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Transdisciplinary approach for building societal resilience to disasters

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ACECC
The Asian Civil Engineering Coordinating Council
For a Better Quality of Life

Initiated in Oct 2015
Launched in Aug 2016

Technical Committee 21
Transdisciplinary Approach for Building Societal Resilience to Disasters

Co-chaired by
Kuniyoshi Takeuchi, JSCE, Prof emeritus of UY and
Romeo S. Momo, PICE, USec DPWH
with members from
Japan, Philippines, Vietnam, Indonesia, Nepal,
Pakistan, Korea, USA, …

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ACECC
The Asian Civil Engineering Coordinating Council
For a Better Quality of Life

Since 1998

Established in 1998 to make policy proposals to decision-makers as a federation of civil engineers consisting of people from academia, government, and private sectors.

- Australia (EA)
- Bangladesh (IEB)
- India (IEI)
- Indonesia (HAKI)
- Japan (JSCE)
- Korea (KSCE)
- Mongolia (MACE)
- Nepal (NEA)
- Pakistan (IEP)
- Philippines (PICE)
- Taiwan (CICHE)
- USA (ASCE)
- Vietnam (VIFCEA)

TC21 was established in July 2016 at 7th Civil Engineering Conference in the Asian Region (CECAR)

Co-Chairs Dr. Takeuchi and Usec Momo at the TC21 Kick-off Meeting

TC21 Members from Indonesia, Taiwan, and U.S.A.

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Objectives

- TC21 aims to *promote* the *transdisciplinary approach* for *scientific knowledge based decision-making* for building societal resilience to disasters *at national and local levels*.

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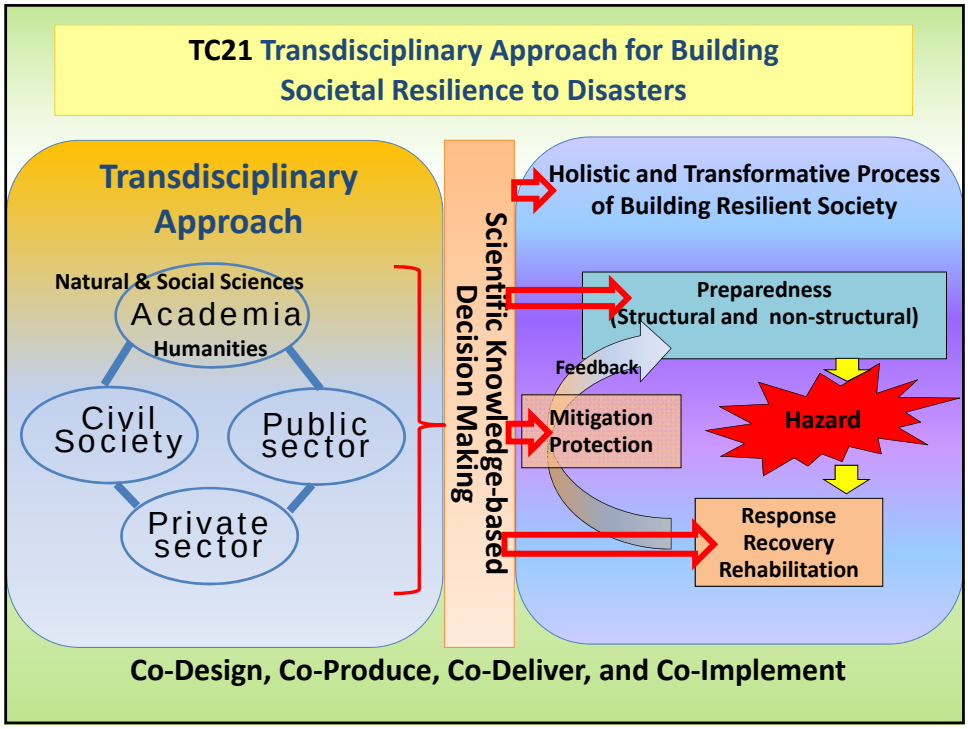

In order to achieve this aim, TC21 will

1. form ACECC transdisciplinary **teams** in all member states,

and together with them,

2. contribute to **national capacity building** to realize TDA for scientific knowledge-based decision making through case studies, comparative analyses, methodological developments, guidelines, workshops, training courses etc.,
3. contribute to establishment of a network of **effective knowledge flow** from where available to where needed,

and through such activities

4. support formation and implementation of **national platform and/or local platforms** with the function of TDA for scientific knowledge based decision making.

