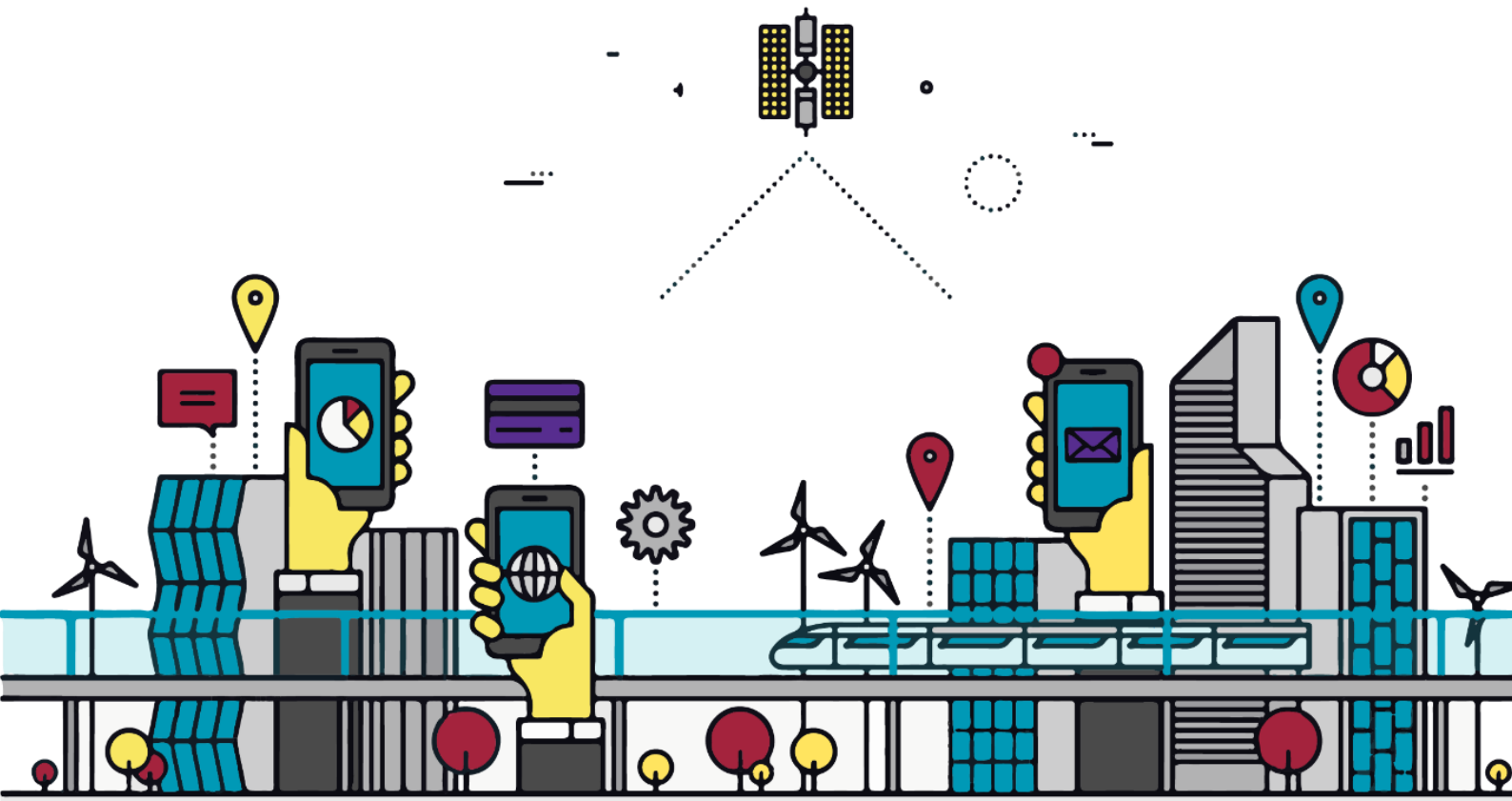
Radio Spectrum Policy Programme

2019 - 2023



Enhancing further the connected community

MCA/C/19-3633

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CEO's message

Welcome to the MCA's Radio Spectrum Policy Programme for the next five years. The five-year Radio Spectrum Policy Programme is a key part of the Malta Communications Authority's strategy of consultation and constructive dialogue with public stakeholders, industry, consumers and citizens alike.

A central purpose in publishing the Radio Spectrum Policy Programme is to provide spectrum users with an updated overview of the MCA's spectrum management priorities. The MCA shall also endeavour to pinpoint the issues it sees arising over the near to medium term, together with the necessary plans to address them. Over the past years, the MCA delivered a number of key spectrum initiatives, including: the updating of the test and trial licensing regime; the assignment of the spectrum in the 800 MHz spectrum and the 2.5 GHz spectrum bands leading to nationwide 4.5 G services, the implementation of interference mitigation measures for DTTV; the publication of the governing decision for the 1.5 GHz band; and the CGC Regulatory Framework amongst others.

During the coming years, developments in 5G including the relevant spectrum, Internet of Things (IoT) and other wireless connectivity technologies will require the MCA to consider whether changes are necessary to the way it manages spectrum including: licensing schemes, pricing and compliance amongst other spectrum related activities. Such activities will, undoubtedly influence the MCA's spectrum management functions as well as the prioritisation of our work.

Our approach to spectrum management continues to be shaped by our ongoing experiences, research, observations and evaluation of the spectrum management environment both in Malta, Europe and across the globe. This enables the MCA to develop innovative management methodologies deemed most appropriate for the unique local market and industries.

The MCA will endeavour to work with Government and all related stakeholders to ensure that the regulatory tools and capabilities are efficient and appropriate in the face of ever-increasing demand for access to spectrum and technology evolution.

Great effort went into the preparation of this five year Policy Programme. On this note, we are keen to receive your feedback on the proposed initiatives. Your feedback will assist us in delivering spectrum management activities consistent with our strategic goals.

Please email your comments to
spectrum@mca.org.mt

Jesmond Bugeja
Chief Executive Officer

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Introduction

A Brief Introduction to Spectrum

Wireless communications have become a necessity. Society continuously utilises them to communicate on a personal level, for business purposes and, to control devices and applications. Thus, wireless communications have become key to personal development and economic growth.

A sound means of communications demands a reliable and robust radio network infrastructure. The latter needs to be coupled with adequate spectrum availability. Therefore, spectrum has undeniably become an indispensable resource. It is the foundation of the wireless electronic communications services industry.

