

Sustainability in global telecommunications

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With the global population crossing the 7 billion mark, the world is too crowded. The race for survival is not limited to food, water, shelter, and other basic needs; it also includes fierce competition in all industrial sectors across the world. These days, there are basically two patterns of uncontrolled industrial growth across the world. The first one is meant to fulfill the

domestic demands and the common needs of the people. The second one is to exploit the present world situation to maximize profits. Of course, this is a race for supremacy that pushes nations to compete in all possible means to achieve the most from their resources.

In recent decades, telecommunications have not only become an essential need of human life but it also plays key roles in connecting businesses and processing business in-

formation around the globe. As the telecommunications industry is one of the most important sectors of the world economy, it too goes through similar kind of challenges due to tough rivalries from competitors.

In this article, we provide the recent global trends of population, carbon emissions, and telecommunications. We then show the needs of sustainability of the telecommunication sector and the ways to achieve them with the present outlook.



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Research on the sustainability of the telecommunication industry is growing steadily. The idea of sustainability and green business became quite popular in the 1990s. In 1998, W.E. Kilbourne provided early ideas for green business from a marketing perspective. Thomas Friedman, in his book, *Hot, Flat, and Crowded*, gave several instances how crowd and competition in the world today are responsible for a huge amount of carbon emission. The telecommunications sector is not different in this aspect. Carbon emissions, due to telecommunication processes, predominantly come

of this consumption are reported by Fettweis and Zimmermann in their 2008 conference paper and a few subsequent studies. This 4% is a large amount and needs to be taken seriously, as telecommunications is one of the fastest growing sectors in many countries of the world. Similarly, radiation pollution also holds a major role in the health concerns across the world. More concerns regarding these issues are found in the work of Tseng in 2010.

Sustainability has its own rewards as well, as it provides significant competitive advantages. A continental study on African telecom and its sustainability options are

son, and Ridgeway, in their 2011 paper in the *Harvard Business Review* clarify how balanced ecosystems can help in the sustainability of businesses and economies. Spreitzer and Porath provide a list of initiatives for sustainable performances.

Overview of the global telecommunications sector

Today, the global telecommunications sector is very large (see Table 1 for an overall picture). It is present in all countries and more than 80% of the global population uses it firsthand. There are more than 6.79 billion mobile subscribers (as of 2013 according to the reports of the International Telecommunication Union). With the projected trends of population growth (see Fig. 1), this number will keep increasing until the middle of 2040. Even with the slowest possible population growth, the trend will increase until the end of the 2040s (as seen from the global trend of population growth, the lower solid black line of Fig. 1). The growth rate projections are presented in Fig. 2.

There are hundreds of service providers and vendors who play important roles in infrastructure building and service provisioning. According to Gartner Inc., the total carbon emissions due to the telecommunications industry was almost 2% of the total global emissions in 2007. The emissions generated from the telecommunications industry is growing globally, mainly due to its growth in developing countries, though the trends of developed countries are somewhat constant. Along with the telecom service industry, the telecom equipment manufacturing industries are also growing at a significant rate. The broad picture of the global telecom sector is included in Table 1 and Fig. 3. The carbon emissions of major countries are shown in Fig. 4, and the total global trend is shown in Fig. 5.

The need for sustainability in telecommunications

The telecommunications sector has a share of almost 5% of the global annual GDP (as per Gartner Inc. and

There are several initiatives being undertaken at different levels such as: the leading companies searching for green options, governments encouraging emissions-free technologies, and much research being carried out on sustainability.

from the operations that support them. The power consumption and bandwidth usage are the prime factors influencing carbon emissions in the telecommunications sector.

The power used for information processing, transmission, and reception is now of the order of 4% of global power consumption. The trends

presented by Mbarika and Mbarika in their May 2006 article in *IEEE Spectrum*. Kang and Kim provide company-level sustainability initiatives in South Korea. Borland, in his 2009 paper in *International Marketing Review*, provides the conceptual bases of sustainability and its management aspects. Chouinard, Elli-

TABLE 1. A global view of the telecommunications industry.