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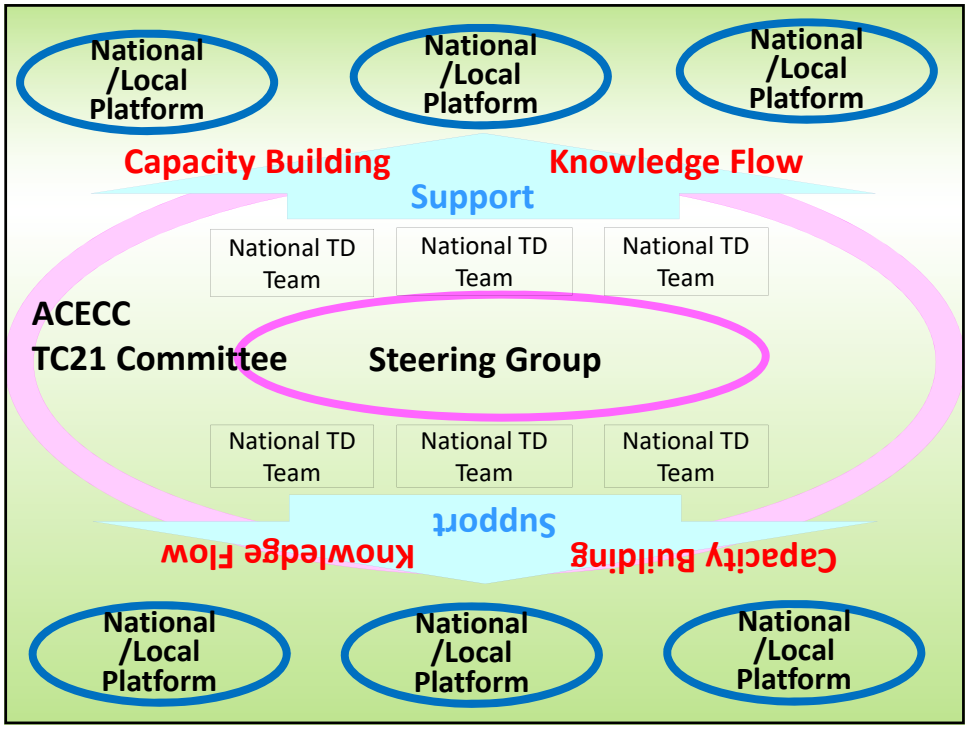

Why do civil engineers and ACECC take such a role?

- Civil vs military
- Transdisciplinary approach is a vocational legacy of civil engineers.
- Professional societies have members from all sectors and offer cooperation.

Why Scientific Decision Making?

- Science and technology advances but disaster losses increase. Why?
  - Scientific knowledge is not used in policy and other decision making at various levels, e.g., public, private, national, local and individual levels.
  - Scientific knowledge in different disciplines and sectors is not enough integrated for practical use especially between natural and social sciences, and between academia and policy making.

Scientific knowledge-based decision making

- **Scientific knowledge-based decision making is a process in which scientific knowledge is systematically used in designing and assessing alternative courses of action and selecting one, considering political, socio-economic, environmental and risk impacts when the plan is implemented.**

- **It is not a DM process where political balance, benefit of certain interest groups or just an idea or intuition of leaders control or prevail the decision.**
- **Scientific knowledge includes indigenous knowledge, wisdom, information and skills in addition to the best available or advanced cutting-edge technologies, that is useful to develop sustainable, resilient and peaceful society.**
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Why transdisciplinary?

