



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE



EPFL



# Transport Technologies: Sustainable



- Safe
- Clean
- Affordable
- Contributes to economic development.

Technology Innovation for Sustainable Development

Hello. Inadequate access to basic health facilities in hospitals, is the cause of an estimated 75% of birth-related child mortality. Today, we will talk about sustainable transport technologies, which can be defined as transports which are safe, clean, affordable and which contribute to economic development. Transport of goods and people is an essential driver of economic and social development. It brings opportunities for the poor and enables economies to be more competitive. Transport technology connects people to jobs, education and healthcare. It enables global and local trade by supplying goods and services. It also allows social interaction between people and promotes social inclusion of the poor. Let us define a general framework to help analyze this vast subject.

Notes

Summary



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		Elements		
		Infrastructure	Vehicle	Operations
Modes	Air			
	Land			
	Water			

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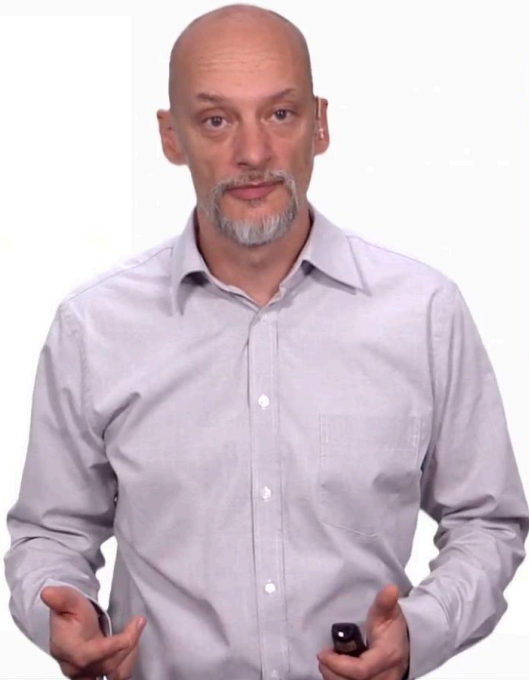
The basic function of transport is to move people, animals and goods from one place to another. There are of course multiple ways to achieve this function and these are called transport modes. Main modes of transport are air, land and water. Each mode can be separated, roughly speaking, into three elements which are infrastructure, vehicles and operations. The last element refers to how the transport mode is operated and by whom. Of course, another crucial component of sustainable transport is missing, which is the policies and governance dimension. However, this subject would take us too far away from our focus on technologies.

Notes

Summary







	Infrastructure	Vehicle	Operations
Air	Airports, control towers, navigation systems.	Planes, helicopters	Airline companies, Freight services,
Land			
Water			

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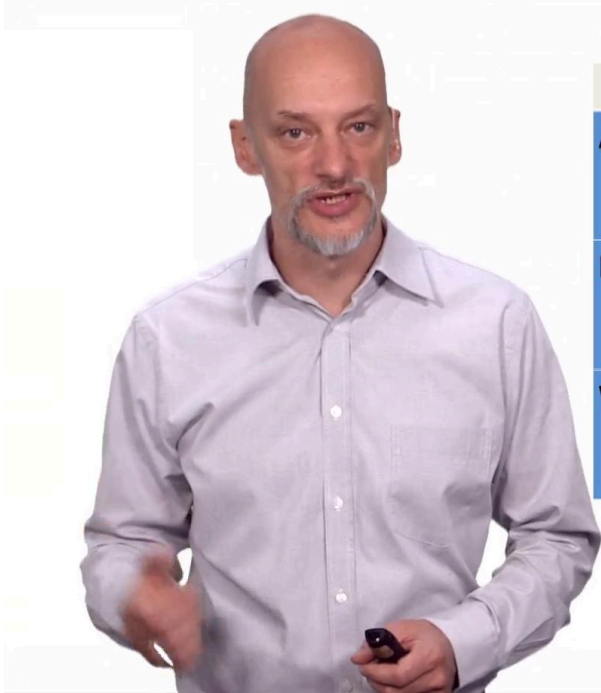
As we think about technology innovation in transport, it is useful to have this simplified framework in mind. Technology is heavily involved in all three elements and all three modes of transport. To make things a little clearer, let us fill in the table with some examples, and discuss the main issues and opportunities for technology innovation. Air transport is very important for business, as it allows efficient trade of perishable goods, such as fresh food or flowers. In Kenya for example, over half a million people depend on flower business for a living. Air transport, very importantly, also opens the way for tourism. Having a strong air transport sector will also attract international businesses to set up offices and manufacturing sites in the country, which creates jobs. Air transport infrastructure involves, for example, airports, control towers and navigation systems. Over the ten years to 2005, both passenger travel and air freight have increased by about 55%. This strong international growth in aviation is straining the capacities of many low income countries. It generates high costs for countries who struggle to maintain the capacity for proper function and meet the demand.

