Regulation Proposal for the Implementation of 5G Technology in Peru

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***Abstract*—Telecommunications play a very important role in people's life, for years there has been an evolution of this technology in the mobile communications' industry reaching up to the 5G technology, which is more advanced than 4G, making it thus more comfortable for the user. In Peru, 5G technology has not been implemented though because there is fear from great part of population regarding its the antennas. Another fear is nowadyas the spread of COVID–19, this is because there is a lot of false information that has poor scientific support, even that information has been denied by the Ministry of Transport and Communications (MTC) from Peru, but still people hold on to these fears. Due to the aforementioned reasons, the present investigation aims to carry out an assessment of the benefits that the 5G technology would bring to the country and also proposes a regulatory frame for the radioelectric spectrum that will occupy this technology in Peru. By evaluating a regulation proposal of 5G technology in Peru, it is shown that the implementation of this technology will bring benefits in the social and economic sectors of the country.**

***Keywords*—5G; regulation; antennas; radio spectrum**

I. Introduction

The 5G technology has high expectations regarding its launch. If we observe the evolution that the mobile technology has had since its inception, it has shown great advancement. So it was expected that the 4G technology in some moment was going to be surpassed. And so, the technology 5G appeared in which people can navigate at higher speeds, that is, allowing individuals to have an internet connection faster than 4G, with the promise of 10 Gbps connectivity and latency less than five milliseconds ($<$ 5ms). Hence, it is no surprise that the current increase in the demand for mobile connectivity is going to accelerate dramatically [1].

In Peru, the 5G technology has not been incorporated due to missing antennas and base stations that can support this technology. According to the Ministry of Transport and Communications (MTC), there is no 5G antenna in the country at the moment nor it is not known if the implementation of them is being carried out during the stage of social confinement due to the COVID–19 pandemic in the country [2]. On the other hand, it has been observed that many citizens fear antennas and even relate it to the spread of COVID–19, this is because they get carried away by false information. Faced with abundant information from unreliable sources, the MTC through several statements and campaigns has indicated to the population that there is no relationship between 5G technology and the spread of COVID–19 [3]. According to the director of Audits and Sanctions in Communications, Patricia Daz, she has indicated that there is no scientific research to support in no way that the antennas have any relation also to cancer and/or any other disease [2].

In the South American nation of Peru there are people who distrust the antennas and even refuse to have them installed within their territory. For instance in the tiny Peruvian town of Chopcca (Huancavelica), villagers burned antennas and kidnapped the personnel in charge of the installation. This is really contradictory, as many people complain about the little coverage that there exist specially in the rural communities. Furthermore due to the current pandemic many students are not able to receive their classes remotely. They complain that the current internet connection they have is very slow and sometimes the image they see in video is pixelated. Hence, a paradox that stands out is that users want greater connectivity but they don't want any more antennas.

Some studies about the 5G technology, such as the work developed by [4], cover the benefits that 5G technology will generate, for example, in Ecuador. It has been indicated that this technology will take time to develop within this country since for the government it represents additional costs and even the operators do not have the necessary resources to do the tests. It should be noted that previously when a new technology such as the 4G has been implemented in Ecuador, there has been a growth in the economic, technological and social sectors. Another work developed in Indonesia [5] mentioned the importance of the features about the 5G technology. To conduct an evaluation and see if such technology can be integrated into this Asiatic country, the authors considered that this technology should be assigned to frequency spectrum that is already being occupied by fixed satellites within this country. The authors in the aforementioned study recommended performing a cost benefit analysis to know if it is convenient to use 5G technology in the selected spectrum of frequency. Finally there is a work developed in Colombia by [6], where a technology comparison between 4G and 5G is made. For this the authors made a description about the evolution that each technology has had in mobile networks and also the increase in their web browsing speeds. The authors of this Colombian study mentioned that the 5G technology will be beneficial in the social and economic realm.