	ENTITY	INDICATOR/NUMBER	YEAR	SOURCE
1)	Worldwide telecommunications industry revenues	US\$3.1 trillion	2010	TIA
2)	Global landline subscribers	1.18 billion	2010	ITU
3)	Global landlines per 100 population	172 (%)	2010	ITU
4)	Mobile cellular service subscriptions, worldwide	6.79 billion	2013	ITU
5)	Total smartphone sales, worldwide	296.6 million units	2010	Gartner
6)	Mobile application downloads, worldwide	17.7 billion	2011	Gartner
7)	Handset sales 2010, worldwide	1.6 billion	2010	Gartner
8)	Total carbon emissions from ICT	0.86 gigatons	2007	Gartner

International Monetary Funds estimations). It uses more than 4% of the global power for its operations. By the end of 2013, there will be no bandwidth left unoccupied in the radio frequency range for communication in the United States, according to Federal Communication Commission reports. In the rest of the world, where the mobile penetration is high, similar scenarios are predicted. As mobile and Internet technologies are ubiquitous, the picture is very much transparent: there is no doubt that the telecommunications sector is responsible for the emission of a lot of carbon dioxide and produces much noise and unwanted radiation, both directly and indirectly. Radiation pollution is predominantly due to this sector.

The growth rate of telecommunication is still high, being the fastest growing sector in some developing countries. Carbon emissions from the information and communications technologies (ICTs) sectors globally is 2% of the net emissions (see Table 2). It is nearly the same as that of the global aviation sector. It is also in the same range as the net carbon emissions of Canada. Obviously, the present telecommunications create an alarming situation like other industrial sectors. To have sustainable growth, a careful analysis should be performed. Accordingly, for a better understanding of key factors on emissions, they can be divided into two broad categories: internal and external.

Internal factors

Internal factors are those that are needed for the survivability and growth of the telecom sector itself. In this category, the main factors are: power consumption in telecommunications, bandwidth used in telecommunications, cost effectiveness, and physical affordability of the components and infrastructure. The power consumption in the telecommunications sector is following a growing trend. According to the *IEEE Journal*

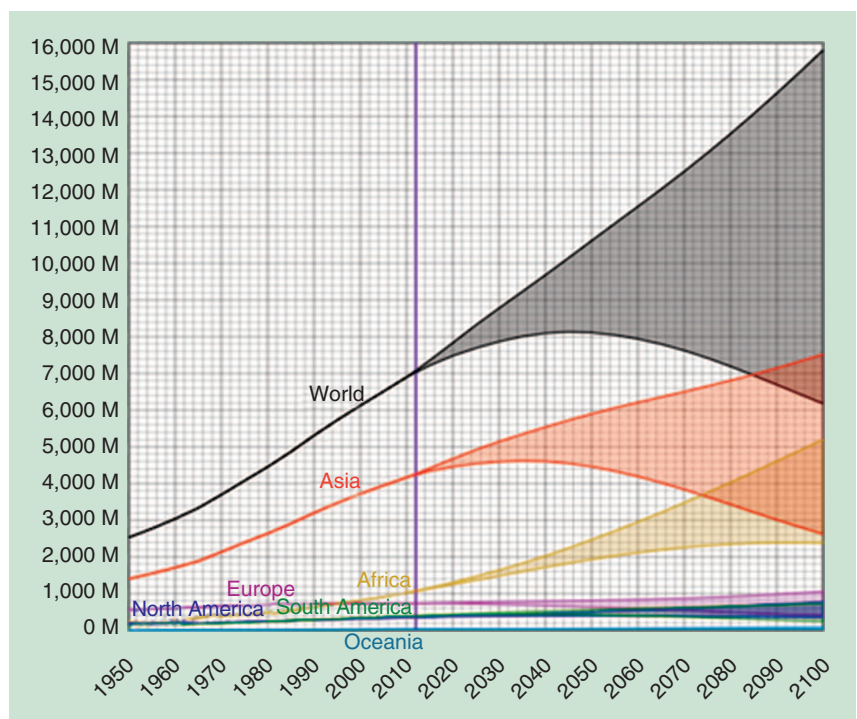


FIG1 Global population trends with projections. (Source: Google public data.)

Executives make key decisions not only for using new smart and green technologies but also in deploying research and development of scarce resources (also in their generation in appropriate cases).

of *Selected Topics in Quantum Electronics*, by 2025 the net power consumed by the telecommunications sector will raise to almost 10% of the total global power consumption. Under

this scenario, the power consumption per component/device cannot be as it is today. Power efficiencies need to be improved significantly, and new sources of power should be explored.

