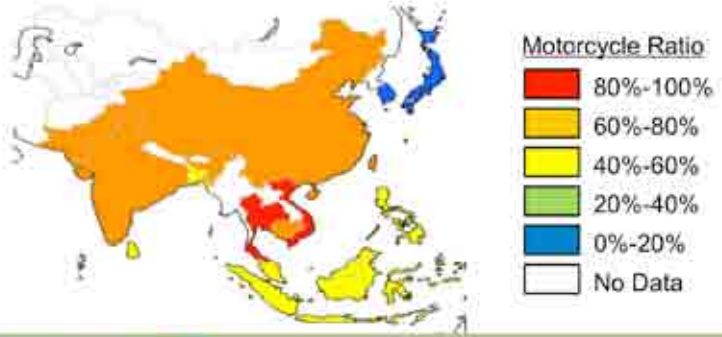
Kyoto University Nobuhiro UNO
Kyoto University Yasuhiro SHIOMI
Kyoto University Teruaki HANAMORI

Contents

- Traffic situations in Asian cities
- Problems of urban transportation in Asian cities
- Some solutions for the problems caused by mixed traffic
- Conflict analysis for mixed traffic flow

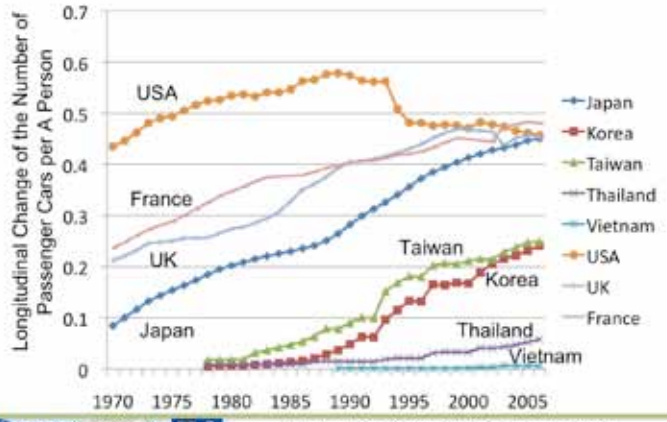
Motorcycle Ratio in Asian Countries

$$\text{Motorcycle Ratio [\%]} = \frac{\text{The number of motorcycles}}{\text{The number of all motorized vehicles}} \times 100\ [\%]$$

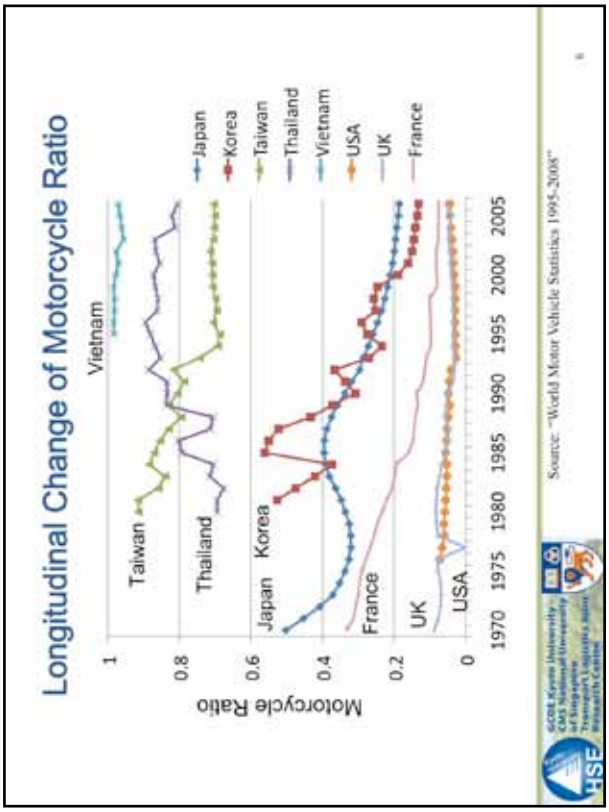


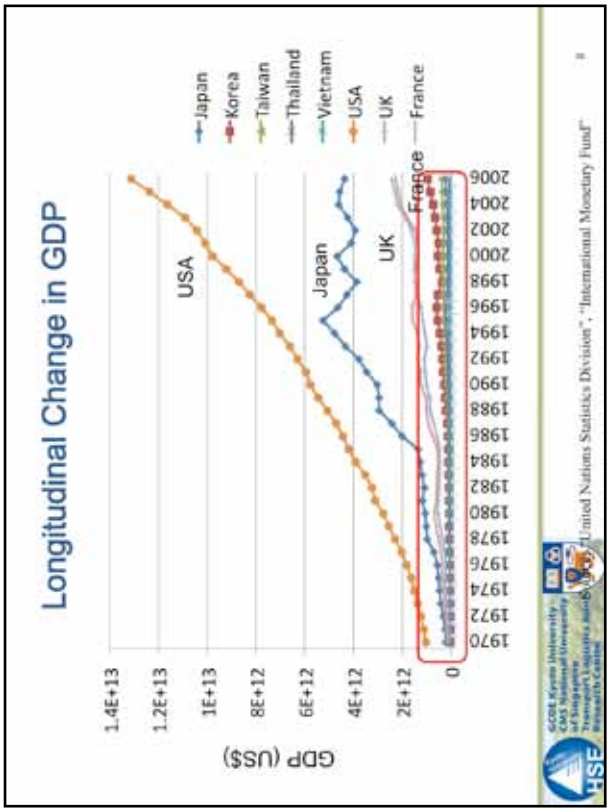
[The percentage of Motorcycles to Passenger Cars in Use, 2007] "World's statistics", Statistics Bureau, Ministry of Internal Affairs and Communications, Japan, 2008.

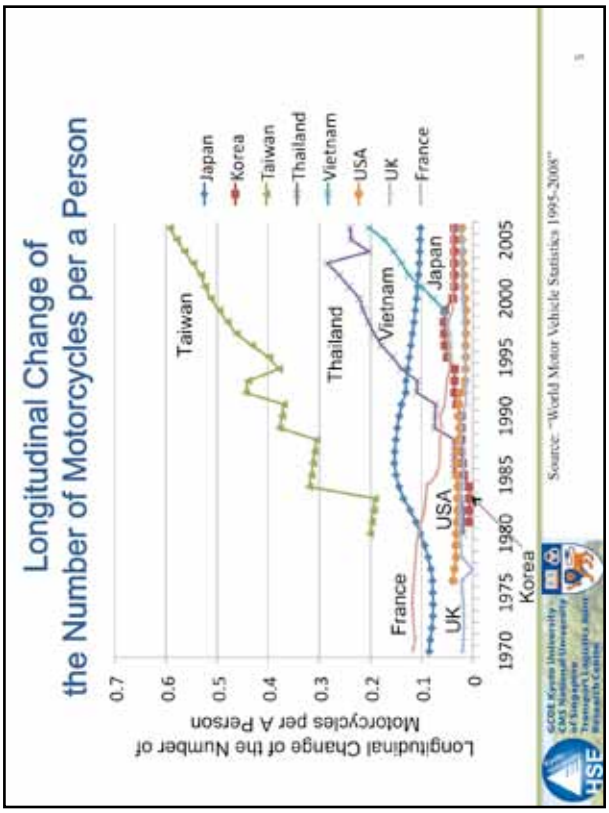
Longitudinal Change of the Number of Passenger Cars per a Person



Source: "World Motor Vehicle Statistics 1995-2008"

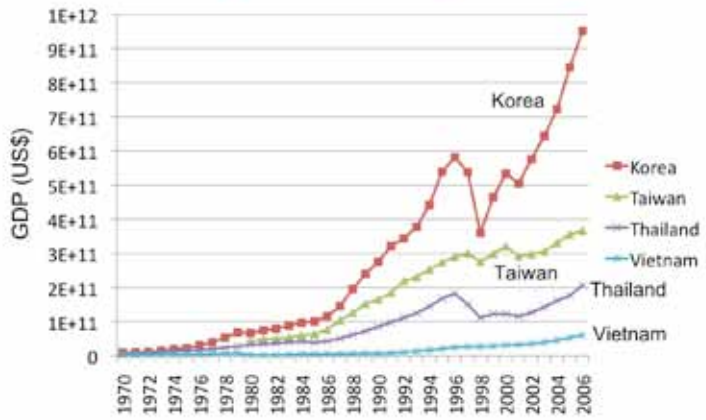

Longitudinal Change of Motorcycle Ratio
Motorcycle Ratio
Vietnam
Taiwan
Thailand
Japan
Korea
France
UK
USA
Japan
Korea
Taiwan
Thailand
Vietnam
USA
UK
France
1970 1975 1980 1985 1990 1995 2000 2005
Source: "World Motor Vehicle Statistics 1995-2006"


Longitudinal Change in GDP
GDP (US$)
USA
Japan
UK
France
Japan
Korea
Taiwan
Thailand
Vietnam
USA
UK
France
1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006
Source: "United Nations Statistics Division", "International Monetary Fund"


Longitudinal Change of the Number of Motorcycles per a Person
Longitudinal Change of the Number of Motorcycles per A Person
Taiwan
Thailand
Vietnam
USA
Japan
Korea
France
UK
Japan
Korea
Taiwan
Thailand
Vietnam
USA
UK
France
1970 1975 1980 1985 1990 1995 2000 2005
Source: "World Motor Vehicle Statistics 1995-2006"

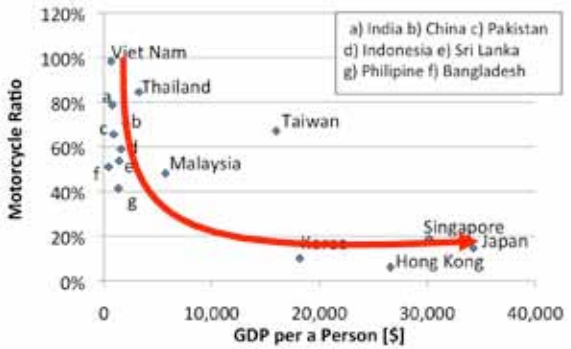

Why Motorcycles?
Low cost in purchase and maintain
[Baht]
In Thailand: Motorcycles | Passenger Cars
Average cost for Purchase 33,715 485,747
Average monthly cost in maintain 490 2,857
(Fukuda, Nakamura, Takeuchi, 2008)
Relationship between GDP and Motorcycles in 2007
Lower impact from traffic congestion than passenger cars
Weather condition suitable for motorcycle riding
(Sekine (2003) reported that it was popular in Vietnam to ride a motorcycle in order to get the cool in the evening.)
Compact city structure
(Average trip distance: 100 km by cars, 10km by motorcycles (Fukuda et al., 2003))
etc.

Longitudinal Change in GDP



Source: "United Nations Statistics Division", "International Monetary Fund"

Relationship between GDP and Motorcycle Ratio



Source: "United Nation, National Accounts Main Aggregates Database"

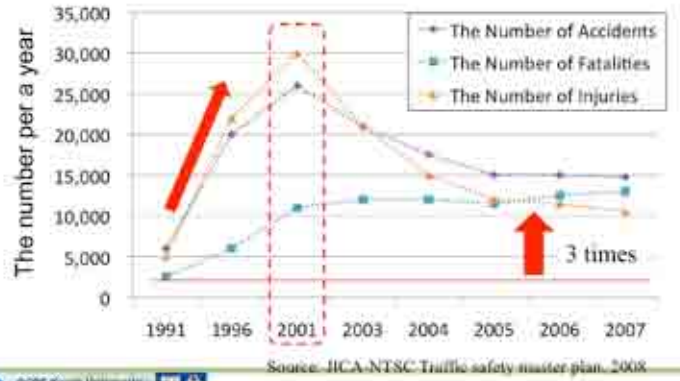
Traffic Situation in Asian Cities

Contents

- Traffic situations in Asian cities
- Problems of urban transportation in Asian cities
- Some solutions for the problems caused by mixed traffic
- Conflict analysis for mixed traffic flow

Road Traffic Safety Issue in Vietnam

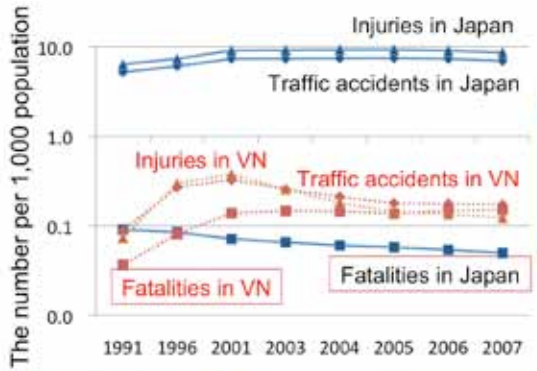
- Road traffic safety is one of the greatest social concerns.



Source: JICA-NTSC Traffic safety master plan, 2008

Road Traffic Safety Issue in Vietnam

- Comparison with the situation in Japan

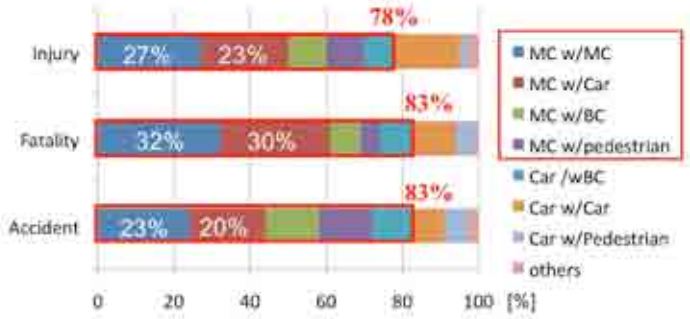


The number of fatalities per 1,000 population in Vietnam is higher than Japan

Source: JICA-NTSC Traffic safety master plan, 2008

Road Traffic Safety Issue in Vietnam

- The proportion of each traffic accident type in Vietnam

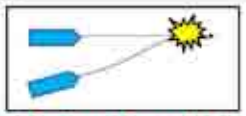


Source: JICA-NTSC Traffic safety master plan, 2008

Tendency of Traffic Accident Related to Motorcycles

- Most accidents are related to traffic conflicts (in Taipei)

Classification of traffic accidents related to motorcycles (%)		
Traffic Accident Type	Roadway Sections	Intersections
a head-on collision	5.70	2.51
a side by side collision	59.82	39.73
a rear-end collision	20.59	4.45
a head-side collision	12.21	54.89
others	1.87	0.65



a side by side collision

a head-side collision

Source:Hsu, T.P. : Development of motorcycle traffic engineering and separated traffic flow concept, Urban Transportation Vol.91, pp.41–49, 1997

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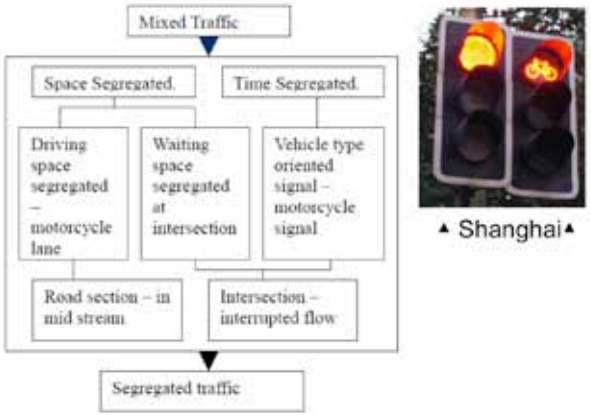
The Way to Improve the Traffic Situation

Short-term goal/ local

- Intersection and roadway configuration
- Optimal signal control
- Strict regulation and crackdown
- Moral education to follow the traffic rule
- Expansion the roadway network
- ITS for road traffic management
- Urban public transportation system

Long-term goal/ wide area

Motorcycle Oriented Traffic Operatioin Policy



▲ Shanghai▲

Hsu, T. *et al.* (2003): A comparative study on motorcycle traffic flow development of Taiwan, Malaysia and Vietnam. (Journal of the EAST, Vol.5, pp.179-193)

Motorcycle Oriented Traffic Operation Policy in Tainan

Traffic Situation on Motorcycle Segregated Lane

21

Motorcycle Waiting Area in Bangkok

22

Dynamic Motorcycle Waiting Area in Taipei

23

Merit and Demerit of the Segregation Policy

	Merit	Demerit
2-stage left turn	• Decrease traffic conflicts and traffic accidents (Hsu, 2004)	• Increase travel time of motorcycles
Motorcycle waiting area	• Decrease traffic conflicts between motorcycles and passenger cars • Increase saturation flow rate of both motorcycles and passenger cars	• Increase the start up loss time of passenger cars • Increase the conflicts between motorcycles
Motorcycle segregation lane	• Decrease traffic conflicts between motorcycles and passenger cars (Hsu, 2004) • Increase saturation flow rate and traffic speed (Hsu, 2004)	• Increase the conflicts between motorcycles • Due to the speed up, traffic accident is more likely to be serious • Decrease traffic capacity for passenger cars

24

Merit and Demerit of the Segregation Policy

	Merit	Demerit
2-stage left turn	• Decrease traffic conflicts and traffic accidents (Hsu, 2004)	• Increase travel time of motorcycles
	• Decrease traffic conflicts	• Increase the start up loss time of
Motorcycle segregation lane	• Decrease traffic conflicts between motorcycles and passenger cars (Hsu, 2004) • Increase saturation flow rate and traffic speed (Hsu, 2004)	• Increase the conflicts between motorcycles • Due to the speed up, traffic accident is more likely to be serious • Decrease traffic capacity for passenger cars

There is no indices to evaluate the segregation policy, not to mention the rigid criteria

Contents

- Traffic situations in Asian cities
- Problems of urban transportation in Asian cities
- Some solutions for the problems caused by mixed traffic
- Conflict analysis for mixed traffic flow

Traffic Safety Analysis and Evaluation

- Structure of traffic accident

Indices for Traffic Conflicts

- Existing conflict indices
  - TTC (Time to Collision. Hayward, 1972)

  - PET (Post encroachment time. Allen et al., 1978)

  - PICUD (Potential index for collision with urgent deceleration. Iida and Uno et al., 2001)

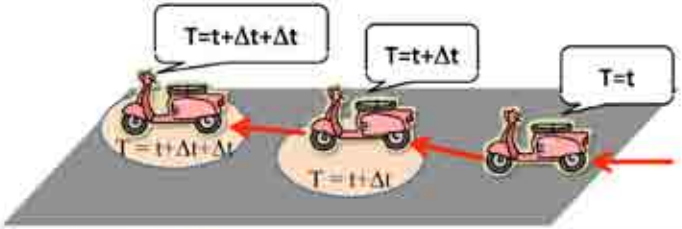
- These indices can not represent mixed traffic with motorcycles.

Characteristics of Mixed Traffic Flow

- High degree of freedom in motorcycles maneuvers
- Unclear definition of "a driving lane"
- Difference in acceleration / deceleration characteristics between motorcycles and passenger cars
- Difference in the area occupied by a vehicle

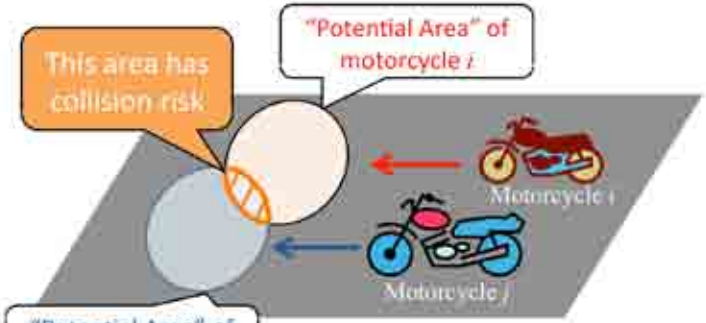
New Concept of Conflict Index (i)

- Focusing on two-dimensional maneuver of motorcycles.
- Assuming that a motorcycle determines its behavior every Δt seconds, it would have a certain area where a motorcycle potentially gets to after Δt seconds.



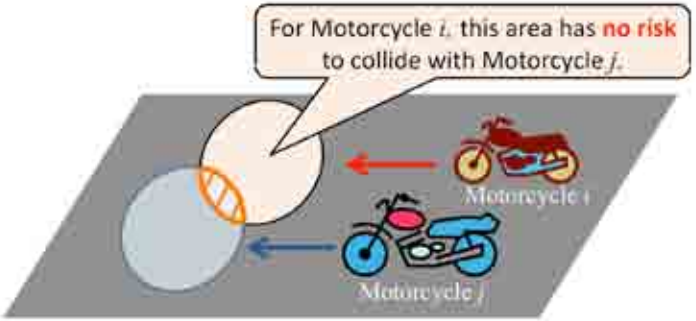
New Concept of Conflict Index (ii)

- An area where a vehicle potentially gets to after Δt seconds is defined as "Potential Area".



New Concept of Conflict Index (iii)

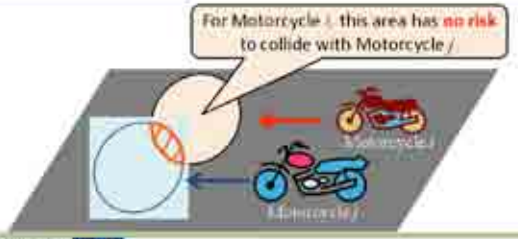
- An area where a vehicle potentially gets to after Δt seconds is defined as "Potential Area".



The Definition of Conflict Index for Motorcycles

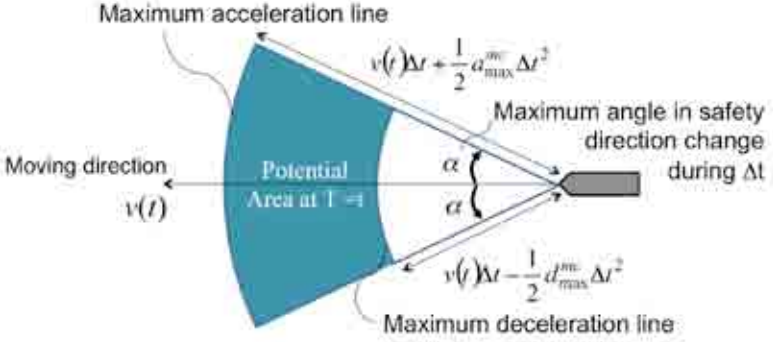
- A motorcycle's conflict index (PPSA, Proportion of Potential Safety Area) is defined as:

$$PPSA_i = \frac{\text{The area of motorcycle } i\text{'s "No Risk Area"}}{\text{The area of motorcycle } i\text{'s "Potential Area"}}$$



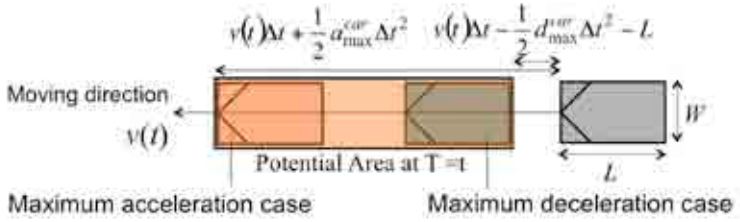
The Definition of Potential Area (i)

- A motorcycle's potential area:



The Definition of Potential Area (ii)

- A passenger car's potential area:
  Supposing that a passenger car would not change moving direction.



