Risk-informed Governance and Innovative Technology for Disaster Risk Reduction and Resilience

Module 3.2: Technology Gaps and Challenges to Implementation of Innovative Technologies for DRR and Resilience

DESA

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Contents

1. Bridging the Digital Divide
2. Institutional Inefficiencies
3. Implementation Dependencies
4. Operational Risks

Learning Outcomes

At the conclusion of this Session, Participants will be able to:

- Understanding the primary barriers to access, adoption, and utilization of emerging technologies, including the strength of public institutions, institutional knowledge and brain-drain, political challenges and policy restrictions, dependencies, public investment problems, donor rigidity, infrastructure dependencies, and more
- Become aware of some of the more significant risks associated with emerging technologies use, including privacy, safety, security, and ethics.
- Better appreciate the requirements for maintaining adopted technologies, including financial costs, staff training, and cascading dependencies.

United Nations | Department of Economic and Social Affairs

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Challenges

1. Bridging the Digital Divide
2. Institutional Inefficiencies
3. Implementation Dependencies
4. Operational Risks

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The Digital Divide

"The development and evolution of new technologies may widen the digital divide between cities. Digital divides arise from broad socioeconomic inequalities, and at the root of both are economic and social disparities between countries, groups and individuals that impact their ability to access and use ICT.1."

- UN E-Government Survey, 2020

- **The Digital Divide**

Gaps between:
- Regions
- Countries
- Urban and Rural Areas
- Educated and Uneducated
- Skilled and Unskilled
- Young and Old
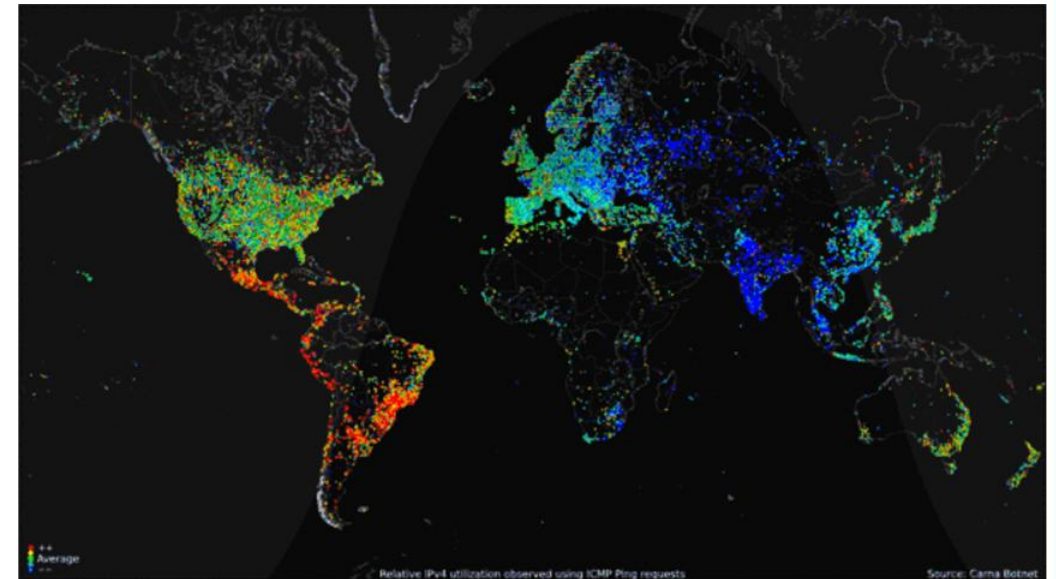- Rich and Poor
- Privileged and Unprivileged

Image: Map of internet use across a 24-hour period as measured by the 2012 Internet Census.

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The first step in bridging digital divides is addressing inequalities

Many cities in low-income countries have:

- limited resources,

- weak ICT infrastructure and

- insufficient skills capacity and are unable to take full advantage of emerging technologies
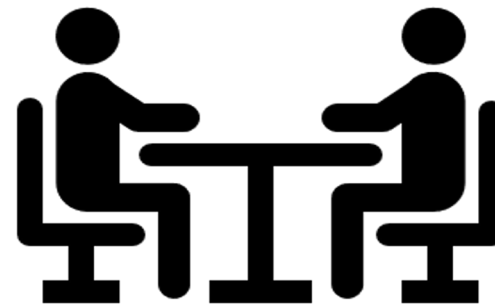
Bridging the Digital Divide

"To bridge the digital divide, Governments can make Internet access more affordable, provide multiple channels to access services, and deliver user-friendly online content.