1.1 The National Frequency Plan and the Role of the MCA

The MCA, under the Electronic Communications (Regulation) Act, Cap. 399[1], is the Authority responsible for effectively managing the radiofrequency spectrum in Malta. The MCA plans, allocates and supervises the spectrum[2].

A National Frequency Plan (NFP) is periodically drawn up and submitted for the approval of the Minister responsible for communications[3]. The Maltese National Frequency Plan outlines the radio frequency spectrum allocations within Maltese territory. It also details the type of radio communication services that are permissible within a particular band. The Plan is based on the Radio Regulations of the International Telecommunication Union (ITU) and also serves to implement EU laws on spectrum. The tables reflect the European table of frequency allocations and applications,

[1] The applicable Maltese Regulations are available at http://www.mca.org.mt/regulatory/legislation

[2] With the exception of spectrum for sound broadcasting services which is assigned by the Broadcasting Authority in accordance with the Broadcasting Act (Cap.350) and which does not form part of this RSPP.

[3] http://www.mca.org.mt/regulatory/authorizations_licensing/national_frequency_plan

the ERC Report 025[4] and is regularly amended to implement EU decisions and the outcomes from the ITU World Radio Conference (WRC).

Objectiveness, transparency, non-discriminatory and proportionality are key criteria underpinning MCA's activities. They reflect the principles laid out in the Framework Directive, Directive 2002/21/EC of the European Parliament and of the Council[5]. The term spectrum management is vast in meaning. It incorporates a number of activities including, amongst others, spectrum monitoring, spectrum planning/allocations, coordination, licensing and enforcement.

Spectrum management is essential for three main reasons. First and foremost, it prevents interference between different sources both within a country's boundaries and outside of them. Indeed, the propagation of radio waves across country borders necessitates the need for frequency coordination. Secondly, spectrum is limited in the sense that, to date, only a limited number of users may use a specific frequency in a particular geographical location. Hence, another need to manage it. A third reason is harmonisation. Harmonisation leads to better economies of scale thus resulting in cheaper products for the consumer and hence delivers benefits to many stakeholders, including users, manufacturers and service providers alike.

Certain radio spectrum falls within individual licensing regimes. Others require a general authorisation. In this case, the spectrum is primarily governed by the articles within the Framework and Authorisation Directive. This is specified in the regulatory framework for Electronic Communications of the European Union and transposed into the Electronic Communications Networks and Services (General) Subsidiary Legislation 399.28 (hereafter referred to as the ''ECNSR''). The ECNSR clearly establishes the trading rules for radio spectrum, the provisions for the right of use of radio frequencies, the conditions which may be attached to the right of use of radio frequencies and, the usage fees for radio frequencies. It also sets up certain spectrum management principles that derive from the EU framework. Annex 1 lists out the Legislation which fall under the remit of the MCA and which is directly, or indirectly, related to spectrum.

[4] ERC Report 025: http://www.erodocdb.dk/Docs/doc98/official/pdf/ercrep025.pdf

[5] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0021&from=EN

1.2 The Need for a New Radio Spectrum Policy

An optimal Spectrum Policy encompasses four important factors, namely:

- It sets out the necessary orientations and objectives for efficient use of spectrum.
- It promotes competition and consumer benefit.
- It safeguards public interests.
- It encourages investment and innovation; thus promoting new technologies and new opportunities.

A spectrum policy outlines the way in which spectrum is managed. It also touches on the monetary value of spectrum. Mapping a cost figure to spectrum is an intricate task given the socio-economic nature of this finite resource.

The MCA last issued a Radio Spectrum Policy in 2007. This last policy effectively addressed the demand for spectrum and technology advancements at the time. Since then, however, the users' needs and expectations have changed as have the plethora of technologies and services available. Technology is being seen through a different lens. Consequently, the MCA felt the need to review and update its Radio Spectrum Policy in order to better mirror the present drive in technology requirements and the new yearn in market demand, particularly the step change that 5G services might represent. This review will ensure that spectrum continues to be efficiently and effectively managed, catering for the present and future needs with regards to the Maltese economic, social and cultural interests. In this sense, spectrum is not only being pictured as a facilitator of technology, allowing technologies to function and operate. It is also being projected as a medium for development and innovation.

The Radio Spectrum Policy is the first step towards a new framework that will encompass the assignment process, the maintenance of existing spectrum assignments, and, the end of life cycle for the rights of use of spectrum.