Data Collection (i)

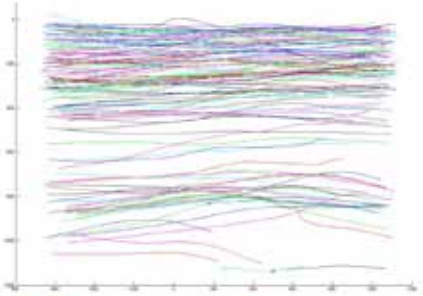
- Kim Ma Rd.-Nguyen Chin Thanh Rd. intersection, Hanoi
- From 9:00am to 11:00am, 29th Sep, 2009.

Data Collection (ii)

- Vehicle trajectory data is obtained by video image data

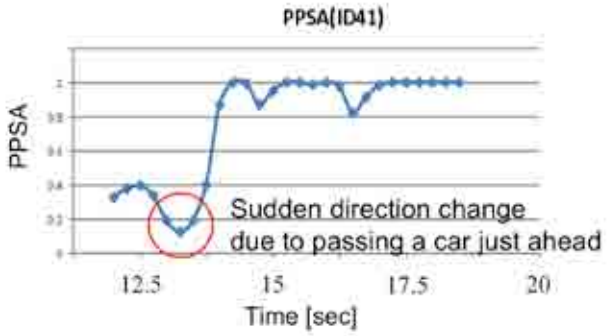
Data Collection (iii)

- Examples of vehicle trajectory after smoothing transformation
- In total, trajectory data of 314 motorcycles and 70 passenger cars is obtained.

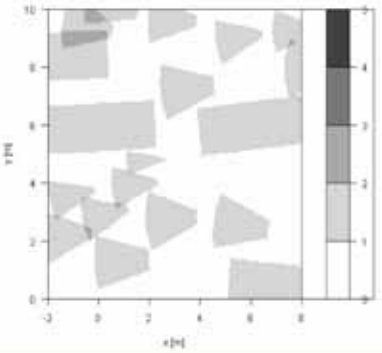


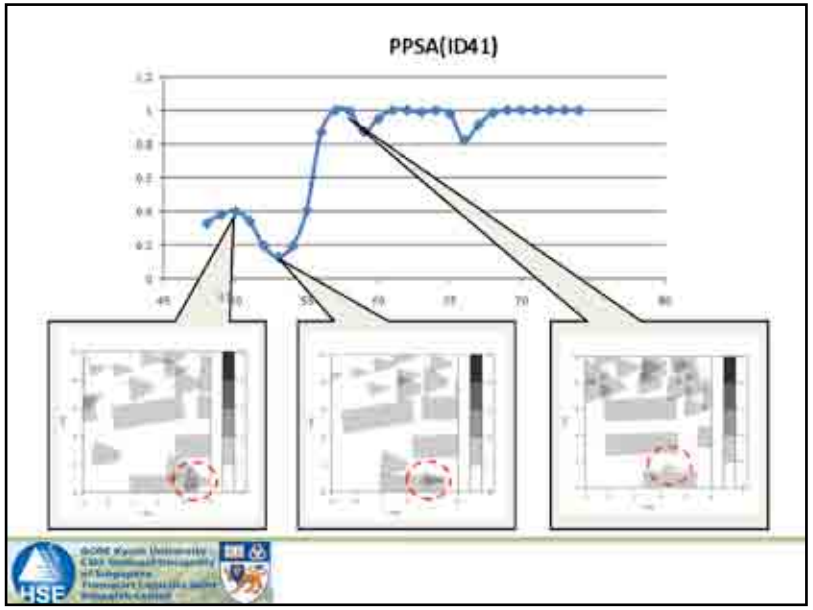
Validation of "PPSA"

- Time series transition of PPSA value for a specific motorcycle



Calculation Results of "Potential Area"





Summary of the Presentation

- In Asian mega-cities, motorcycles play a important role as an urban transportation mode.
- As economical development, traffic safety issue becomes one of the most serious problems.
- There is no criteria for adopting motorcycle-oriented traffic management policy, nor method to evaluating traffic safety in mixed traffic flow.
- This study established a conflict index, PPSA, for motorcycles.
- It is validated that the proposed index can represent conflict situation properly.

Research Subjects

- The conflict index, PPSA, should be applied for the mixed traffic flow situation in order for evaluating its degree of danger.
- Some possible countermeasures including segregation policy should be evaluated using PPSA.

Thank you for your attention!

Activities of AIT-KU Joint Research Center for Human Security Engineering Bangkok, Thailand

Noppadol Phienwej

Asian Institute of Technology

Kyoto University
Global Center for Education and Research on
Human Security Engineering for Asian Megacities

Activities of AIT-KU Joint Research Center for Human Security Engineering Bangkok, Thailand

By
Dr. Noppadol Phienwej
Asian Institute of Technology

Kyoto University
Global Center for Education and Research on
Human Security Engineering for Asian Megacities

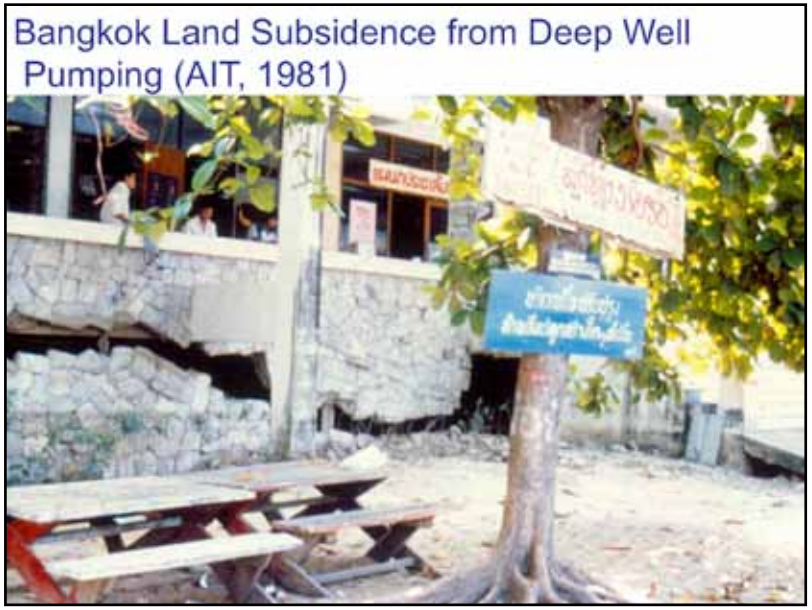
Educational Activities and Symposia

- Training courses on Geotechnical Infrastructure Asset Management: AIT Bangkok in March 2009 & AIT CV, Hochiminh City, in October 2009
- Course on Earthquake Engineering : AIT Bangkok, June 2009
- EIT-JSCE-AIT GCOE Symposium on Urban Infrastructure Asset Management, Bangkok in September 2009
- KU Global COE Annual Symposium, Bangkok, November 2009

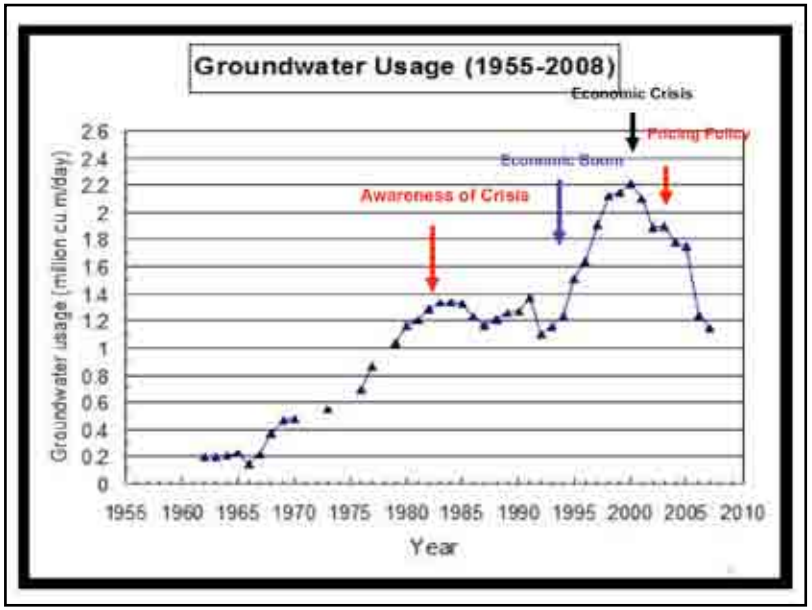
Research Topics

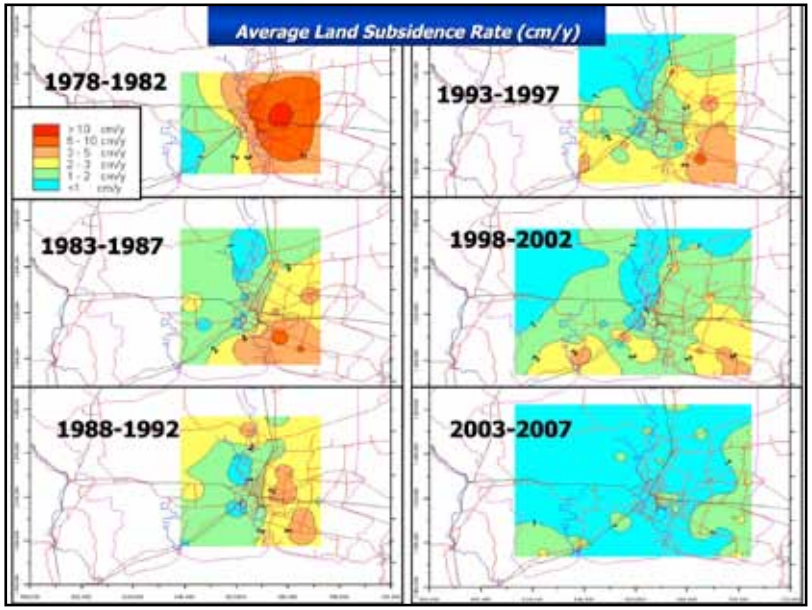
- Impact of Bangkok Land Subsidence from Deep Well Pumping
- Bangkok Coastal Erosion Problem and Mitigation
- Disaster Mitigation of Bangkok MRT Subway System
- River Bank Slope Erosion Protection
- Geotechnical Infrastructure Asset Management – Stability of Tropical Slopes

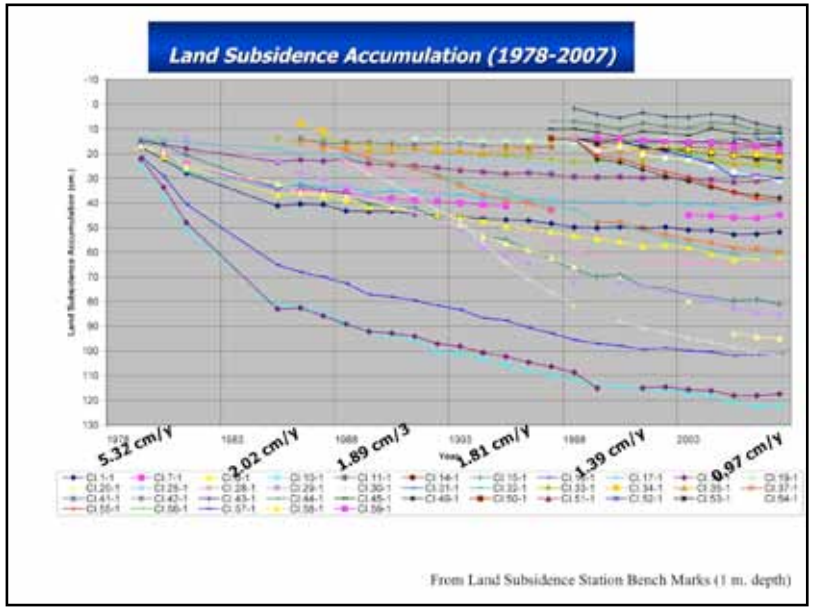

Research Related to Bangkok Problems
• POPULATION: 10 MILLION
• FLAT AND LOW LYING PLAIN IN COASTAL ZONE
• MAIN RIVER DRAINING FLOOD WATER FROM CENTRAL AND NORTHERN REGIONS


Bangkok Land Subsidence from Deep Well Pumping (AIT, 1981)


Coastal Erosion problems


Groundwater Usage (1955-2008)
Economic Crisis
Pricing Policy
Economic Boom
Awareness of Crisis
Groundwater usage (million cu m/day)
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010
Year



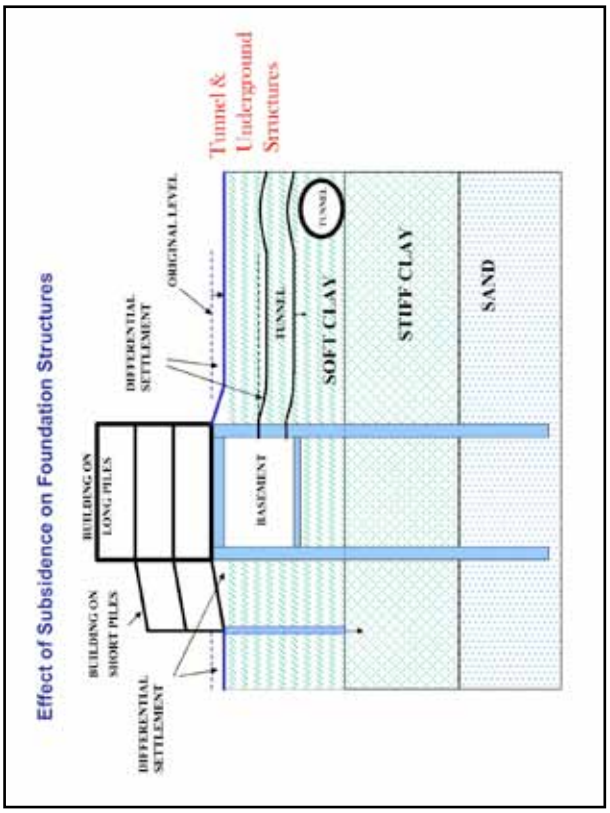


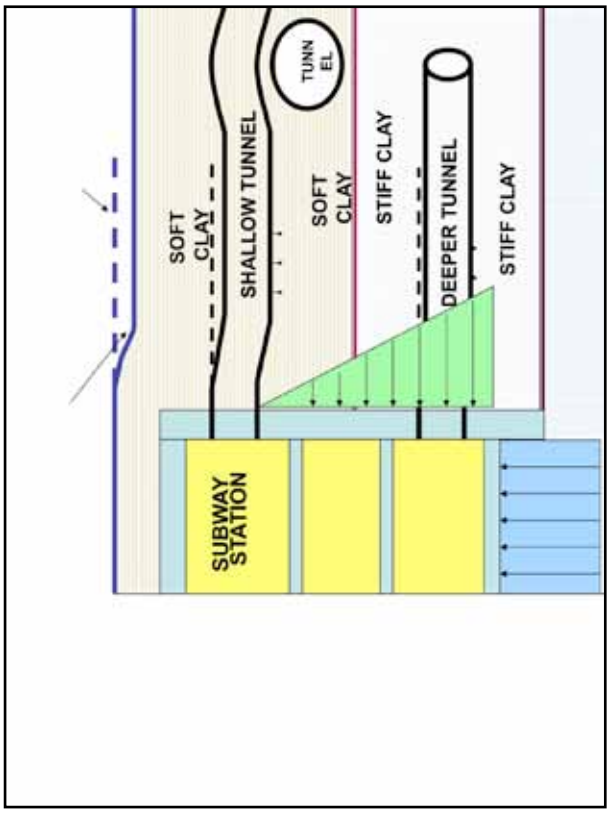
Environmental Impacts

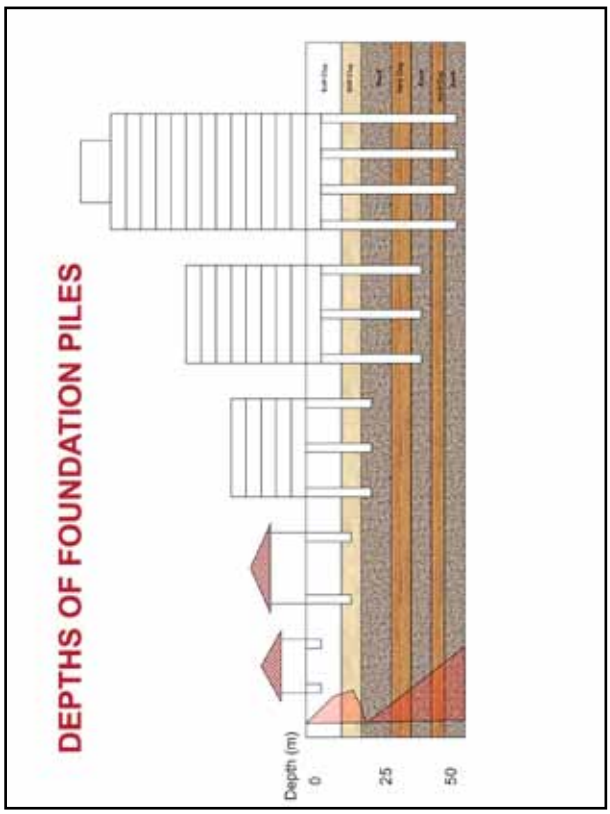
- Intensify Flood Risk
- Sea Water Intrusion
- Loss of Coastal Area

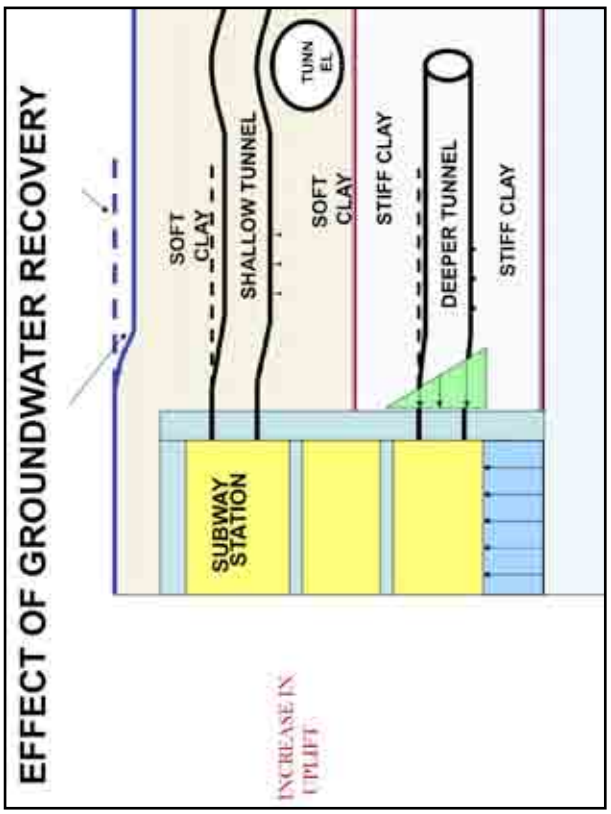
Problems Related to Foundation Engineering

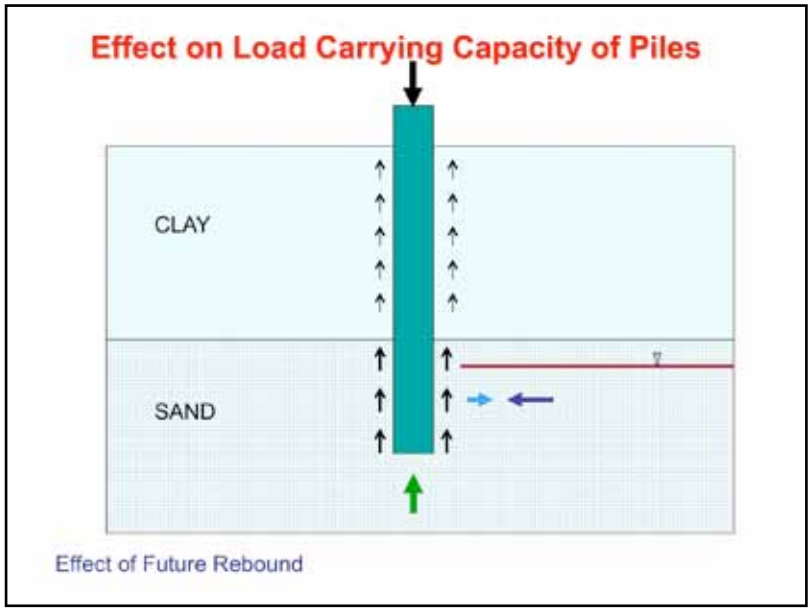
- Settlement of Surface and Roadways
- Differential Settlements and Building Cracks
- Capacity of Piles
- Uplift on Underground Structures
- Drainage Problems

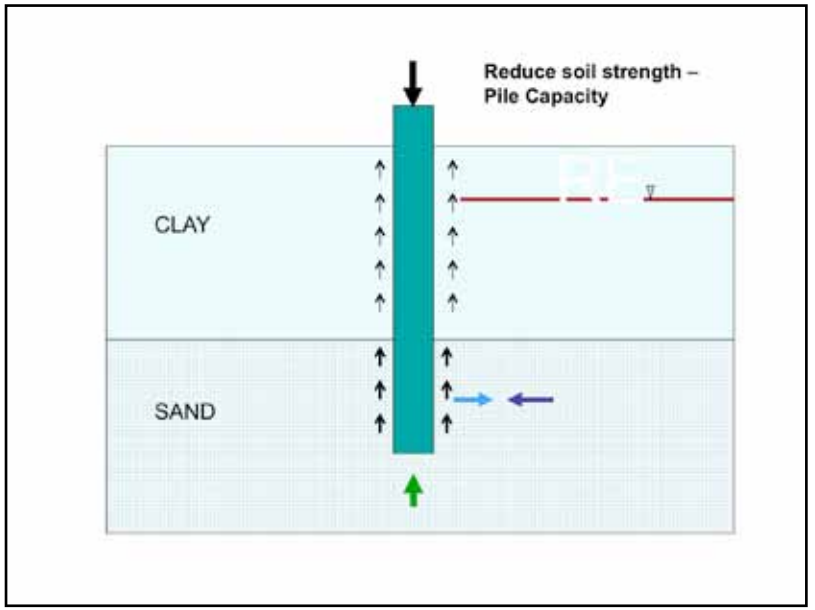

Effect of Subsidence on Foundation Structures
Tunnel & Underground Structures
ORIGINAL LEVEL
DIFFERENTIAL SETTLEMENT
BUILDING ON LONG PILES
BUILDING ON SHORT PILES
DIFFERENTIAL SETTLEMENT
BASEMENT
TUNNEL
SOFT CLAY
STIFF CLAY
SAND