- UN E-Government Survey, 2020

"We live in a time of stunning technological wizardry, but unfortunately, not all of us benefit from it. Many have already been left behind and risk falling even further behind due to the political, economic, and social consequences of rapidly expanding inequality. Tremendous technological leaps are being made, but the economic and social benefits remain geographically concentrated, primarily in developed countries."

- Utoikamanu, Fekitamoeloa. 2018

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Group Work and Activities

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Activity 1: Bridging the Digital Divide

- Many developing countries have limited resources, weak ICT infrastructure and insufficient skills capacity contributing to digital divide
- **For this activity, the Facilitator** can group students into teams of 3 or 4 Participants each to help address these questions:
    - What are they key factors in your country that could help to bridge the digital divide?
    - What is needed at the national and local levels to help bridge this gap?

Case Study: Recipient Capacity Affects Technology Impact

- **Problem**: An appropriate public response is guided by a storm's behavior of a storm (location and intensity).
- **Need:** Accurate storm predictions.
- **Obstacle**: The media and public lack the capacity to communicate and/or understand warning storm predictions.
- **Solution**: Improved training for the media who are tasked with communicating warning messages, and public training to better understand and respond to prediction data.
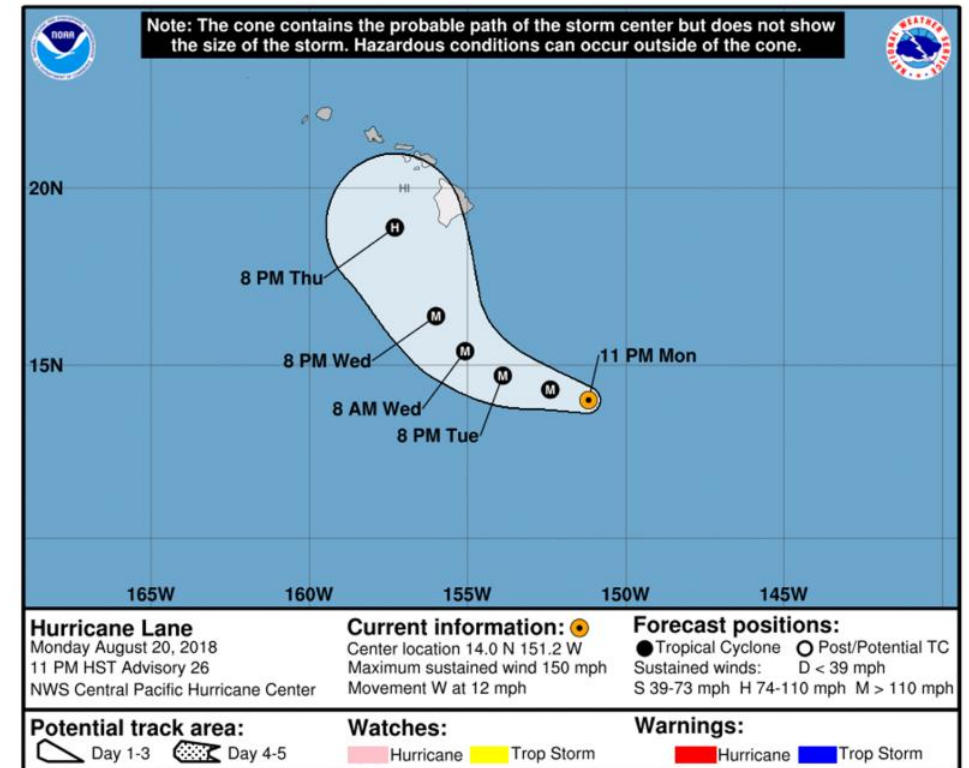

Image: US National Weather Service Prediction of Storm Track and Intensity. Source: NOAA, 2018.

