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GREEN COMMUNICATION

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Abstract

It is undeniably true that today people across the globe are linked together by an efficient telecommunication system; and with the increasing developments in this field, it has proven its importance in the modern society- a world without media is beyond our imagination. It has faced an exponential growth over the past few years, and will keep growing, giving rise to a more close-knit world. The increased demands are leading to the production of new, advanced devices. However, there's a flip side of the coin- this has enormous impacts on the environment (energy consumption, radiation, biological impacts, etc.) These prevalent issues have given rise to the concept of 'Green Communication'.

Keywords:*Green communication; Energy consumption; Energy efficiency; Sustainability; CO2 emissions; Wireless media*

INTRODUCTION

In the present scenario, the availability of communication devices over a range of affordable prices and varied features has increased the growth of its applications around the globe. Moreover, the introduction of new, updated and highly advanced devices such as portable mobile phones has expanded faster than anticipated, enabling people in every corner of the world to connect. Consequently, the demand for energy consumption and distribution has increased drastically in many parts of the world.

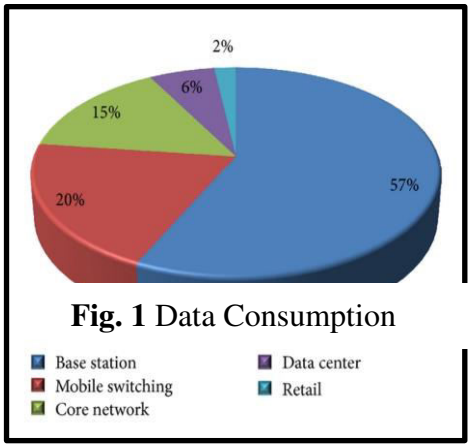

Fig. 1 Data Consumption

Statistics suggest that about 57% of energy is consumed by the base stations while 20% is utilized by switching of mobiles alone. In addition, a lot of power is used to process e-waste, especially when it is not disposed in the right manner. From the figures, it is clear that more than 65% of the consumption is due to electricity sectors, production sector, and areas that are prominent of pollution. The only solution to combat all of the above problems is Green Communication. This futuristic technology aims to reduce the carbon dioxide emissions, energy consumption, radiation, or any other environmental impact, without compromising the quality for the users. Even though the topic is not much talked about;

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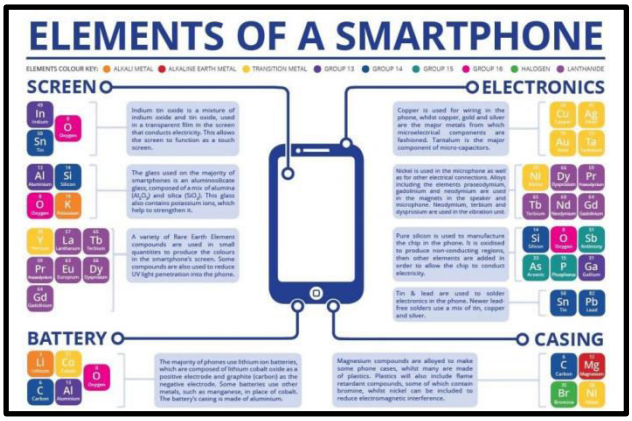
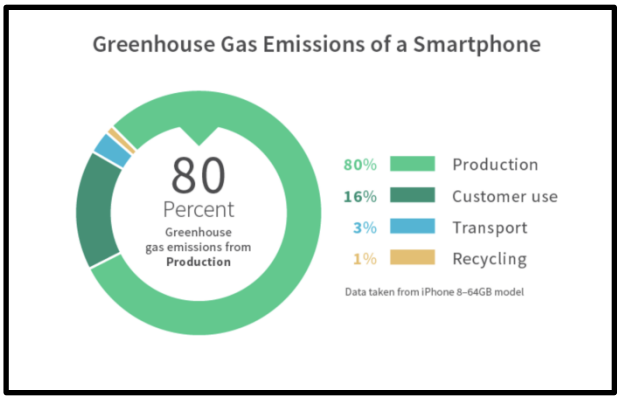
it has received a lot of attention recently. There have been a lot of surveys that summarize a blend of different opinions on the work carried out and actions taken on the above concept.

ENVIRONMENTAL IMPACTS

While the telecommunication industry has many ill effects on the environment, lately carbon dioxide emissions have gained a lot of importance due to its role in global warming and climate change. Other major impacts include water pollution, air pollution, ozone layer depletion, exploitation of natural resources and more. Since this industry requires large extracts of rare metals and other sparse materials, it is hard and damageable to gain and disposethe waste matter.



The picture on the left shows the various components that go into making a smartphone. As mentioned earlier, its sale is faster than anticipated, increasing the thirst for new advancements. People buy the latest technology, unaware of the impacts the disposal of old and production of new devices is having on the environment. The statistics on the right suggest that the production of each smartphone is responsible for about 80% greenhouse emissions, followed by 16% from customer usage, 3% for transport and 1% for recycling. While this may seem like shocking numbers, in 2019, an estimated of 82% the world's e-waste was dumped or burned rather than recycling increasing the emissions by more than 48%. The overall carbon footprint of the phone has jumped from 17 megatons of emissions per year to 125 megatons of emissions per year (730% increase). A mobile phone used 1 hour a day has a carbon footprint of 63 kg a year.



Berners-Lee, a famous computer scientist and inventor of the World Wide Web stated that, "It would take 34 years of average use for the footprint of electricity to equal the footprint of the phone itself.So, if you keep your phones twice as long, you almost halve the total annual footprint."