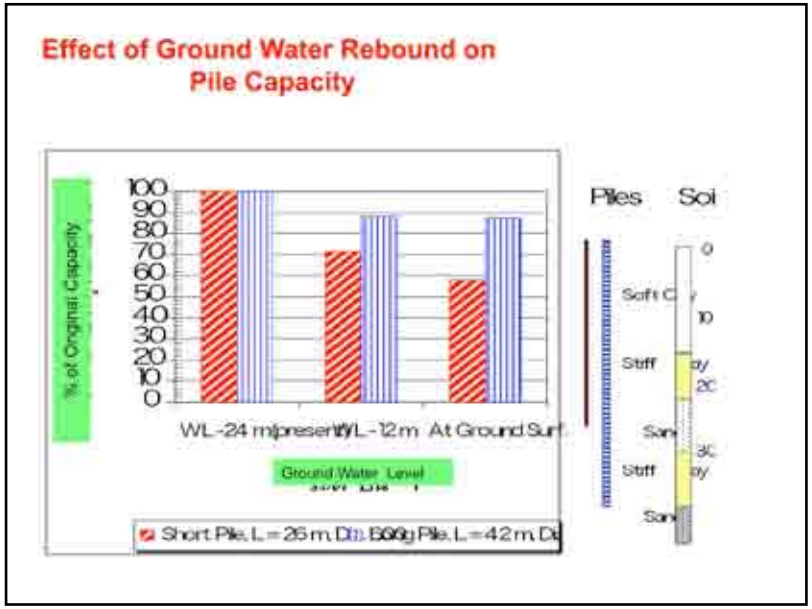

SOFT CLAY
SHALLOW TUNNEL
TUNN EL
SOFT CLAY
STIFF CLAY
DEEPER TUNNEL
STIFF CLAY
SUBWAY STATION

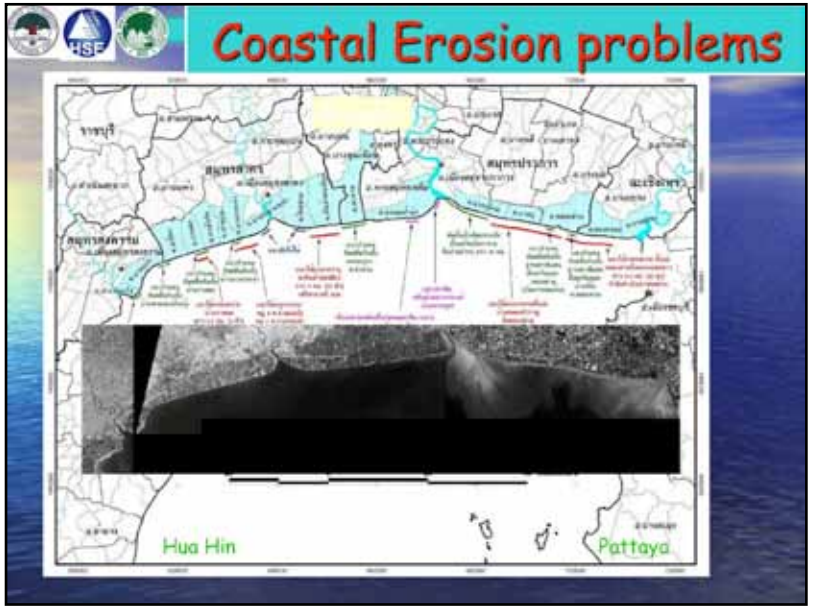

DEPTHS OF FOUNDATION PILES
Depth (m)
0
25
50


EFFECT OF GROUNDWATER RECOVERY
SOFT CLAY
SHALLOW TUNNEL
TUNN EL
SOFT CLAY
STIFF CLAY
DEEPER TUNNEL
STIFF CLAY
SUBWAY STATION
INCREASE IN UPLIFT


Effect on Load Carrying Capacity of Piles
CLAY
SAND
Effect of Future Rebound


Reduce soil strength –
Pile Capacity
CLAY
SAND


Effect of Ground Water Rebound on
Pile Capacity
% of Original Capacity
100
90
80
70
60
50
40
30
20
10
0
WL -24 m
WL -12 m
At Ground Surf
Ground Water Level
Piles
Soi
Soft C
Stiff
Stiff


Coastal Erosion problems
Hua Hin
Pattaya

2009 AIT-KU Joint Symposium on Human Security Engineering for Asian Megacities

Causes and Attributing Factors

- Changes in land use
  - urbanization
  - mangrove deforestation
  - fish ponds and shrimp farms
- Oceanic and climate changes
  - Changes in wind and wave forces
  - Sea level rise
- Subsidence of the soft Bangkok clay from natural consolidation
- Land subsidence from deep well pumping
- Reduction in sediments fed into delta areas of main rivers
- Soft clay and low lying tidal flat of Bangkok plain

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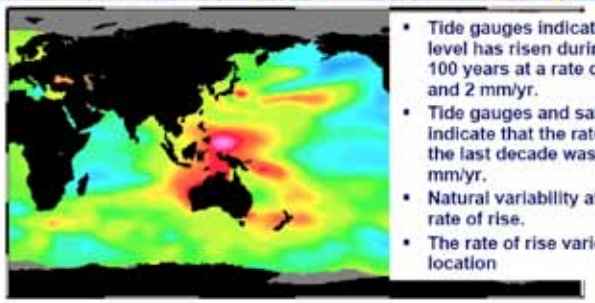
Tidal Flat Low Lying Area

2009 AIT-KU Joint Symposium on Human Security Engineering for Asian Megacities

Regional variation of SLR during 20th century (Crown, 2004)

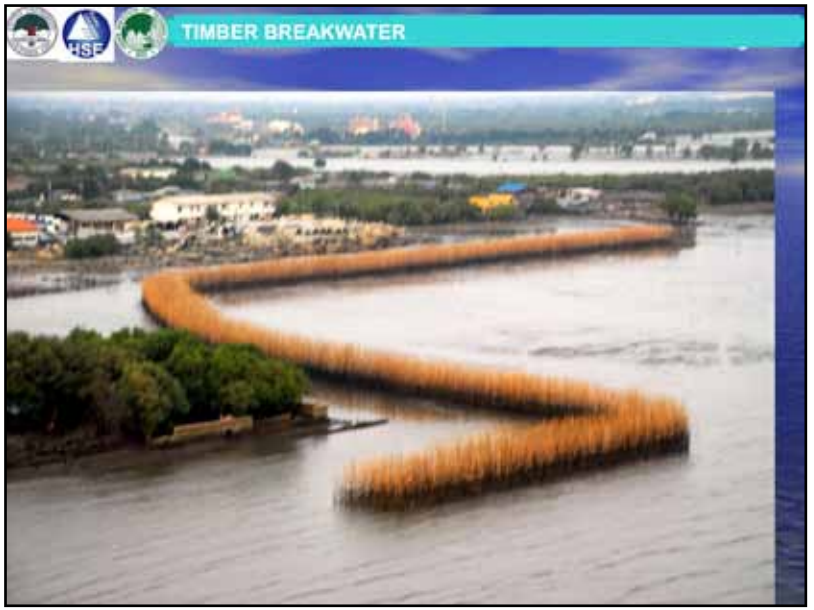


- Tide gauges indicate global sea level has risen during the last 100 years at a rate of between 1 and 2 mm/yr.
- Tide gauges and satellites indicate that the rate of rise over the last decade was around 2.8 mm/yr.
- Natural variability affects the rate of rise.
- The rate of rise varies with location

2009 AIT-KU Joint Symposium on Human Security Engineering for Asian Megacities

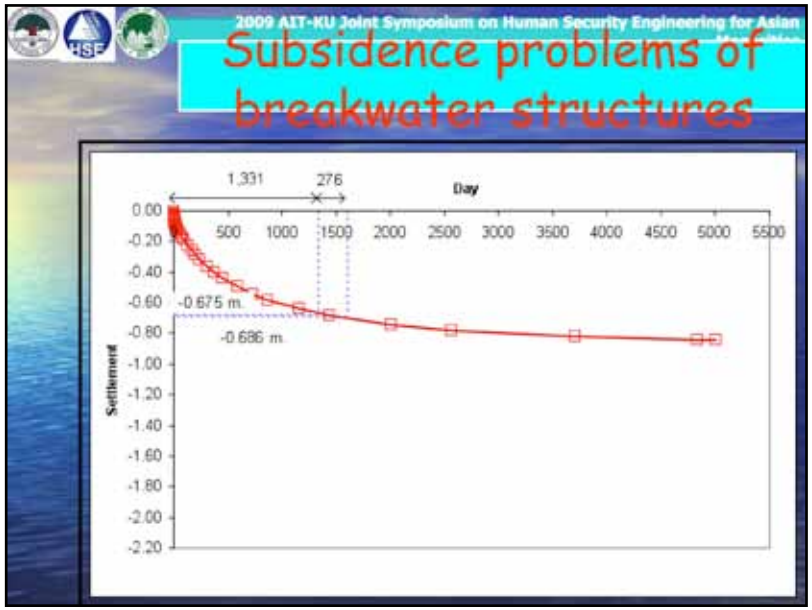
MITIGATION MEASURES


ROCKFILL BREAKWATER

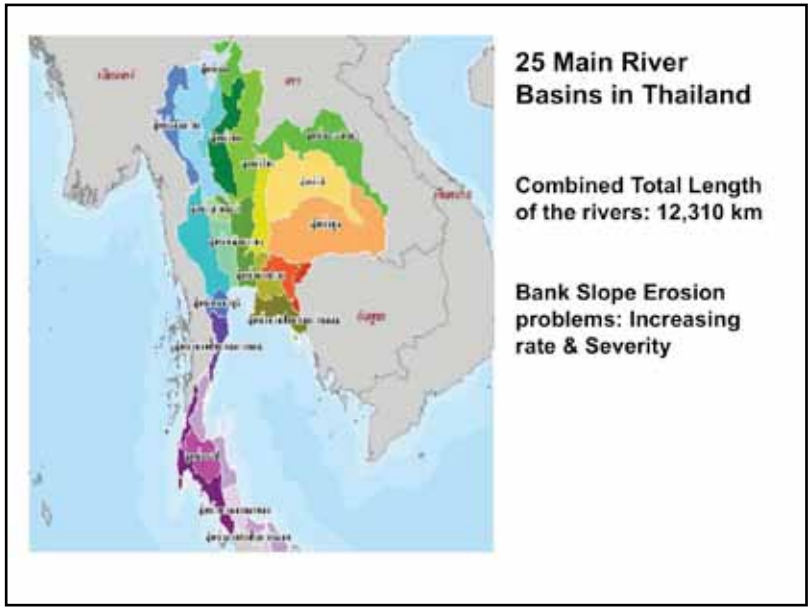

TIMBER BREAKWATER

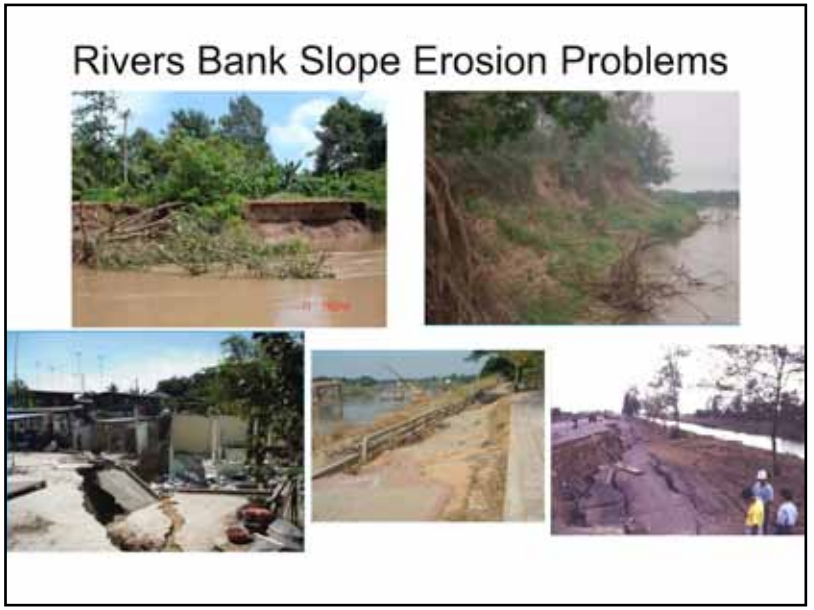

GEOTUBE


2009 AIT-KU Joint Symposium on Human Security Engineering for Asian Megacities
GEOTUBE APPLICATION IN BANGKOK


2009 AIT-KU Joint Symposium on Human Security Engineering for Asian
Subsidence problems of breakwater structures
1,331
276
Day
0.00
-0.20
-0.40
-0.60
-0.80
-1.00
-1.20
-1.40
-1.60
-1.80
-2.00
-2.20
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
-0.675 m.
-0.686 m.
Settlement


Engineering for tackling problems of bank slope instability along water ways in Thailand

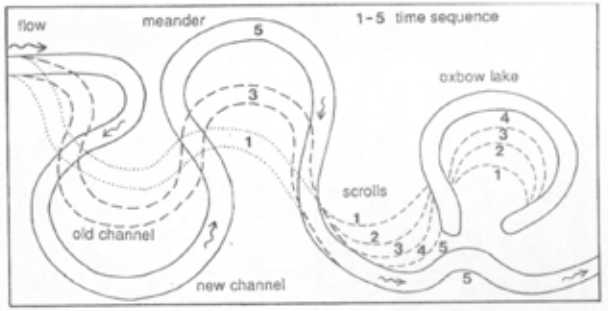

25 Main River Basins in Thailand
Combined Total Length of the rivers: 12,310 km
Bank Slope Erosion problems: Increasing rate & Severity


Rivers Bank Slope Erosion Problems

Causes

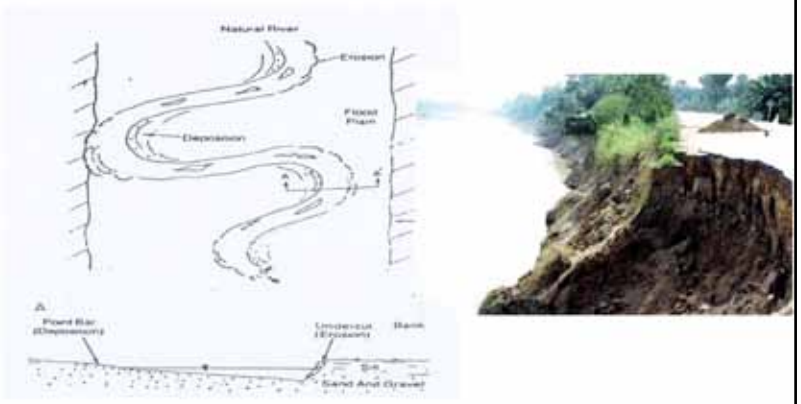
- Natural meandering
- Upstream deforestration/landuse change
- Sand and gravel dredging for construction materials
- Human encroachment and interference near river bank areas
- River training for navigation (Excavation of rapids)
- Loss of natural vegetation protection along bank slopes
- Major Dam construction – sediment reduction
- Construction of river bank protection structures in nearby area
- Climate change

Natural Meandering

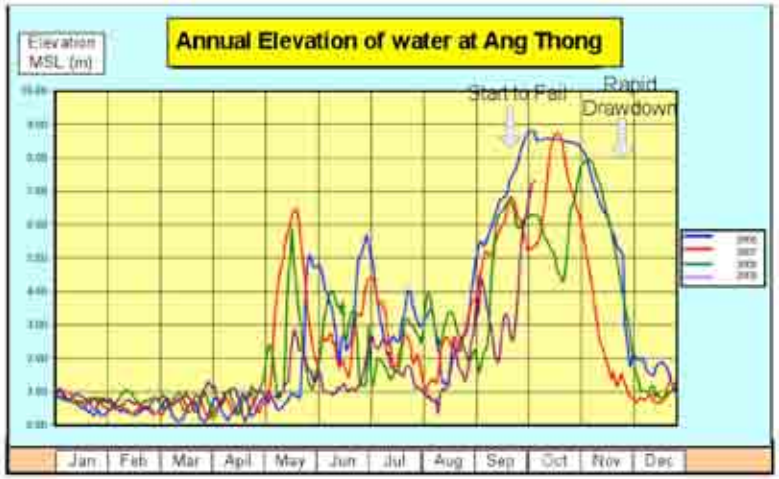


Development of river meanders

Erosion at River Meander



Annual Fluctuation of Rivers (Chao Phraya River)



River bank erosion along 7 boarder rivers

•Mekong River:
Land loss 444,023 sq.m/ year,
8 m bank retreat/year
- Menam Hueng
- Menam Moei
- Menam Sai
- Menam Rauk
- Menam Kra
- Menam Kolok

River bank erosion along 7 boarder rivers

Total length 1,754 kilometer – problem area 126 km for total remedial cost of cost of 7,969 million Baht (22.8 billion yen)

5 level of severity – National security & impact on human security: National Agenda

In 2009 Government approved 541 million Baht to construct 7,760 m of riverbank erosion protection structures (less than 10%)

Remained 118,145 m at the estimated cost of 7,427.50 million baht is approved in principle for further implementation and budgeting.

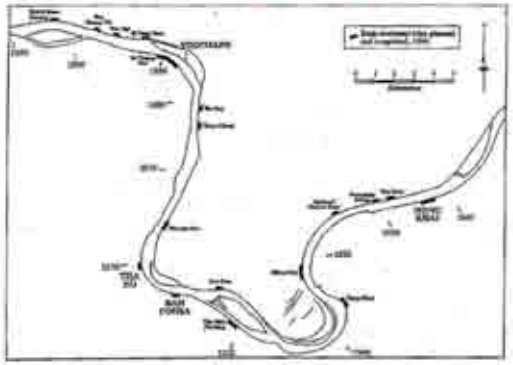
Nongkai, Thailand – Vientiane, Lao PDR

Nongkai province

80 km of 330 km of river banks were damaged and only 40 km of length has been remedied. Need 2 billion Baht budget.

Vientiane suffers a similar problem but lack of budget

Loa's Implementation of Measures along Mekong River in Vientiane area



-2.5 km of erosion protection structures were built

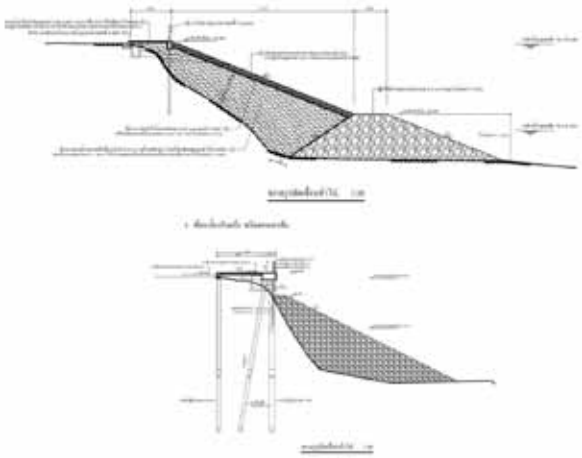
-The structures led to increase in erosion in other areas as well as the areas of the structures built & opposite bank downstream

Mitigation & Preventive Measures

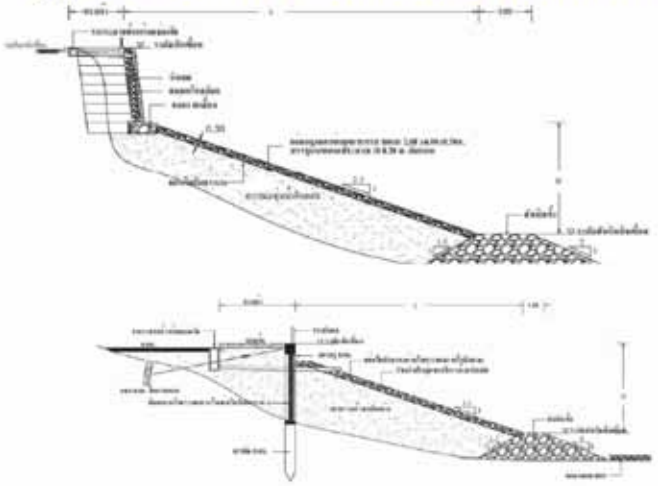
Mitigation & Preventive Measures

- National Agenda
- National Security
- Department of Public Works and Town Planning – Guideline and Handbook
- Allocated Annual Budget by Government

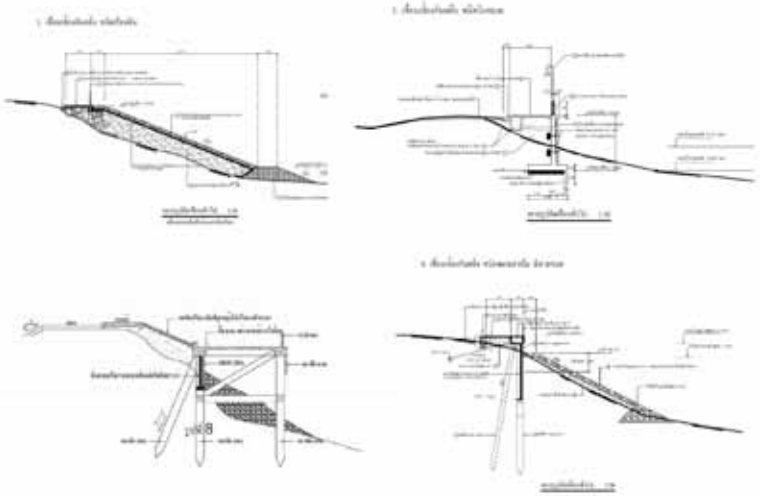
Type of Bank Protection Structures



Type of Bank Protection Structures



Type of Bank Protection Structures



Problems on the Implementation of the Measures

- Structure type selection
- Frequent cases of failure or unsuccessful performance soon after completion
- Lack of understanding on the mechanisms of the erosion, local site controlling factors, function and and limitation of alternative types of the measures
- Phased/Staged Construction - Budget & Social response constraints
- Side effects/impacts: Instability at other areas

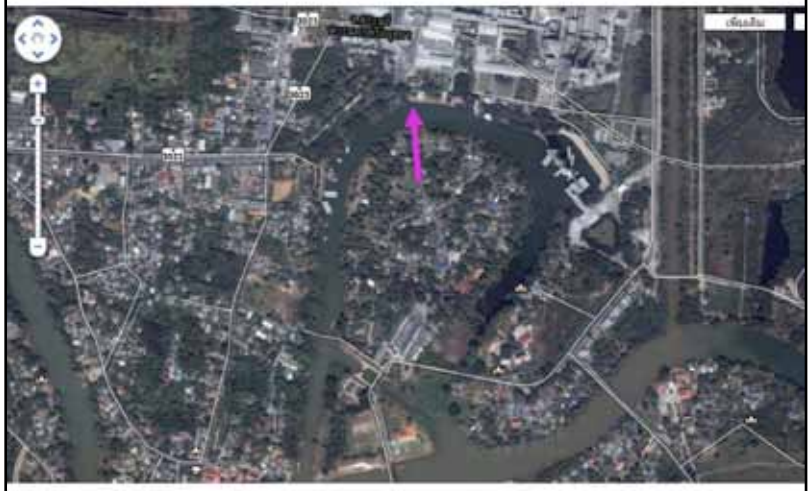
IMPLEMENTATION AND SIDE EFFECT

Case Examples

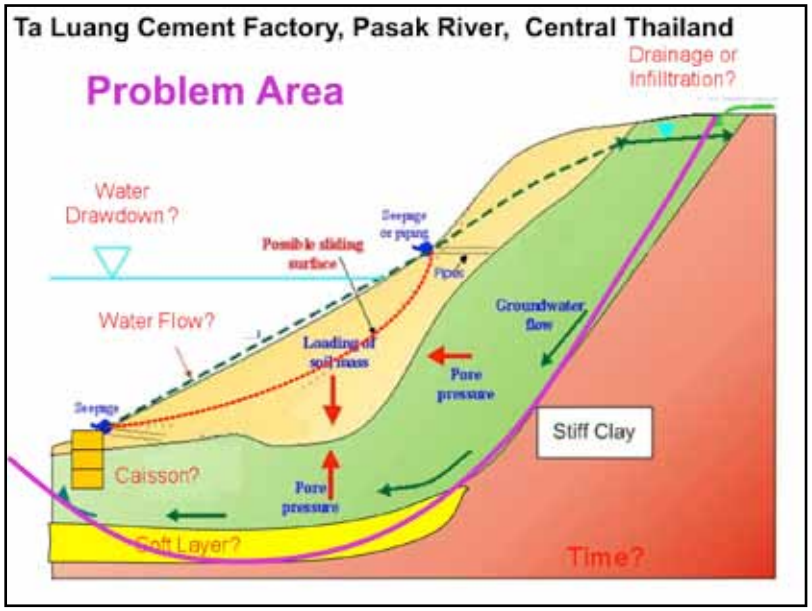
Ta Luang Cement Factory, Pasak River, Central Thailand