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- **Sources of the Divide**

  - Education
  - Skills
  - Access to platforms / interfaces
    - Hardware
    - Mobile cellular
    - Mobile broadband
  - Strategies, plans, and policies need to approach implementation, and the divide, holistically
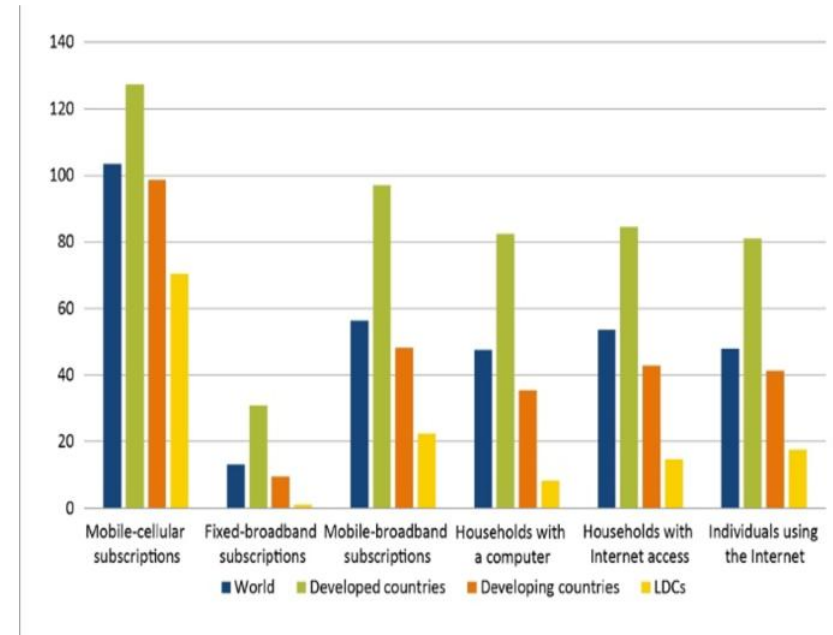

Image Source: Saez, Catherine. 2018.

United Nations | Department of Economic and Social Affairs

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- ## Case Study: Digital Moonshot Initiative

- **Problem**: African countries are unable to fully exploit development opportunities associated with STI.
- **Need:** Increased capacity to operate in a digital economy.
- **Obstacle**: Complex roots of lagging digital implementation progress.
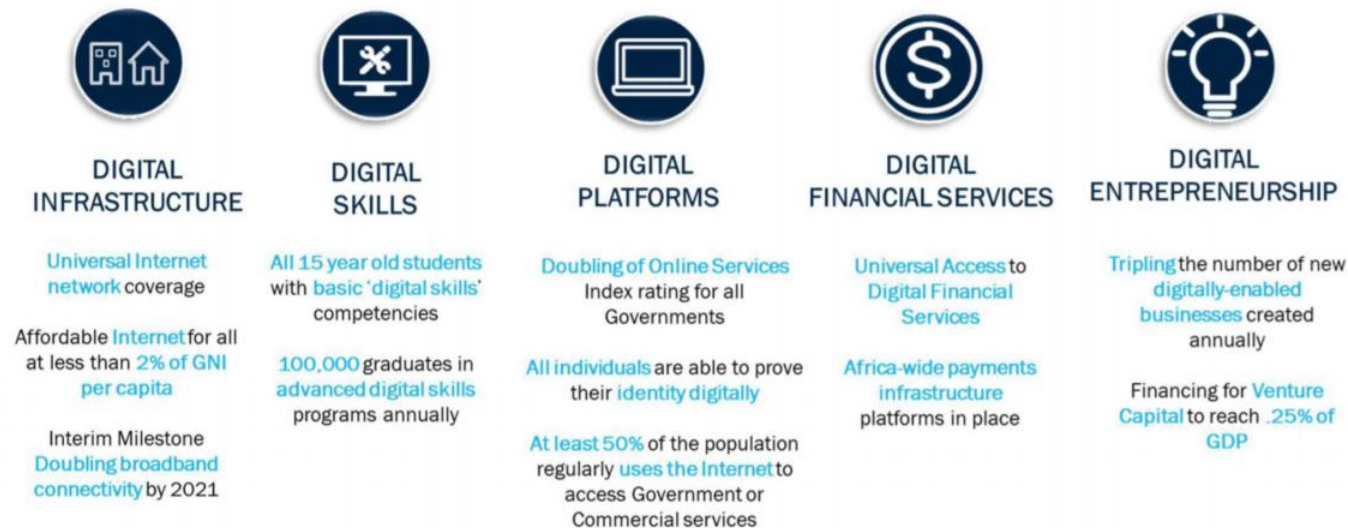- **Solution**: Multi-faceted technology implementation strategy.

