Science and Technology for DRR – Concepts and Definitions

A Resilient Future: Science and Technology for Disaster Risk Reduction

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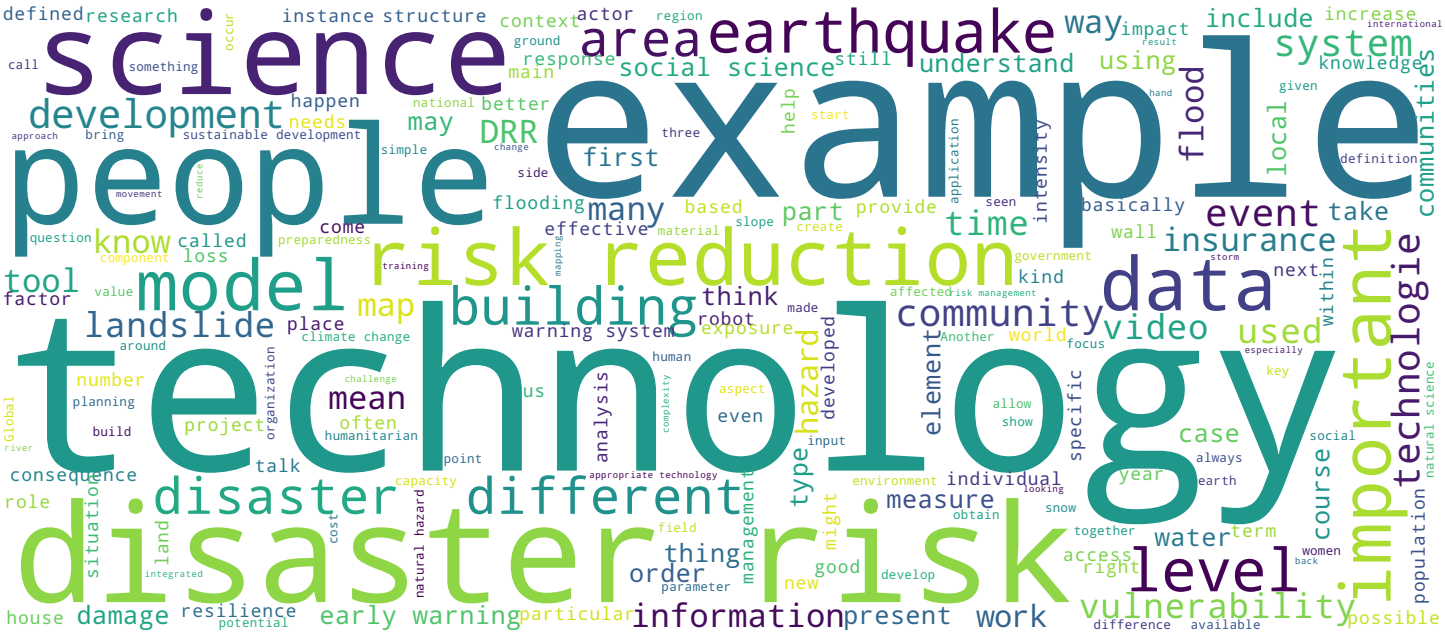

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What is Science?

Science is “the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment;”

or

“a systematically organized body of knowledge on a particular subject.”

(Oxford Dictionaries)

As this course is about science and technology for disaster risk reduction, in this video I will present definitions for science and technology, general types of science and technologies, and an overview of their specific relevance for disaster risk reduction. According to the Oxford Dictionaries, science can be defined as "the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment." Science can also be defined as "a systematically organized body of knowledge on a particular subject." There are many different types of science.

