

ENGINEERING FOR SOCIAL CHANGE

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INTEGRATING FACTORS TOWARDS NATIONAL DEVELOPMENT

INVITATION: Dynamics among engineering, humanities and social science – three disciplines important in shaping society

But we also need to include leadership and management, both public and private. Otherwise the studies of the three disciplines may remain unimplemented.

And also technicians, because when the LRT breaks down, it is not scientists and engineers who fix them.

TWO ENGINEERING CHALLENGES

- **I would like to use two technological challenges, which would really make a big difference for Philippine society:**
 - **MASS TRANSPORTATIONS SYSTEMS FOR PHILIPPINE CITIES**
 - **MANAGING WATER: FLOODS, SEA RISE**
 - **While these are dominantly engineering challenges, they also need the social sciences and humanities, as well as leadership, business and a culture that values technicians.**

DREAM FOR METRO MANILA AN EFFICIENT MASS TRANSIT SYSTEM

- **LRT – 1 Monumento to Baclaran**
- **LRT –2 Marikina to Recto**
- **MRT – 3 Along EDSA**
- **MRT – 7 In construction Quezon Mem Circle to San Jose del Monte**
- **In Planning**
 - **LRT-4 Ortigas-Taytay**
 - **LRT -6 Bacoor- Dasmariñas**
- **METRO MANILA SUBWAY – several scientists have very serious reservations about this project.**

WHAT DO WE NEED TO FIX?

- **1. What can we learn from the Dalian Railcars disaster**
 - 48 Railcars procured in 2016 at cost of P3.77 billion
 - Delivered in 2017, but cannot be used, do not meet specs
 - Japanese technical review: return for repair
 - Decision-makers are unable to decide
- **2. Lack of technical expertise at the decision-making level and/or lack of thorough checks before accepting the railcars for delivery**
- **3. Perhaps our psychologists might study why the decision-makers cannot decide, given the clear technical recommendations.**

LEADERSHIP COMPETENCE

- **China in a few years has built the world's largest High Speed Rail (HSR) network: 9,357 km with another 14,160 km in construction.**
- **It is perhaps no accident that the present leader Xi Jinping is a chemical engineer from Tsinghua (but also with a PhD in Law from Tsinghua). Previous leader Hu Jintao is a Hydroelectric engineer from Tsinghua.**
- **80% of China's leaders over the past years were in science and engineering.**
- **A thought: Should DOST ERDT consider providing courses for engineers to prepare them for leadership. Should engineers consider taking up Law? Or DOST ERDT provide lectures/courses to officials in DOTC, to members of Congress with oversight over transportation on needed technology?**

Ateneo Science & Society course: We never went through the Industrial Revolution.

We can manufacture jeepney bodies and repair them. But we import engines.



So with tricycle cabs. But we import the motorcycles.



WE DON'T HAVE THE NEEDED TECHNICIANS (MAYBE BECAUSE WE DO NOT VALUE THEM)

We cannot maintain and repair our trains.



Our ability to repair and maintain buses is limited



EXAMPLE OF TECHNICIAN CONTRIBUTION TO NATIONAL DEVELOPMENT IN CHINA

- **Zhou Qunfei worked as a factory girl at a glass company. She realized that she could create a business manufacturing touch-sensitive glass. This does not require new science or technology. But it requires extremely high precision and very rigorous quality control.**
- **So she founded Hunan-based LENS TECHNOLOGY in 2003.**
- **Lens Technology primarily makes touch-sensitive glass covers for mobile phones, computers and cameras. It supplies Apple, Samsung and other technological giants. According to the South China Morning Post, its covers are used in nearly 21 percent of the world's smartphones.**
- **Now 45, she owns an 89 percent stake in the firm, which had more than 80,000 employees and revenue of \$3.3 billion in 2013, according to Bloomberg.**
- **She is now China's richest woman with a fortune surpassing \$8 billion.**

QUESTIONS FOR SOCIAL SCIENTISTS

I also tell my class that the exception to incompetence in transportation is Air Transport. We don't have problems like the Dalian Railcars in our airline industry.