Notes

Summary



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	Infrastructure	Vehicle	Operations
Air	Airports, control towers, navigation systems.	Planes, helicopters	Airline companies, Freight services,
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Water			

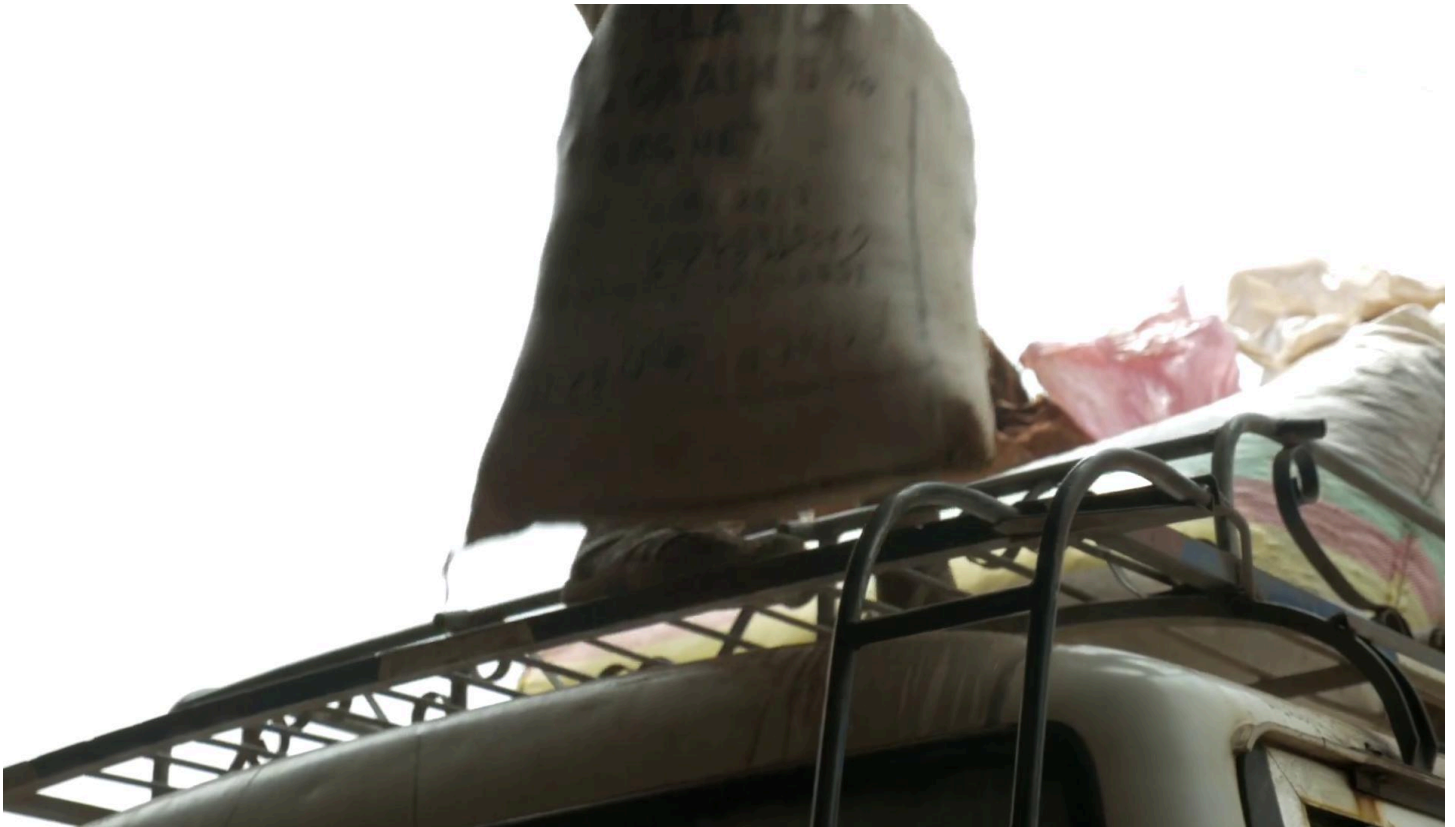
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As a consequence, there is a risk for degradation in safety, which is extremely important to the development of aviation services. West Africa, for example, has an aviation accident rate thirty times that of the United States. As far as vehicles, we can mention airplanes and helicopters. Of course, this sector has an impact on the environment. Emissions represent 12% of all CO2 released in the transport sector.