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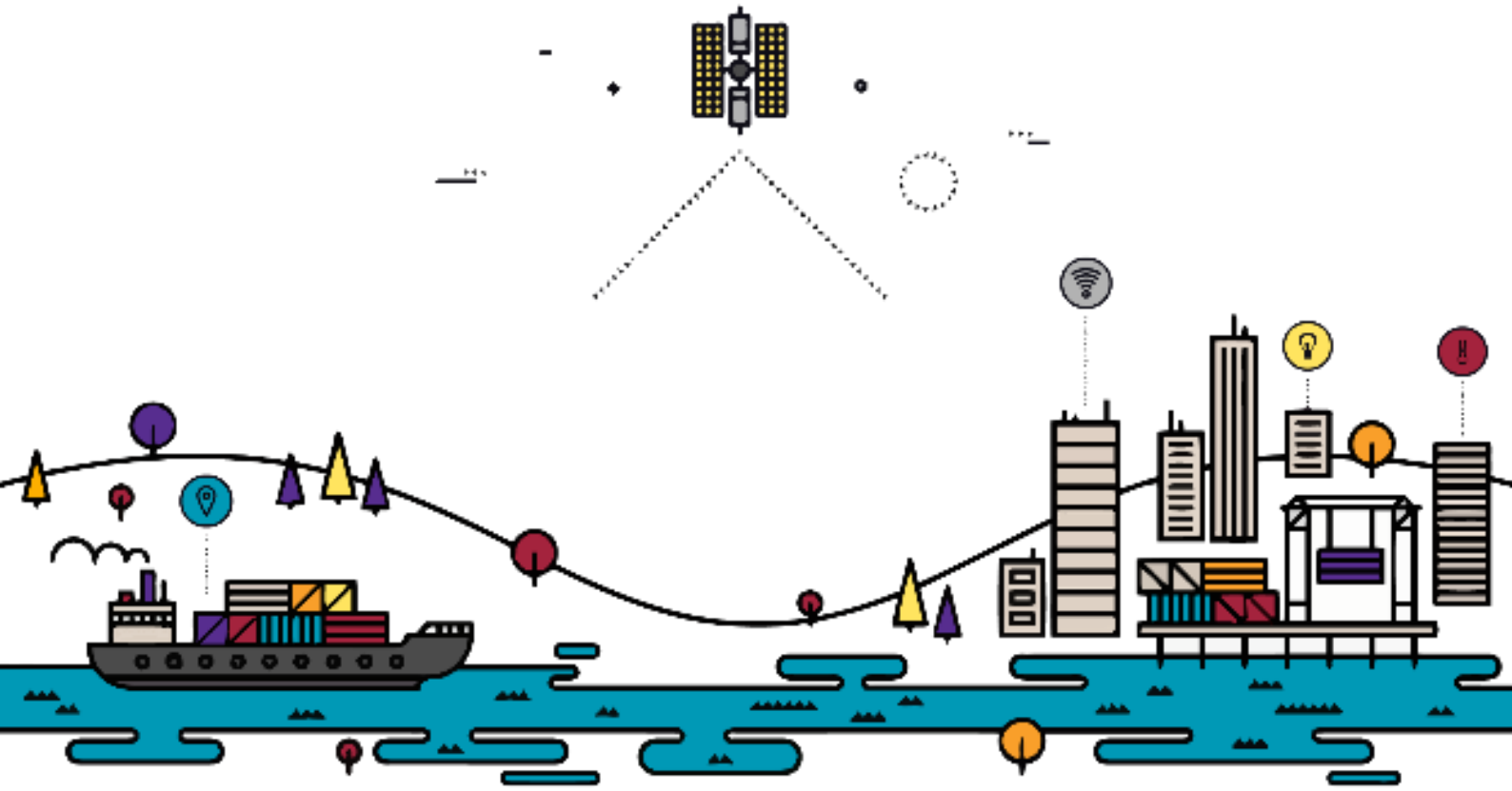
Context



The Context

The use of telecommunications has grown significantly in recent years. Such a growth is anticipated to continue as more applications embrace further digitisation. The spectrum needs for the myriad of applications differs greatly by time, location as well as technological advancement.

2.1 Technology, the economy, society and spectrum. *What is the relationship?*

Telecommunications is a fundamental building block the catalyst to the country's economy. Advancements in digital technologies leverage on a nation's telecommunications infrastructure. It is its driving force. This is especially true when it comes to wireless services and applications.

Telecommunications is markedly used for business transactions - the advertising of products, the selling and buying of goods and services, transport and stock handling, to name a few. In this respect the availability of technology, and its reliability, have become vital for the key national economic sectors.

Telecommunications and technology are also essential tools when it comes to education, and research.

Advancements in technology are also subtly, yet markedly, affecting the perspective with which society, in general, looks at life. People expect ubiquitous connectivity; they want to be connected anywhere and at any time. The emergence of the Internet of Things further strengthens this new drive.

Radio Spectrum is fundamental in all the above. The availability, and effective management and assignment, of licensed and license-exempt frequency bands permit multiple technologies and services to operate. This, in turn, fulfils the ever increasing user demand and expectations. The availability of technology would be futile without the necessary measures to ensure the quality, territorial coverage and integrity of these services.

2.2 Advancement in Technologies. *How is technology shaping our future? Where is it leading to?*

Presently, telecommunications is at the doorstep of an extremely fascinating era. New technologies are constantly being conceived and existing technologies are evolving with the sole intent of creating a ubiquitous global network whereby everything may communicate with everything; the Internet of people and things. The modern, social trend of being capable of communicating with anyone, from anywhere and at any time further instigates this demand.

The Internet of Things (IoT) is very simple in concept. Its impact on the way in which society lives, communicates and works, however, is significant. It predicts a scenario whereby everything from mobiles, to coffee makers, washing machines, fridges, wearable devices, lamps and any other possible existing device connects to the Internet. This also applies to machine components used in the enterprise environment. Consequently, the Internet of Things will consist of a giant network of connected devices, including, people-to-people, people-to-things and things-to-things.

Low Power Wide Area Networks (LPWAN) facilitate IoT. They are used in various innovative technologies and standards. They operate in the 868MHz band (in Europe); allowing low-powered devices to communicate with Internet-connected applications or sensors and meters over long range wireless links. Low data rates enable the low power transmission to be received across a wide area network. The technology is a good fit for any application that needs to send small, infrequent bursts of data. LPWAN uses simpler waveforms than cellular. This results in cheaper devices.

5G technology is at its pinnacle of expectations. It is the upcoming generation of mobile network technologies which will enable widespread automation and the Internet of Things. It is, however, a technology which is still at its initial stages of deployment. Whilst service providers across the world start launching 5G services, standardisation, harmonisation and use case development efforts continue. 5G technology has the potential to revolutionise the wireless telecommunications world. It will dramatically increase the speed, quality and security at which data is transferred. It promises download peak data rates of at least 20 Gbps

and uplink data rates of 10Gbps for the enhanced Mobile Broadband (eMBB). 5G will also significantly reduce latency opening doors to delay sensitive applications. In short, 5G will create the capacity required to power thousands of connected devices that will reach homes and workplaces.

New antenna designs, together with growth in computer power, are empowering the advancements in technology. Indeed, they strongly influence the way in which technology operates. High performance computing is leading to the accomplishment of more complex computing algorithms, higher data volumes and speed rates. Also, advanced antenna designs are permitting frequencies higher up the radio spectrum, which typically provide larger bandwidths, to be utilised. Higher frequencies imply that signals travel for shorter distances allowing better reuse at smaller distances. 5G can operate across multiple frequency bands. The 700MHz (WRC-15), the 3.6 GHz and the 26GHz band have been chosen as pioneer bands for 5G. Studies are also underway gauging higher frequency bands in an attempt to determine their adequacy for wireless broadband communications.

Cognitive radio is a relatively novel concept. Although, it has been in the pipeline since the turn of this century, its materialisation has evolved slowly due to the complexity inherent in providing better flexibility. Cognitive radio technology will be the next major step forward enabling more effective radio communications systems to be developed. The present and future processor powers will allow for the development of a radio that is capable of scanning through the spectrum, detecting which frequencies are unoccupied, and thus implementing the best form of communications for the required conditions. In

brief, cognitive radio technology will be able to select the frequency band, the type of modulation and power levels most suited for the requirements, prevailing conditions and geographic requirements. Certain features of cognitive radio technology, like the DFS (in RLANs) and DAA (in SRDs) mechanisms, already exist to date. Cognitive radio results in higher spectral efficiency.