DIGITAL INFRASTRUCTURE	DIGITAL SKILLS	DIGITAL PLATFORMS	DIGITAL FINANCIAL SERVICES	DIGITAL ENTREPRENEURSHIP
Universal Internet network coverage	All 15 year old students with basic 'digital skills' competencies	Doubling of Online Services Index rating for all Governments	Universal Access to Digital Financial Services	Tripling the number of new digitally-enabled businesses created annually
Affordable Internet for all at less than 2% of GNI per capita	100,000 graduates in advanced digital skills programs annually	All individuals are able to prove their identity digitally	Africa-wide payments infrastructure platforms in place	Financing for Venture Capital to reach .25% of GDP
Interim Milestone Doubling broadband connectivity by 2021		At least 50% of the population regularly uses the Internet to access Government or Commercial services		

...age: African Union Digital Moonshot ...jectives. Source: Marc Lixi, 2019. ...p://bit.ly/3bKj13B.

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- **Case Study: DRR and S&T in Asia**

- **Problem**: Asian countries facing ongoing leading global disaster risk despite STI implementation gains.
- **Need:** Increased capacity to address disaster risk through regional cooperation.
- **Obstacle**: Complex roots of lagging digital implementation progress.
- **Solution**: Multi-stakeholder, regional policy-focused strategy development process.

Science & Technology into Action

Disaster Risk Reduction Perspectives from Asia

2018

Image: Cover of the Conference Report. Source: UNDRR, 2018. http://bit.ly/2EjZCqV.

- ## Case Study: Infrastructure Investment in Solomon Islands

  - **Problem**: Emerging technologies have many infrastructure dependencies, and therefore cannot be implemented where the requisite infrastructure is in place.
  - **Need:** Infrastructure construction and/or modernization.
  - **Obstacle**: Insufficient public and/or private investment capital.
  - **Solution**: Investment in infrastructure modernization with the support of a development partner.

Images: The Solomon Islands Domestic Network cable laying process. Source: Australian Aid, 2019.

Case Study: China Brain Drain Reversal

- **Problem**: Lagging progress in emerging technology research and development contributes to the digital divide.
- **Need:** Highly-skilled staff.
- **Obstacle**: Lack of jobs to utilize specialized skills or competitive salaries.
- **Solution**: Coordinated public/private program that entices educated and skilled workers to return home with appropriate jobs and salaries.
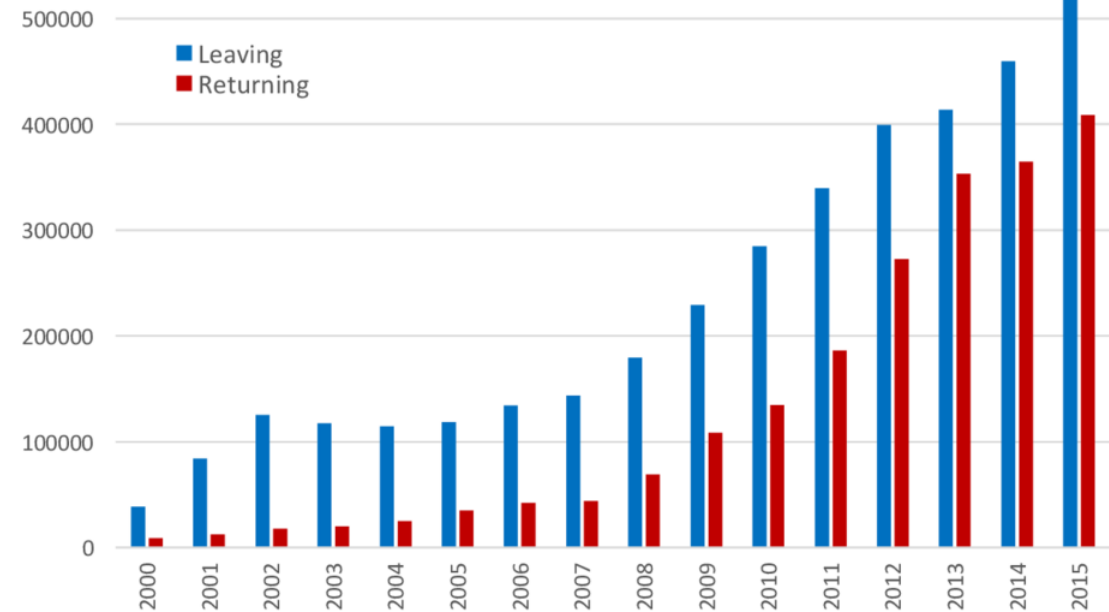