Ta Luang Cement Factory

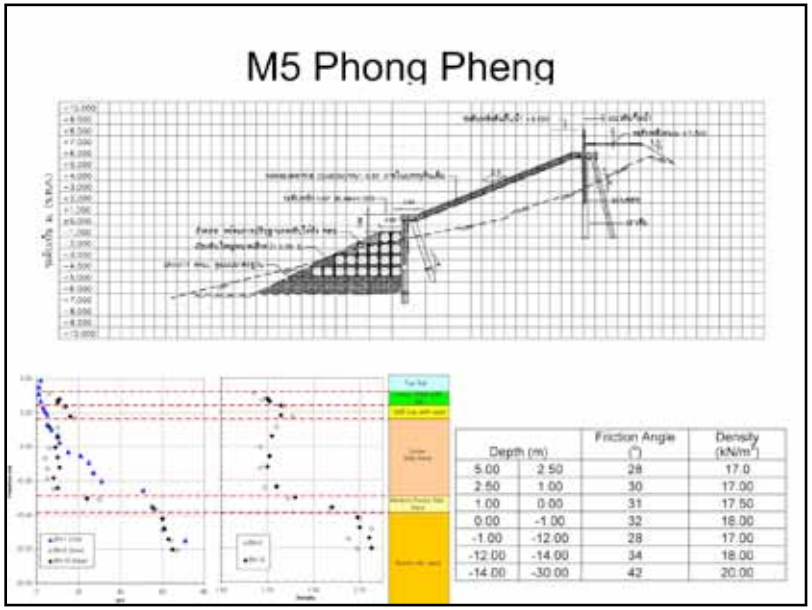
Ta Luang Cement Factory: Bank Slope Failure Location

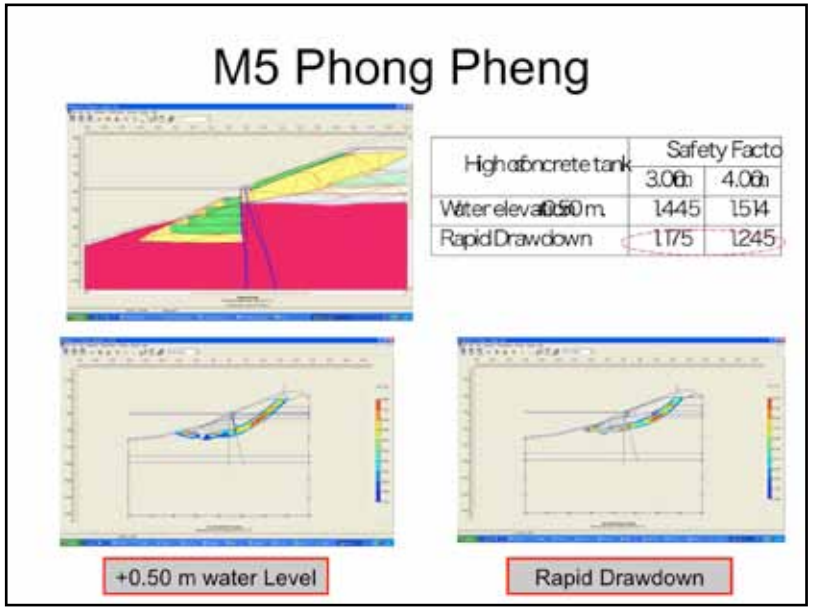


Ta Luang Cement Factory, Pasak River, Central Thailand


Ta Luang Cement Factory, Pasak River, Central Thailand
Problem Area
Drainage or Infiltration?
Water Drawdown ?
Water Flow?
Possible sliding surface
Pipes
Groundwater flow
Loading of soil mass
Pore pressure
Stiff Clay
Caisson?
Pore pressure
Soft Layer?
Time?


Chao Phraya River, Central Thailand- Location 1
Google


M5 Phong Pheng
Depth (m)
Friction Angle (°)
Density (kN/m³)
5.00 2.50 28 17.0
2.50 1.00 30 17.00
1.00 0.00 31 17.50
0.00 -1.00 32 18.00
-1.00 -12.00 28 17.00
-12.00 -14.00 34 18.00
-14.00 -30.00 42 20.00


M5 Phong Pheng
High concrete tank
Safety Factor
3.00
4.00
Water elevation 0.50 m.
1.445
1.514
Rapid Drawdown
1.175
1.245
+0.50 m water Level
Rapid Drawdown

Early stage of construction

Failure at half way of construction stage

M5 Phong Pheng

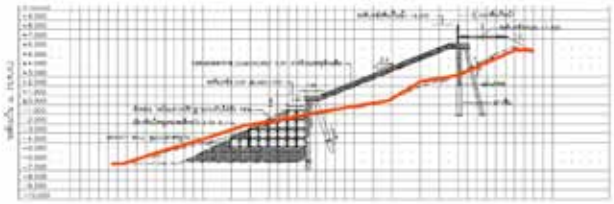
Started to Fail before rapid drawdown (mid of September 2009)

M5 Phong Pheng

After rapid drawdown: Total failure

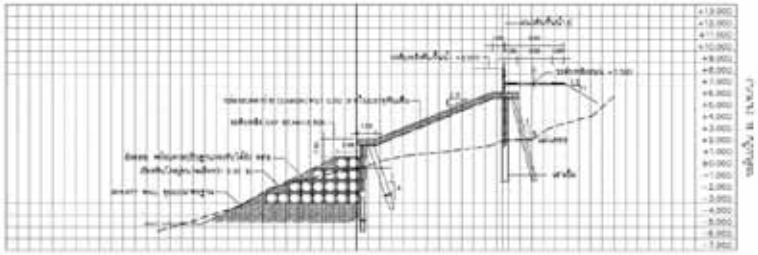
Construction of Rock Toe Buttress

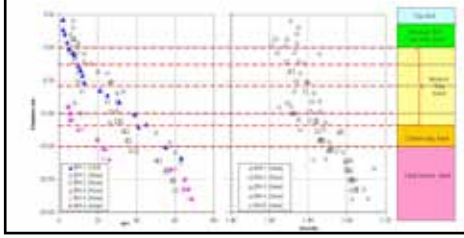
Design modification during construction?



Chao Phraya River, Central Thailand- Location 2

M5 Bang Sa Dej





Depth (m)		Friction Angle (°)	Density (kN/m³)
5.00	0.00	29	17.00
0.00	-2.50	30	17.00
-2.50	-6.00	32	17.50
-6.00	-10.00	34	18.00
-10.00	-12.00	35	18.00
-12.00	-15.00	37	19.00
-15.00	-25.00	43	20.00

M5 Bang Sa Dej

M5 Bang Sa Dej

Failures at Ends

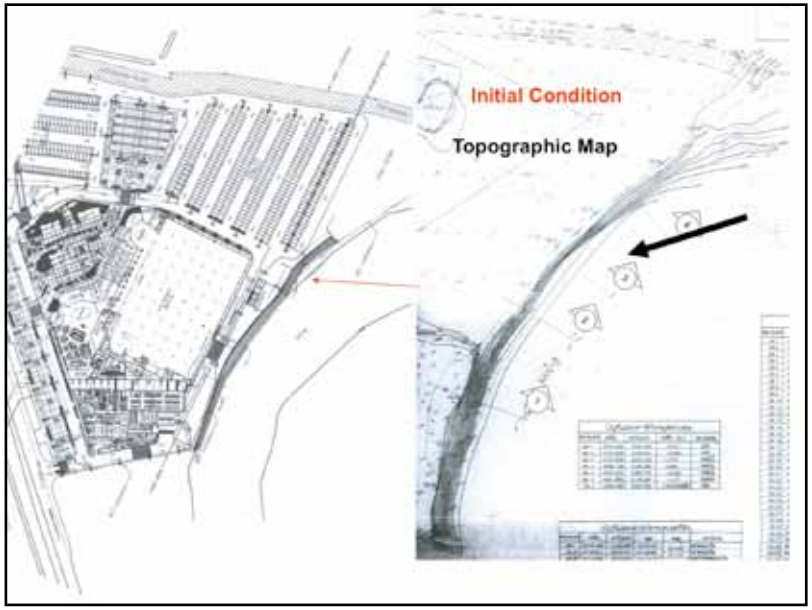
Downstream end

Upstream End

Case 3: River bank protection in Northeast Thailand

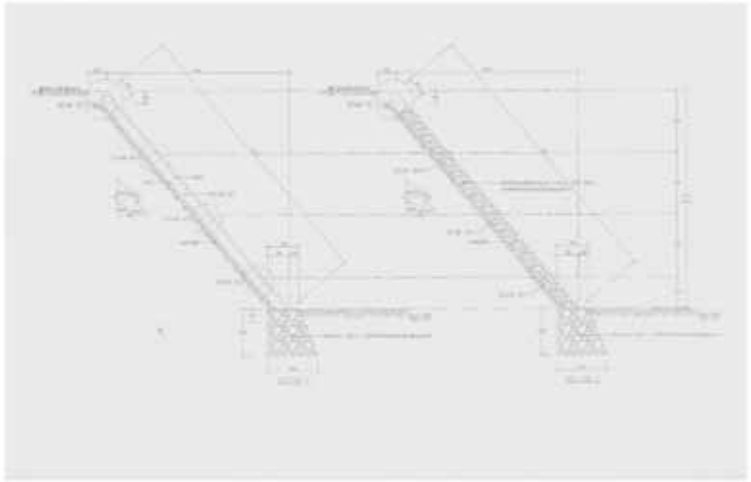
River Bank at site of a department store complex development

6 months after construction

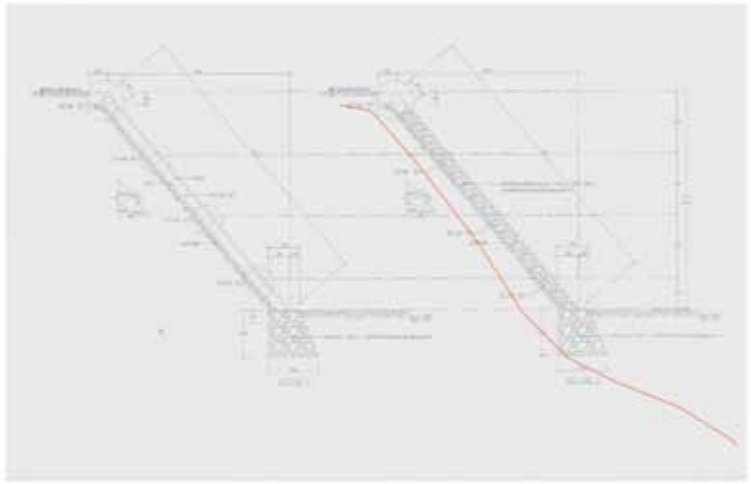


Shortly after completion

Design Drawing – Actual Site Condition ?



Design Drawing – Actual Site Condition ?



Actual Construction: Fill at toe

Actual Construction: Fill at toe

Remedial Measures

Conclusions

- River bank erosion- Occurring nation wide-Aggravating problems
- Department of Public Works and Town Planning have launched manual and guidelines on remedial and protective measures as well training for responsible units at various levels
- However, remedial & protective measures as implemented have mixed success with a number of unsuccessful cases
- Needs for engineer to understand well mechanisms and causes of the problems and site conditions pertaining the function, effectiveness and and limitations of alternative types of measures
- Needs to realize and understand side effects of the measures.

Introduction of Geotechnical Infrastructure Asset Management in Thailand

Hiroyasu Ohtsu

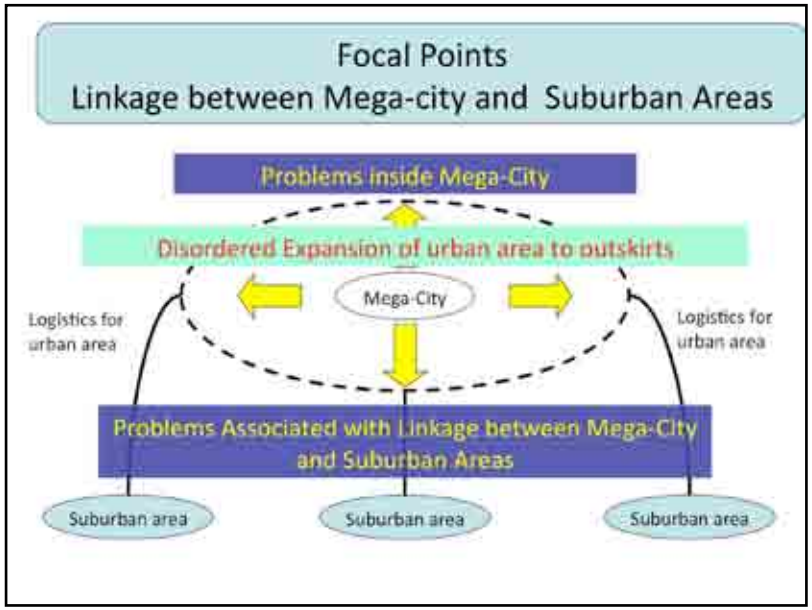
Kyoto University

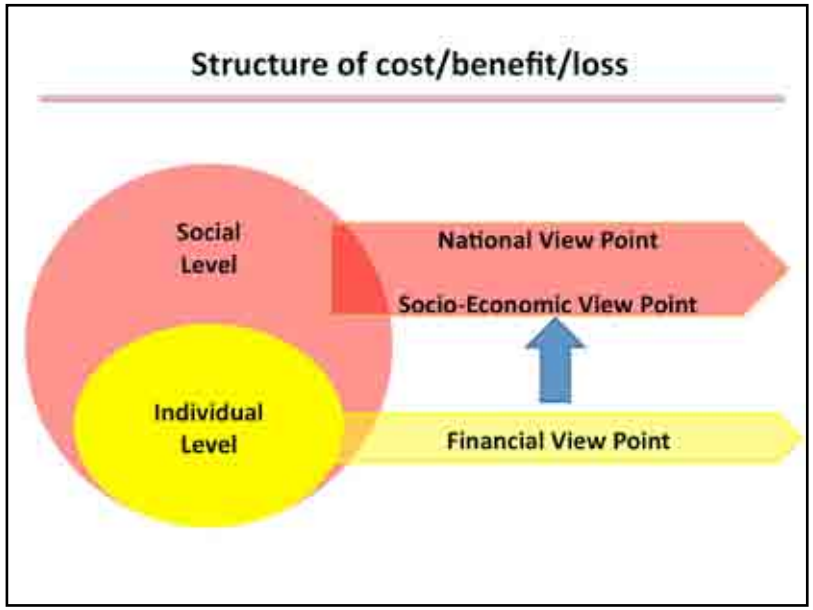
KU-JICA Joint Symposium on Human Security Engineering
HUMAN SECURITY AND RELATED CAPACITY DEVELOPMENT, March 1-2, 2010

Introduction of Geotechnical Infrastructure Asset Management in Thailand

March 2, 2010

Hiroyasu Ohtsu
Professor, Kyoto University





Geotechnical Infrastructure Asset Management

Problem Inside Megacities:

Land subsidence caused by excessive groundwater extraction in Bangkok Metropolitan Regions, BMR

Problem associated with Linkage with suburb:

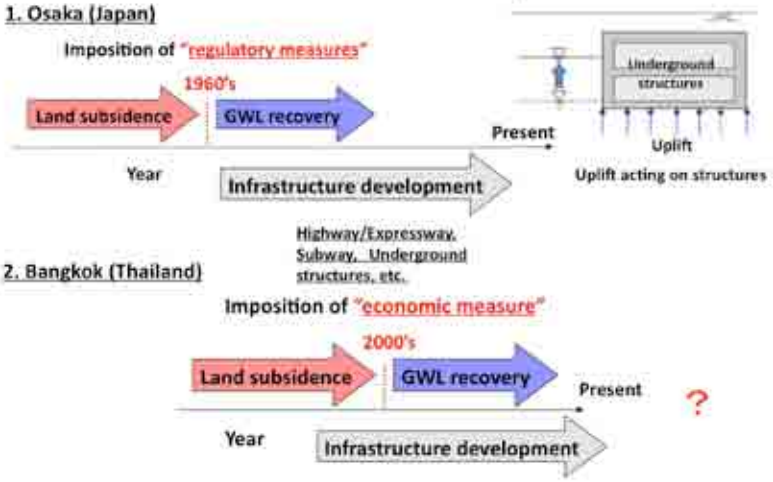
Landslide/Slope closed to highway & residential areas in Thailand

Inside Megacities :

Land subsidence in Asian countries

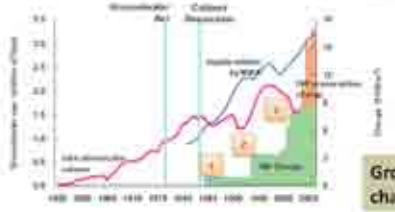
Damage/Loss Caused by Excessive Groundwater Extraction

Two examples related to Excessive GW extraction and infrastructure development



Economic Measures in BMR

-Implementation of groundwater use charges



Groundwater abstraction volume and charges for use in Bangkok (IGES, 2006)

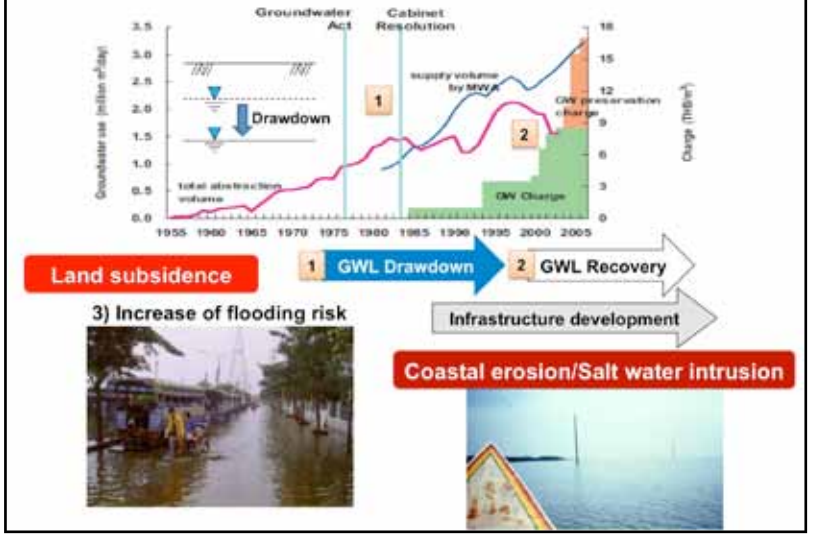
-Implementation of preservation charges

2003 : Levied for all GW users in the critical zone
(1.00THB/m³, Sep 04 → 8.50THB/m³, Sep 06)
Expected total GW charge :
9.50THB/m³, 2004 → 12.50THB/m³, 2005 → 17.00THB/m³ by July 2006

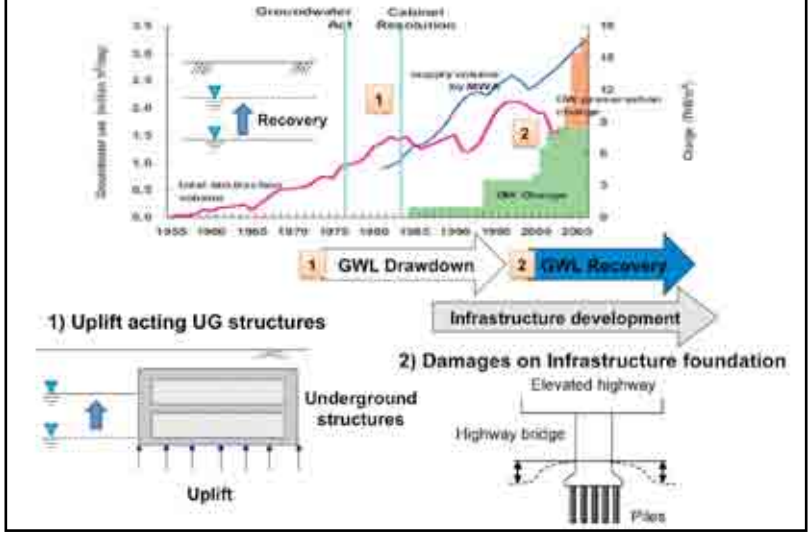
-Levying surcharges and penalizing violators of regulations

Losses due to Excessive GW Extraction (1) in BMR

Losses due to Excessive GW Extraction (2) in BMR



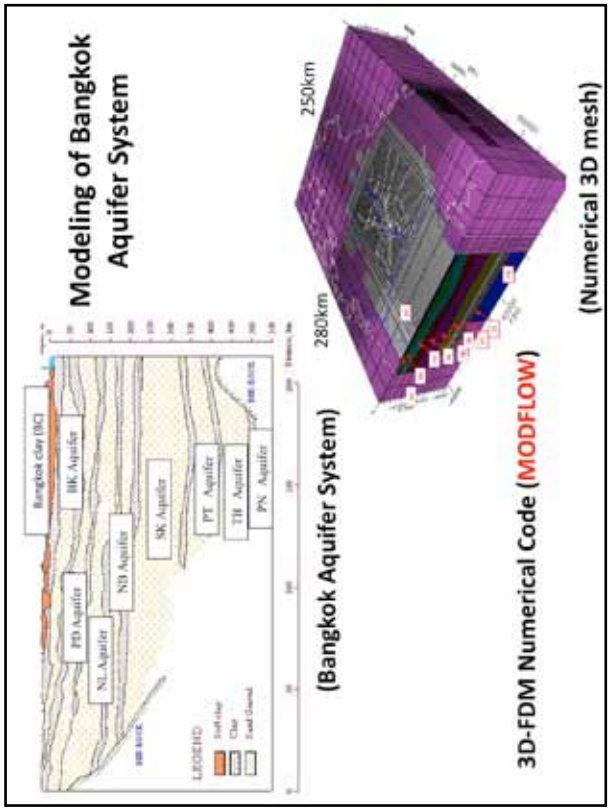
Losses due to Excessive GW Extraction (3) in BMR