Multidisciplinary

Good dish needs various materials and ingredients such as meat, vegetables, spices, drink,

Interdisciplinary

Good cooking needs good materials, cook, pans, cook books,

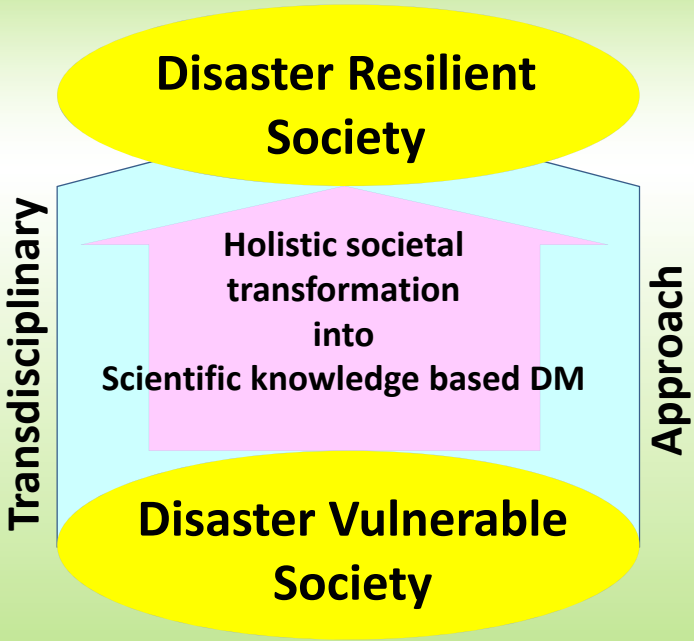
Transdisciplinary

Good dinner party needs meals, waiters, partners, music, talks, interior design,

Co-design, co-produce, co-deliver,

Why transdisciplinary?

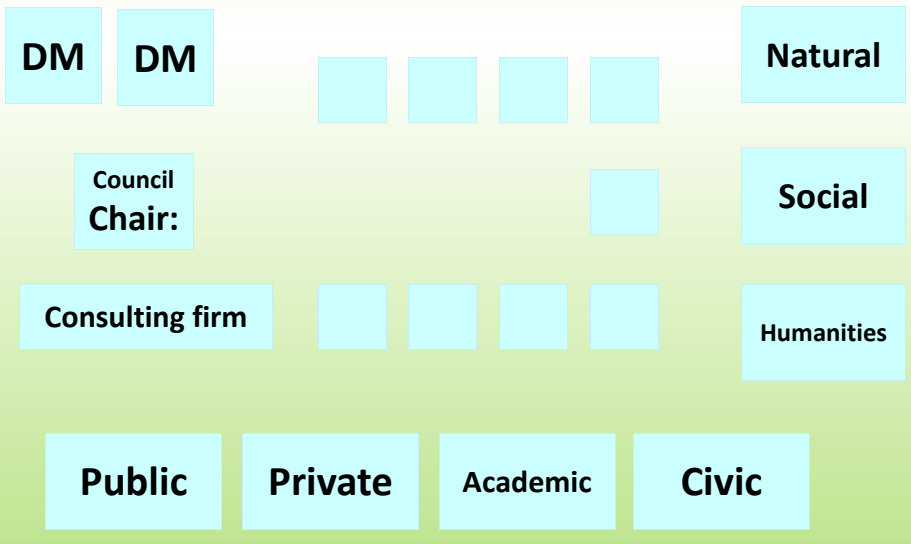
- Gaps between science and practice can only be filled by an integration of disciplinary knowledge and sectoral capacities.
- Real integration is possible only during implementation to achieve a common goal.
- If disciplines of natural and social sciences and humanities, and private, public, academic and civic sectors work together, innovative ideas and means can be created and holistic and transformative changes are made possible.