Image: Rapidly-decreasing rates of 'brain drain' resulting in part from a coordinated effort to entice students studying in overseas universities to return home to work. Source: Nguyen, Dinh Loc, 2018. http://bit.ly/2SADnEO.
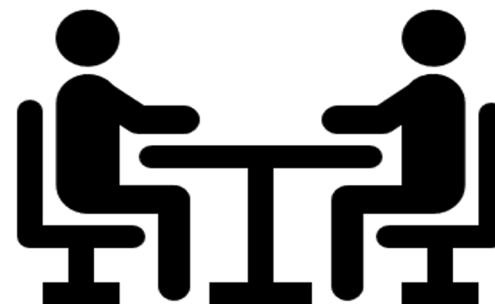
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- **Institutional Inefficiencies**

"While technological progress is fundamental for achieving the SDGs, there is no guarantee that this progress will be aligned with the most pressing needs of humanity: eradicating poverty and hunger, reducing inequality, generating shared prosperity and building resilience against climate change."

- UNDESA, World Economic and Social Survey, 2018.
https://app.box.com/s/x457si1bcth18wy0awmi9f33j6otvuxp

Group Work and Activities

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▪ **Discussion 2: Regulations and Policies Guiding Drone Use**

▪ Policies and regulations differ greatly from community to community and country to country regarding drone use.

▪ Drones, however, are finding an increasing number of uses in the pre- and post-disaster contexts.

▪ **The Facilitator** can initiate a discussion with Participants about the importance of clear policies and laws, with drones as the discussion example.

▪ **The Facilitator can use the following questions to guide the discussion**:

- Why are regulations required for the use of drones?

- Are there differences in pre- and post-disaster drone use that would have to be captured in policies and laws? What are those differences?

- What kinds of provisions should drone policies and laws address? What is the risk of too much structure? What is the risk of too little structure? How can communities create policies that are adaptive?

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Case Study: Effect of STI Policy Perception

- **Problem**: Scientific research in the absence of regulations and policies can result in unnecessary risk and a potential for lost national income.
- **Need:** A regulatory policy framework.
- **Obstacle**: Individuals and organizations focus on the provisions and impacts of policies that affect them most directly.
- **Solution**: Improved coordination with the STI community in the drafting and implementation of policy.
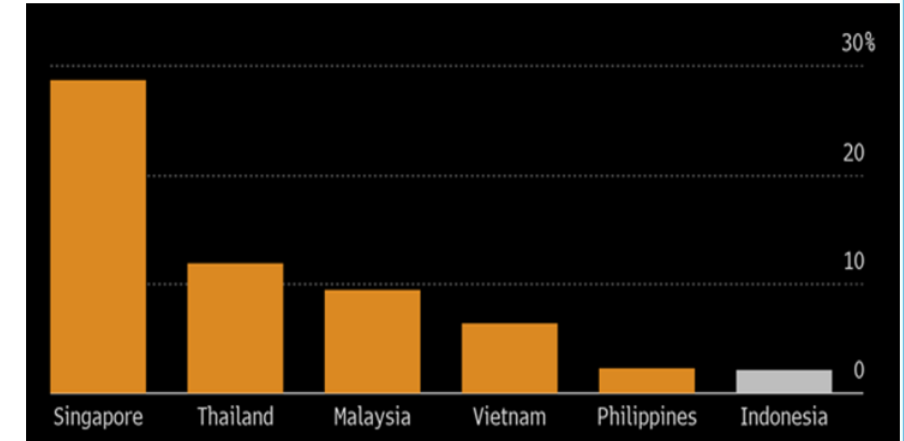

Image: Indonesia's foreign direct investment as a share of GDP as compared to countries in the region. Source: Maybank Kim Eng Research, using CEIC data for first half of 2019.
https://bloom.bg/2vL3W10

Case Study: Effect of Policies on Response Speed

- **Problem**: Foreign technologies often fall under the regulations contained in policies that address technology import and use.
- **Need:** Rapid processing of permits and permissions.
- **Obstacle**: Jurisdictions impacted by disasters are unable to quickly address permitting and other regulatory requirements.
- **Solution**: Pre-disaster establishment of policies that expedite technology use in a disaster response.