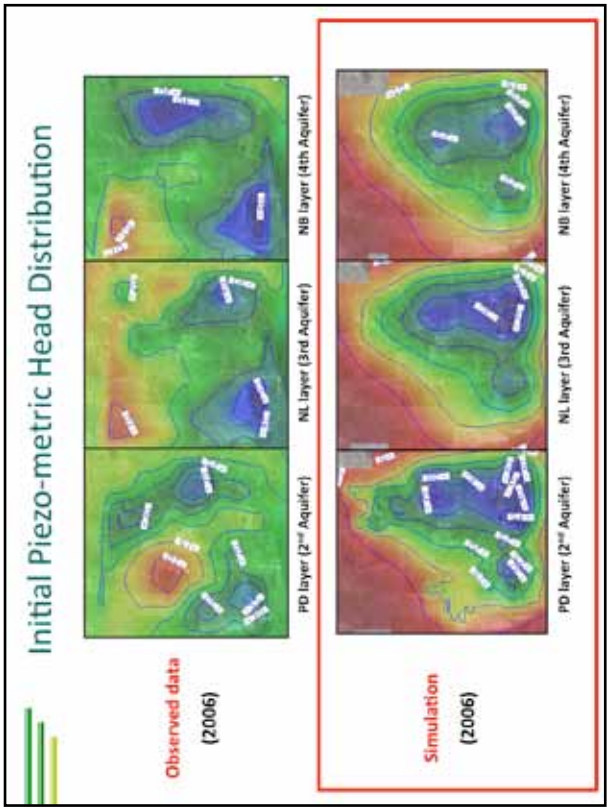


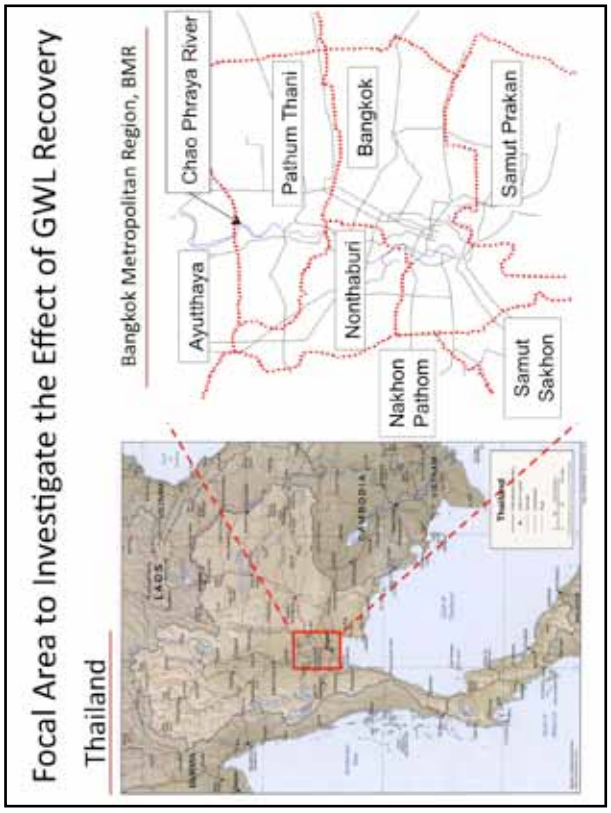
Classification of Losses Caused by Excessive GW Extraction

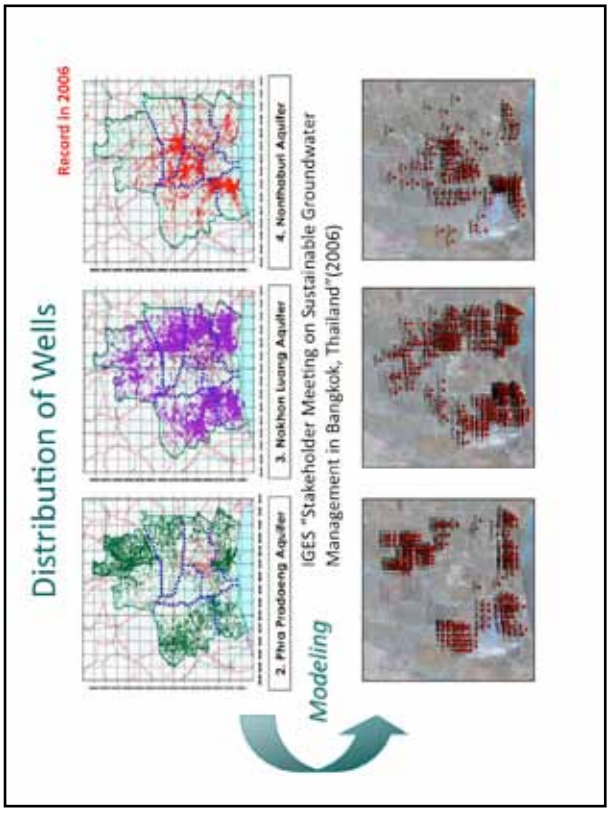
Past → Present → Future

	Type of Damages	Losses
GWL Drawdown	Damages on Housing/ Building	Individual
GWL Drawdown	Damages on elevated highway	Society
GWL Drawdown	Increase of flooding risk	Society
GWL Drawdown	Coastal erosion	Society
GWL Drawdown	Salt water intrusion	Society
GWL Recovery	Uplift acting UG structures	Society
GWL Recovery	Damages on Infrastructure foundation	Society


Modeling of Bangkok Aquifer System
Bangkok clay (BC)
BK Aquifer
PD Aquifer
NL Aquifer
NB Aquifer
SK Aquifer
PT Aquifer
TH Aquifer
PN Aquifer
LEGEND
(Bangkok Aquifer System)
280km
250km
3D-FDM Numerical Code (MODFLOW)
(Numerical 3D mesh)

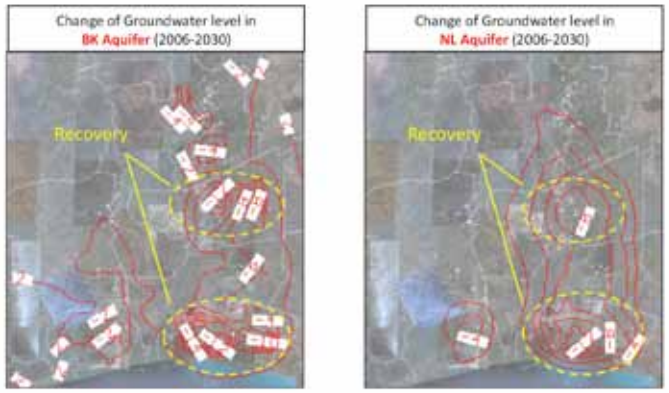

Initial Piezo-metric Head Distribution
Observed data
(2006)
PD layer (2nd Aquifer)
NL layer (3rd Aquifer)
NB layer (4th Aquifer)
Simulation
(2006)
PD layer (2nd Aquifer)
NL layer (3rd Aquifer)
NB layer (4th Aquifer)


Focal Area to Investigate the Effect of GWL Recovery
Thailand
Bangkok Metropolitan Region, BMR
Chao Phraya River
Ayutthaya
Pathum Thani
Bangkok
Nonthaburi
Samut Prakan
Nakhon Pathom
Samut Sakhon
LAOS
CAMBODIA
Thailand

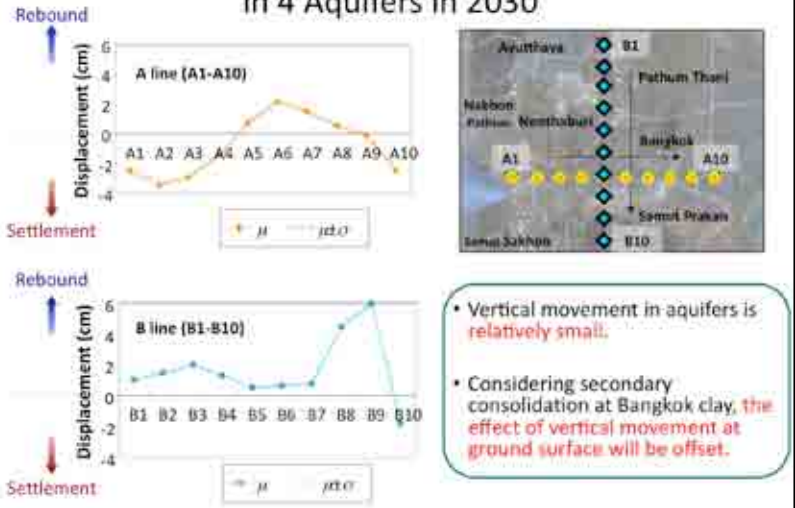

Distribution of Wells
Record in 2006
2. Phra Pradaeng Aquifer
3. Nakhon Luang Aquifer
4. Nonthaburi Aquifer
Modeling
IGES "Stakeholder Meeting on Sustainable Groundwater Management in Bangkok, Thailand"(2006)

Numerical results on Change of Groundwater Level Distribution in Aquifers

Typical recovery of groundwater level in Samut Prakan and Pathum Thani, where currently amount of groundwater extraction is relatively large, compared with other provinces.



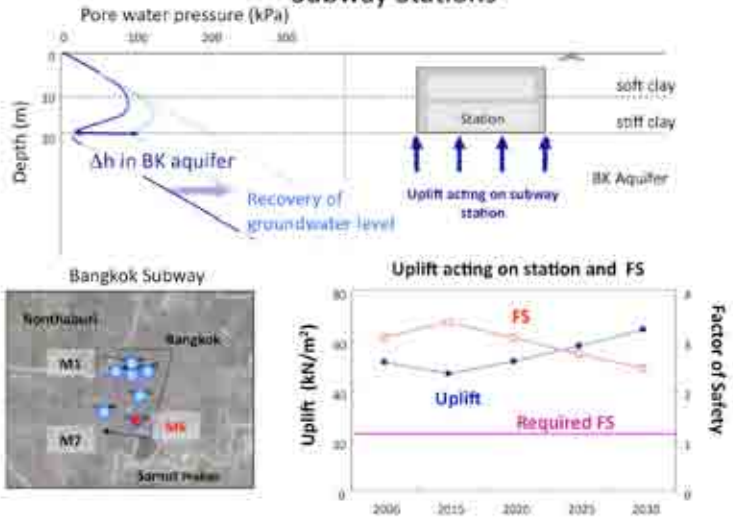
Prediction of Vertical Movement in 4 Aquifers in 2030



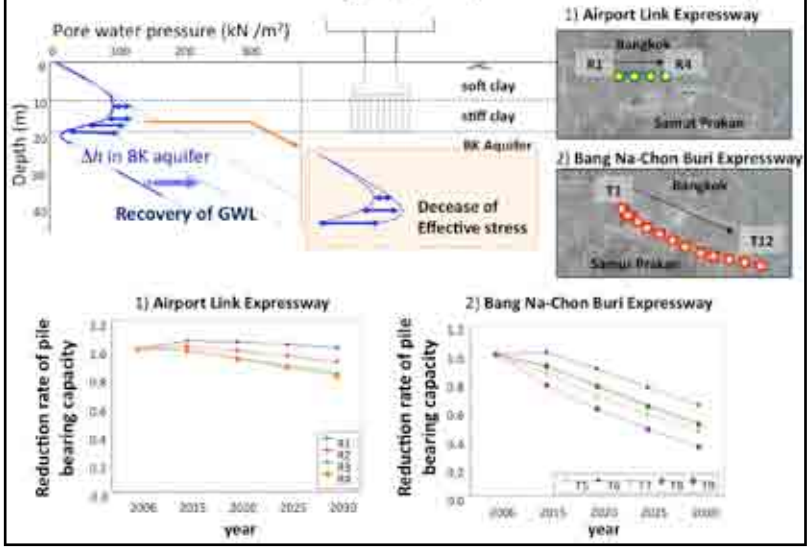
- Vertical movement in aquifers is relatively small.
- Considering secondary consolidation at Bangkok clay, the effect of vertical movement at ground surface will be offset.

Evaluation of the effect of GWL Recovery on Underground Infrastructures

Evaluation of the effect of uplift on Bangkok Subway Stations



Decrease of Pile Bearing Capacity due to GWL Recovery



Summary on Problems Associated with Bangkok Groundwater Usage

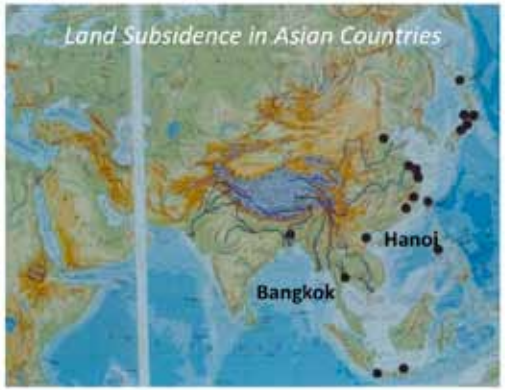
	Timing	Type of Damages	Response
GWL Drawdown	Present	Damages on Housing/ Building	-
	Present	Damages on elevated highway	Required
	present	Increase of flooding risk	-
	Present-Future	Coastal erosion	Required under climate change (sea level rise)
	Present	Salt water intrusion	-
GWL Recovery	Future	Uplift acting UG structures	OK?
	Future	Damages on infrastructure foundation	Required

It is required to establish new training program on geotechnical asset management.

Inside Megacities :

Land subsidence in Asian countries

Damage/Loss Caused by Excessive Groundwater Extraction



Three examples related to Excessive GW Extraction and infrastructure development

1. Osaka (Japan)

2. Bangkok (Thailand)

3. Hanoi (Vietnam)

It is required to establish new training program on geotechnical asset management considering project life.

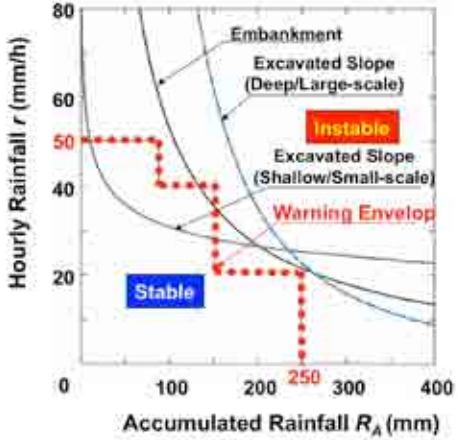
Problem associated with Linkage with suburb:
Landslide closed to highway & residential areas

Date	Place	Victim
Nov.,1988[1)]	Nakhon si thammarat	370
Nov.,2001[1)]	Phetchabun	160
Jun.2003[1)]	Northern Chiang Mai	0
May,2006[2)]	Uttaradit	100
Sept.,2007	Phetchabun	5

1)The Japan-Thailand collaborative project of landslide risk evaluation and hazard mapping in Thailand

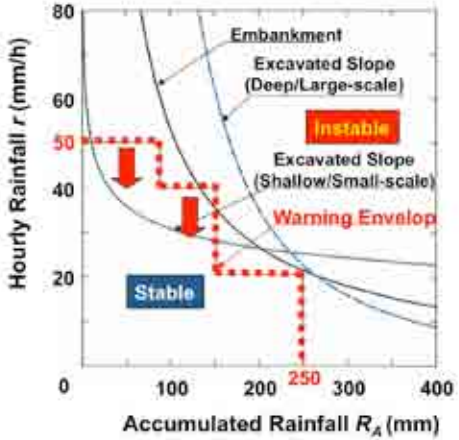
2)Investigation on the Damage by the Landslide Disaster in Northern Thailand

Early warning system for interruption of road service & evacuation



C/D on Risk Perception

Revision of Early warning system



It is required to establish implementation program for road service interruption & evacuation.

KU-JICA Joint Symposium on Human Security Engineering
HUMAN SECURITY AND RELATED CAPACITY DEVELOPMENT, March 1-2, 2010

Concluding Remarks

Collaboration Plan

- To establish training program on geotechnical infrastructure asset management.
- To establish implementation program for road service interruption & evacuation.

1. AIT Short Course Lecture on Geotechnical Infrastructure Asset Management, March, 2009 at AIT, Bangkok

2. AIT CV Short Course Lecture on Risk Management for Infrastructure Development and Planning, September, 2009, at AITCV, Ho Chi Minh City.

3. AIT Short Course Lecture on Geotechnical Infrastructure Asset Management, March, 2010 at AIT, Bangkok

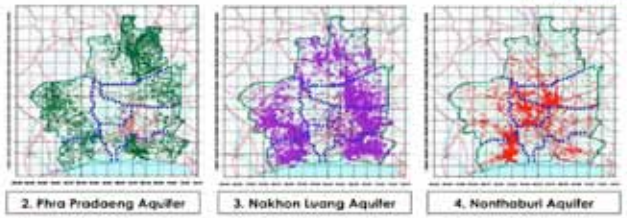
KU-JICA Joint Symposium on Human Security Engineering
HUMAN SECURITY AND RELATED CAPACITY DEVELOPMENT, March 1-2, 2010

Thank you for your attention

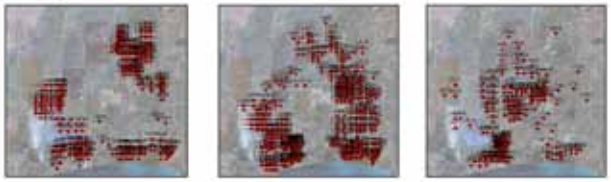
ขอบคุณครับ

Distribution of Pumpage Wells

Record in 2006



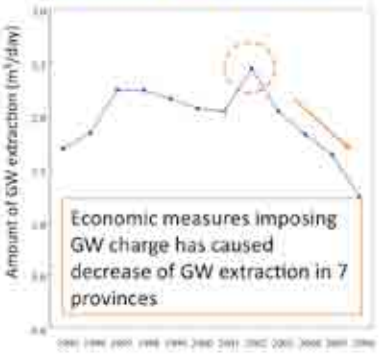
Modeling



IGES "Stakeholder Meeting on Sustainable Groundwater Management in Bangkok, Thailand"(2006)

Prediction Model for Amount of GW Extraction

Change of Amount of GW Extraction in 7 Provinces (BMR & Ayutthaya)



Economic measures imposing GW charge has caused decrease of GW extraction in 7 provinces

Geometrical Brownian Motion

$$Q(t) = Q(0) \cdot \exp\left\{\left(\mu - \frac{\sigma^2}{2}\right)t + \sigma \cdot \varepsilon\right\}$$

Amount of GW Extraction in 2006

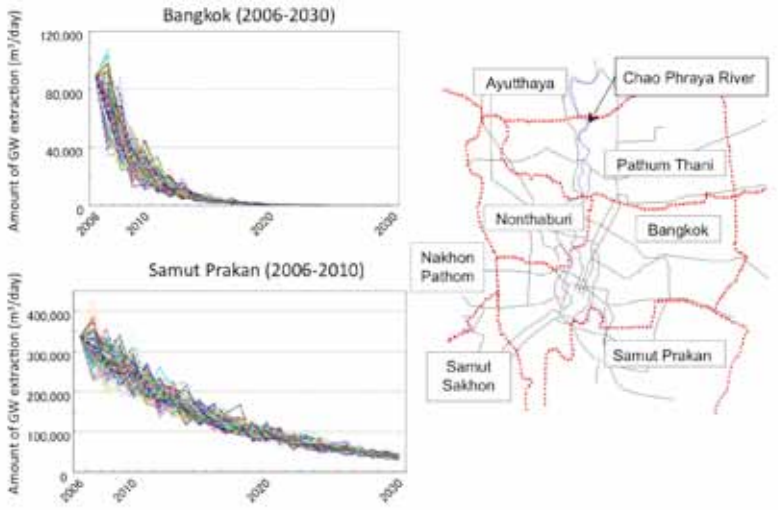
$t = 1, 2, 3 \cdots$

- Amount of GW Extraction
- Trend (2000-2006)
- Volatility (2000-2006)
- Standard random number

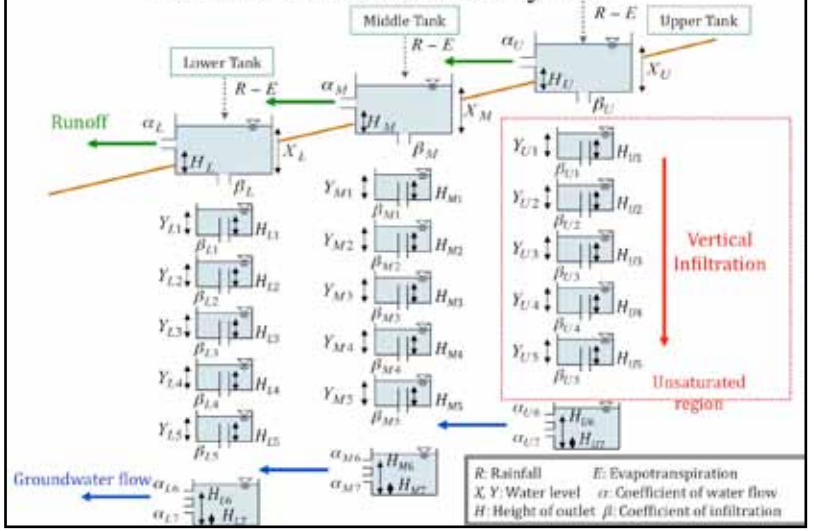
Evaluation of both historical trend and volatility based on historical records of GW extraction

Monte Carlo simulation, of which realization number is 100

Prediction of Amount of Groundwater Pumpage



Modified Multi-Tank Model System



The establishment of strategic decision-making on priority to slope maintenance considering socio-economic losses

Definition of Risk

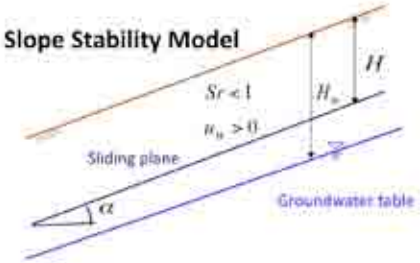
Expected Loss: $R = p \times C$

p **: Probability of Failure**

C**: Consequence corresponding to slope failure**

Evaluation of Probability of Failure

Slope Stability Model

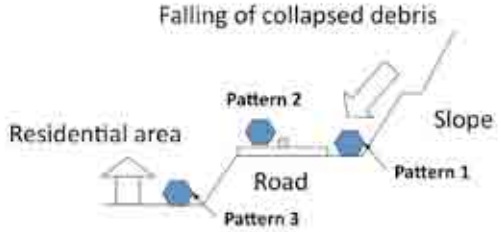


Saturated Region : Decrease of Shear Strength with positive pore water pressure

$$FS = \frac{c'}{\gamma H \cdot \sin\alpha \cos\alpha} + \left(1 - \frac{u_w}{\gamma H}\right) \cdot \frac{\tan\phi'}{\tan\alpha}$$

u_w: Pore-water pressure
ϕ': Effective angle of internal friction

Damage scenario due to road slope failure



Classification of damage pattern

Pattern 1: Collapsed debris stops besides road
Pattern 2: Collapsed debris moves to road
Pattern 3: Collapsed debris move to residential area

Evaluation of Loss

1) Direct losses:

The expense due to the removal of collapsed debris and the repair of slopes

2) Indirect losses:

