



U.S. DOT Region 3 University Transportation Center

Imagine the Future: Exercises on Conceptualizing Infrastructure Systems for an Interconnected World

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16. Abstract This educational project executed Imagine the Future exercises with more than 100 students and young professionals at the ASCE Region 2 Assembly held on the George Mason University Fairfax campus on November 17, 2018. These exercises aimed to educate the next generation and to have them critically consider the future of our nation's infrastructure systems. With limited assistance from Professor Miller-Hooks, PhD students designed and orchestrated the PowerPoint presentation along with the exercises.			
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CHAPTER 1

Introduction

Background

In October 2017, Professor Miller-Hooks held a symposium that she conceptualized and designed, called "Imagine the Future: Conceptualizing Infrastructure Systems for an Interconnected World" (civil.gmu.edu/imagine). This symposium hypothesized that infrastructure systems, including roadways, clean and wastewater pipelines, power networks, natural gas networks and more, are no longer detached systems that can be designed and operated in isolation. They are interdependent and together form the fabric of society. Along with other elements of our built environment, they provide basic sustenance, protection, support for societal functioning, goods and services. Ensuring a vibrant societal future requires that these systems be resilient, sustainable, and secure and can offer services that improve our well-being. Technological advancements have created a socio-technological web of infrastructure interwoven with the people who use, interact with, and live within it. These advancements have empowered people through the provision of information. They enable collaboration. Thus these systems, if conceived smartly, can offer more than merely serving our basic needs. They can be reinvented to support and encourage new mechanisms of operation, ownership, service types and their provision, and have the flexibility to allow for the creation of services we might not have anticipated. Symposium attendees were, thus, tasked with imagining a new future and reinventing how we conceptualize, design, operate, and control these systems to take advantage of our newly connected world.

In this educational project, Professor Miller-Hooks and her graduate students executed Imagine the Future exercises with more than 100 students and young professionals at the ASCE Region 2 Assembly held on the George Mason University Fairfax campus on November 17, 2018. Region 2 includes: Washington, DC, and parts of Northern Virginia, Maryland, Delaware, and Pennsylvania.

Objectives

The objectives of these exercises were to educate the next generation and to have the students and young professionals critically consider the future of our nation's infrastructure systems. Additionally, with limited assistance from Professor Miller-Hooks, her team of seven graduate students designed and orchestrated the exercises.

CHAPTER 2

Methodology

Preparing for the Event

With limited assistance from Professor Miller-Hooks, her team of seven graduate students (Hossein Fotouhi, David Prentiss, Bahar Shahverdi, Yutong Liu, Weiwen Zhou, Sohrab Mamdoohi and Wenjie Li) designed and orchestrated the PowerPoint presentation along with the exercises. With only an introduction and conclusion from Professor Miller-Hooks, and a small bit of advice during and between activities, these seven students ran the event.

Tasks

The following tasks were proposed and carried out.

Task 1. Two or three short lectures (on the order of 10 minutes each) will be designed and PowerPoint slides will be created. These lectures will support 2-3 group activities around the following potential topics: (1) cognitive infrastructures, (2) multipurpose infrastructure, (3) space-age and underground construction, and (4) lifecycle and green building.

Task 2. Prepare materials and design activities so as to facilitate an event with over 100 people.

Task 3. Hold the event (November 17, 2018), making presentations, administering activities, and taking notes on outcomes.

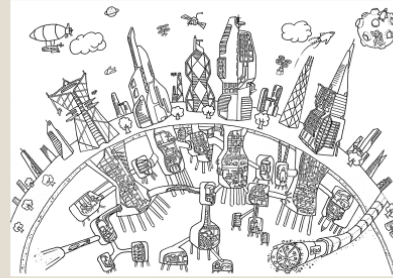
Task 4. Complete a short (on the order of one page) writeup on developments created from the activities.

Presentation Materials

To meet the objectives of this effort and carry out the tasks of the project, the following slides and associated activities included in the slides were presented and run. The images of the slides do not reflect the animation that was included on many of the slides.