Image: Danoffice IT quadcopter drone in typhoon-ravaged Tacloban, Philippines. Source: Swiss Foundation for Mine Action, 2016. http://bit.ly/2SQ5u1O

Case Study: National System of Innovation (NSI) Policy Reform in South Africa

- **Problem**: Weak policy frameworks create an environment that is not conducive to the development of STI capabilities.
- **Need:** Policies that foster and guide technological implementation and innovation.
- **Obstacle**: Policies are more reflective of restrictive government institutions and antiquated systems than the pursuit of STI progress.
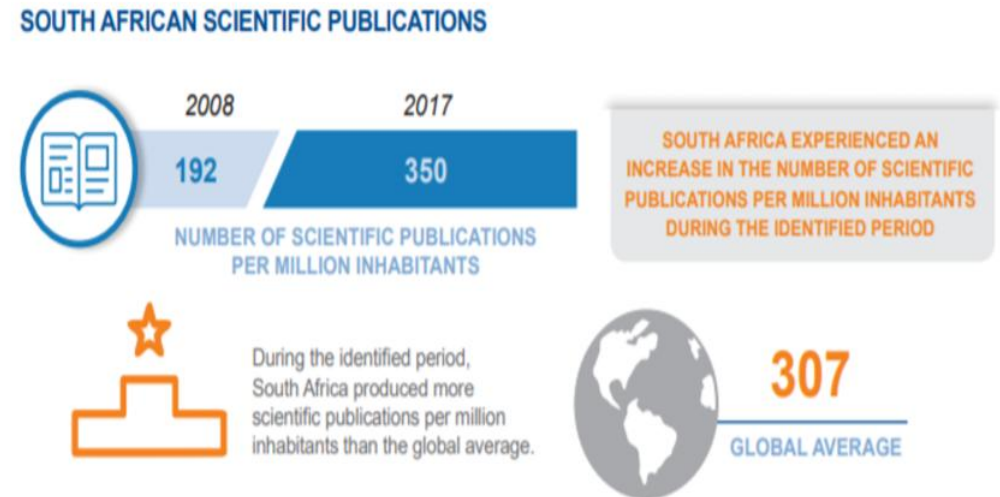- **Solution**: Comprehensive reform of all NSI policies.

SOUTH AFRICAN SCIENTIFIC PUBLICATIONS

2008 — 192
2017 — 350

NUMBER OF SCIENTIFIC PUBLICATIONS PER MILLION INHABITANTS

SOUTH AFRICA EXPERIENCED AN INCREASE IN THE NUMBER OF SCIENTIFIC PUBLICATIONS PER MILLION INHABITANTS DURING THE IDENTIFIED PERIOD

During the identified period, South Africa produced more scientific publications per million inhabitants than the global average.

307 GLOBAL AVERAGE

Image: South African Scientific Publications. Source: National Advisory Council on Innovation, 2019.

- ## **Case Study: Fear of Politicization of Warning Data**

- **Problem**: The efficacy of cyclonic storm preparedness is increased in proportion to the amount of warning time that is provided.
- **Need:** Accurate and trustworthy warning data.
- **Obstacle**: Conflicting messages can cause mistrust among audiences who perceive an ulterior motive in discrepancies or incorrect information.
- **Solution**: Coordinated warning messages between technology stakeholders.

> NWS Birmingham ✔
> @NWSBirmingham
>
> Alabama will NOT see any impacts from #Dorian. We repeat, no impacts from Hurricane #Dorian will be felt across Alabama. The system will remain too far east. #alwx
>
> 9:11 AM · Sep 1, 2019 · TweetDeck
>
> 562 Retweets   1.8K Likes

Image: Image of US National Weather Service Twitter Posting in advance of Hurricane Dorian.
Source: National Weather Service Birmingham, 2019.