The losses due to traffic diversion during the interruption of the road service

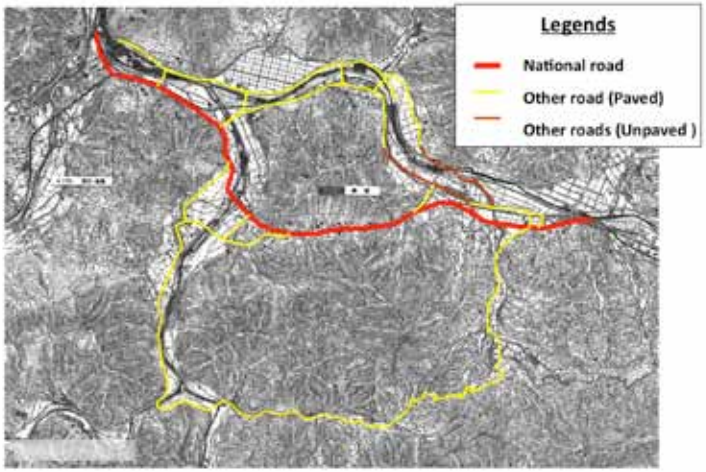
Indirect losses

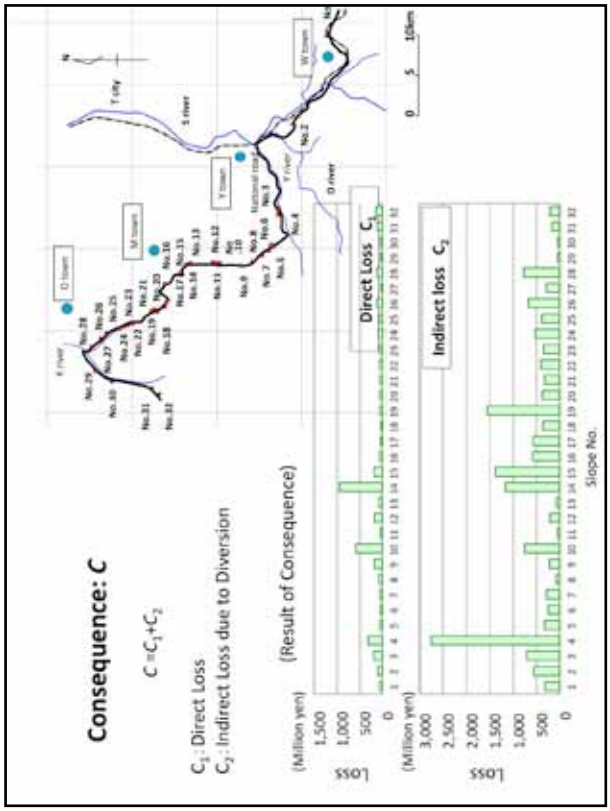
a) Travel time loss due to diversion
b) Energy loss due to diversion

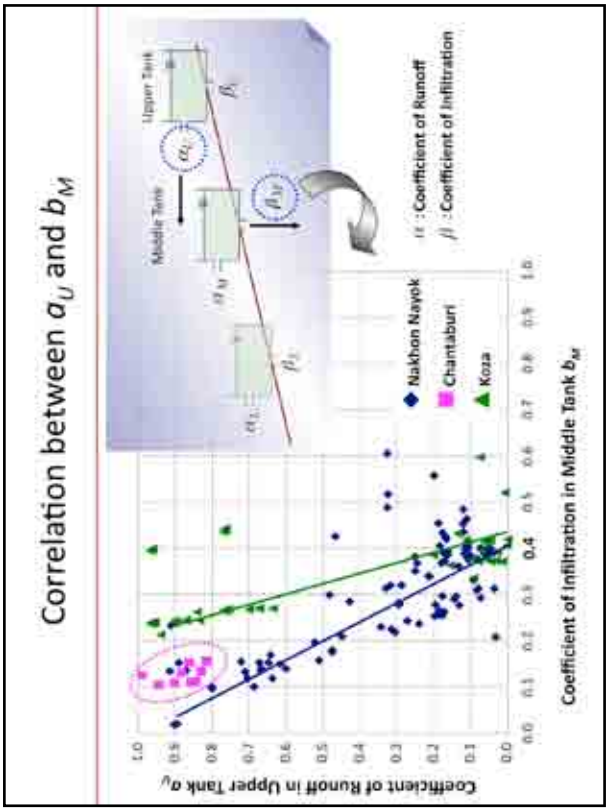
- Number of days, which road service is to be interrupted
  - ✓ Function of total volume of collapsed debris
- Traffic Volume
- Time Loss /Energy loss
  - ✓ Distance of between original route and diversion route
  - ✓ Maximum speed difference between original route and detour route

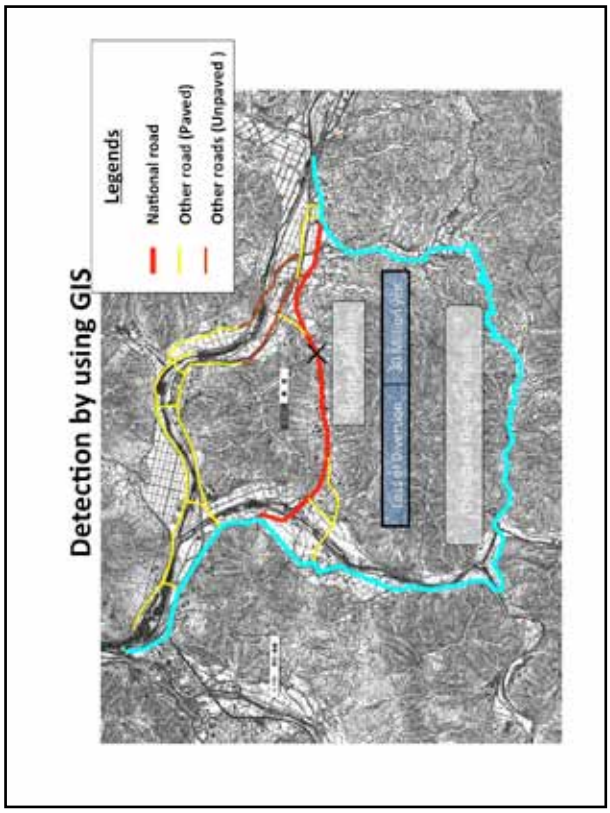
Adoption of findings proposed in traffic engineering

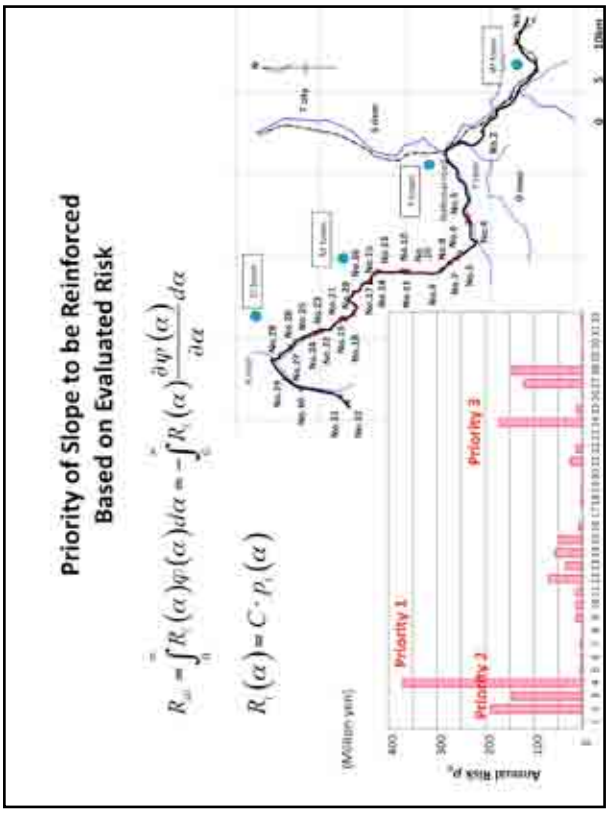
Detection of De-tour Route Using GIS System

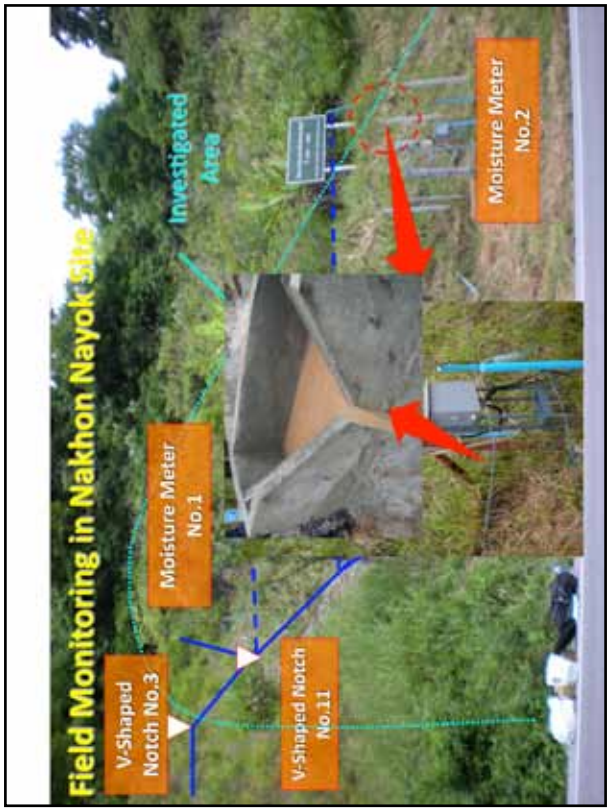


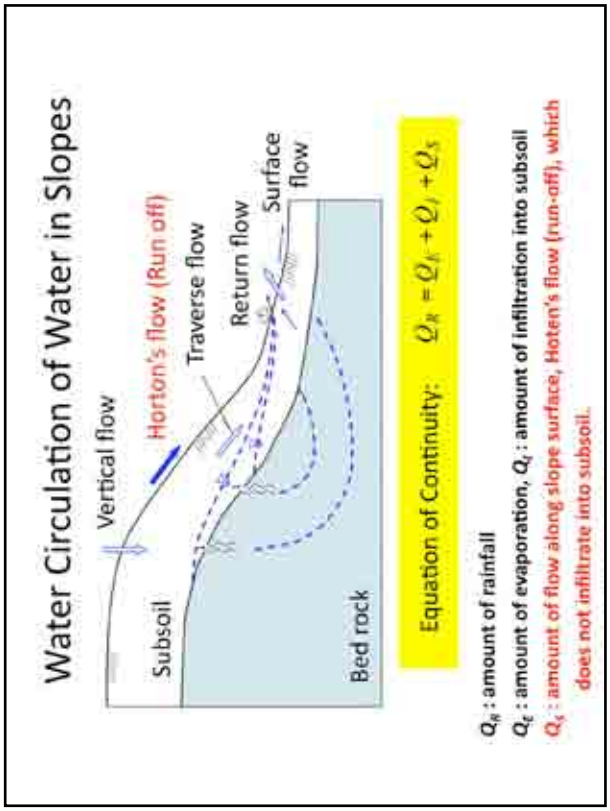

Consequence: C
C = C1+C2
C1 : Direct Loss
C2 : Indirect Loss due to Diversion
(Result of Consequence)
Direct Loss C1
Indirect loss C2
(Million yen)
Loss
Slope No.

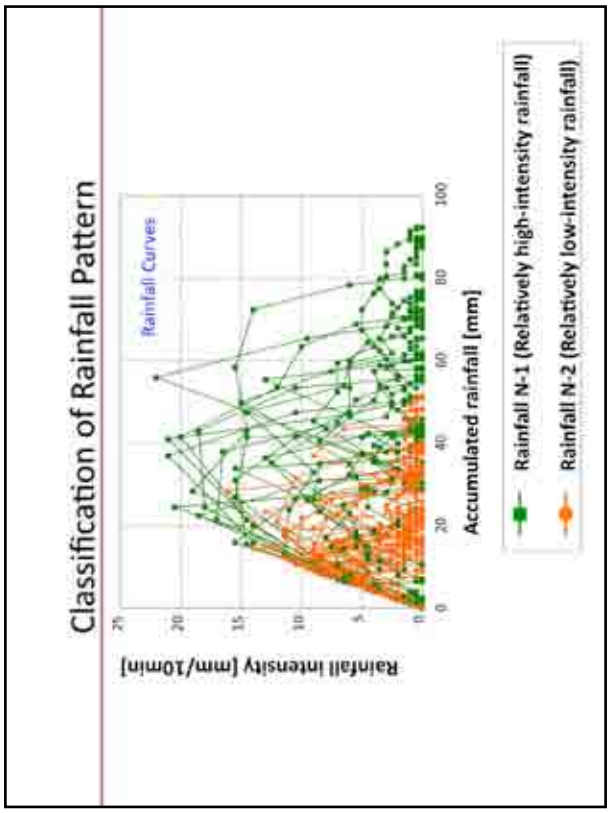

Correlation between a_U and b_M
Upper Tank
Middle Tank
α : Coefficient of Runoff
β : Coefficient of Infiltration
Nakhon Nayok
Chantaburi
Koza
Coefficient of Runoff in Upper Tank a_U
Coefficient of Infiltration in Middle Tank b_M

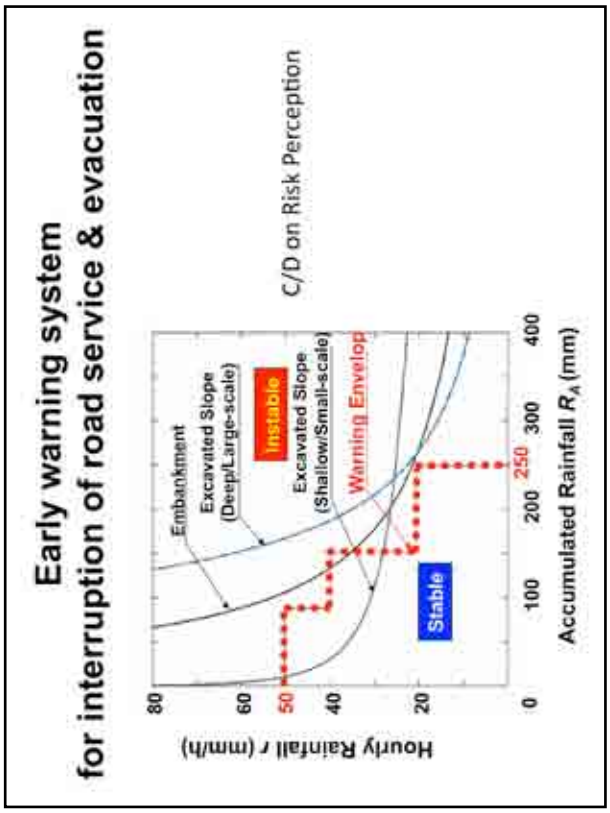

Detection by using GIS
Legends
National road
Other road (Paved)
Other roads (Unpaved)


Priority of Slope to be Reinforced
Based on Evaluated Risk
$R_{ui} = \int_0^{\infty} R_i(\alpha) g(\alpha) d\alpha = -\int_0^{\infty} R_i(\alpha) \frac{\partial \psi(\alpha)}{\partial \alpha} d\alpha$
$R_i(\alpha) = C \cdot p_i(\alpha)$
Priority 1
Priority 2
Priority 3
(Million yen)
Annual Risk p_i

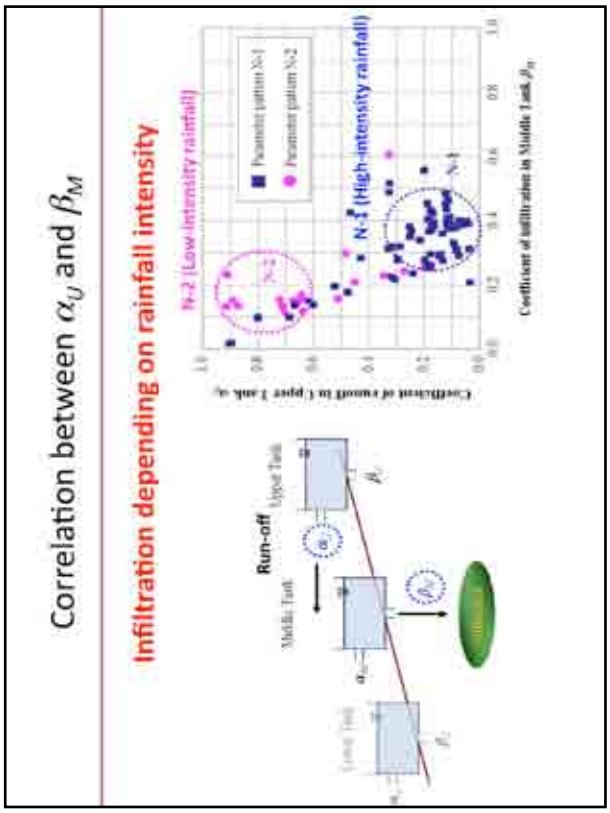

Field Monitoring in Nakhon Nayok Site
V-Shaped Notch No.3
Moisture Meter No.1
Investigated Area
V-Shaped Notch No.11
Moisture Meter No.2

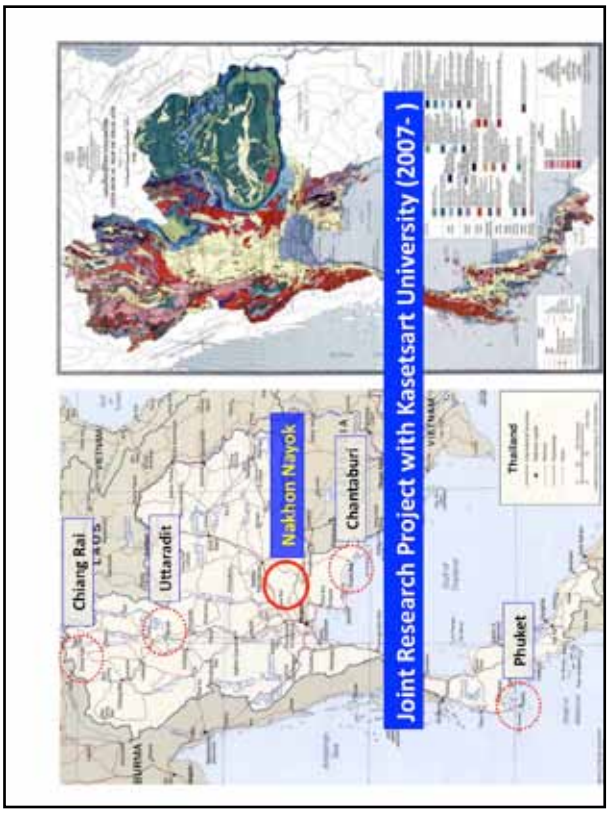

Water Circulation of Water in Slopes
Vertical flow
Horton's flow (Run off)
Traverse flow
Return flow
Surface flow
Subsoil
Bed rock
Equation of Continuity: $Q_R = Q_E + Q_I + Q_S$
Q_R : amount of rainfall
Q_E : amount of evaporation, Q_I : amount of infiltration into subsoil
Q_S : amount of flow along slope surface, Hoten's flow (run-off), which does not infiltrate into subsoil.

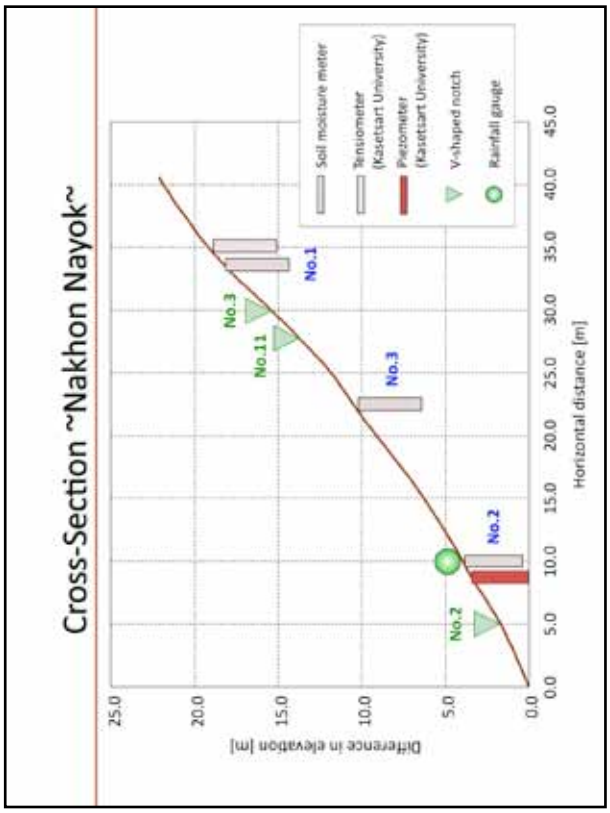

Classification of Rainfall Pattern
Rainfall Curves
Rainfall intensity [mm/10min]
Accumulated rainfall [mm]
Rainfall N-1 (Relatively high-intensity rainfall)
Rainfall N-2 (Relatively low-intensity rainfall)


Early warning system
for interruption of road service & evacuation
C/D on Risk Perception
Hourly Rainfall r (mm/h)
Accumulated Rainfall R_A (mm)
Embankment
Excavated Slope (Deep/Large-scale)
Excavated Slope (Shallow/Small-scale)
Instable
Warning Envelop
Stable

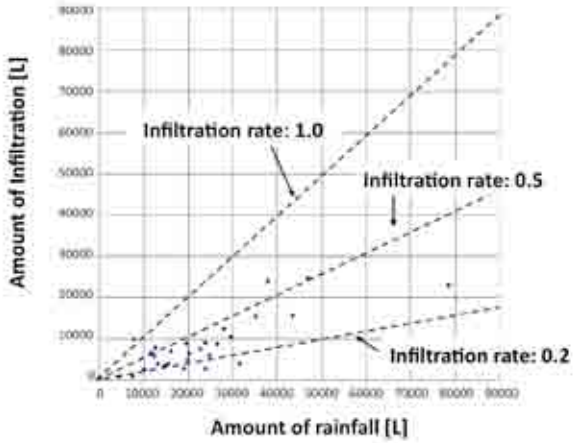

Relatively shallow landside
Kao-Kichakud, Chantaburi


Correlation between α_U and β_M
Infiltration depending on rainfall intensity
N-2 (Low-intensity rainfall)
N-3 (High-intensity rainfall)
Run-off
Middle Tank


Joint Research Project with Kasetsart University (2007-)
Chiang Rai
Uttaradit
Nakhon Nayok
Chantaburi
Phuket
Thailand

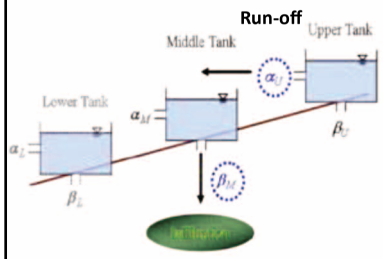

Cross-Section ~Nakhon Nayok~
Soil moisture meter
Tensiometer (Kasetsart University)
Piezometer (Kasetsart University)
V-shaped notch
Rainfall gauge
No.1
No.2
No.3
No.11
Difference in elevation [m]
Horizontal distance [m]

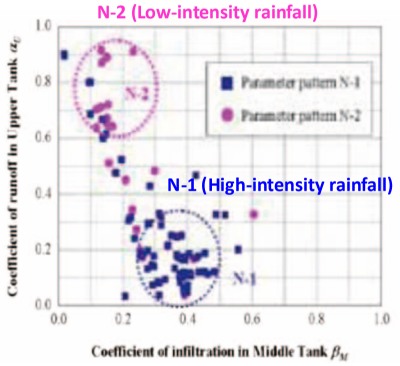
Relationship between amount of rainfall and infiltration



Correlation between α_U and β_M

Infiltration depending on rainfall intensity





Maintenance Strategy for Concrete, Steel and Hybrid Infrastructures

Yoshinobu Oshima

Kyoto University

KU-JICA Joint Symposium on Human Security Engineering

Maintenance Strategy for Concrete, Steel and Hybrid Infrastructures

Y.OHSHIMA, H. SHIRATO, K.SUGIURA, H.KAWANO
T.UTSUNOMIYA, A.HATTORI, T. YAMAMOTO
T. YAGI, K.HASHIMOTO and S. TAKAYA

Material and Structure Group, Kyoto University

KU-JICA Joint Symposium on Human Security Engineering

Infrastructure Asset Management in Asian Megacities

Activities in Materials and Structures Group

Bangkok

Singapore

Shanghai

H. Kawano, M. Kimura, **H. Shirato**, **K. Sugiura**, **A. Hattori**, **Y. Oshima**, **T. Utsunomiya**, **T. Yagi**, **T. Yamamoto**, **K. Hashimoto** and **S. Takaya**

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MS11: Self-Sustaining Technologies for Small Infrastructures Using Local Materials (traditional)

MS12: Maintenance Strategy for Concrete, Steel and Hybrid Structures (modernized)

3

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Deterioration of Structures

corrosion

Environmental Condition (Hot and Humid)

Economy Condition (Heavy Traffic)

fatigue cracks

4

Mission

- Environmental evaluation in Asian countries with regard to structural deterioration
- Safety assessment of infrastructures
- Propose maintenance strategy suitable in Asian countries

Corrosion (Steel and concrete structures)
- Salt, humidity, temperature, CO2, etc.