Though not directly related to spectrum, the assignment of adequate addressing resources is crucial in terms of communications and technology. This is especially true when considering the Internet of Things whereby everything needs to communicate with everything. In this case, every object in the communication channel requires a distinct address. Such type of communication is made possible through the allocation of E.164 numbering resources for machine-to-machine applications or through the adequate availability of Internet Protocol (IP) addresses. As new IPv4 address space continues to become scarce on a global level, the adoption of IPv6 increases in importance. IPv6 is the newer version of the Internet Protocol. It supplies sufficient IP addresses to guarantee large-scale connectivity. The uptake of IPv6 is increasing multi-fold at an international level and is becoming increasingly mainstream to meet the demand for the estimated 50 billion online devices by 2020. The assignment of spectrum would be therefore limited without the appropriate addressing resources, in this case IPv6 and E.164 numbering, to support it.

Advancements in technology are not merely influencing the way in which things are done. They are also shaping the way that society will benefit from connectivity in the future as technologies such as AI, blockchain, automated vehicles and connected health care mature.

Technological developments are, nowadays, unlocking previously unconceivable opportunities. Notwithstanding this, they also elicit new questions and challenges. While, for example, the digitisation of frequency, results in more efficient use of particular frequency ranges within the radio spectrum, it also produces elevated noise floor triggered by other applications and an increased number of (wireless) equipment devices within the vicinity. Furthermore, 5G and all evolving technologies are posing particular constraints on spectrum. Additionally, the boundaries between different networks and network technologies are increasingly becoming blurred. Consequently, services that previously could only be provided by one specific technology, now have a number of alternatives.

The MCA will be factoring in all the above mentioned issues when assigning frequencies.

2.3 The World around us. *How are international developments affecting spectrum management?*

The organisation and oversight of Malta's national spectrum assets is shaped by harmonisation rules and spectrum regulations arising from EU law and from Malta's participation in the ITU as well as cross-border coordination with neighbouring countries to ensure non-interference. Consequently, Malta cannot operate on its own. Its frameworks and strategies need to factor in, and reflect, EU law as well as other international agreements and commitments.

The allocation of frequencies for specific applications is largely determined at an international level. The allocations are based on global agreements made under the International Telecommunication Union (ITU) framework. Agreements made within the ITU relate to the classification of the frequency spectrum into frequency bands, the allocation given to the frequency bands and the procedures that must be adhered to in order to coordinate use of frequencies with other countries. Coordination is required to reduce the risk of harmful, cross-border interference. The ITU agreements on allocation are determined in the Radio Regulations. The Regulations are modified to accommodate new markets and technological developments every 3 to 4 years in the World Radiocommunication Conferences (WRCs) where MCA participates actively. The authority implements the action items agreed in the preceding WRC (WRC15) whilst engaging in shaping the discussions for the subsequent conference. The next WRC is scheduled for 2019, WRC19. 5G and Wi-Fi are high on WRC19's agenda. There will also be an increased focus on satellite services, in particular Earth Satellite in Motion (ESIM).

ITU regulations are binding in nature. Allocation deviations are only permitted if they do not cause interference to other countries and following consensus among all the parties concerned.

Some of the outcomes of the WRC are elaborated within a European context prior to a concrete decision being taken. This takes place in the European Conference of Postal and Telecommunications Administrations (CEPT), a collaboration between 48 European countries. Within CEPT, the Electronic Communications Committee's Conference Preparatory Group

(ECC CPG) is responsible for developing briefs, studies and, European Common Proposals (ECPs) for the WRC. The ECPs represent the common European view on specific agenda items. CEPT decisions are not legally binding but EU decisions are. CEPT deliverables, however, cover a wider range of bands and applications. They are prepared together with industry and standardisation bodies. Other outcomes of the WRC are directly incorporated into the National Frequency Plan, including those that relate to global services such as those used for satellite, aeronautical and maritime applications.

EU decision making is often based on the Radio Spectrum Decision (RSD) concerning a legislative framework for the radio spectrum policy in the European Union and/or on the multi-annual Radio Spectrum Policy Group (RSPG). The RSPG develops either opinions, which serve to guide member states and/or the Commission, or, reports which discuss, for example, best practises. The Radio Spectrum Decision gives the European Commission the authority to achieve a coordinated approach to spectrum policy, in terms of technical elements. Political elements are addressed by the European Parliament and the Council. Where appropriate, the Radio Spectrum Decision also gives the European Commission technical harmonisation of the conditions for the availability and efficient use of radio spectrum. By virtue of the RSD, the Commission adopts Commission Implementing Decisions requiring Member States to make available certain spectrum bands for certain applications. These decisions also establish the least restrictive harmonised technical conditions. These are today based on studies undertaken by CEPT. The European Commission is supported in this by the Radio Spectrum Committee. In March 2012, the European Parliament and Council approved the first Radio Spectrum Policy Programme (RSPP). This Decision creates a comprehensive roadmap contributing to the internal market for wireless technologies and services, particularly in line with the Europe 2020 initiative and the Digital Agenda for Europe. The Decision calls for concrete actions in order to meet the objectives of EU policies.

Significant work is currently being carried out by CEPT, RSPG and Radio Spectrum Committee (RSC). Various frequency bands are being considered for the deployment of numerous technologies and services. The Radio Spectrum Policy Group is working on enhanced coordination of radio spectrum policy between Member States on the basis of best practice and voluntary peer reviews of proposed award procedures. MCA's participation in theseThe authority studies any recommendations made

in order to determine their feasibility and applicability to Malta.

In September 2016, the European Commission published a proposal to revise the legislative framework overseeing the regulation of electronic communications networks and services. The proposal is comprehensive and touches on a number of topics including that of radio spectrum.

If not up to standard, radio equipment, as well as other electrical equipment and installations, are common culprits of interference. The European Radio Equipment Directive formulates the objectives that are intended to safeguard public interests. These requirements are known as 'essential requirements' and relate to safety/health, electromagnetic compatibility and efficient and effective spectrum use. They are incorporated in technical specifications by the European Telecommunications Standards Institute (ETSI) and contained in the harmonised standards.