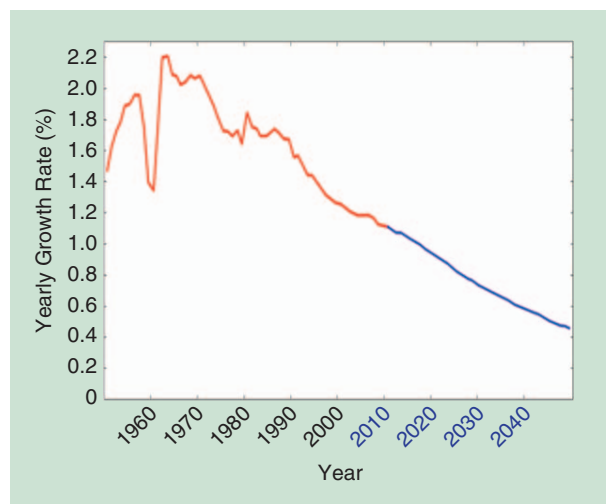


FIG2 The growth rate of global population with projections. (Source: Google public data.)

It is desirable that the devices can generate their own power instead of taking it from external sources as most of them do these days. The entire spectrum has already been allocated for different services and operations. The search for new spectrum is vigorous. Infrastructures are the essential parts of the fixed investment of the telecommunications sectors. They are needed for all kinds of communication. In the coming years, there will be an increase in telecom infrastructure as well. Accordingly, cost and efficiency factors of

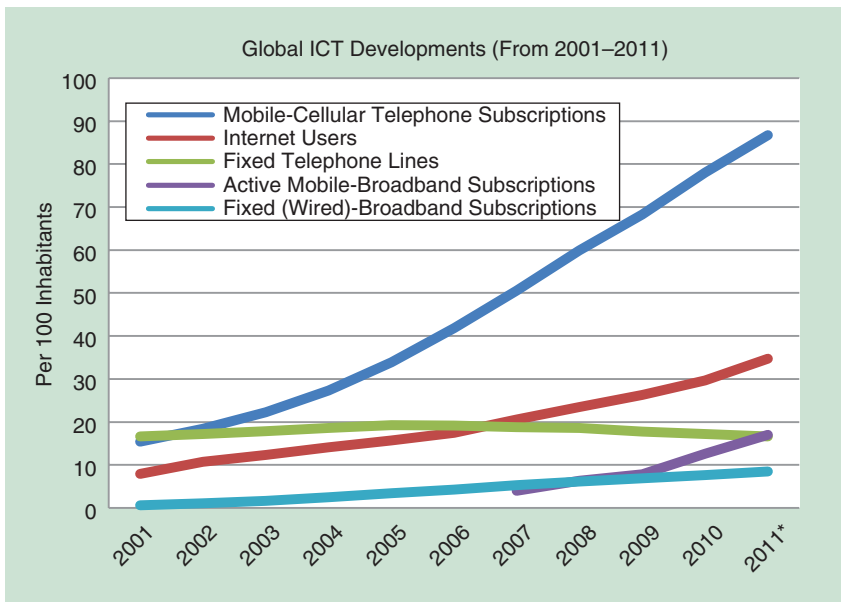


FIG3 Global ICT developments. (Source: ITU, 2011.)

the components and raw materials will increase. All of these problems can be solved only if the sector is made sustainable in the long run.

External factors

All external factors are intertwined, which should push the telecom sector toward sustainability. These factors either support the telecom sector or are supported by it. The external factors include: power generation methods, power storage technologies, equipment manufacturing technolo-

gies, raw materials used for the generation of telecom resources, and the production of infrastructure and equipment, among others.