Seeing the problems in Peru regarding the little knowledge that people have about the 5G technology, this article will conduct an assessment based on the benefits this technology will bring. In Section II, characteristics of the 5G technology will be presented, such as the concept of this technology and its radio spectrum radio for 5G. In Section III, we will show a

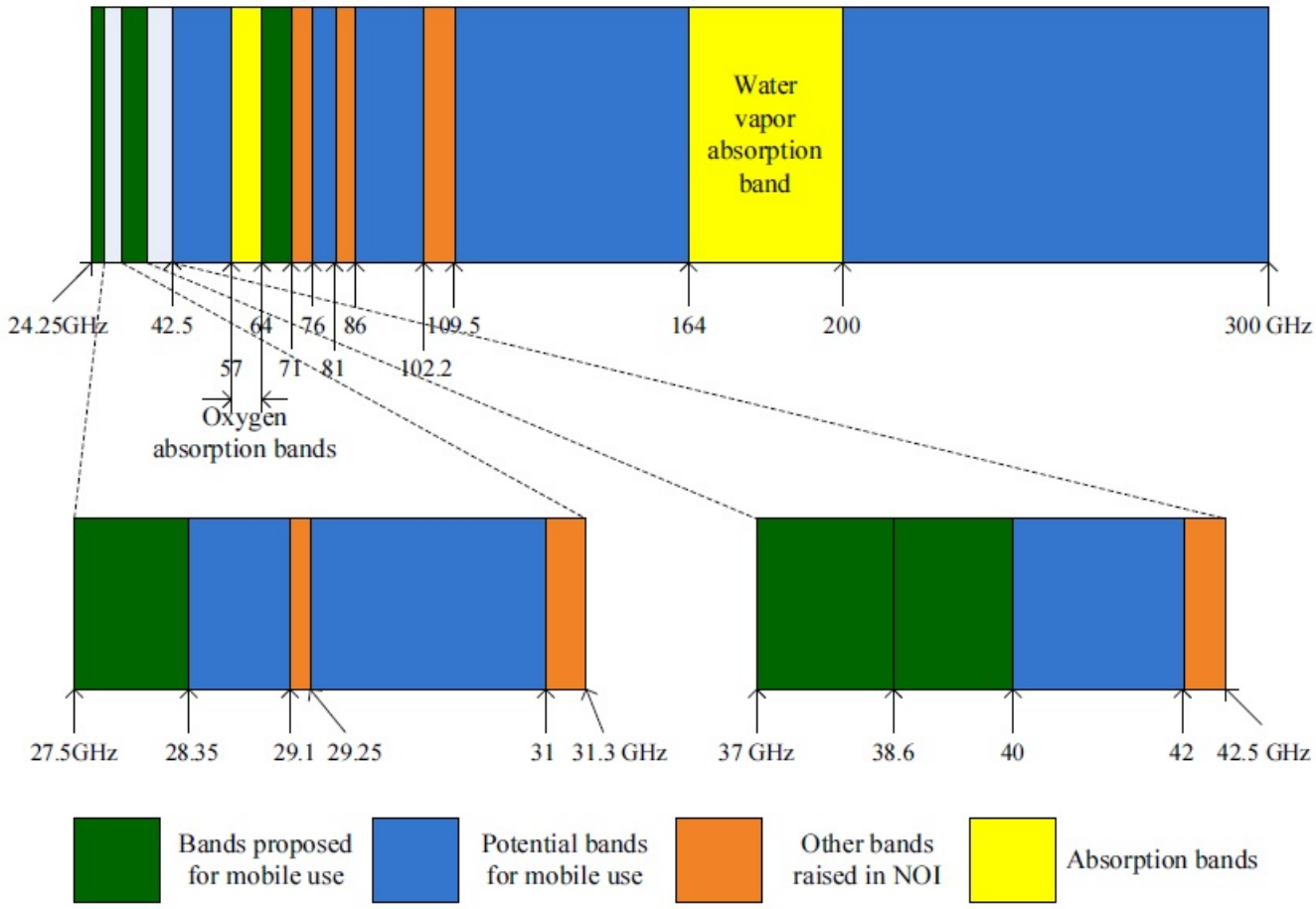

Fig. 1. Spectrum Usage in mmWave Bands [7].

brief description of the mobile telephony industry in Peru and also discuss the improvement that 5G will bring by considering the social and economic perspectives. Finally, in Section IV the conclusions are indicated.

II. Characteristics of 5G

A. Concept of 5G Technology

The 5G technology or the fifth generation one, is an evolution of mobile communications systems that throughout the years has been cherished, where each generation is distinguished in improved data transmission speeds. This technology features a data transmission speed of several gigabits per second, latencies of approximately 1ms and reduced energy consumption for wireless broadband [8]. According to these characteristics, the increase in internet connection speed is remarkable. On the other hand, this technology also provides solutions for automation, power, agriculture, among other applications [4]. This is important since it allows that communication between man and machine is fluent, and also spares the need that individuals physically control machines.

