

Developing Community Resilience

- Post COVID-19 -

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Engineering in the context of COVID-19

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Basic Question

“Post COVID-19, What will change?”

Nature of COVID-19

- COVID-19 was a Black Swan event
- Previously unknown virus - *medically*
- No vaccine **yet** available for cure
- Transmission due to closeness of individuals
- Impacted globally
- *Social distancing “most effective” as prevention*

Health and safety of community became the predominant concern

Impacted the entire society in all aspects, destroying economies

What did COVID-19 change?

Countries lacked resiliency to deal with such an event

1. Countries or parts of countries locked-down for containment.
2. Societies impacted - **economically, socially and technically.**

A. Engineering systems (Direct impact)

- ❖ Physical facilities, e.g. **places of assembly, manufacturing plants, public buildings, private office buildings, sports facilities,**
- ❖ Transportation systems – **air, surface, limited water systems ,**

B. Engineering systems (Indirect impact)

- ❖ Power systems- **electricity, gas.**
- ❖ Water and Wastewater systems – **collection and distribution, water contamination issues.**
- ❖ Special use facilities- **nursing homes, elder-care facilities, schools, higher education facilities.**

What will change - *post COVID-19?*

Resiliency - *The ability to prepare and plan for, absorb, recover from or more successfully adapt to actual or potential adverse events*

1. Response & Recovery is based on:

- Context:

Geographical, societal, economic status, cultural, religious, political structure.

- Available Community Capacity :

Needed tools and equipment, available infrastructure for delivery, product innovation, flexibility in manufacture.

2. Impact for future - *engineering focus*

- Immediate (near-term)

- Long-term

Impact for Future

Resiliency Components:

---- *ability to prepare and plan for* --- Failed

----- *absorb* --- Only partially successful

----- *recover from or more successfully adopt to actual events* ---- Long and painful recovery, adoption very challenged

■ Immediate (near-term)

a. Operational Changes

- Public Transportation systems
- Limited use of Public assembly places
- Supply chain problems
- Delivery of services- remotely, electronically

Short –term disruptions

Impact for Future

■ Long-term

- Many services will be provided remotely because this *method has proved to be more efficient*
- Character of supply chain will change **from global to national/local**
- Work environment – *working from home*
- Medical services- **telemedicine**
- Less demand on physical space – **including, retail centers, entertainment centers or other places of assembly.**
- Tremendous demand for **on-line trade for basic necessities,**
- Character of major cities will change- **fewer services needed,**
- More people migration to suburbs – **more demand on services,**
- Tremendous demand on electronic tools, demand on social media – **more connectivity to remote areas will be needed,**
- **Investment** for buildings, and infrastructure will undergo change.

Only some changes will be permanent

Impact for Future

Engineering Education

Viewed through the Lens of UN Sustainable Development Goals-

1. Content
2. Delivery

1. Content

- a. Less emphasis on *traditional individual disciplines*,
- b. Focus on Bio-engineering and connection *to medical disciplines*,
- c. *More focus on Robotics, Artificial intelligence, Machine learning*,
- d. Changes in *Information Technology discipline*,
- e. Trans-disciplinary approach – *societal problem focused*,
- f. Inclusion of other *pure and social sciences* in curriculum,
- g. Preparing students culturally to *work in Global environment*.

2. Delivery

- a. More focus on *distance-learning*,
- b. Remote teaching – *less classroom attendance*,
- c. Global student body – *more on line courses*,

Impact for Future

Construction

- Lesser direct physical contact,
- More remote controlled tools and equipment,
- New sensors for inspection and quality control,
- Larger use of prefabricated products from controlled environment,
- Use of new composite materials.

Professional Practice

- Convergence approach to problem resolution,
- Comprehensive advice to clients, *particularly public agencies,*
- Remote work environment,
- **Electronic transmission** of documents between agents,
- Changes to specifications *in many ways,*
- *Development of new technologies and better connection to academia and research institutions.*

How to develop Resilience in societies for *such events?*

UN Sustainable Development Goal -11

Goal 11



Make Cities and human settlements inclusive, safe, resilient and sustainable by *Resource Utilization, considering Long-term Costs, & creating a Circular Economy*

Pre-Requisites



Impact for Future

Basic Question

“Post COVID-19, What will change?”

Make Cities and human settlements inclusive, safe, resilient and sustainable.

Fundamental approach to develop Resilience for *Black Swan like* events

- Remote controlled systems, tools, and equipment,
- Remote and global engineering education,
- Use of AI, Robotics, and Machine learning,
- Big data analysis, transdisciplinary methods, convergence approach to solve large societal problems.

Only 50% of the Global population can access internet resources

T H A N K Y O U