- Aircraft engineers and technicians are very competent.**
- Is the reason that our middle/ upper class decision makers ride airplanes, but not the LRT?**
- Also, how do we overcome the Filipino's low esteem of working with our hands, low regard of the technicians needed for technological progress?**

KEY POINTS FOR ERDT TO CONTRIBUTE TO SOCIAL CHANGE

- 1. NEED TO ADDRESS TECHNOLOGICAL COMPETENCE AT THE TOP DECISION MAKING LEVELS
- 2. NEED FOR SPECIFIC ENGINEERING EXPERTISE
 - Just as we have specific training programs for Aircraft engineers, we should have similar programs for LRT engineers
- 3. NEED FOR TECHNICIANS
 - LRT technicians
 - Technicians for elevators, escalators etc.

A CHALLENGE TO LONG-TERM PLANNING WATER CONTROL

- I have been working for many years with Gawad Kalinga communities in several towns of Nueva Ecija, notably Gabaldon and Cabiao.**
- Every few years they experience severe floods coming from the Sierra Madre mountains, destroying rice and vegetable crops and claiming lives– floods start in Gabaldon, go down to Cabanatuan, Cabiao and end up in Hagonoy into the sea.**
- Here are slides from my Science and Society Class on the topic: Making Climate Change Real.**

DENUDDATION OF FOREST IN THE SIERRA MADRE 1960-70

- **In the 1960's- 70's, many activists and NGOs fought to stop illegal loggers in the Sierra Madre**
- **Bordering Aurora and Nueva Ecija**
- **They failed and the mountains there are totally denuded**

4 TYPHOONS IN DEC 2004

- **In December 2004 a succession of four typhoons:**
 - **UNDING, VIOLETA, WINNIE AND THE STRONGEST, YOYONG hit Eastern Luzon**
- **There was a devastating landslide in Gabaldon, Nueva Ecija, which is at the foot of the Sierra Madre**
- **It swept away many homes along the mountain side**

LOGS CAME DOWN THE MOUNTAIN DESTROYING MANY HOMES



A photograph of a man sitting on a concrete ledge next to a large pile of driftwood. He is looking out over a river with a bridge in the background. The scene is outdoors, with mountains visible in the distance.

A COMMITMENT TO HOPE

ATENEO DE MANILA UNIVERSITY
PRESIDENT'S REPORT ON ADDRESSING POVERTY
2004-2005

Typhoon Yoyong 2004







In October 2015,
Typhoon LANDO brought
rains over the Sierra
Madre

Huge Rocks & Trees strewn about by landslide from Sierra Madre mountains



Reduced to a Wasteland



People watch & wait helplessly



CHANNELING FLOODWATERS

- **This is just one example of the challenges we face from floods that come every year in our country.**
- **This demands: planting trees, dredging rivers, building floodways to channel the water etc.**
- **Addressing the challenge will require long-term thinking – overcoming our tendency not to think beyond the next election.**

Climate change impacts and responses in the Philippines coastal sector

Rosa T. Perez^{1,*}, Leoncio A. Amadore¹, Renato B. Feir

- **ABSTRACT: The Manila Bay coastal area was evaluated for the possible consequences of accelerated sea level rise and to assess adaptive responses to such threats.**
- **Results show that areas along the coast if inundated by a 1 m sea level rise would include coastal barangays from 19 municipalities of Metro Manila, Bulacan, and Cavite and would cover an area of 5555 ha.**

ADDRESSING SEA RISE

- **Proposed response strategies:**
 - **building sea walls;**
 - **institutional actions such as formulation of setback policies and construction regulations;**
 - **an integrated coastal zone management, with the involvement of communities in the area.**

PREPARING FOR THE FUTURE

- **This challenge will clearly involve humanities, social science, science and engineering – as it will demand adjustments from communities and new engineering and technical expertise.**
- **In a UNESCO meeting some years ago I attended a presentation by Dutch experts on water control and coping with the sea. They are the world experts on coping with the sea.**
- **They said they were invited once to help develop expertise in the Philippines, but there was no follow up.**
- **Maybe we should follow up before it is too late.**