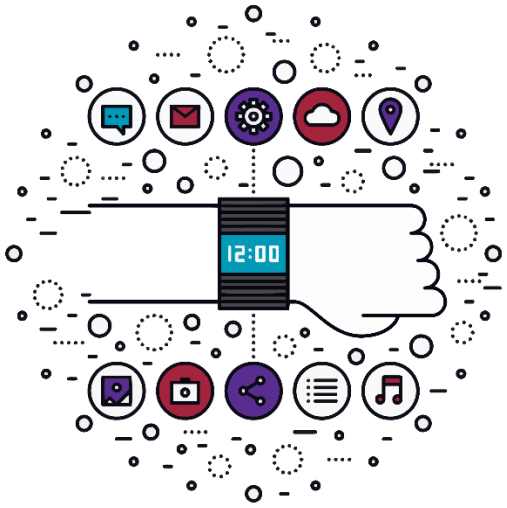
In addition to spectrum-specific recommendations and requirements, European policy often touches on issues which are directly related to spectrum. These include, among others, the EU's Digital Agenda and 2020 strategy and BEREC's document ''Enabling the Internet of Things''[6].

In the preparation of its spectrum policy, the MCA took a holistic approach and considered relevant international legislation, agreements and commitments.

2.4 Time for change. *Why now? Why is the time opportune for a spectrum policy review? Which factors are instigating it?*

Emerging technologies, existing and upcoming International obligations and regulations together with social demand and expectations are all placing radio spectrum in the limelight. In conjunction with this, licences associated with the right of use of certain radio frequencies bands will expire as certain generations of communications technologies start to approach their end of life. In view of all this, the MCA deemed it the most adequate time to review its Radio Spectrum policy.

[6] "BEREC Report on Enabling the Internet of Things," http://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/5755-berec-report-on-enabling-the-internet-of_0.pdf



5G technology is one key driver underpinning this policy review. The MCA has reviewed the feasibility of 5G business models in Malta. To this effect, the MCA has updated its test and trial regime, facilitating the carrying out of trials in any band. The MCA, in line with harmonisation rules mandated across the European Union is working on particular frequency bands to make them available for 5G. The 700 MHz, 3.6GHz and 26GHz have been identified by European legislators as 5G pioneer bands and member states are required to make them available by 2020. Notwithstanding, all spectrum licenses issued by the MCA are technology neutral and can eventually be used for 5G. This is in line with the Framework Directive.

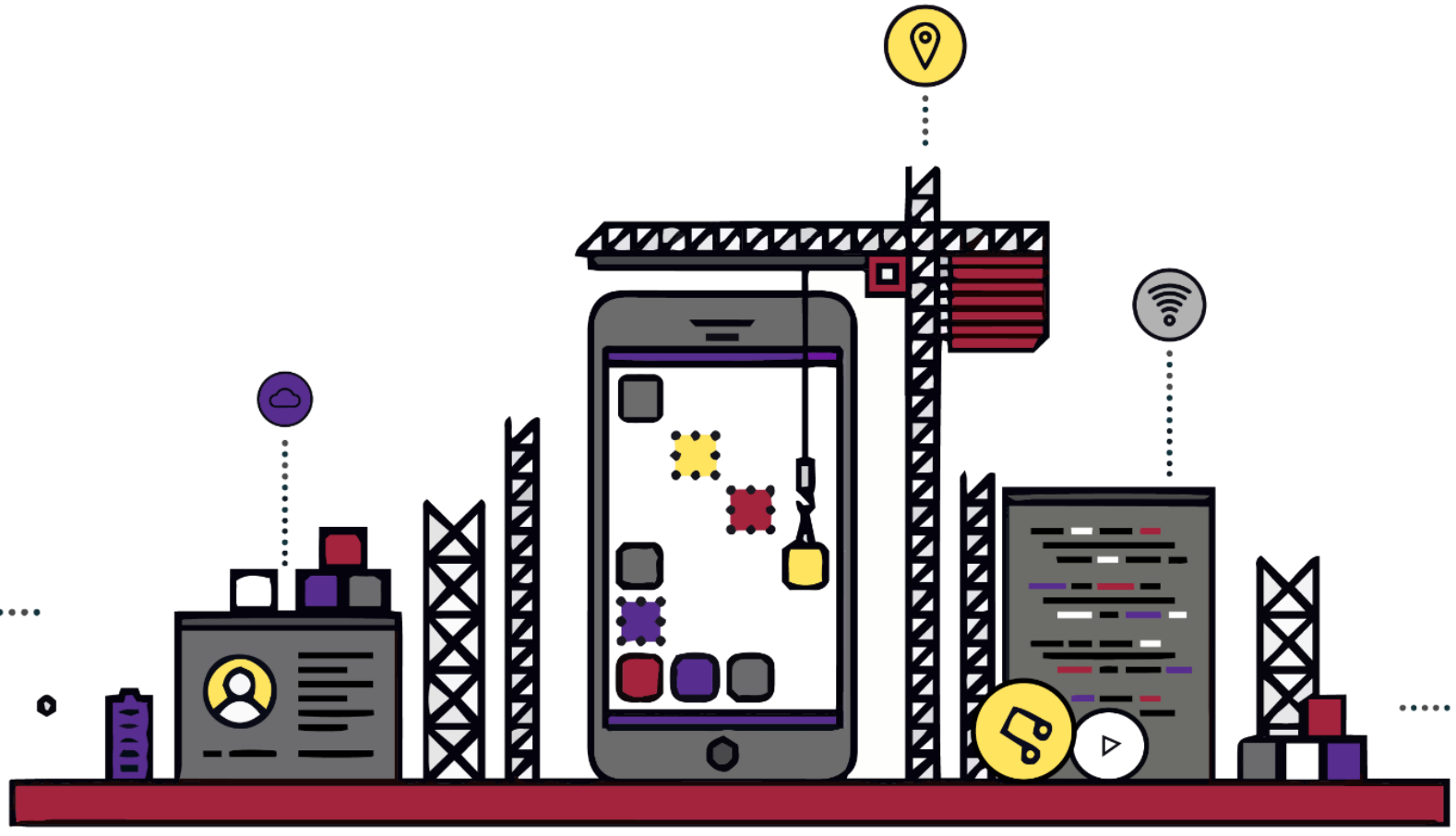
The expiry of individual licences, and/or, the switch-off of particular technologies, within the next few years, will free a number of frequency bands. The MCA needs to update the frameworks applicable to these frequencies to renew their availability and make them available to the market.