Transdisciplinary approach

- **An approach to achieve a common societal goal, by all players and stakeholders at all levels of all related disciplines and sectors working together, going beyond the limit of disciplinary knowledge and sectoral capacities by creating innovative means, and making holistic and transformative solutions possible.**

Ex.) Governmental councils



Barriers against scientific knowledge-based decision making

- Over reliance on the S&T level of engineering officers, consulting firms, aid agencies, available professors nearby local/regional universities.
- Lack of attention to root causes and lack of challenges against on-going institutional, financial and political constraints.
- Irrational decision making process based on selfishness, unfairness, corruption, poor judgment etc.

Knowledge Flow

from where available to where needed

Gaps between science and practice

Science here represents science and technology

- Unavailability of necessary knowledge
  - Premature and limited in applicability to practical conditions. (Accuracy/preciseness, uncertainty, coarse resolution, costly etc.)
  - Bits available but not assembled for ready to solve problems.
  - Lack of resources to utilize knowledge (funds, materials, experts etc.)

- Inaccessibility to scientific knowledge
  - Lack of channels and guides to connect right researchers to right users.
  - Lack of incentives for researchers to serve for society.
  - Lack of resources for users to seek for scientific knowledge.

Inaccessibility (continue…)

Experts' side:

- No guidance to whom, to which lab to approach in universities or governmental institutes
- Experts are too busy
  - Little career merits in public service especially for young researchers
- Narrow disciplines open to consultation
  - No entrance to network of holistic approach

Inaccessibility (continue…)

Users' side

- Lack of time and funds
- Lack of imagination and capacity to organize scientific knowledge
- Over reliance on private consulting firms
- Lack of capable private companies to help the holistic problem

- Lack of institutional mechanism to bring scientific knowledge into DM
  - Science advisors in president's office
  - Legal binding to include scientists in an advisory committee for policy making.

Infrastructure of knowledge flow

TC21 Case Studies:
examining recovery processes from TC21 points of view

Ormoc flood 1991, Philippines
Tacloban storm surge 2013, Philippines
Gorka Earthquake 2015, Nepal

Site Survey in the Philippines, Nov 2016

Ormoc City:
Establishment of Flood Mitigation Committee covering central and city government, and barangay, the smallest administrative unit in the Philippines. River maintenance works are done by communities.

Tacloban City
Palo Municipality
Ormoc City

Slit Dam in Ormoc City, Leyte Island, the Philippines

Resettlement Housings, Tacloban, Leyte Island, the Philippines

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Site Survey in Nepal, April 2017

Source: BBC News

Source: http://www.ifrc.org/en/news-and-media/news-stories/asia-pacific/nepal/in-pictures---nepal-earthquake/