Ways to achieve sustainability

After reviewing the scenarios of growth in the telecommunication sector, it is essential to make this sector sustainable. There are several initiatives being undertaken at different levels such as: the leading companies searching for green options, governments encouraging

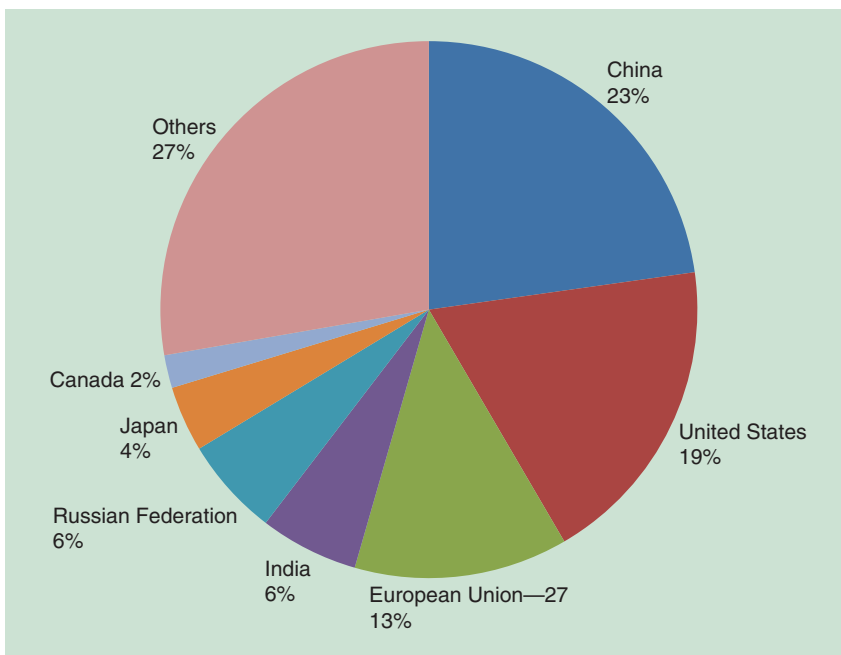


FIG4 The global share of CO₂ emissions. (Source: IPCC, 2007.)

emissions-free technologies, and much research being carried out on sustainability. The following are some feasible solutions that have been proposed for the telecommunications sustainability.

- The use of *power efficient technologies* is important not only because power efficient equipment is able to save over 80% of power currently consumed in the telecommunications industry but also because power shortage is a real problem in the underdeveloped world, hindering social and economic development.
- As power generation from fossil fuels is not sustainable, the *generation of power by smart energy sources* such as solar, wind, tidal, hydroelectric, and other sustainable means is crucial to underpin a cleaner industrial development. The main problems of these sources are the uncertainty of their availability and difficulty of use due to the lack of effective power storage methods.
- Power saving in telecom equipment and infrastructure is essential to take on an increasing energy demand. *Power saving and storing* not only need to be improved, but also the wattage of the devices should be decreased. Accordingly, corporate environmental responsibility must target new promising technologies. Storage area networks and efficient storage methods play a key role in the future. Solar power-enabled devices and systems are emerging from new research. However, this must grow faster than the growth of the telecommunication sector itself, which is not the case currently.
- *High-capacity core networks* reduce the common traffic congestion found in local and metro area networks. Although they are expensive, they do have a longer life span and better performance, which make them attractive in telecommunications. Such high-capacity and high-speed core networks can lead to a better efficiency in the wireless spectrum

in some selected services, and the overprovisioning of spectrum can be avoided. Optical fibers are the most suitable choice for such networks as they are able to carry multigigabit traffic in very cost effective ways without much maintenance. Free-space optics (FSO), which is a fiber-less, laser/LED-driven technology that supports high bandwidth, also has great potential in local and metro area networks.

- As the spectrum for radio communications influences the wireless communications, *improvement of spectral applications* are very important to accommodate new services and operations. There are new technologies to improve the spectral efficiency by several times. For example, the 256 quadrature amplitude modulation (QAM) and 1024 QAM can provide two and four times the quadrature phase-shift keying spectral efficiency (the modulation technique used in the Global System for Mobile Communication in 2G). Emerging technologies such as the cognitive radio (it is a new technology to use dormant spectrum) can be used to utilize the allocated but unused spectrum (in the form of spectrum holes or voids) at any time. This is a great hope for the new services that are facing the spectrum scarcity. FSO can also be used in the access area for high data rate communications.
- Today, infrastructures used for communications are not too smart (intelligent and efficient on their own) as far as their power consumption and sensitivities are concerned. However, they are better than the technologies of the last decade. This indicates that they are not yet fully smart; rather, semismart. For the coming years, *smart infrastructures* and components are in high demand.
- The devices used for communications such as handsets and set-top boxes are also semi-smart at the moment. Their evolution to a