Notes

Summary





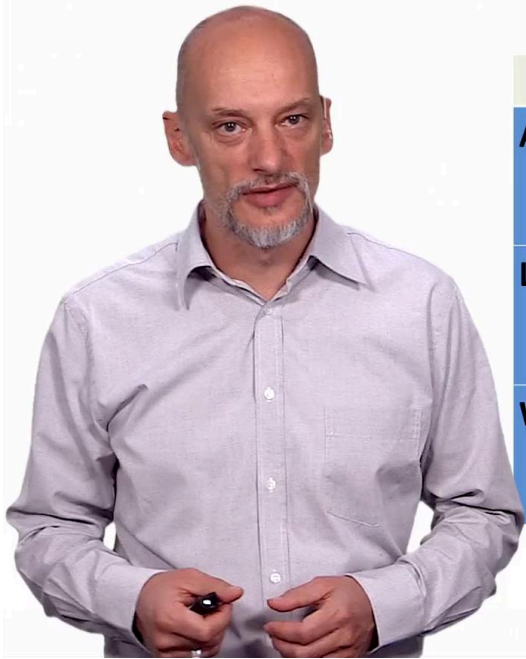
In terms of operations, air traffic is operated by both public and private operators, who rely on a series of technologies to track freight and passengers, to assure security and to minimize delays. Technology innovation can be an important contributor in improving safety, which is crucial to the industries that depend on air transport. New technology can also contribute to reducing emissions, which remains a big issue in this industry, as we have seen. Finally, innovative drone technology will most certainly play an important role in this sector. And there are many experiments currently being conducted by companies and research institutes. Since the beginning of human history, land transport has underpinned economic progress and remains an essential contributor to development. It involves a wide variety of infrastructures, such as roads, bridges, tunnels, railways, train stations, fuel stations bike lanes and walkways, but also pipelines, which can be used to transport fluids. In Africa, road transport accounts for 80% of the goods traffic and 90% of passenger traffic. This leaves a lot of room for improvement, for example, in railway transport, especially for long distances and high volume.

Notes

Summary

3m 52s





	Infrastructure	Vehicle	Operations
Air			
Land	Roads, bridges, tunnels, railways, train stations, fuel stations, bike lanes, walkways, pipelines	Cars, trucks, busses, bicycles, trains, pipelines	Individual car owners, bus companies, cities, states.
Water			

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In rail transport, infrastructure construction and maintenance costs remain a big challenge for low income countries. For land transport there are many vehicles, but we can cite of course, cars, trucks, buses, bicycles and trains. Again we should mention that pipelines are both a piece of infrastructure and a vehicle. Land transport can be operated by individual car owners, bus companies, cities or even states. Internal combustion engines have revolutionized transport yet they account for an estimated 15% of global greenhouse gas emissions. In large polluted cities such as Kuala Lumpur or Jakarta, it is estimated that the total economic damage of air pollution represents up to 10% of GDP. Traffic congestion is another very problematic issue, which we will discuss a little later.

Notes

Summary



5m 11s

	Infrastructure	Vehicle	Operations
Air			
Land			
Water	Ports, lighthouses, container cranes, canals, locks, pipelines	Ships, barges, small boats, pipelines	Maritime transport companies, individuals, Port authorities