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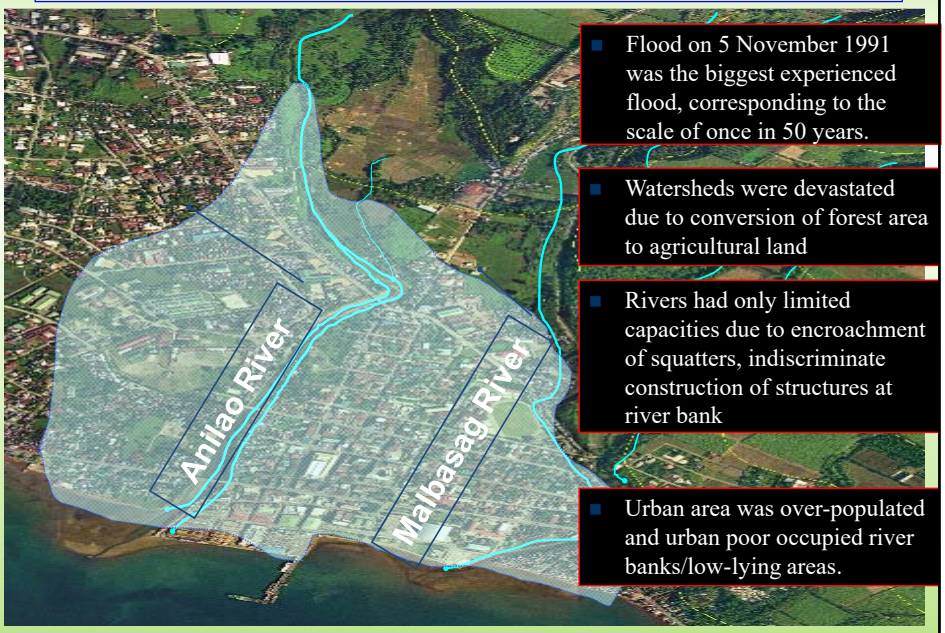
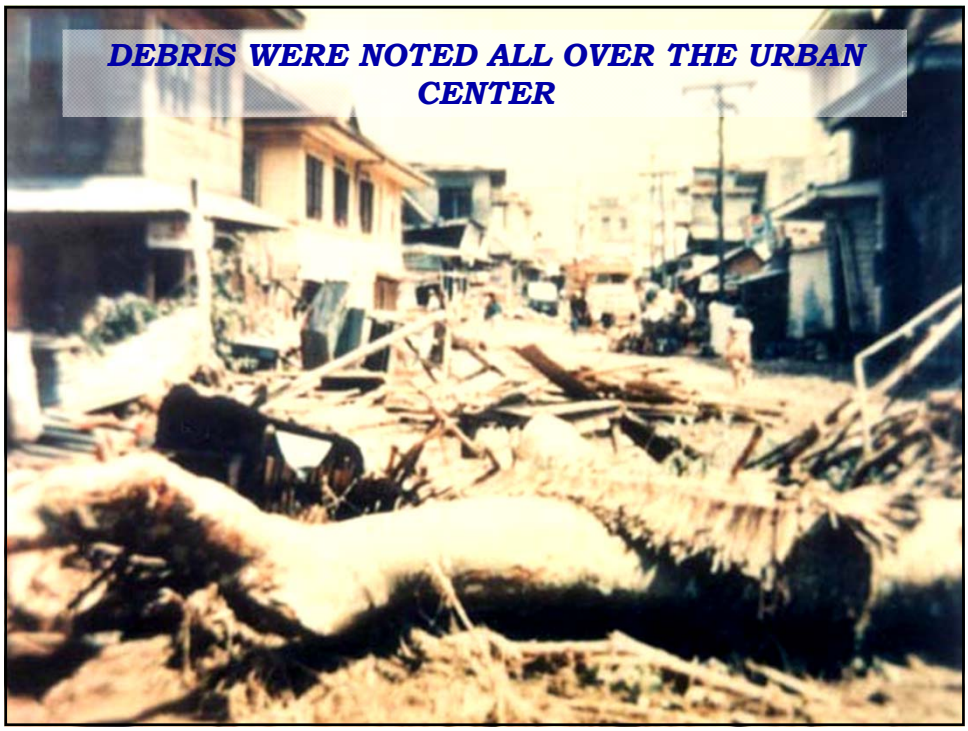
THE ORMOC CITY TRAGEDY



- Flood on 5 November 1991 was the biggest experienced flood, corresponding to the scale of once in 50 years.
- Watersheds were devastated due to conversion of forest area to agricultural land
- Rivers had only limited capacities due to encroachment of squatters, indiscriminate construction of structures at river bank
- Urban area was over-populated and urban poor occupied river banks/low-lying areas.