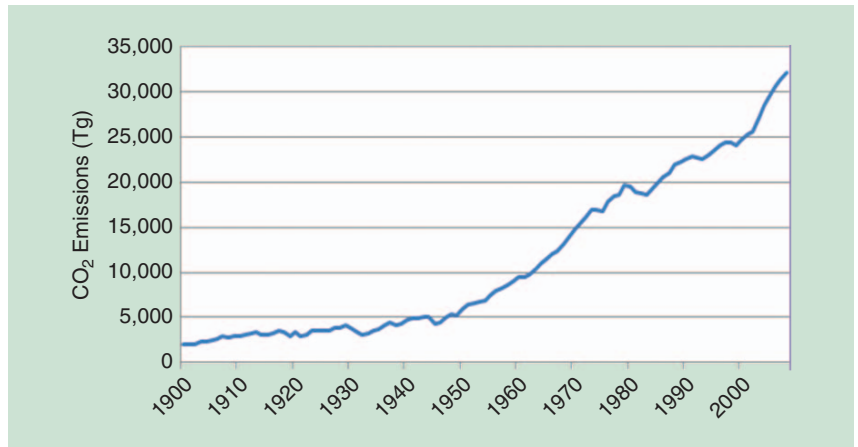


FIG 5 The trend of global CO₂ emissions until 2009. (Source: U.S. Department of Energy, 2011.)

smart category is in high demand. In the quest for smart technologies and *smart devices*, there are several achievements so far in communication receive-

the above mentioned ways toward the efficient utilization of resources. Cloud computing is the best example of green methods to store data and use it

As power generation from fossil fuels is not sustainable, the generation of power by smart energy sources such as solar, wind, tidal, hydroelectric, and other sustainable means is crucial to underpin a cleaner industrial development.

ers. The receivers used today are quite better in several aspects, such as energy efficiency, than those of the last decade. It is expected that energy efficiency and other resource savings will be improved in the future.

- Going green will enable sustainability. There are several applications in telecommunications that can use green technologies. Of course, it is the collection of

locally instead of mobilizing it repeatedly in the traditional way. According to the Gartner's report in 2012, cloud computing market values have gone up to US\$109 billion and this trend should keep increasing for many years. Cloud computing reduces energy consumption quite significantly.

- *Corporate players and their executives* play an important role in

TABLE 2. Global share of telecommunications.

INDICATORS	GLOBAL SHARE IN %	REMARKS
1) Net power consumption	>4%	It would reach around 10% by 2025
2) Net carbon emission	>2%	Almost same as the global aviation sector
3) Share of global GDP	>5%	Still growing around 10% per year



The emissions generated from the telecommunications industry is growing globally, mainly due to its growth in developing countries, though the trends of developed countries are somewhat constant.

deploying sustainability. Executives make key decisions not only for using new smart and green technologies but also in deploying research and development of scarce resources (also in their generation in appropriate cases). Without their participation in the supply and demand of smart and green technologies, sustainable initiatives are doomed.

■ **ICTs** are very often proposed as one of the main drivers for the reduction of the carbon emission, as they can underpin the reduction of expenditures, processes, transports, and carbon emissions of different business sectors. For example, at a corporate level, video conferencing will largely reduce transportation expenditures as businessmen/women need not to travel as often. Telemedicine can also result in the plummeting of travel and physical relocation expenditures to a large extent. Clearly, a change in paradigm is mandatory across the world for telecommunications sustainability.

Conclusion

Sustainability is now on the agenda of more than 90% of the large telecommunications companies in the world. However, only a few of them are successfully implementing the appropriate initiatives. The measures toward sustainability are not too complex to achieve, keeping the growth of new technologies and standards in view. However, supervision from governments and standardization enforcing bodies worldwide are necessary.

Companies must take initiatives toward sustainability right now. For small- and medium-sized companies it may be expensive but in the long run they can save a lot in several ways. The new initiatives of green technologies and cloud computing will reduce the power needed per bit of data. In the quest for a better world, the next generation communication systems need to be sustainable in a majority of these aspects.

Read more about it

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