2018 IMAGINE THE FUTURE: EXERCISES IN CONCEPTUALIZING INFRASTRUCTURE SYSTEMS FOR AN INTERCONNECTED WORLD

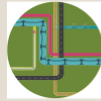
ASCE REGION 2 ASSEMBLY/CIAMTIS-UTC-USDOT
LED BY: PROF. ELISE MILLER-HOOKS



For Imagine 2017
copyright Prof. T.Bock, W.Pan 2017

IMAGINING IMAGINE...

- Infrastructure systems are no longer detached stand-alone systems → interdependent
 - together form the fabric of society
- With other elements of our built environment, these systems provide:
 - Basic sustenance, protection
 - Support for societal functions, goods and services
- Ensuring a vibrant societal future requires that these systems be:
 - Resilient, Efficient, Sustainable, Secure (RESS)
- Offer services to improve our well-being



Robotic World
copyright Prof. T.Bock, W.Pan

RECONCEIVING AND REINVENTING

- Recent technological advancements
 - Infrastructure interwoven with the people who use and interact with it and live within
 - People empowered through provision of information
 - If conceived smartly, these systems can be reinvented to support and encourage:
 - new mechanisms of operations, ownership, service types
 - more than just about sustenance
 - Allow for creation of services we might not have anticipated



OUR JOURNEY ...

- **Multipurpose Infrastructure**
 - Hossein Fotouhi, Sohrab Mamdoohi
- **The Next Frontier**
 - David Prentiss, Wenjie Li

Interactive games

- Bahar Shahverdi, Weiwen Zhou, Yutong Liu
 - designed to help us be **innovative**
 - crush** that box (what box?)
 - create a **shared** vision

... A JOURNEY

Let's reinvent (mini-version) how we:

- Conceptualize
 - Design
 - Operate
 - Control
- the built environment to take advantage of our newly connected world



Our charge: think big, think small, think upside down...
think together

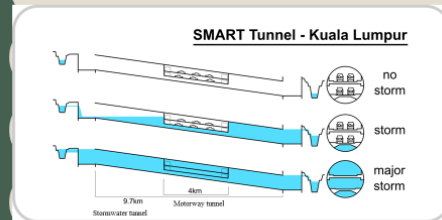
MULTIPURPOSE INFRASTRUCTURE

- Hossein Fotouhi and Sohrab Mamdoohi
 - Introduction to concept

MULTIPURPOSE INFRASTRUCTURE



1. KUALA LUMPUR SMART TUNNEL



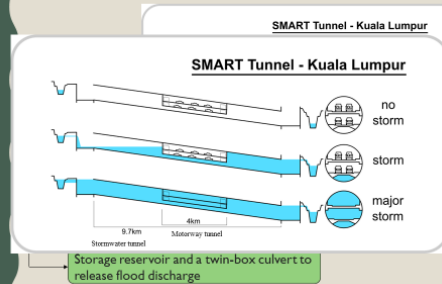
- World is getting more congested



- Life is more demanding



1. KUALA LUMPUR SMART TUNNEL



Say No To
Single Use
Infrastructure!