Fatigue (Steel structures)
- Heavy traffic

Prediction Corrosion Deterioration for Steel Structures based on Climate Condition

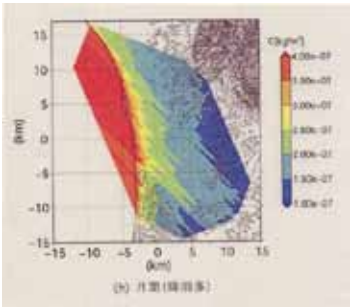
H.Shirato, T.Yagi

Environmental Factors for Corrosion Damages

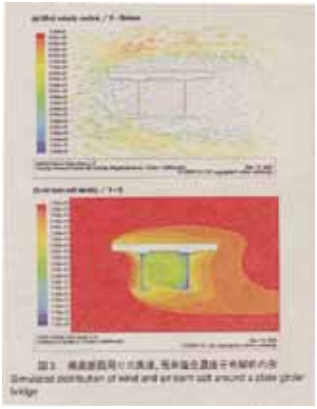
- Air-borne sea salt
- Wetting duration
- Precipitation
- Temperature
- Humidity
- Daylight
- Ultraviolet
- Wind conditions
- Sulfur dioxide
- others

Asia Climate Map
Most of megacities are located in Hot and Humid conditions

Numerical predictions

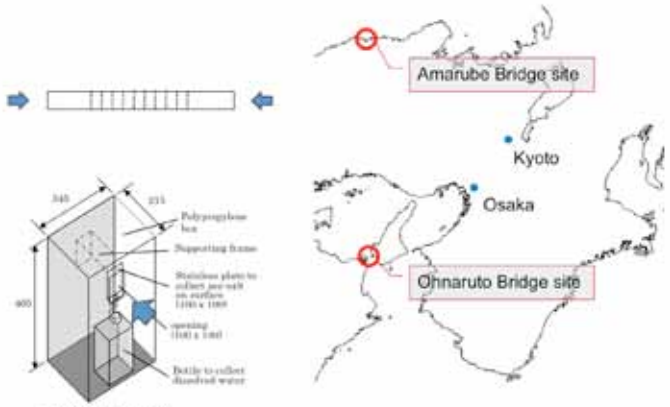


Sudo, et.al (CRIEPI rep., 2008)



Kihira, Matsuoka, et.al (JSCE, 2003)

On-site measurement of air-borne sea-salt

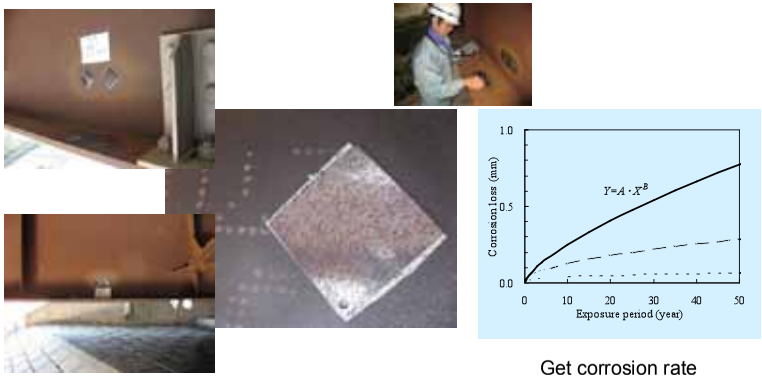


Ohnaruto Bridge, HSBC

Button Test for Corrosive Environment Assessment

K.Sugiura, K.Hashimoto

Direct measurement
–Exposure test on site-



Get corrosion rate
in the Hot & Humid condition

Investigation sites

- Button test specimens installed at 8 sites in 2009, at Singapore, China (Shanghai) and Thailand (Bangkok & Chon Buri).


Singapore


Shanghai


Chon Buri

Bang Sai Bridge in Chon Buri, Thailand

Other planned sites in Thailand


Rama 4 bridge


Chulalongkorn University

Deterioration in Concrete Structure in Asian Mega-City and its Effect on Structural Behavior

T.Yamamoto, S.Takaya

Typical deteriorations of RC structures


Chloride induced attack in RC pier


Re-bar Corrosion due to carbonation


Alkali-aggregate reaction

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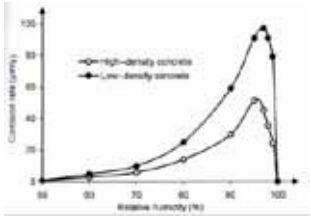
Corrosion of reinforcing steel in concrete

- Factors of corrosion
  - Humidity
  - Temperature
  - Oxygen
  - Chloride



Effect of humidity on corrosion rate

→ The corrosion may accelerate in hot humid climates in Southeast Asia.

→ Rebar corrosion may reduce the structural performance

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Expected results

- The relationship between the structural performance and steel corrosion
- Prediction model of deterioration for the structures in Asian countries
- Proper management system for concrete structures

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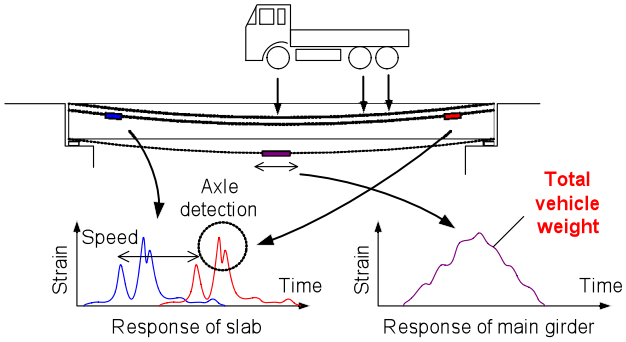
Live Load Monitoring

Y.Ohshima, K.Sugiura

Live load monitoring in Bangkok

- Rama IV bridge
- Chulalonkorn University (Prof.Tospol)
- Two weeks monitoring, Mar 15-25, 2009

Traffic Load Monitoring by BWIM

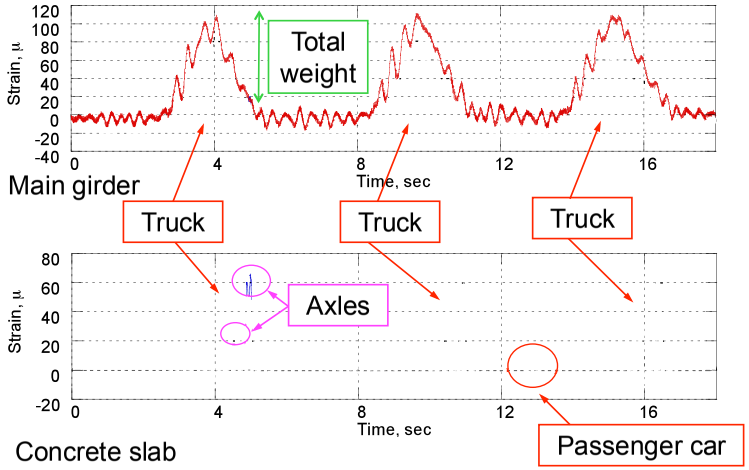


BWIM →

- Vehicle type
- Axle load
- Total weight
- Velocity
- Traffic volume

Installation

Obtained data in Rama IV



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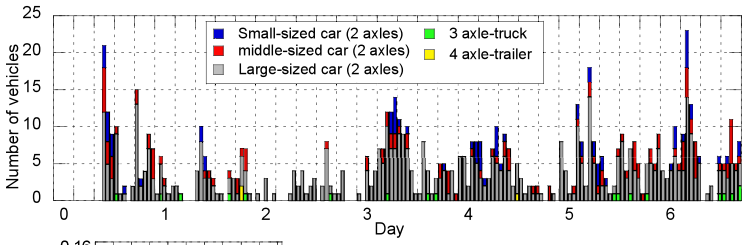
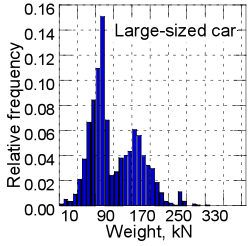
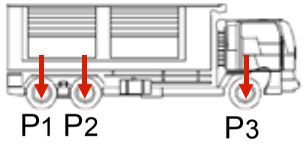
Results





Adequate live load model in Bangkok



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Expected results

- Adequate live load model in Bangkok
- Assessment of bridge structures subject to overloaded vehicles

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Bridge assessment in Cambodia

- Temporary bridges (Bailey bridge) are still used in Cambodia as a permanent structure
- The bridges should be assessed by WIM data

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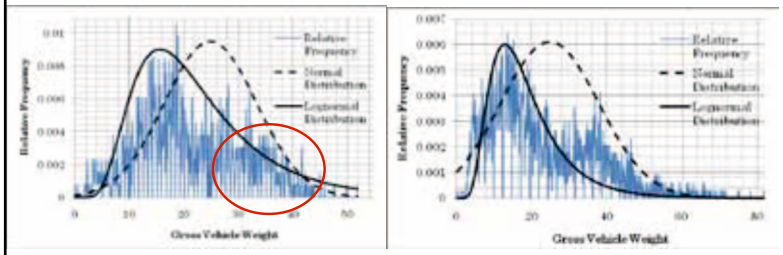
Weigh Station

WIM data

- Site 1 has more serious condition than that expected in design



Site 1 Site 2

Design Codes Change in Asian Countries

- **Standard of former colonial master**
  - Russian standard — Vietnam, Mongolia,…
  - British standard — Thailand, India,….
  - Japanese standard — Taiwan, Korea,…
- **Original standard** (modified standard)
  - AASHTO –LRFD — Thailand, Indonesia,…
  - Australian Standard — Cambodia, Vietnam,…
- **Donated structures**
  - Sponsor's standard (ex. Japanese code for ODA)

30

Summary
-Out comes of this project-

- **Meteorological data**
- **Current Design Conditions**
- **Present Conditions of Concrete, Steel and Hybrid structures**
- **Empirical Formulae for Structural Deterioration due to Rebar Corrosion and Heavy Traffic**
- **Methodologies for Improvement of Durability and Strength**
- **Maintenance Strategies**

Comprehensive Guidelines for Structural Engineers

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Thank you for your attention

Water Resources and Integrated River Basin Management on Human Security Engineering

Yasuto Tachikawa

Kyoto University

Water Resources and Integrated River Basin Management on Human Security Engineering

Yasuto TACHIKAWA
Junichi SUSAKI
Masayasu MAKI
Kazuaki YOROZU

Dept. of Urban and Environmental Engineering
Kyoto University, Kyoto University

Motivations

- How will the global warming change the hydrologic cycle?
- How will the possible hydrologic change influence on water resources, food production, and water-related disasters?
- How do we adapt the change?

Study Structure

MS41: Monitoring of Water Use and Agricultural Production Using Remote Sensing Data

- Irrigation water monitoring using satellite remote sensing data
- Food production prediction using satellite remote data and crop growing model

MS42: Predictions of Water Resources in Southeast Asia

- Hydrologic change analysis using GCMs projection data sets
- Hydrological cycle modeling including land surface process
- Development of crop growing model

Water Resources Management on Human Security Engineering

Resilient water resource management to reduce water-related disasters and to ensure food production

Office of Research and Development,
Royal Irrigation Department

Research items

1. To analyze the possible future change of external condition, e.g. how will rainfall pattern change? How will river flow pattern change?
2. To analyze how the hydrologic change will have impact on our life, e.g. water resources, food production, and water-related disasters.
3. To analyze the resiliency for the possible change.
4. To develop adaptive water resources management to ensure human security.

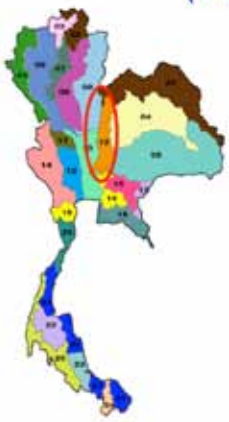
Study River Basins in Thailand

Khun Dan Prakan Chon Dam catchment (194km^2)

Pasak Jolasit Dam basin (14,520km^2)

Khun Dan Prakan Chon Dam catchment (194km^2)

Pasak Jolasit Dam basin (14,520km^2)



Demonstration study at Khun Dan Prakan Chon Dam basin

- Hydrologic analysis
- Hydrologic modeling
- Crop yield modeling

Future climate projection data

- Hydrologic prediction
- Crop yield prediction

Develop adaptive measures to ensure human security

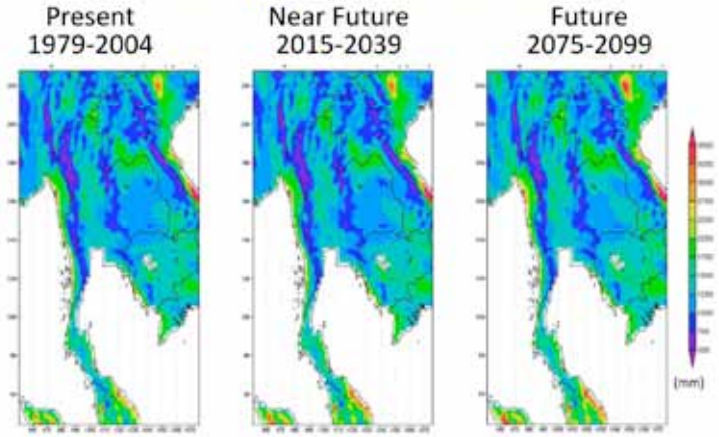
Future climate projection data using General Circulation Model developed by MRI, Japan

Current climate
experiment: 1979-2004

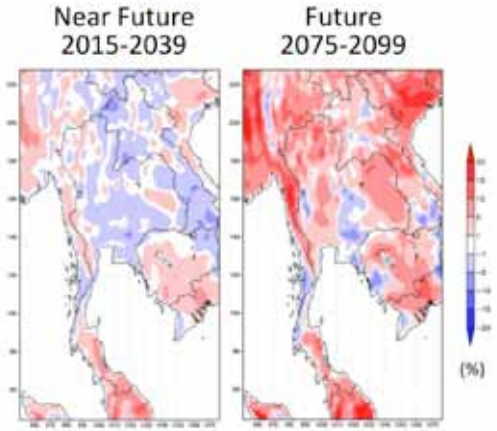
Near future climate
experiment: 2015-2039

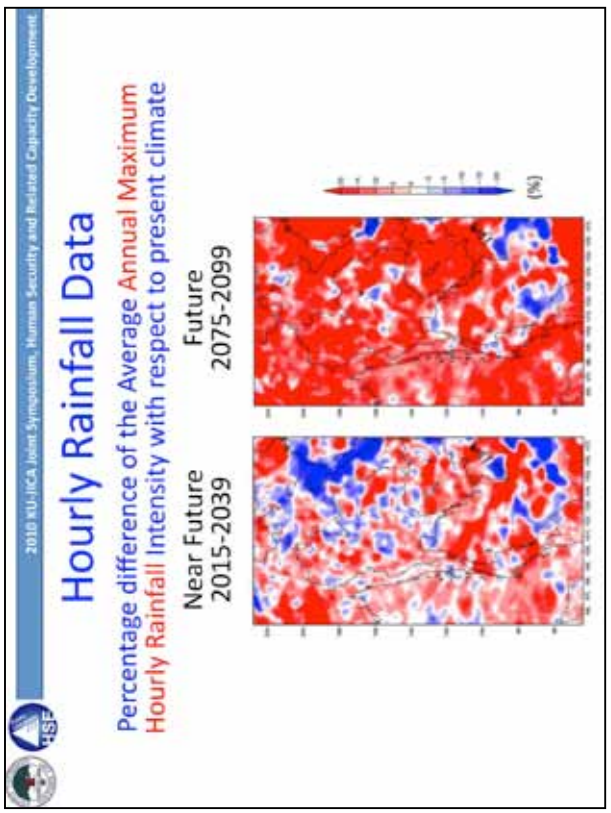
Future climate
experiment: 2075-2099

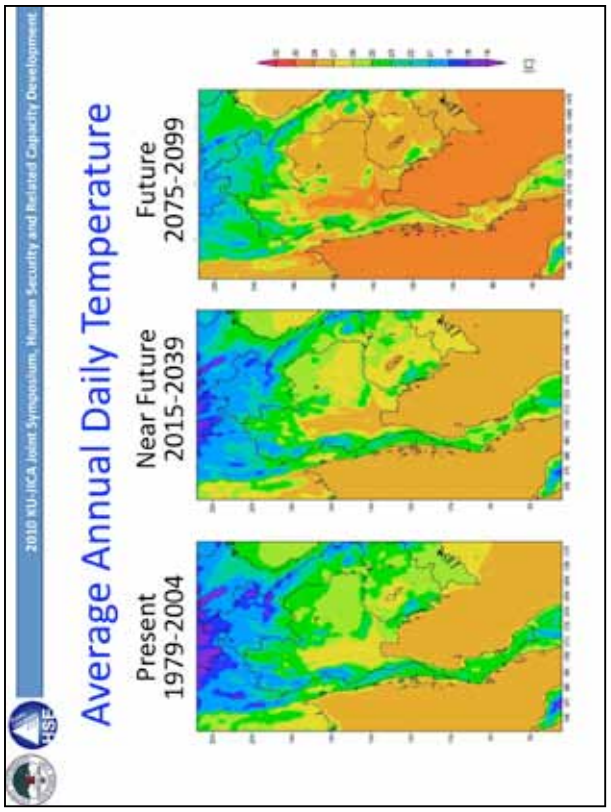
Average Annual Rainfall

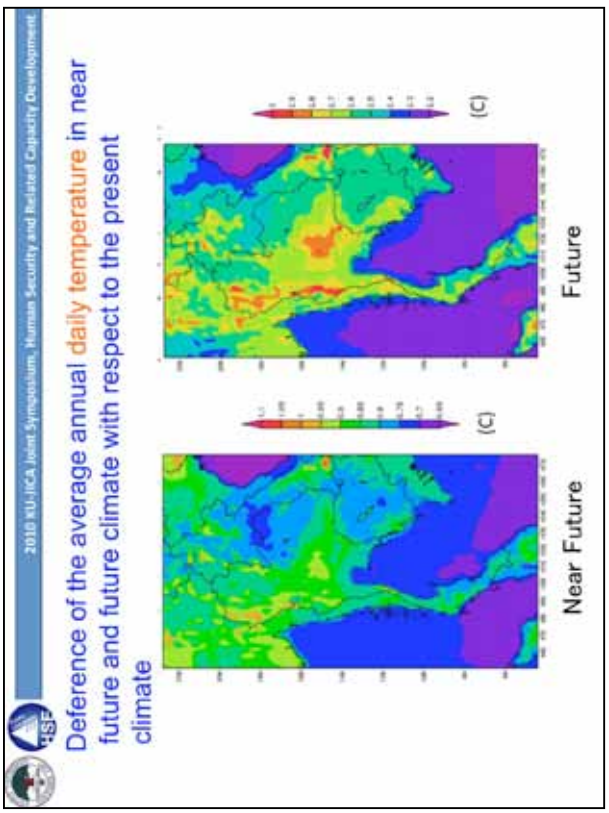


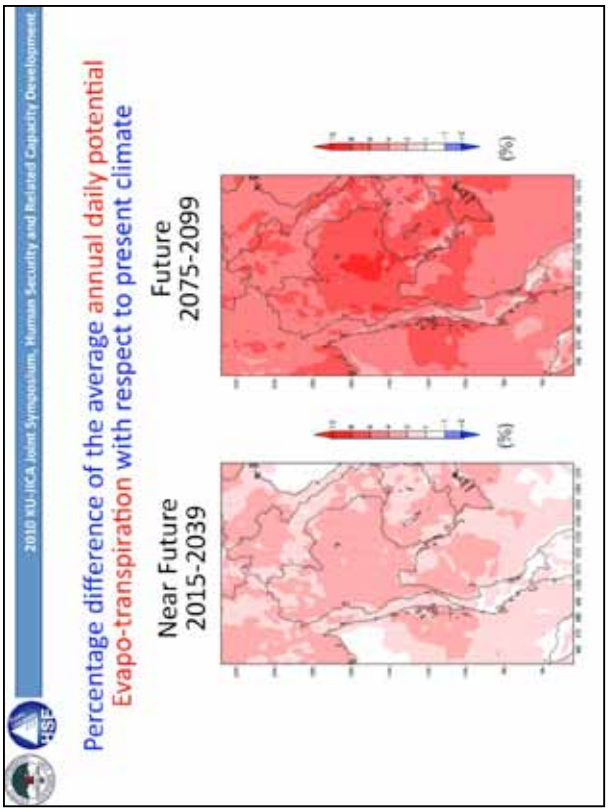
Percentage difference of the average annual rainfall with respect to current climate