In order to assist radio amateurs, in 2017, the MCA revisited the Radio Amateur licensing framework. The intent was to rationalise the framework thus reducing unnecessary administrative burdens and bureaucracy on existing and future licensees. The new framework also increases the transparency in the regulatory service.

IoT, ITS, Short Range Devices (SRD), Ultra-wide band, Point-to-Point links, and satellite technologies are some of the spectrum-related projects which the MCA plans to work on in the coming years. This list is not exhaustive. The MCA may add or remove projects in the course of its work.

3

Objectives



The Objectives

The Radio Spectrum Policy, needs to reflect the current as well as near future use for such a resource. The policy needs to adapt and shift its focus in order to be able to support and continue to assist the social and technological demands on spectrum. The latter can only be achieved within a framework that clearly depicts the central objectives for spectrum management.

3.1 Radio Spectrum Resource.

Why is it indispensable? What is spectrum management?

Radio spectrum is a valuable resource. Its effective and efficient management leads to the availability of resilient electronic communications networks and services. Key economic sectors including aviation, maritime, as well as the public administration and the private sector depend on the effective management of spectrum. Consequently, the appropriate usage of spectrum ensures that the needs and the well-being of society is protected and, possibly, enriched. It facilitates the introduction of new technologies, thus reaping out maximum potential from the spectrum.

A spectrum policy defines the rationale behind spectrum management. It caters for the allocation, assignment, monitoring and enforcement of the spectrum. A Radio Spectrum Policy aims to achieve the following four goals:

- ***Ensuring efficient and effective use of spectrum;***
- ***Promoting a competitive approach;***
- ***Promoting further investment and innovation; and***
- ***Safeguarding the public interest.***

The above listed spectrum policy objectives will help address the ever-increasing demand for more bandwidth. This is especially so with the emergence of new technologies such as 5G and IoT. Spectrum efficiency, the safeguarding of competition and the promotion of innovation and investment are also objectives

underlying the Decision No 243/2012/EU[7] of the European Parliament and of the Council.

3.2 Radio Spectrum Management. *What determines spectrum efficiency? What can be done to achieve it?*

Spectrum efficiency is dependent on a number of factors. It is conditioned by the size of the spectrum block, the licence type, the licence duration, interference and spectrum usage. Adequate spectrum allocation is important in terms of block size and spectrum caps. Technical constraints ensure that new systems do not create interference to other systems. They might also arise in relation to the application for which the spectrum will be used.

Some applications will only function within individual frequency bands. This limitation is due to the radiofrequency requirements of the particular applications. Indeed, the characteristics of specific frequency bands determine the conditions regulating the rights of use of these bands. For example, low-frequency bands are better suited to provide coverage whereas high-frequency bands offer more capacity. As a result, the rights of use of frequency bands should take into consideration coverage and capacity objectives. This stringent relationship between the attributes of the frequency bands and the applications' functional requirements tends to create a scarcity in the allocation of frequencies. Not all frequencies are fit for use for all applications.

Service providers demand spectrum for coverage and capacity in order to keep up with their commitments, and, offer their services. Thus, the MCA oversees the availability of an assortment of frequency bands thus, facilitating efficiency and resiliency.

Efficiency is also dependent on the authorisation process used to assign the spectrum. This authorisation process may affect whether spectrum is available in a timely manner. General authorisations (GA) ensure more flexibility than individual licences. The spectrum is more readily available through

[7] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D0243&from=EN

such a regime. However, in the case of frequency bands which may generate significant, harmful interference to other users, individual licences are more appropriate. Spectrum is a finite resource and thus the number of entities that may be awarded an individual licence for a particular radiofrequency band is also limited.

Technology is developing at a fast pace. In view of this, the MCA adopts a technology and service neutral approach which is in accordance with the Authorisation Directive 2002/20/EC[8]. This guarantees the most efficient and effective use of the spectrum. It also ensures that no barriers exist to the introduction of innovative technologies and services by service providers.

Spectral efficiency needs to be sought for all types of technologies, including wireless technologies for Program Making and Special Events (PMSE) and Public Protection and Disaster Relief (PPDR).

It is the MCA's task to ensure that any spectrum is assigned to commercial entities that have the necessary resources, both technical and financial, to take advantage of the spectrum. Service providers need to use spectrum as effectively and as efficiently as possible. The MCA, therefore, needs to find ways and means of creating incentives which will enhance the operations within a particular frequency band and maximise its benefits.

3.3 Radio Spectrum in the telco market. *Can competition be sustained in a small telecommunications market like Malta's?*

Incentives and competition are crucial when it comes to innovation and fair pricing. Healthy competition instigates service providers to offer improved services whilst keeping service costs low. It also pushes companies to invest more in Research and Development in order to be the first-to-market. They thus gain market share whilst offering new and/or enhanced technologies.

[8] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32002L0020

The RSPP continues to support the principles of non-discrimination, transparency and proportionality in the assignment of spectrum. The award process will seek fair and realistic value realisation whilst promoting competition. In its assignment process, the MCA will endeavour to achieve a compromise between awarding the spectrum to service providers who can put the most value to it (extending the maximum socio-economic benefits from a particular frequency band) and, where possible, meeting demand with supply. The award process will include selection criteria and rights of use all aiming at striking this balance between economic value and competition. Due diligence in the award process will ensure that service providers who cannot make use of spectrum will be filtered out from the selection. On top of all this, the MCA will pursue measures which will introduce further flexibility within the regulatory framework; facilitating services for both existing and new service providers.

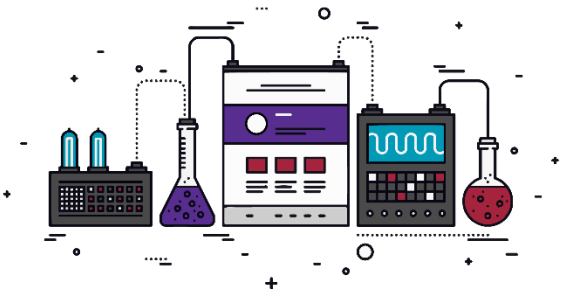
Due to its geographical size, the technologies available to date, and market demand, spectrum is, in general, not a scarce resource in Malta. Indeed, multiple frequency slots available for wireless broadband remain vacant. Spectrum trading and licensed shared access models are yet to to be used in Malta.