B. Radio Spectrum for 5G Technology

The 5G technology offers faster connection speeds to the internet, so it requires a greater radio spectrum and an efficient one. Since the radio spectrum is a finite resource, the International Telecommunications Union (ITU) that is the global agency responsible for the spectrum management of radio frequencies and the resources of the satellites in orbit [9]. The ITU has to regulate a radio spectrum that does not generate conflict with those technologies that work already in a certain frequency spectrum and can be maintained in such a way also that 5G can meet the expectations required.

For the 5G technology, decisions about the management of the spectrum will play a critical role in meeting of the expectations established for the 5G networks [9]. This technology will have a wide bandwidth so it can offer a capacity and speed of data transmission optimally for the comfort of the users. One of the novelties of 5G is that a frequency band that was previously not considered for mobile communications such as the 24 GHz band and it is seen in Fig. 1 can be used. So 5G implies a higher spectrum and which is widely available in the millimeter range. This can accommodate as well the Massive-MIMO implementation that involves multiple small antennas and processing in devices [10]. MIMO or multiple input and multiple output, is used to improve wireless communication and will result important for the 5G technology.

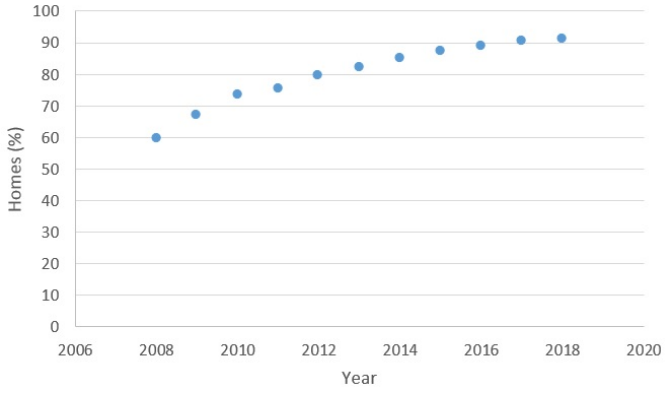

Fig. 2. Households with at least One Member of the Family having a Mobile Phone in the 2008-2018 period.

III. 5G in Peru

A. Mobile Communications in Peru

In Peru, the radioelectric spectrum being a finite resource, is administered by the Ministry of Transport and Communications (MTC). It is known that in various parts of the Peruvian territory there is no coverage, thus this limits the use of the maximum data transmission speeds that it already has for technologies such as 3G or 4G. The number of users has noticeably incremented in the last few years [11], however the technological capacity to satisfy all users has not increased.

At present there is a growth in mobile technology. Fig. 2 shows the number of households between 2008 to 2018 who have a mobile phone in Peru according to the National Institute of Statistics and Informatics from Peru. There is no doubt that a clear increment can be seen. Thus, this will lead to a growing demand of the radioelectric spectrum. To ensure that the development of 5G technology is optimal, a good management is needed, since the development of 5G involves large challenges at the technological and structural level. The architectures of mobile networks will have a notable change in their components, in the way of managing resources, and in the provision of services [12]. While it is true, some operators have conducted tests in Peru with 5G technology obtaining good results, only the tests were carried out and still this technology has not been implemented anywhere in the country.

The objective of implementing 5G technology is that all people can use it on their mobile devices to stay connected and being informed of what may happen in the world in a different way, without the famous bottleneck that occurs when a large number of users use the network at the same time. Therefore, the management of the radio spectrum for 5G technology is a crucial matter. On the other hand, the Supervisory Agency Private Organism in Telecommunications (OSIPTEL) from Peru, mentions that the arrival of these technologies require highly trained professionals to develop it [13].

B. Social Perspective

Since the 5G technology has not been implemented in Peru, the social perspective will not be so exact, so the analysis to know how the Peruvian population would take 5G technology could be evaluated by observing the impact the 4G technology has generated in the society of the country, and to what extent this has improved the comfort of the users.

The 4G technology in Peru has been well received, because it was a different experience from its predecessor. Its greatest internet browsing speed is of 100Mbps, communication of people by video call, etc.. Thus, this has generated greater expectations about the mobile communications that 5G technology will bring about. Currently with the pandemic generated by COVID–19, many people telecommute, students have classes remotely, so it should come as no surprise that when this technology is implemented in the country, it will increase the consumption of this one, since most of the users will always seek comfort. Although there are people who oppose the implementation of this technology due to the abundant false information that exists, the truth is that there is not yet scientific support that confirms the damage that 5G may generate.