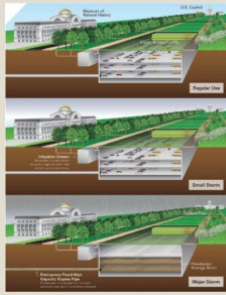
2. A GREENER NATIONAL MALL



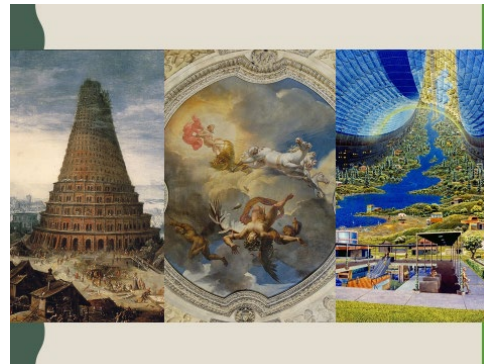
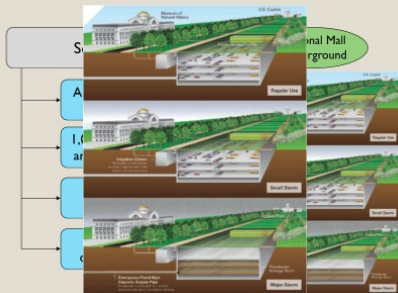
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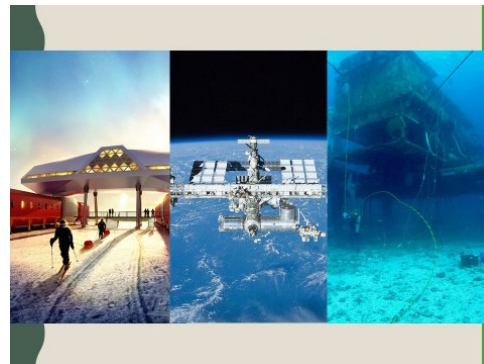


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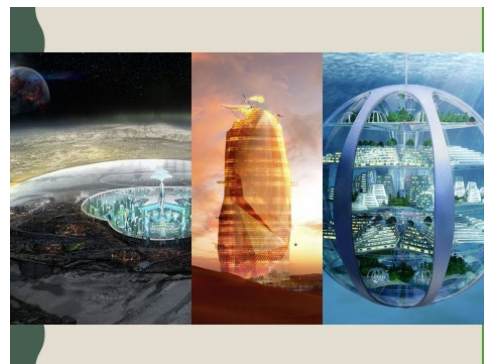
MULTIPURPOSE INFRASTRUCTURE ACTIVITY

- Bahar ShahVerdi and Weiwen Zhou
 - Form groups of 10-12 people
 - Index cards with 2 infrastructures
 - Each group picks a judge who stands aside, comments if (s)he wishes
 - In pairs (or 3s), develop multipurpose infrastructure concept with these 2 infrastructures
 - Judge for group chooses favorite
 - Group discusses and draws idea on one piece of paper - can include up to 10 words explanation
 - Pictures taken and uploaded for presentation to room



THE NEXT FRONTIER

- Where will we build next?
 - Underground?
 - Under the seas?
 - In outer space?



THE NEXT FRONTIER ACTIVITY

- Wenjie Li and Yutong Liu
 - Move to the center of the room.
 - Listen for your group assignment (1, 2, or 3).
 - Consider where we should build a future megacity.
 - Move to the side of the room you chose when your group is called.
 - Entice others to join you!

VISUALIZING OUR THOUGHTS



VISUALIZING IMAGINE 2017

Hackathon outcome

- Hackathon's help companies and venture capitalists locate new areas for innovation and investment.
- We took the **Hack Day** concept to **infrastructure and the built environment**
- Rashin Kheiriyeh helped us visualize our final outcome



THANK YOU

CHAPTER 3

Findings

Observations

Allowing the graduate students to design and run the event gave them opportunities for real-world experience in education and leadership. Moreover, they experienced speaking to a large audience on a microphone from a podium, and learned what does and does not work in an active learning environment.

Participants to the event tended to stay in the groups they arrived with. Future activities could aim to break up the groups to allow greater interaction across participants from different universities and parts of the region.

Anticipated Outcomes and Significance

This event encouraged participants to think about the future of our infrastructure systems, to think big and to think beyond the familiar. This exercise contributed to the ASCE Region 2 Assembly, whose focus is leadership and professional development through presentations and activities.

CHAPTER 4

Recommendations

This activity demonstrated the value of allowing students to run student activities, of course with assistance from more experienced faculty.

References

Miller-Hooks, E. “Imagine the Future: Conceptualizing Infrastructure Systems for an Interconnected World,” civil.gmu.edu/imagine (2017).