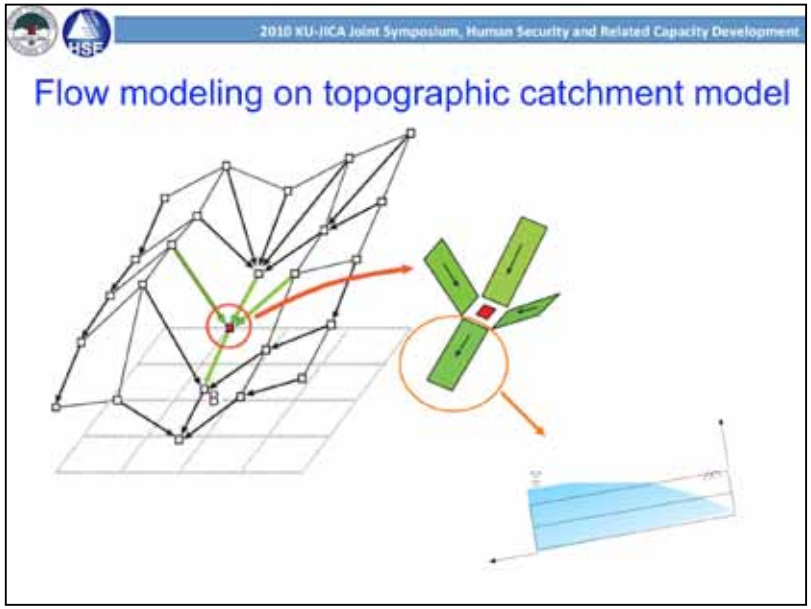


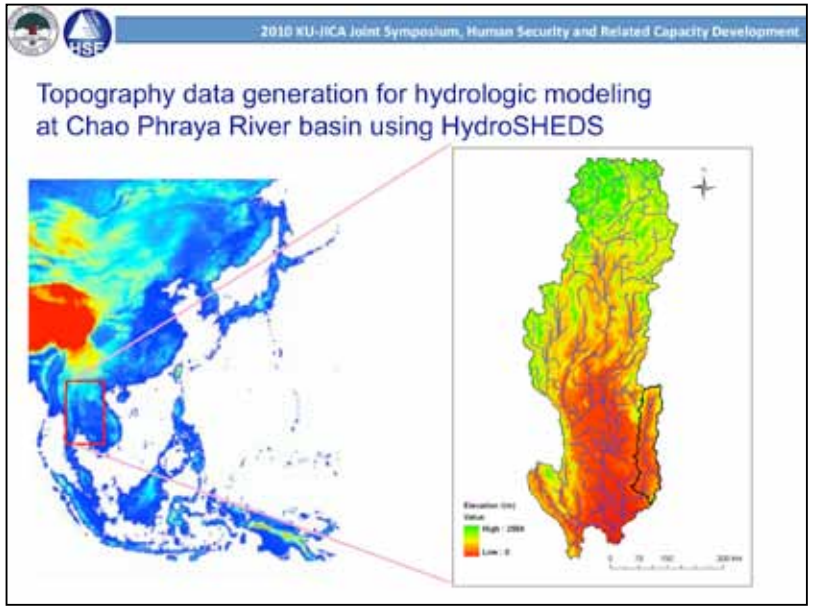

2010 KU-IICA Joint Symposium, Human Security and Related Capacity Development
Hourly Rainfall Data
Percentage difference of the Average Annual Maximum Hourly Rainfall Intensity with respect to present climate
Near Future 2015-2039
Future 2075-2099
(%)

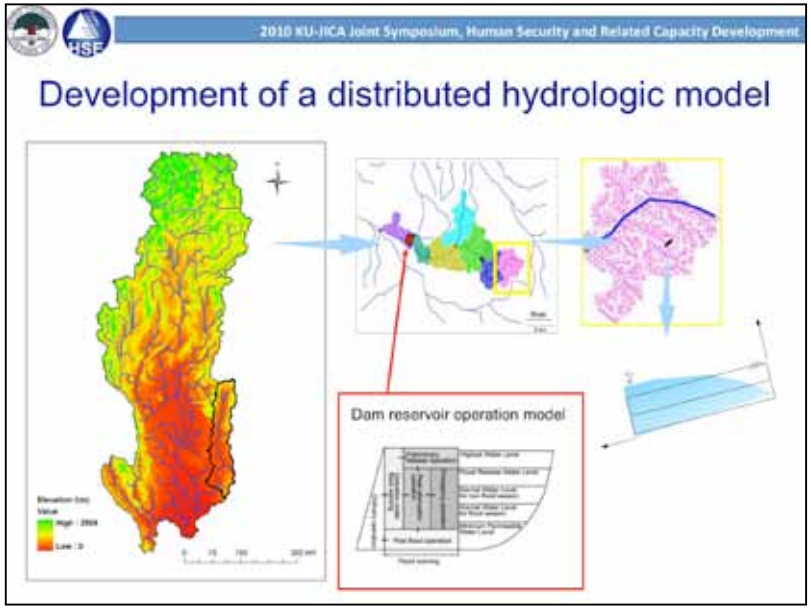

2010 KU-IICA Joint Symposium, Human Security and Related Capacity Development
Average Annual Daily Temperature
Present 1979-2004
Near Future 2015-2039
Future 2075-2099
(C)

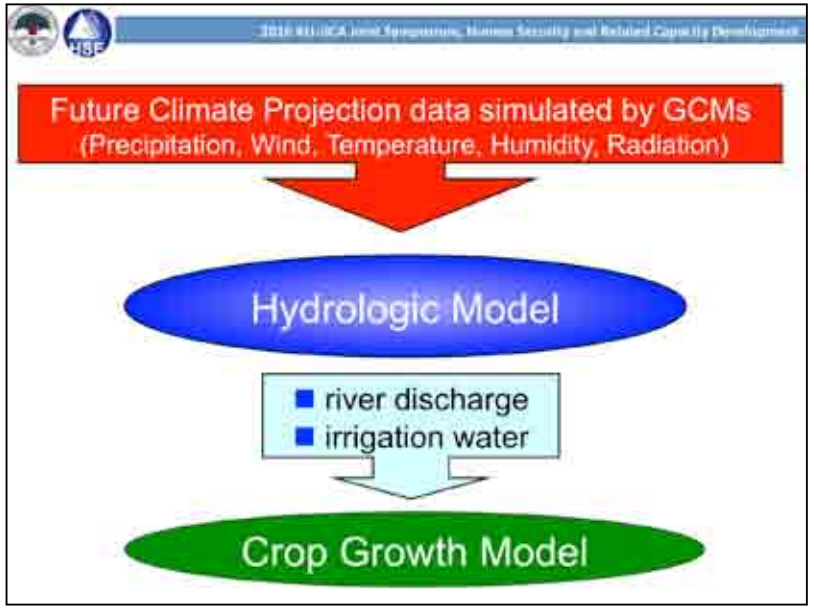

2010 KU-IICA Joint Symposium, Human Security and Related Capacity Development
Deference of the average annual daily temperature in near future and future climate with respect to the present climate
(C)
(C)
Near Future
Future


2010 KU-IICA Joint Symposium, Human Security and Related Capacity Development
Percentage difference of the average annual daily potential Evapo-transpiration with respect to present climate
Near Future 2015-2039
Future 2075-2099
(%)
(%)


2010 KU-JICA Joint Symposium, Human Security and Related Capacity Development
Flow modeling on topographic catchment model


2010 KU-JICA Joint Symposium, Human Security and Related Capacity Development
Topography data generation for hydrologic modeling
at Chao Phraya River basin using HydroSHEDS


2010 KU-JICA Joint Symposium, Human Security and Related Capacity Development
Development of a distributed hydrologic model
Dam reservoir operation model


Future Climate Projection data simulated by GCMs
(Precipitation, Wind, Temperature, Humidity, Radiation)
Hydrologic Model
river discharge
irrigation water
Crop Growth Model

Field experiment in Thailand

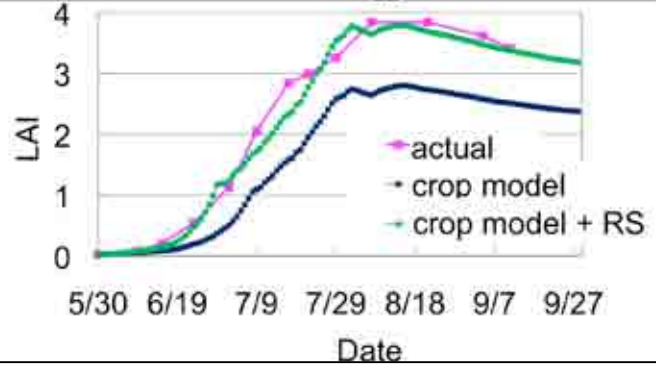
Study area

Nakhon Nayok, Thailand

Result of rice growth simulation using RS and crop growth model

Minimizing

$$y = f(Kus, Nm, RER, Nmc) = \sum (LAI_{Model} - LAI_{actual})^2$$



Further study

- Development of Distributed Rainfall-Runoff Model
- Improvement of Crop Growth Model

Analysis of the Impacts of climate change on water resources, rice crop production, and water-related disasters

Propose resilient water resource management to reduce water-related disasters and to ensure food production

Urban Energy Supply –The case at Indonesia–

Toshifumi Matsuoka

Kyoto University

Urban Energy Supply
- The case at Indonesia -

Kyoto University : Toshifumi MATSUOKA

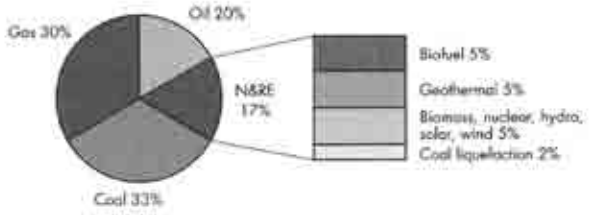
Human Security Engineering

- **Indonesia** is the world's fourth most populous nation, with 240 million people spread over a large area of more than 17,508 islands. The population is concentrated, with about 80% living on Java-Bali.
- After the significant dip as a result of the Asian financial crisis of 1997-99, Indonesians economic growth has returned to a stable path of 5-6% annually.
- However, the challenges of the Government are still huge: the unemployment and the services of electricity, water, sewage, transport, trade, education, and health is still limited.
- **Urban Energy supply** becomes one of key issue for HSE.

Energy Issues of Indonesia

- Indonesia's energy demand is highly dependent on fossil fuels and its proven fossil fuel reserves are limited and declining.
- **Energy Blueprint**

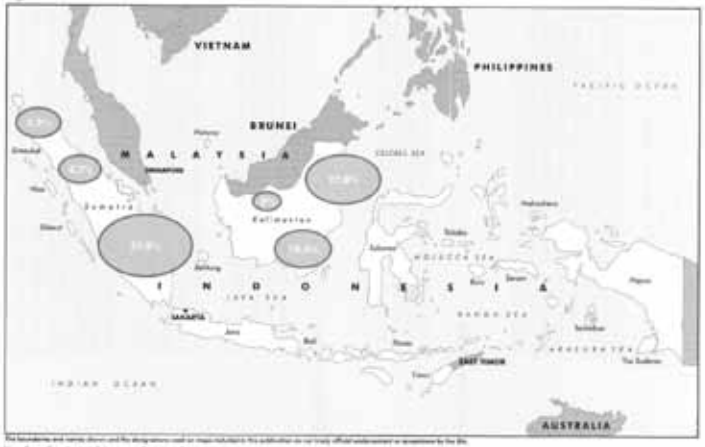
National primary energy supply in year 2025



Coal Country

- Indonesia is rich in coal resources, with 18.7 billion tonnes of coal identified as reserves and some 90 billion tonnes as potential resources.
- Today, Indonesia is one of the leading coal producing countries with production of 206 million tonnes in 2007 (Note: World 3,600 million tonnes), almost entirely from opencast mines.
- 48 million tonnes was consumed domestically, accounting for 17% of Indonesia's energy supply, and 157 million tonnes was exported.

Distribution of coal resource



Oil and Gas Issues of Indonesia (Indonesia is a member of OPEC)

- Possibly the most important issue is declining oil and gas production and the fast increasing domestic demands for oil and gas.
- This comes from the natural maturing of Indonesia's oil and gas fields, combined with limited investment in recent years and consequent reduced reserve replacement rate.
- The supply-demand mismatch has dramatically impacted on Indonesia's oil and gas exports. At 1990, the oil and gas sector contributed 43% of export earnings and 45% of government revenues but now 19% of export earnings and 30% of government revenues.

Indonesia's High Exploration Potential

- 60 sedimentary basins, 38 are drilled, 23 been discoveries, 15 oil production and 22 remain to be drilled.

National Gas Demand

- Its natural gas resource, Indonesia's domestic natural gas market has remained underdeveloped.
- Government blueprint: increasing the share of gas in the primary energy mix to 30% in 2025 (from 27% in 2006).
- To enable this, Government established a master plan in December 2006 to construct a national gas transmission and distribution network connecting the producing regions of Sumatra and Kalimantan with the major consuming regions of Java.

Plan of Indonesia gas pipeline network

Finding New Oil Field Exploration Activates

3D Seismic gathered in Indonesia

	2004	2005	2006	2007
Offshore	0	9 904	5 205	4 992
Onshore	772	1 625	1 008	7 783
Total	772	11 529	6 213	12 775

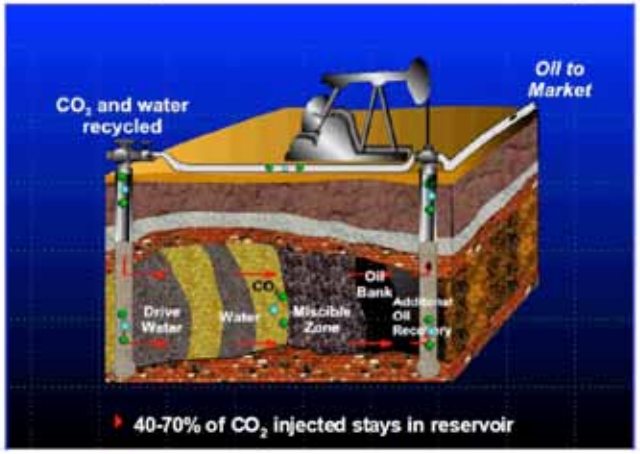
Source: Ministry of Energy and Mineral Resources.

Number of exploration wells

	2000	2001	2002	2003	2004	2005	2006
Offshore	53	49	43	25	28	19	31
Onshore	29	57	45	39	43	49	33
Total	82	106	88	64	71	68	64
Discovery	44	55	46	15	26	30	23
Success ratio	54%	52%	52%	23%	37%	44%	36%

Source: Ministry of Energy and Mineral Resources.

Treatment of Matured Oil Field CO2-EOR (Enhanced Oil Recovery)



Candidate of CO2-EOR in Indonesia South Sumatra Oil Field

- Close to Gas field contains CO2 (Grisik, Suban, Sumpal)

Conclusions

- From Human Security point of view, the energy supply is getting mare attentions.
- Some of oil fields at Indonesia becomes mature and need EOR (Enhanced Oil Recovery) treatments in future.
- Form environmental point of view, the CO2-EOR is attractive technology since global warming gas is injected into the oil reservoir. However, it is required to develop the technologies of how to handle CO2 for this purpose.
- We (ITB and KU) will continue this study at this GCOE program.

Thank you !

Research Activities in Indonesia –Collective Action upon Social Capital–

Kiyoshi Kobayashi

Kyoto University

Research Activities in Indonesia

-Collective action upon social capital-

Kiyoshi KOBAYASHI

1

spontaneous provision of public goods

Hobbs, Olson

Neoclassical : Arrow, Becker, Bergstorm, Alesina

Social norm : Greif, Aoki

Social capital : Putnam, Coleman, Ostrom

Identity : Akerloff

Research Interest

- Urban governance
  - enhancing human security towards environment-friendly and sustainable development society with consideration of diverse society members and their situations.

3

Research Interest

- Globalization and local water problems
  - Water scarcity & Limitation of Water Access: In the midst of economic globalization, there are people who live without getting through the current global trend, or in order to go against to it.
  - According to 2007 report of Network of Asian River Basin Organizations (NARBO), about 600 million people in the Asia-Pacific region can not access to clean water.
  - In the midst of the growing expansion of scarcity of water resource, it is most urgent task to seek for a safe, secure and reliable water supply measure.

4

Research Question

- How do we ensure the sustainability of both ecosystem and resources which people take out for their life?
- How do we share the cost and benefit upon the processes to produce and sustain goods and service?

5

Collective Action upon Social Capital and Water Resource Allocation

- Social capital plays a role in resource allocation for people who don't have resource as the need arises.
- The common resource management is that "*what and how entrust to government*", not that "*whether entrust to government or not*".

6

Research Organization

- Collaboration with
  - Kyoto University (KU)
  - Institute Technology Bandung (ITB)
  - University of Brawijaya
  - Institute Technology of 10th November (ITS)
  - Universiti Teknologi Malaysia (UTM)
  - Royal Institute of Technology (KTH, Sweden)
  - Jönköping International Business School (JIBS, Sweden)
  - London School of Economics
  - University of Slovakia

7

Research Activities in Indonesia Malang Regency

8

Water Supply Systems

Characteristic	PDAM	HIPPAM
Start operation	1984	1999
Funding	National Budget	Regional Budget, WSLIC (USAID)
Institution	Branch Office of PDAM of Malang Regency	Local community 1 leader, 1 treasury, 2 technical staffs
Transmission system	Gravitation, Pump; open water storage - iron pipelined	Gravitation, Pump; group water storage(2x2.5x1.7 m3) - plastic pipelined
Distribution system	Water metered in every house	Plastic upper water tank or direct water tap from group water tank; water metered (some groups)
Capacity	1 □17 liter/second	2 □15 liter/second
Total coverage	33.260 inhabitants (24%)	5.575 inhabitants (4%)
Price/month	1st 10m³= IDR 11.500; 11-20m³ = IDR 1.500/m³ (2009) for household	IDR 2.000 □30.000/month; based on community agreement
1st Installation	IDR. 1.500.000	IDR. 500.000

Field Work

- Drinking Water Facility



- Agriculture Water



10

Survey
(21th Dec 2008 □9th Jan 2009)

- Survey for assessment of social capital in community managed water supply management at Malang Agency, Indonesia in collaboration with Brawijaya uni.
- To test the hypothesis, following items are asked
  - □ Water usage
  - □ Satisfaction to the water supply
  - □ Level of social capital, communication network
- 500 households in Singosari district, East Java province
- 1st survey: December 2008
- 2nd survey: February 2010

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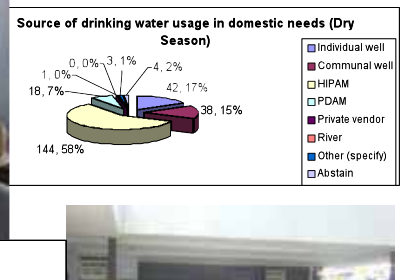
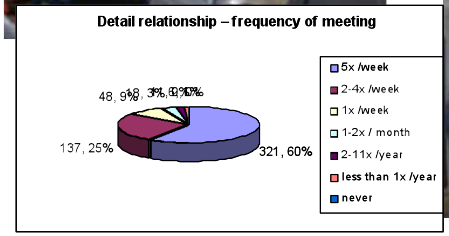
Interviews





1st Workshop : March 20, 2009 at ITB (Bandung)
10 presentations from 3 countries

Joni Hermana, Professor
Environmental Engineering Department, ITS

Ibnu Syabri, Associate Professor
School of Architecture, Planning and Policy Development, ITB

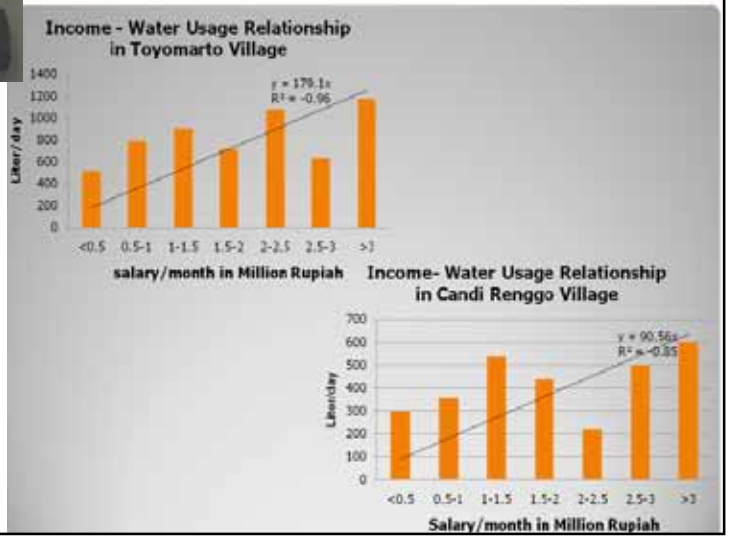
Pro-poor Water Management

Photo 1: An example of the impacts of the sea level rise in Legon Kidoi village, the north coast of Sabang Regency showing several houses (reach up to 50 cm) are inundated (this condition may cause health problem, e.g., malaria and yellow fever).

Constructing a groundwater well by 5 local participants

15

ISMU Rini Dwi Ari (PhD students
at the laboratory of Human Security Engineering, KU)



Hayeong JEONG, GCOE Researcher
Department of Urban Management, KU

Develop a Collective Action Model

$$y^* = X\beta + u + \varepsilon \quad \varepsilon \sim N(0, V)$$
$$u = \rho W u + \delta \quad \delta \sim N(0, \sigma^2 I_N)$$

$$y_i = \begin{cases} y_i^* \text{ when household } i \text{ belongs to the club} & y_i^* > 0 \\ 0 \text{ when household } i \text{ does not belong to the club} & y_i^* \le 0 \end{cases}$$

- u: endogenous variable
- *X*: households attribute
- ρ: degree of dependent on social capital
- *W*: correlation matrix about households network

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General Theory of Human Love

U = α V + x α~(-∞,1)
V = β U + y β~(-∞,1)

U= x + α y /(1 - αβ)
V= y + β y /(1 - αβ)

Estimation Results

	probit model					collective action model				
variables	parameters	standard error	90% Confidence interval		Geweke statistic	parameters	standard error	90% Confidence interval		Geweke statistic
constant	[illegible]	1.359	1.206	5.707	0.215	3.020	1.545	1.212	6.200	1.872
FAM	[illegible]	[illegible]	-0.363	0.218	[illegible]	[illegible]	0.204	-0.415	0.246	[illegible]
GENDER	[illegible]	0.468	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AGE	-0.079	0.021	-0.065	0.005	1.097	-0.011	0.025	-0.009	0.006	[illegible]
EDU	-0.089	0.532	[illegible]	0.794	[illegible]	-0.136	0.579	-1.112	[illegible]	0.222
OCCU	[illegible]	0.633	-1.007	[illegible]	[illegible]	-0.234	[illegible]	-1.062	[illegible]	[illegible]
INCOME	0.252	0.363	-0.228	0.676	1.075	0.228	0.307	-0.284	0.644	0.496
LENGTH	0.024	0.012	0.002	0.046	0.416	0.028	0.014	0.000	0.049	1.948
COST	-0.004	0.001	-0.006	-0.003	0.390	-0.004	0.001	-0.005	-0.002	2.224
σ^2	-	-	-	-	-	0.125	0.027	0.092	0.177	1.226
ρ	-	-	-	-	-	[illegible]	5.466	[illegible]	[illegible]	1.203

Future Perspectives

- 2nd Workshop on water supply management system and social capital
  - March 15-16, 2010 at ITS (Surabaya)
  - More than 30 presentations (planned) from 4 countries
  - http://psa2.kuciv.kyoto-u.ac.jp/joomlaJP/content/view/386/84/lang,ja/

Future Perspectives

- Book publishing
  - Tentative title: "Collective actions, community network, and voluntary provision of infrastructure systems"
    by Kiyoshi Kobayashi (KU) and Ibnu Syabri (ITB)
  - Part 1: Why people collaborate?
    - prisoner dilemma, social capital. assurance game, participatory approach, voluntary provision of public goods
  - Part 2: How the collaboration is legitimated? -participatory approaches-
    - legitimacy, accountability, responsibility, integrity, identity, entitlement, governance
  - Part 3: How they organize? How to finance? (Social Institutions/ Engineering Views)
    - social benefit, ownership and management structure, transaction cost
  - Part 4: Case Studies

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Closing Remarks

Kiyoshi Kobayashi

Kyoto University

Concluding remarks

Kiyoshi KOBAYASHI

- The human security engineering research integrates the technological rationality characterized by universality, logics, and objectivity, and the systems of professional thoughts managing specific, symbolic and active practice.

Anderson-Herr principle

- Output validity
- Process validity
- Democratic validity
- Catalytic validity
- Dialectic validity

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