Case Study: Blended Approach to Stakeholder Engagement

- **Problem**: Engagement of the private sector in technology and innovation development and implementation will stall in certain conditions.
- **Need:** Increased private sector investment.
- **Obstacle**: Bureaucratic inefficiencies and risk avoidance.
- **Solution**: Program to support business registration that has associated preferential treatment and financial and procedural incentives.

HOW TO PROMOTE STI IN VIETNAM?

Improving framework conditions for innovation

Improving public governance of the innovation system

Strengthening the human resource base for innovation

Fostering innovation in the business sector

Increasing the contribution of universities and public research institutes

Fostering innovation linkages

Image: Excerpt from World Bank infographic on Science, Technology, and Innovation Support in Viet Nam. Source: World Bank, n/d.

Implementation Dependencies

Infrastructure
- Non-existent
- Susceptible to failure

Data
- Non-existent
- Poor quality
- Inaccessible

Case Study: Entire Country Taken Offline

- **Problem**: Most emerging technologies have some internet dependency.
- **Need:** Constant and reliable access to the internet.
- **Obstacle**: Infrastructure weaknesses that result in outages, oftentimes frequent in LDCs.
- **Solution**: Infrastructure redundancies and other mechanisms for mitigating interruptions and failures.

https://www.ace-submarinecable.com/ace/default/EN/all/ace_en/map.htm
Image: Map of the ACE cable network in Europe and West Africa.

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Case Study: The Flying Cellphone Tower

- **Problem**: Many emerging technologies that require or only work effectively when citizens are connected to the internet cannot be used in situations where disasters interrupt networked coverage.
- **Need:** Reliable access to the internet.
- **Obstacle**: While many organizations have the capacity to implement data network redundancy, most individuals do not.
- **Solution**: Deployable drone-based internet mobile data transmitter.

Image: Telelift "Flying Cellphone Tower". Source: CNN, 2020.

- ## Case Study: Multiple Mobile Warning Failures

- **Problem**: In some situations, people will need to react fast to protect themselves; when that happens, mobile voice and data networks can facilitate rapid notification and warning.
- **Need:** Reliable warning issuance.
- **Obstacle**: Systems, both human and technical, can fail for reasons linked to design, operations, technical configuration, or damage.
- **Solution**: Simplified warning issuance procedures and drills to test systems.

Image: Toxic smoke containing chlorine compounds rising from a fire in Pennsylvania, USA. Beaver Falls Fire Department, 2019.

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Case Study: Social Media Rumors

- **Problem**: Alert and warning information must pass through multiple channels to reach all at-risk citizens given communication preferences and capabilities.
- **Need:** Mechanisms that promote valid information and suppress false or rumor-based information.
- **Obstacle**: Social media platforms have enabled very fast sharing of information across populations and distances.
- **Solution**: Ensure that public officials and public safety and security agencies have policies in place to counter, and not support, false rumors.


Castor Ave, Philadelphia).
22 November at 10:48 · Philadelphia, PA, United States ·

Somebody sent me a video saying that white vans like this are being used to kidnap women and children for human trafficking. This one parked at the wawa on Castor Avenue & a caucasian man and woman got out. Why did they park with the license plate up against the bushes? Why the huge lock on the outside of the doors? Probably nothing but it is kind of curious.

36

35 comments 21 shares

Image: Screenshot of a reposting of information based on false rumors. Source: Medium.Com, 2019.

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- **Operational Risks**

  - Innovation Risk and Uncertainty
  - Errors
  - Ethics
  - Safety
  - Security

Group Work and Activities

Group Work and Activities
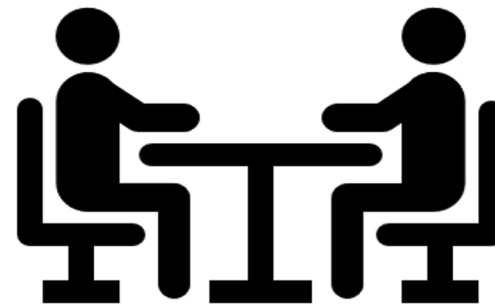
▪ Discussion 3: Implementation Risks

▪ There is risk in everything, without exception. In the case of emerging technologies implementation, the range of possible risks varies significantly between the different technology types.