DEBRIS WERE NOTED ALL OVER THE URBAN CENTER



ILLEGAL STRUC-TURES

Houses above the revetment

Rest house under the bridge

Blocked drainage due to house extension

Poverty & Governance: Illegal housing over rivers

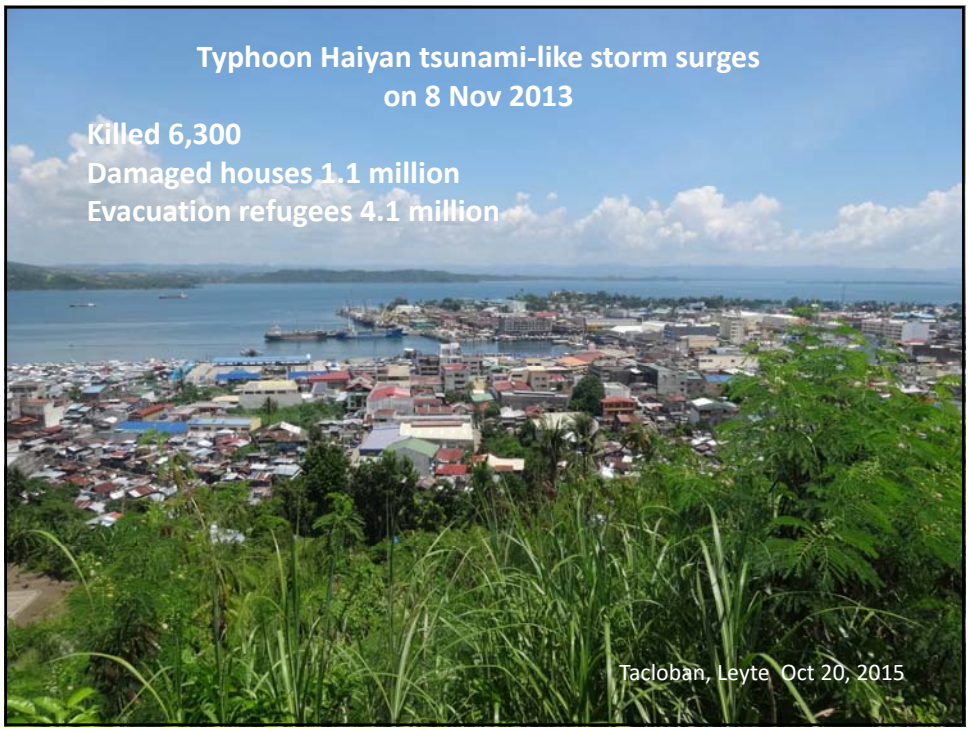
Jakarta, May 2007

Ormoc flood by Typhoon Thelma on 5 November 1991

Installation of Perimeter Fence

Flood by Typhoon Thelma (Uring) 1991.11.5
Dead & missing about 8000

- JICA assistance with slit dams and river improvement.
- Solved informal residents issue by protecting fence along the river dikes.
- Tested by similar Tyhoon Koni in 2003
- Maintenance by transdisciplinary approach involving all stake holders.
- Root causes are not solved



40m no build zone -> rapid recovery
Replacement of about 14,600 houses in the northern Tacloban.

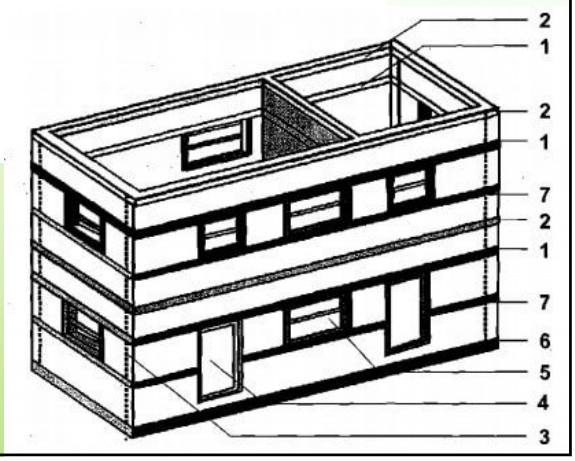
Intensive consensus building process involving 138 barangay chiefs

The Gorkha earthquake, Nepal
11:56 NST April 25, 2015

- Killed nearly 9,000 people
- Injured nearly 22,000
- 7.8Mw and max Mercalli Intensity IX (Violent)
- $10Billion (50% of Nepal GNP)

https://en.wikipedia.org/wiki/April_2015_Nepal_earthquake

Fig.1: Representation of Horizontal Bands
In a Masonry Building, where
1 -Lintel Band,
2- Roof Band,
3- Vertical Reinforcing Band,
4-Door,
5-Window,
6- Plinth Band,
7 – Window Still Band



https://theconstructor.org/construction/horizontal-bands-masonry-buildings-types-location-design-applications/14462/