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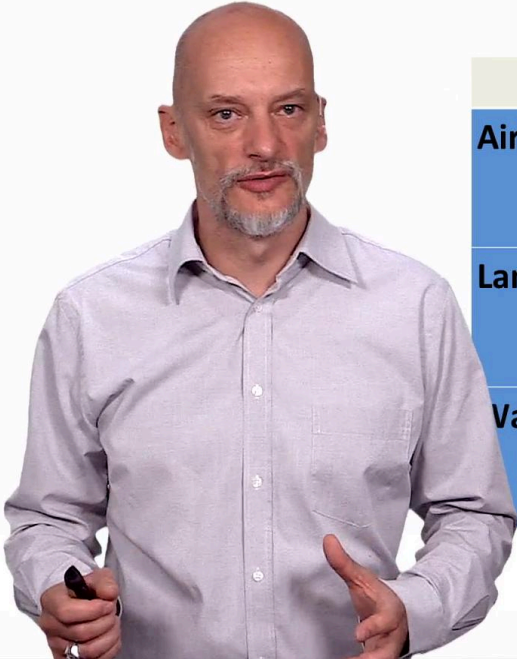
Every year, around 1.3 million people die as a result of road accidents, and 78 million more require medical care. Low and middle income countries bear over 90% of that burden. People who may not be poor to start with, may become poor due to a handicap or loss of life of the family's breadwinner. Technology innovation would be especially welcome in three areas: improving safety, reducing pollution and preventing traffic congestion. Recent developments in making vehicles such as buses, or intelligent systems capable to predict and prevent crashes are very promising in this regard. Water transport involves not only maritime transport infrastructure such as ports, lighthouses, container cranes, but also inland waterway infrastructure, such as canals and locks. As for land transport, pipelines can be used as submarine infrastructure to transport fluids such as oil, gas or water. Vehicles can be ships, barges, small boats and pipelines. Operations may involve maritime companies or simply individuals owning a boat, or port authorities.

Notes

Summary







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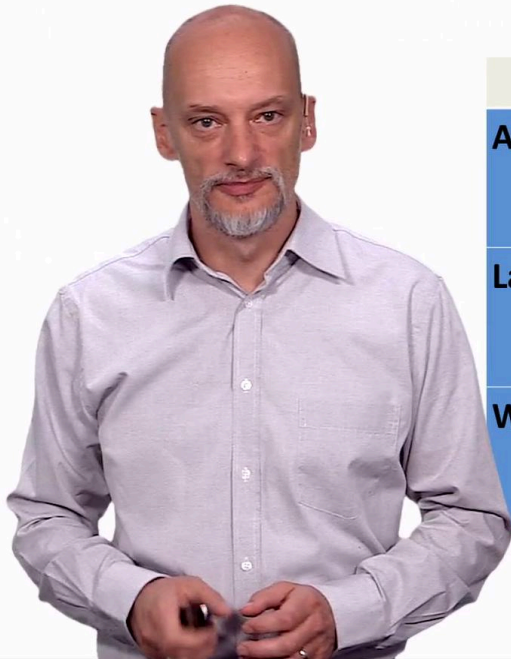
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Maritime transport is the backbone of international trade, as it represents 90% of global trade by volume. Because of the presence of rivers, canals, lakes, inland waterways also play an important role for freight and passenger transport in China, Brazil, Vietnam, Uganda and other countries. One great technological innovation in this sector is certainly the ISO container. Since it has been internationally normalized it can be easily handled by standard cranes and other equipment worldwide. This has made global supply chains extremely efficient.

Notes

Summary





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Due to the great importance of water transport in trade, technology solutions that can further reduce costs, improve speed and reliability, will be very important contributors to development. Here is now our complete table. This is, of course, by far not an exhaustive view, and it reveals something else which is quite obvious but yet very important. In many cases, there will be several transport modes involved, or more precisely, transport vehicles. This is called multimodal transport. It is very important that the transfers from one mode to another are as efficient and seamless as possible.