▪ **The Facilitator can group Participants into groups of two or three and assign each group** one of the following technologies:

- UAVs o Crowdfunding
- Volunteered Geographic Information
- Artificial Intelligence
- Additive Manufacturing
- Big Data Analysis
- Virtual Reality

▪ **Groups should brainstorm all the possible risks that exist related to implementation** of the particular technology. Participants should consider things like financing, privacy, life safety, human rights, impact on other sectors, intellectual property rights, and others specific to each technology category.

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Case Study: Errors in Response Caused by VGI

- **Problem**: Individuals in need of rescue need a way to communicate that information.
- **Need:** A reliable platform to communicate rescue information.
- **Obstacle**: Social media is an effective channel to transmit information to large populations, but it can be difficult to gauge the affect of those transmissions.
- **Solution**: Provide a social media option for citizens to report status, such as an Emergency Services Agency facebook page, and monitor social media for relevant postings that might initiate action.

Image: Tasmania bushfires. Source: Reuters, 2013.

- **Case Study: Fast Track Approval of Experimental Technology**

  - **Problem**: Disaster consequences often exceed the standard capacities that are in place to manage them.
  - **Need:** Technology solutions to solve problems traditional response mechanisms and resources are unable to solve.
  - **Obstacle**: Emerging technologies use often requires special permitting given its experimental nature.
  - **Solution**: Provide fast-track approval to private sector businesses' technologies with consideration of risks versus benefits.

Luis Arocho
Chief Information Officer
Government of Puerto Rico

Video: Loon: Delivering Emergency Connectivity in Puerto Rico. Source: Loon, 2018.

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Case Study: Drones Disrupt Wildfire Operations

- **Problem**: Emerging technologies promise to greatly expand the capacity of responders for several different hazard types.
- **Need:** Affordable and open access to emerging technologies so that any organization in need has some access to that technology if appropriate.
- **Obstacle**: Many technologies are so accessible that stakeholders with motives misaligned to responders or perhaps counter to them are able to purchase and use them in disaster situations.
- **Solution**: Implement policies and restrictions that support the safe use of technologies in disasters.

Image:
https://images.app.goo.gl/vD6bipPaqDzYoaYb8

Case Study: UAV Code of Conduct

- **Problem**: The range of uses for drones in disasters is increasing, and with it so is the presence of drones at a disaster incident location.
- **Need:** Safe, ethical, and responsible operation of UAVs in the disaster setting where injuries, fatalities, and damages can result from improper or irresponsible drone use.
- **Obstacle**: A universally accepted set of rules and norms does not exist to guide drone use by different stakeholders.
- **Solution**: Widely-adapted humanitarian code of conduct to guide drone operations in the humanitarian environment.

Image: Logo of the UAV Code of Conduct

Group Work and Activities
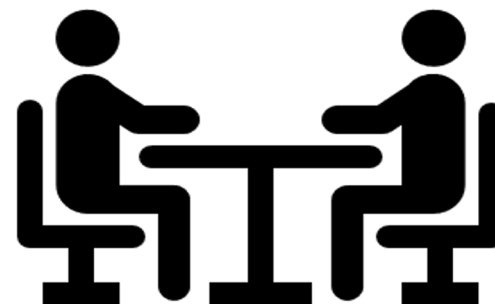
- **Discussion 4: Policy and Regulatory Measures on Digital Divide**

- **The Facilitator could group participants into two or three and assign each group** to discuss this question:

  - What changes are needed at the policy and regulatory levels; organizational level and individual level as well as technological and data issues to help bridge the digital divide?

Key Readings	· Aid and International Development Forum. 2018. The Digital Divide is Closing: Worlds Least Developed Countries on Track for Universal Internet. http://bit.ly/2MfZVZP
	· Almarzooqi, Ahmed. 2017. Infusing Technology Into Third World Countries. International Center for Global Leadership. http://bit.ly/2XWwi0J
	· Kellen, Vince. 2019. Difficulties and Challenges of Data Democratization. Cutter Business Technology Journal. January 2. http://bit.ly/2OVCOFW
Further Readings	· Pew Research Center. 2015. Internet Seen as Positive Influence on Education but Negative Influence on Morality in Emerging and Developing Nations. http://bit.ly/303DoT1.
	· Saez, Catherine. 2018. 4 of 5 People in LDCs Can Access Mobile Networks, But Are Not Using Internet. Intellectual Property Watch. January 24. http://bit.ly/32xKcKk

Thank you

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