

Can engineers make a beneficial contribution to society?

EPC Student Essay Competition

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Essay & Video

Engineers play a fundamental role in facilitating the functioning of modern society. There are many ways in which they do this, and this essay will be focusing on three specific forms of the infrastructure where engineers benefit society. These relate to the connection, supplying and protection of society. This will also be exemplified in the accompanying video. This Infrastructure designed and built by engineers has the ability to impact on society from the smallest family unit to the global community.

The first area to be considered is termed '**Connect**'. Engineers link communities together through transport infrastructure. An efficient transport network is vital for sustained economic growth, and the development and well-being of society. It is also highly important on a human level: roads, railways and aircraft all allow people to travel over varying distances, and the importance of this for encouraging more frequent personal contact between people cannot be understated. Integrated design has made the system highly efficient, and time wasted by travelling has been significantly reduced. Engineers also provide the logistics and infrastructure to collate, sort and distribute food, medicines and other consumables reliably. Such a contribution is invaluable to the smooth functioning of society and the well-being of its members.

Telecommunications are another part of this strand: Engineers are responsible for the reliable phone and broadband networks that society is dependent upon. They have also given us the faster, higher capacity 3G & 4G networks to enable transfers of large data files between mobile devices, so that people can communicate better and share ideas faster, meaning the option is there for people to collaborate and work together more by breaking down the distance/travel barrier.

By creating the option for people to join together, engineers have created a huge choice for people in where they work, in their leisure options, and have enabled people to meet together who would otherwise remain isolated.

The second strand is '**Supply**'. Water, gas, electricity and sewage infrastructure – again, developed and built by engineers. These systems don't just make a contribution to society; they sustain society by meeting the most basic everyday needs of all its members, raising living standards for all, reducing hardship and poverty, and helping society to achieve its potential. The consistent reliability of this infrastructure is tribute to the skill of the engineers who designed, built and maintain it. When this basic infrastructure is suddenly threatened or disrupted, for example by natural disaster, society can quickly become dysfunctional, as basic requirements

for food, healthcare, water and warmth cannot be met. Other factors such as corruption, poor government and self-interest can limit the effectiveness of the contribution which engineers make. Also the everyday nature of the supply infrastructure can often lead people to take it for granted. This is illustrated by the lack of British governmental investment in energy infrastructure in recent years¹.

The third strand is **'Protect'**. There are many ways in which engineers protect society, but those mentioned here are some of the most significant at present. By designing and constructing flood defences, engineers protect those who live near rivers from repeated flood damage to their houses, and from the associated damage to local communities and personal finances. Engineers protect historic buildings and structures too, by retrofitting them with additional structural supports and monitoring equipment. This is a benefit to society both now and in the future, by ensuring the past is preserved for current and future generations to enjoy, and to learn from. By making buildings and transport greener (the electrification of the Midland Mainline will reduce its CO2 emissions by 40%²), engineers are also meeting requirements to reduce greenhouse gas emissions.

Key to the success of any engineering project is planning and fore-thought before it is completed, opened to the public or mass-produced. By testing technologies and structures with physical or mathematical modelling, engineers can check that all requirements are met, and that any faults are fixed before it could affect people.

Engineers are also involved in planning for the future. A significant number of engineers work in urban design teams to ensure that a healthy balance of new developments and green spaces are kept in urban areas. Rather than new developments on parks, engineers can produce clever solutions to re-use existing structures such as Victorian Warehouses for offices, and keeping parkland attractive and well-maintained so that its full recreational potential remains. Engineers are also involved in cases where planning ahead is not possible; in retro-fitting buildings with green roofs which reduce peak discharge into the storm water system by storing it on flat roofs. This is a highly complex task, and requires individual designs for every building. Green roofs will, if widely taken up, reduce flash flooding in downstream areas, create urban 'green stepping stones'³ which could support urban wildlife, and create relaxing recreational spaces to reduce urban stress for residents.

In addition to these three strands, engineers have created opportunities for an open society. The ability to cross physical barriers, travel long distances to connect with others, and to store and share information have all been revolutionised by engineers throughout the ages. The job of engineers has been to facilitate openness, and by creating these links, it has never been easier to share an idea, visit friends, or form a group to share in a common interest. However, people still need to take a step; regardless of how small it has become; out to participate in

¹ <http://www.theguardian.com/business/2014/jan/10/armitt-power-blackouts-politicians-energy-crisis-infrastructure>

² <http://www.railfuture.org.uk/MML+electrification>

³ http://www.thegreenroofcentre.co.uk/green_roofs/benefits_of_green_roofs

society, and engineers have successfully made this step easy and positive. This step of openness can be by individuals or nations: After the fall of the Berlin Wall, the German government commissioned the reconstruction and remodelling of the Bundestag building in Berlin. A glass dome over the parliamentary chamber complete with walkways conveys the 'openness' of modern German politics, allowing the public access to the heart of the German parliament, signifying the end of secretive or oppressive government, and emphasizing the democratic system where the parliament is there to serve the people, and where decisions are made in the open.

Such a government as that is essential for the functioning of society; without law, order and an overall direction, society would rapidly disintegrate into factions, all with different goals and aims. However, the stability of a government can only be maintained if necessities of the population are consistently met. Infrastructure built by engineers is essential to meeting these needs, and doing so consistently. The rule of law itself is therefore largely supported by infrastructure, and by keeping the rule of law, civilised society is maintained. Engineers are therefore essential for the very fabric of our society; without engineers to build and maintain infrastructure, any modern government would struggle to maintain law and order.

This point is not obvious at a glance, so we should also investigate engineers' presence in a more superficial environment; in the media. The link between media attention and beneficial contribution to society is actually highly debatable. Engineers often suffer from a lack of attention in the media, but that isn't necessarily such a bad thing. Disasters, scandals and celebrities of debatable talent dominate the headlines of today, whilst stories of hard work and successes such as the operational success of the London Overground, the discovery of potential next generation antibiotics and the 100-fold reduction of deaths in Bangladesh from severe cyclones in 1970 to 2007⁴ go largely un-noticed by the media. The lack of engineering media attention could be due to a lack of 'spin factor' on success stories; engineers think first and (mostly) get it right, so the media can't whip it up into an easy story. Past individuals such as I. K. Brunel managed to gain significant publicity for their projects; the daring flat arches of the Maidenhead Railway Bridge, unlined Box Tunnel or the first modern ship; the steel-hulled and screw-driven SS Great Britain. However today's highly personal and aggressive media deters engineers from entering into a more public life. Instead, most engineers today remain content with an inner pride in their works, with no need to publicise them far beyond engineering circles.

Bringing all these different points together, it must be accepted that engineers contribute so significantly to society that without them, it couldn't function effectively. As shown in the video, by facilitating a connected society, supplying it and protecting it, engineers are right in the centre of solving physical problems which are of huge benefit to the whole of society. However engineers do more than contribute: By designing the built environment to serve society, engineers can actually collectively influence the direction that society moves in. Breaking down physical divisions in public spaces, advising decision makers and making sustainability a priority

⁴ <http://www.who.int/bulletin/volumes/90/2/11-088302/en/>

in projects, engineers are highly important for giving society direction. Like the German Parliament assembled below with the people up above in the dome, engineers' works are placed below society, as an essential support, and an invaluable contribution.

Postscript

The video aims to show how engineers are crucial to the sustaining of the most complex society situations, using the example of a city environment. It follows the three strand pattern of the essay – connect, supply & protect.