Notes

Summary

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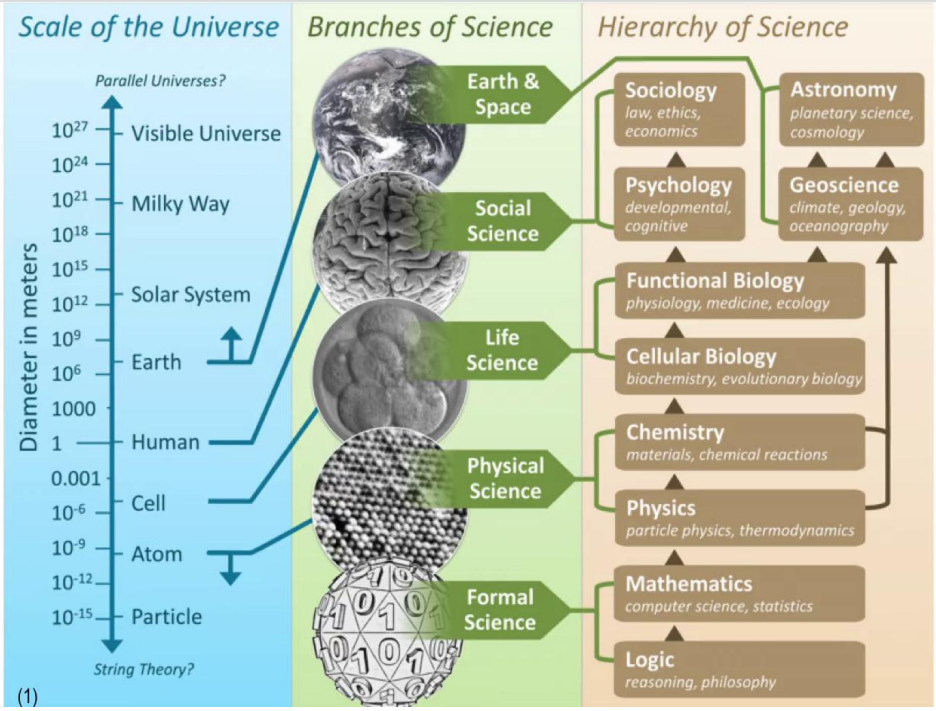
Types of Science



For instance, formal science, life science or social sciences. This diagram shows the different branches of science, the level on which they focus, and the level of complexity and integration. For example, physical science and earth and space science are combined and integrated into geoscience.

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What is Technology?

Technology is “the application of scientific knowledge for practical purposes, especially in industry;”

or

“machinery and devices developed from scientific knowledge;”

or

“the branch of knowledge dealing with engineering or applied sciences.”

(Oxford Dictionaries)

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Let me now define technology, which is "the application of scientific knowledge for practical purposes, especially in industry;" "machinery and devices developed from scientific knowledge;" or "the branch of knowledge dealing with engineering or applied sciences." As with science, there are many ways to define technology, and there are entire papers destined to the description, study and analysis of these definitions.

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Therefore, to have a better idea of what we mean by technology, I will present some examples of the types of technologies we might see throughout the course. For this, I will use the work of Alexander Laszlo, who published *The Evolutionary Challenge for Technology*, in 2003, and other sources. Alexander Laszlo defines low-tech as the small-scale technologies which do not require complex infrastructure, are relatively simple to use, cost little to construct or obtain, and next to nothing to operate. Here are some examples: weaving produced on non-automated looms, folk music played on acoustic instruments, organic farming, milling, glassblowing, et cetera. And by high-tech, we mean sophisticated technologies, which require complex infrastructure, technical expertise to construct and to use, and are often costly to obtain and to operate. Let's now look at the difference between hard and soft technology. Hard technology includes the tools, machines, devices and equipment, that are the physical embodiment of technology and/or technological process based on engineering techniques and principles, what we call the "know how." In contrast, soft technology is the scaffolding.

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1m 30s

Types of technology: Appropriate

Appropriate technologies are “technologies that contribute to sustainable development at the global level. They are robust, socio-culturally adequate, financially sustainable, scalable and have a minimal impact on the environment.”

(Hostettler, 2015)

For instance, support systems, group process techniques, design methodologies, decision-making processes for individual and collective self-determination. It is what we call the "know why," or the "know what for," and the "care why." By alternative technology, we mean equipment or organizational forms that represent viable alternatives to existing mainstream technologies. For example, small-scale organic farming, instead of large-scale energy and chemical-intensive cultivation techniques. There are also so called intermediate technologies. These are technologies that stand halfway between traditional and modern technology. The ox-drawn plow can be described as an intermediate technology. More sophisticated than the traditional hoe, but less complex than the tractor. Another intermediate technology is the human-powered treadle pump, as opposed to the fully automated large-scale irrigation system. An important question we have to ask ourselves, is what is an appropriate technology? There are several ways of defining appropriate technology. I define appropriate technologies as "technologies that contribute to sustainable development at the global level.

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Types of technology: Appropriate

Appropriate technologies are “technologies that contribute to sustainable development at the global level. They are robust, socio-culturally adequate, financially sustainable, scalable and have a minimal impact on the environment.”

(Hostettler, 2015)

They are robust, socio-culturally adequate, financially sustainable, scalable, and have a minimum impact on the environment." The sustainability of the technology itself also matters substantially. It should be produced with minimal impact on the environment, and under fair socio-economic conditions. In short, appropriate technologies are energy efficient, accessible to all, and environmentally and financially sustainable in the long term.