Nepal's reconstruction

- Dept. of Urban Development and Building Construction (DUDBC)
- National Reconstruction Authority (NRA)
- A sill and lintel band method
- 300k Rupee Grants Subsidy
- With agreement 50k, print 150k, roof (band) 100k & final (50k?)
- Training of 306 inspection engineers

Dr. Youb Raj Paudyal, DUDBC, Chautara, Nepal, 23 April 2017

Preliminary Conclusions

Scientific methodology is OK but not governance

- Unclear on the decision making process on selection of methodology of S&T
- Unclear who involved in decision making and process of scientific assessment -> no RIA
- Unclear how sectoral integration was made in policy making

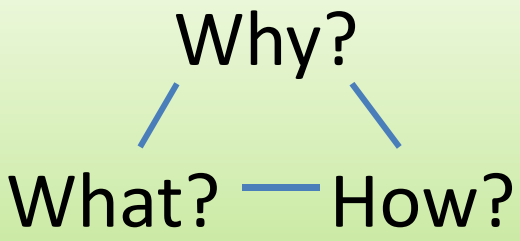
Top-down approach by responsible agency

Very limited transdisciplinary approach

Lack of transdisciplinary approach

results in

- Lack of Transparency: potential corruption
- Lack of Sinergy: lack of jump and efficiency



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Port-au-Prince, Haiti, 2010.

Corruption kills

On the anniversary of Haiti's devastating quake, **Nicholas Ambraseys** and **Roger Bilham** calculate that 83% of all deaths from building collapse in earthquakes over the past 30 years occurred in countries that are anomalously corrupt.

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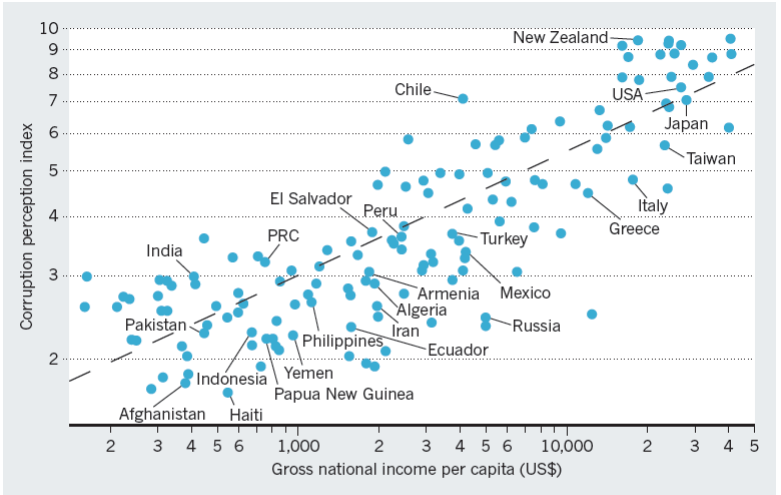

Figure 2 | Cash and corruption. The poorest countries are the most corrupt, but some are more corrupt than others. A weighted regression line (dashed) divides nations that are perceived as more corrupt (below the line) than might be expected from the average income per capita from those that are less corrupt (above the line). Named countries have lost citizens in building collapse caused by earthquakes since 1980.

Since 1995, Transparency International (TI) publishes the **Corruption Perceptions Index** (**CPI**) annually ranking countries "by their perceived levels of corruption, as determined by expert (Banks, consulting firms, NGOs etc.) assessments and opinion surveys." The CPI generally defines corruption as "the misuse of public power for private benefit."

居安思危 Be aware of risk while we are safe

思則有備 Awareness leads us preparedness

有備無患 Preparedness leaves us no regret

「春秋」左氏伝
Source: Zuo Qiuming "Zuoshi Commentary" in Confucius ed."Spring and Autumn" 480BC

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