C. Economic Perspective

To know what benefits the 5G technology in the country will have from an economic perspective, this could be evaluated using the growth that mobile devices have had. While it's true, mobile devices have grown considerably, now with the arrival of the 5G technology there is no doubt that growth will be greater. Moreover, if proper policies are implemented, the use of 5G technology in Peru could give a kick to the e-government and e-commerce sectors of the country. It should be noted that for the implementation of this technology in the country, it would have to make some regulations with the radioelectric spectrum. Although in the country, the spectrum they propose is being used for mobile communications, so there won't be much inconvenient for the use of 5G technology. The implementation of the 5G technology in the country, initially will be carried out in places where there are a greater number of users, that is to say where the industries that move the economy in the country are centralized. It has to be indicated that 5G implementation for the whole country would be really slow due to the lack of technology at the moment. In Fig. 3 we can observe both perspectives considered for the regulation of the implementation of the 5G technology in Peru.

IV. Conclusions

From the present investigation, it is concluded that the implementation of 5G technology in the country will bring benefits in the social and economic sectors. Mainly because users will have the convenience that this technology will provide. Furthermore, the demand of mobile telephony in the country will have a growth each year. This is because users always seek to have a tool that makes things easier for them. As future work, an analysis of this technology considering mathematical models in order to know exactly how much revenue will generate in the economy of Peru will be considered.

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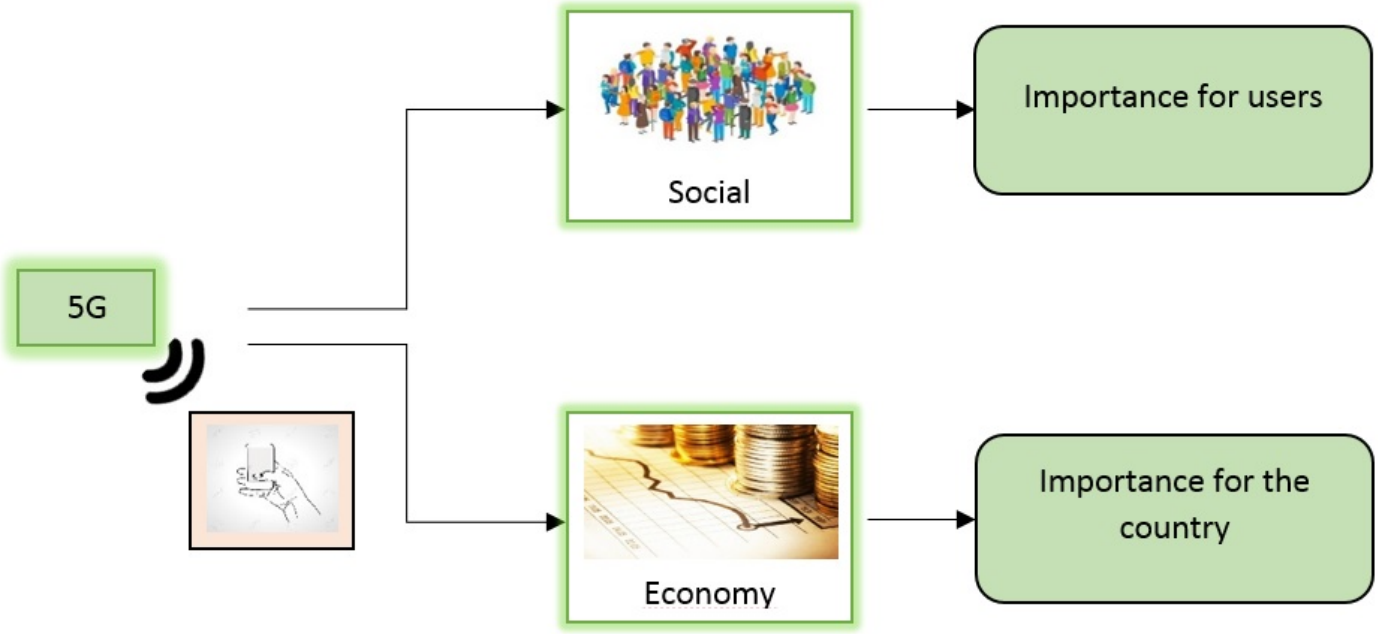

Fig. 3. Social y economic Perspective for the Implementation of the 5G Technology in Peru.

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