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TECHNIQUES

5G is a major component in the green communication techniques. Here I have explained 4 of the major techniques used. The first and most widely used is device-to-device (D2D), which is the radio network access and communication between devices in proximity. This is a very efficient way since it reduces latency and reliable link through the direct communication system. In this method, since users communicate directly, it reduces the load of the data traffic at the stations, this allows the stations to be dormant and save power at intervals. This in turn reduces the carbon footprints. The figure to the right shows the reduced involvement of data centres with the D2D method.

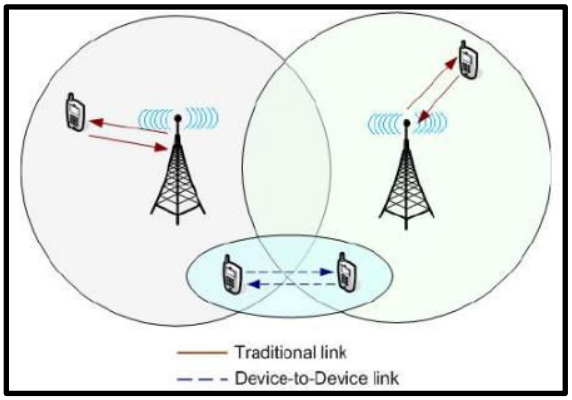

Fig. 4 Device to Device

The second most widely used method is called Multi-user Multiple Input Multiple Output (Massive MIMO). Here, a base station with numerous antennas can simultaneously serve multiple users. As represented by the illustration on the left, one station can benefit lots of devices. This system of Massive MIMO is very robust, efficient, helps in latency reduction, high-capacity gains, profit and more. In this method, the type of antenna plays a significant role. It can be integrated in 3 ways: network, single and distributed. The choice of method is based on the number of devices, network needed and area covered by the centre. However, this method is used lesser than D2D method as it involves more resources and is more expensive. Hence, it mainly deals with larger data.

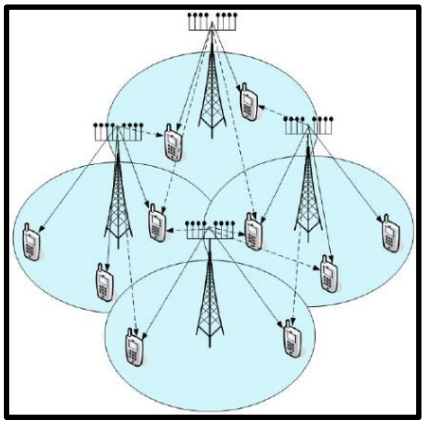

Fig. 5 Massive MIMO

The next technique is known as heterogeneous networks, often referred to as Hentet. It consists of small cells. A network is generated by connecting to the base station to the main network through a series of wires, wirelessly, or in some cases both. The picture to the right shows the framework of connections. This mixed usage of wired and wireless technology helps Hentet to be robust with minimal bandwidth issues. The power can be saved by putting the cells in sleep mode when there is little or no load on the network. This helps save energy as well as make the system more efficient in time of use.

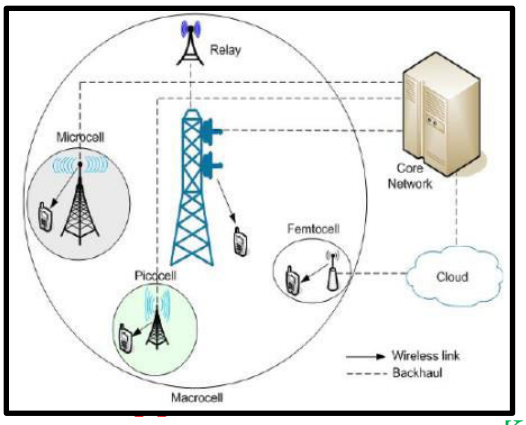

Fig. 6 Heterogenous network

Finally, Green Internet of Things is yet another branch of 5G technologies. The image to the left shows the various industries it is used in. Green IoT greatly aids in reducing greenhouse effect through the different methods it possesses. One of the main components in IoT is Wireless Sensor Networks. In Green IoT, you can keep the nodes in these sensors on sleep mode and reduce power when needed, thus saving about 19% of energy being wasted. It can be used with various methods, but when interlinked with D2D, it can become even more energy-efficient.

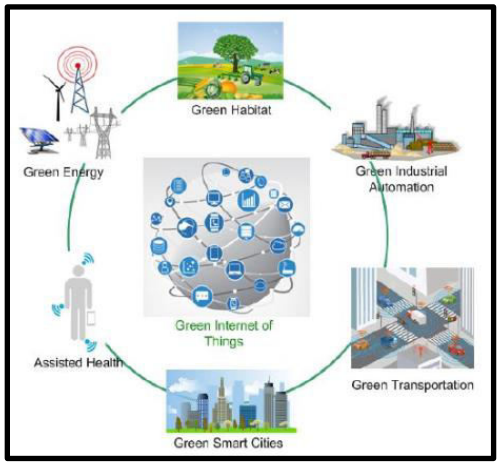

Fig. 7 Industrial uses of Green IoT

CHALLENGES

Green Communication, however, has a huge price to its benefits.
The main drawback is cost. Even though green communication involves lesser use of energy, the installation and infrastructure of the devices is not very cost-effective. Moreover, in order to establish an efficient network, we need a complex and expensive computer system.
The other secondary challenges may include bandwidth, spectrum efficiency and antennas. There are variable factors, thus making it hard to make the right choice and get the desired result.

CONCLUSION

Overall, this research paper talks about Green Communication, its environmental importance, its techniques and its challenges. Green Communication is the concept referring to establishing a network system with least number of resources and energy being wasted. It is very important, especially after the rising concern over carbon footprints and global warming. There are various techniques to practice it- most common being device to device (D2D), massive MIMO, Hentet and Green IoT. While there are many negative sides, main ones include cost, choice of devices, bandwidth, spectrum efficiency, etc.

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