Spectrum hoarding, whereby spectrum is purchased for the sole purpose of depriving it

from competitors, needs to be avoided. It does not stimulate competition. The MCA seeks to address this issue through licence obligations and by creating incentives, thus prompting spectrum operators to use the spectrum which they have been granted rights of use rather than leaving it idle. By promoting niche areas in which particular frequency bands may be used, the MCA would be addressing spectrum from a different, but extremely important, point of view - it would be advocating technology and spectrum use, and, not solely managing it. The MCA reserves the right to audit particular frequency bands if it feels that they are not being utilised appropriately.

3.4 Innovation and Investment: *How best to promote them?*

Spectrum availability and allocation walk hand-in-hand with technical innovation and investment. One is not possible without the other. Furthermore, the guarantee of particular frequency bands (with clean-cut, and detailed, rights of use), together with a clear definition of the frequency access parameters and adequate licence duration, ensures legal certainly. This instigates investment. Providing economically viable conditions ascertains that the ever increasing demand for high speed broadband connections is addressed. It encourages new and existing operators to acquire more spectrum and also to invest in new technologies such as 5G.



In addition, technology and service neutrality give service providers the necessary flexibility to implement technology and services that are most economically feasible.

Regulation, as outlined above, incentivises innovation. Coupled with a healthy competitive market, which stimulates innovation in its own respect, regulation thus creates a predictable market that favours investment and innovation.

Technology and service neutrality is a clear example of how a regulatory framework can promote innovation and investment. Technology and service neutrality eliminates technological distortion. It allow service providers to opt for the most economically viable solution.

Malta's size, population and telecommunications infrastructure creates an attractive prospectus for setting up test-beds for new technologies as well as launching trials for new Electronic Communication Networks (ECN) and Electronic Communication Services (ECS). For this reason, the MCA's Spectrum Policy aims to encourage innovation through the test and trial licensing regime. The rights of use and fees associated with the test and trial licences are such that the process of obtaining these licences is simplified, minimising the expense but still protecting

other frequency users. Distinguishing between different needs allows the MCA to also protect the spectrum efficiency by providing different rights of use conditions. For example, licence durations for well-developed commercial applications have a longer duration than those of a test or a trial licence. Test and trial licences are issued for a one-year period with the possibility of extending them for another one year. This is in converse to individual licences which are awarded for much longer periods. This methodology encourages innovation without decreasing spectrum efficiency.

Quality of experience and spectrum efficiency, are directly related to interference. The higher the interference, the less the efficiency. The new Radio Spectrum Policy promotes investment and innovation while, at the same time, warranting that interference doesn't deter the quality of service. Interference elimination or mitigation is crucial in providing operators with individual licences and the necessary legal certainty to promote further investment. Hence, the MCA's regulations stipulate transmission characteristics, spectrum allocation, rights of use and penalties to protect against interference. These techniques are in line with those published by the ITU and the European Union.

In order to further strengthen its stance on controlling interference, the MCA regularly participates in frequency coordination meetings with neighbouring countries (Italy, Tunisia and Libya) to mitigate cross-border interference. Harmonisation of spectrum, as prompted and/or defined by international and European regulations, is also beneficial in terms of minimising interference from/to neighbouring countries.

The MCA persistently strives to simplify processes. It also works to keep itself abreast with the latest market developments. The MCA will continue to ensure that the new spectrum policy will continue to attract new services and new market players, guaranteeing no unnecessary barriers to investment and innovation in Malta.

3.5 Radio Spectrum and the general public. *How can public interest be safeguarded?*

Public interest has many facets. It includes services such as the Emergency Services and Public Protection services as well as the widespread availability of electronic communications which in itself delivers significant socio-economic benefits.

The MCA will pursue public interest by continuing to make spectrum available and attach conditions that derive maximum socio-economic benefits. It also needs to mitigate interference. The MCA may define the technical conditions of transmitters operating within specific frequency bands so as to eliminate interference among users.

Monitoring of the spectrum usage, and

enforcement of penalties related to the misuse of spectrum, further protect the public interest. This reiterates the good practise of having continuous, and reliable, electro-communications networks with good Quality of Service.

Through appropriate spectrum awards, rights of use and, licence conditions, the Spectrum Policy shall protect consumers' right to choose. It will act as a stimulant to service providers; driving them to offer better pricing, quality of service and customer care. Moreover, the policy seeks to support the delivery of the European broadband and 5G targets.

3.6 Radio Spectrum Policy. *Can spectrum management be a flexible exercise?*

Defining the rationale for spectrum management is important. Notwithstanding this, the spectrum policy needs to be flexible enough so as to address future challenges. The market drive from new technologies, user demands and international trends all contribute in shaping the future of telecommunications. However, these are just forecasts. The future's real picture might be completely different.