Notes

Summary





Technology Innovation for Sustainable Development

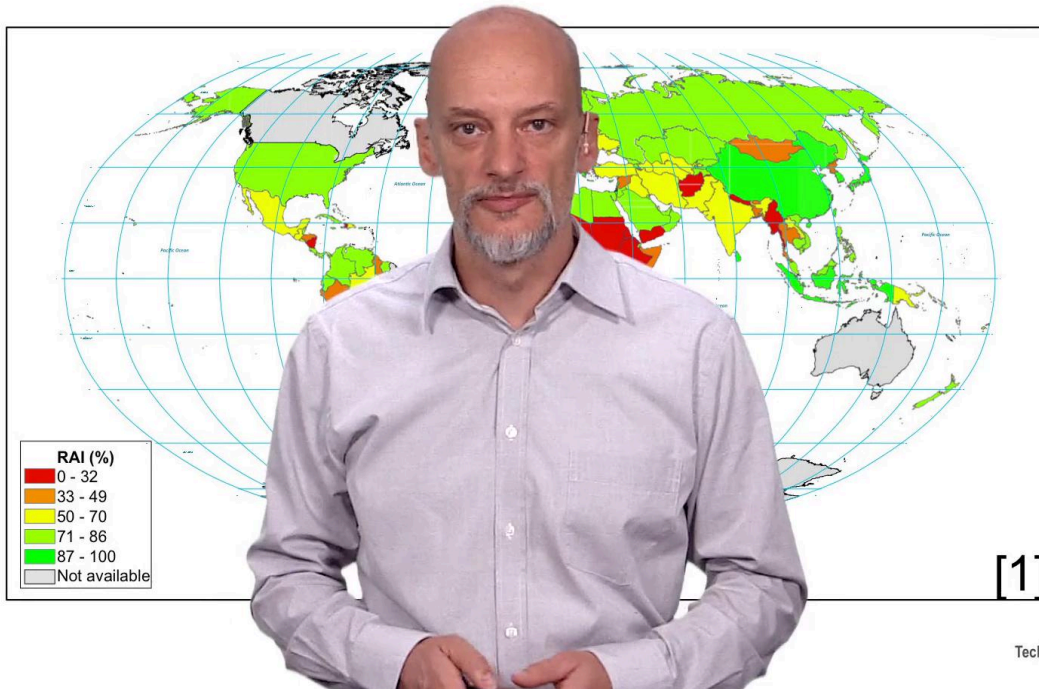
As we discuss transport technologies, let us keep in mind that according to United Nations forecasts by 2050, more than 67%, or two-thirds of the world's population will live in cities. Today the number of private cars is over 900 million worldwide. And it will reach an estimated 1.6 billion by 2035. The largest increase will take place in developing countries. One consequence is traffic congestion. Traffic congestion plagues all major cities and has a great impact on economic development. Innovative ideas and incentives are urgently needed for efficient traffic management. It is, for example, crucial to shift mobility away from individual private cars, towards more efficient public transportation, such as bus rapid transportation systems. Today, in many cities of Africa and Asia, the proportion of trips made without cars is 90% or more. This raises again the issue of road traffic accidents: more than half the road deaths in these urban areas are pedestrians and cyclists. These facts lead us to emphasize the importance of efficient solutions to protect and support non-motorized transport in cities and especially in slums.

Notes

Summary



8m 27s



**1 bn without access**

Technology Innovation for Sustainable Development

After this glimpse at the urban context, let us now look at the rural world, where still a large fraction of today's poor live. In order to measure access to transports we use the Rural Access Index. The Rural Access Index measures the number of rural people who live within 2 kilometers of an all-season road, as a proportion of the total rural population. Two kilometers is typically equivalent to a walk of 20-25 minutes. An "all-season road" is a road that is motorable all year round by the prevailing means of rural transport, for example a pick-up or a truck which is not a four-wheel-drive. By this measure, globally, about 1 billion people don't have access to adequate transportation. In Africa, two-thirds of the rural population about 300 million of the world's poorest people do not have reliable access to an all-weather road. Most are thus locked into subsistence living and have disadvantaged access to reliable health care and education. As we said in the beginning of this video, the isolation of those communities prevents them from an easy access to health facilities in the case of emergency. I would like to speak about a simple and yet innovative technology that tries to address this need.

Notes

Summary



9m 48s





# Transport Technologies : motorcycle ambulance



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According to the World Bank, between 40 to 60% of the people in developing countries live more than 8 kilometers from a healthcare facility. In poor communities, the majority of health facilities don't have ambulances. When they do, these vehicles can't access the patients due to a lack of adequate all-weather roads as we have just seen. A company called eRanger has noticed that in many places where cars and pick-ups didn't have access, motorbikes were still working. The company has thus designed a motorbike ambulance, which has a side-car for one patient. It is light in weight, rugged in design, and able to negotiate the roughest terrain. It comes with a complete set of equipment, tools and spares so that it is sustainable in the bush, miles away from anywhere. Over 2000 of these ambulances have already been distributed through major aid agencies, such as UNICEF, UNHCR and Save The Children. The complete ambulance sells for around US\$ 6000, including training, which makes it a very affordable solution. According to a study performed in 2015 in a district in Uganda where 26 such motorbike ambulances were deployed, 22,000 referral trips were made. This has had a massive impact on infant and maternal mortality. I hope you now have many ideas of innovative transport technologies. Good-bye.

Notes

Summary



11m 10s