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4m 02s

Types of technology: Appropriate

- Based on the needs of intended users
- Co-developed
- Low-cost
- Robust
- Example: GlobalDiagnostiX

(Hostettler, 2015)

Technologies in the Global South, need to furthermore to be based on the needs of the intended users, and be co-developed with them. Technologies need to be low-cost and robust, regarding sudden changes in electric current, dust, heat and moisture. One example of an appropriate technology is the development of an X-ray machine, such as GlobalDiagnostiX, which is a project of the EssentialTech program of the Cooperation and Development Center at EPFL.

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4m 31s

Example of science for DRR

- Applied sciences
- Social sciences
- Integrative sciences:
  - Environmental sciences
  - Health science
  - Building science
  - Development studies
  - Business and finance
  - Information science…

(Basher, 2013)

Another really interesting question that is increasingly gaining in importance, is what we understand by frugal technology. For Srikanth Kumar Darapu, frugal technology or innovation involves the process of reducing the complexity of the manufacturing process of a product, and increasing the durability with better and cheaper services. Initially, it was thought to be specific to developing countries. But developed countries have quickly realized that this kind of innovation is not region-specific. For instance, a 3D printer that has been made out of electronic waste was developed in the Global South. Technology can also be classified by the type of activity, or objective it hopes to achieve. For example, communication, space or medical technologies. After this introduction, let me present some examples of science and technology for disaster risk reduction. Disaster risk reducion science has been developed rather recently, and it is still evolving. Different sciences contribute to disaster risk reduction. These include applied sciences, for instance seismology, meteorology, geography, or social sciences, for instance sociology, anthropology, ethics. These sciences integrate and form what is called the integrative sciences. For instance, environmental sciences, health sciences, risk management, geospatial science, natural resources, coastal management, and public administration.

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Summary

5m 01s

Examples of technologies for DRR

- Mapping technologies
- Information and communication technologies (ICTs)
- Post-disaster and emergency technologies (e.g. unmanned aerial vehicles, UAVs)
- Ecosystem-based DRR
- Health technologies

Examples of technologies for disaster risk reduction include, for instance, mapping technology, communication technology, post-disaster and emergency technologies-- for instance, unmanned aerial vehicles, that are also known as drones-- ecosystem-based disaster risk reduction, and health technology.

Notes

Summary

6m 31s

Relevance of science and technology for DRR

- Reduce the consequences of disasters
- Help in emergency relief and recovery
- Prevent disasters

→ Sustainable development

(Basher, 2013)

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Science and technology can help reduce the consequences of disasters. and most importantly, prevent disasters, and by doing so, lead to more sustainable development. I invite you to look at the additional material section of this video, where we include a non-exhaustive overview with examples of science and technology for disaster risk reduction.

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Relevance of S&T for DRR: Discussion

- Natural sciences / technologies
  - Help in the development of early warning systems, protection structures, building codes
  - Overall, it is supply-driven, expert-led, resource-demanding

(Basher, 2013)

According to Dr. Reid Basher, both natural sciences, technology, and social sciences are important in disaster risk reduction. For example, natural science and technology permitted the development of technological approaches, such as specific early warning systems, protection structures such as dikes, and building codes. It is important to point out that certain technical approaches are effective in certain contexts. In addition, the chosen approaches tend to be driven by supply, depend on specialists, and require many resources. These are some of the factors that could make such technology less apt for implementation.

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7m 12s

Relevance of S&T for DRR: Discussion

- Social sciences
  - Help gain knowledge of vulnerability and its linkages to poverty
  - Communicate risk
- Need to integrate natural and social, and other sciences

(Basher, 2013)

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Social sciences can help us to frame research issues, and develop risk reduction strategies. Through social science approaches, we can gain knowledge on vulnerability, for example, and its links with poverty. Therefore, there is a need to integrate the input of natural science, technology, social sciences and other sciences, to generate knowledge, approaches, and tools for effective management and reduction of risk.

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7m 54s

Main points

- Many definitions of science and technology exist
- Disaster risk reduction science has recently been developed
- Different sciences and technologies contribute to disaster risk reduction
- There is a need to integrate science and technology

Let me now come back to the main points discussed in this video. First, we looked at different definitions for science and for technology. Then we saw how many different branches of science and types of technologies contribute to disaster risk reduction, and that in fact, disaster risk reduction science has been developed only recently. Finally, we learned that it is important to integrate science and technology, in order to effectively reduce the risks related to disasters.

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Summary

8m 22s

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