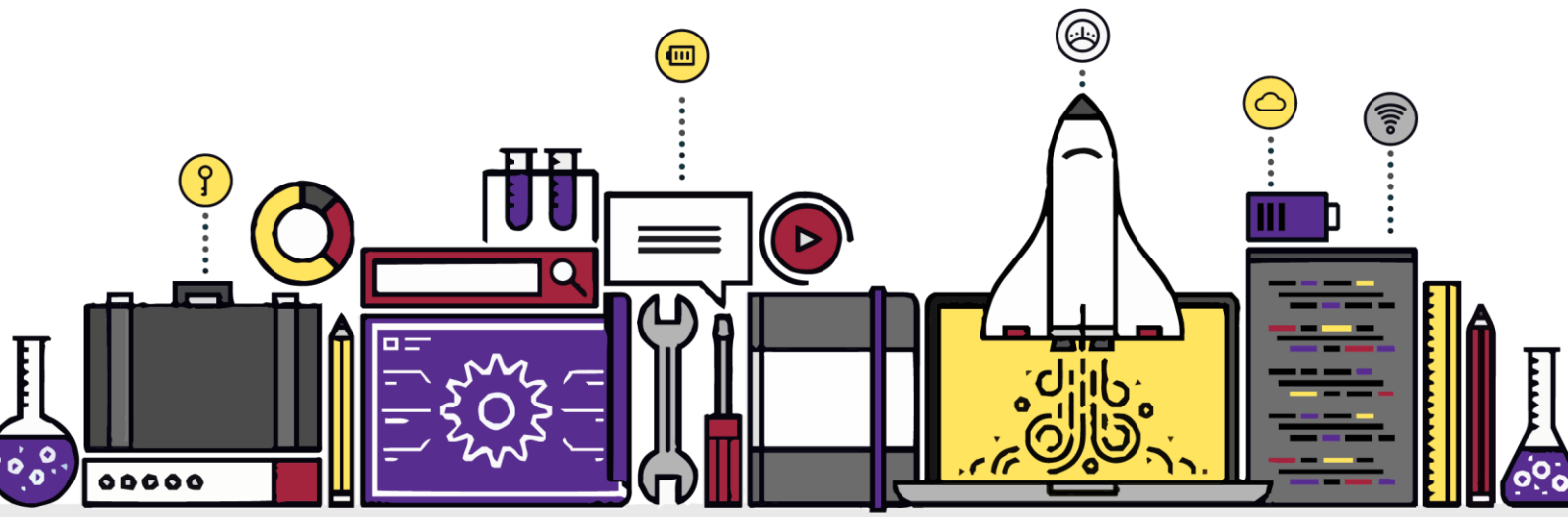
The MCA is, and will continue, to make a conscientious effort and remain at the forefront of technology. In view of this, the MCA reserves the right to put to market any frequency bands which it may deem attractive,

and with the appropriate credentials, to promote innovation and technology. It will present the frequency bands to the market in an attempt to prompt demand.

The MCA's spectrum policy must adapt to new decisions and recommendations published by ITU and CEPT. It is legally bound to adopt new European Union decisions. Emerging technologies may be more efficient and therefore might require less spectrum or wider channel bands or smaller cell sizes. Flexibility to adopt new regulations and plans is therefore a must in order to guarantee efficient and effective spectrum use, to protect consumer's interest and, to promote innovation and investment.

4

Challenges



The Challenges

The proliferation of new wireless technologies and services is creating an ever increasing demand for radio spectrum. Unlike other resources utilised in the telecommunications industry radio spectrum is finite. As a result, the risk exists that future demands for spectrum may not be accommodated. This fact instigates the need to develop new spectrum efficient technologies as well as new spectrum assignment and management mechanisms. All frequency bands need to be taken into consideration in such an exercise.

The processes of spectrum assignment, management and use, have followed particular cyclic patterns in the last few decades. The introduction of 5G technologies, however, coupled with technology and service neutrality principles (established within the EU regulatory framework) are now demanding new approaches when it comes to spectrum assignment and management. Indeed, big challenges lie ahead. This may be even more so for a small country like Malta. The norm and best practices for large economies and markets may not always apply.

The MCA constantly strives to maintain and augment its objectiveness, transparency, non-discriminatory and proportionate approach when dealing with spectrum management.

The MCA recognises that the regulatory environment in which it operates is extensive and complex. In such a continuously changing environment, improving and adapting the regulatory instruments is crucial in order to support the ever changing telecommunications market.

The subsequent issues summarise the MCA's line of thought, in terms of spectrum regulation, when designing assignment procedures based on recommended best practices.

4.1 Radio Spectrum. *Is there an optimum way of assigning it?*

Currently, the MCA employs a spectrum assignment and management model which is founded on a number of factors, namely, market demand, a pool of different licence categories, and, interference.

Radio spectrum is used by countless applications in our everyday lives. The harmonisation of specific frequency bands, the introduction of specific service obligations, the technology advancements that allow the combining of sparse frequency bands, the introduction of 5G technology, coupled with the technology and service neutrality principles, necessitate that the MCA reassess the methods employed in the assignment and management of spectrum.

A good spectrum assignment exercise needs to be paired with appropriate spectrum allocation procedures. Spectrum allocation defines the frequency band slots within which particular applications may function. Different frequency bands have distinct characteristics. They thus result in particular coverage, penetration and capacity capabilities. Not all frequency bands are adequate for all applications.

New technologies such as 5G may challenge traditional allocation concepts. 5G will provide much faster mobile broadband speeds. In order to achieve such speeds, large blocks of contiguous spectrum is required. A mix of current and new spectrum will be needed. Aggregation of bands/carriers in the current and near harmonised spectrum represents a strategic opportunity to most EU states. Globally, regulators are starting to shun away from allocating different blocks of spectrum for specific services. The objective is to have services being provided over the same spectrum bands, perhaps over separate slices of spectrum, or, where necessary, through more shared use. These methodologies, and allocation/assignment mechanisms raise several questions. Not all models may be applicable to Malta. In the near future, the MCA will be scrutinising the multitude of spectrum assignment permutations available so as to consult on which option (or combination of options) is most viable for Malta.

The appropriate method adopted in awarding the right of use for frequency assignments, depends on the type of users utilising the frequency band together with their intended use for such a frequency band. The MCA adopts a myriad of licensing categories when assigning the right of use of spectrum to

eligible parties. Licence exempt, light licensing, individual licensing and test and trial licensing are all different types of licensing mechanisms currently in place.

As per the principle established in the governing EU framework, the general assignment or licence exempt regime is to be considered as the base scenario. Only in the case where the conditions for the general authorisation regime are not met, the assignment of spectrum has to adopt the light licensing or individual licensing regimes.

A number of assignment methods are of practical relevance when the individual licensing regime is employed. However, not all assignment approaches are equally suited for achieving the efficient outcomes that are entailed by the different industry and market scenarios. In addition, the evolvement and possible introduction of new technologies such as Intelligent MIMO networks, as well as the latest development amongst the local mobile telecommunications players, may require the implementation of new, or revised, assignment methodologies so as to better factor in the recent state-of-play of the market. In view of these matters, the MCA shall continue to ensure that the assignment methodology adopted is compliant with the necessities of both the current and future network demands.

The possible introduction of innovative assignment methodologies may also imply revising a number of pre-set terms that are attached with the assignment methodology. New technological developments and market demands may require adaptation of terms and conditions associated with right of use.

Prior to introducing any new spectrum assignment principles, the MCA shall endeavour to ensure that such concepts will not adversely affect the existing and well established wireless communications economy. In addition, the MCA guarantees that regulatory certainty and predictability will be provided through clear, and well documented, processes. This is in line with the approach that MCA has adopted since its establishment.

In order to certify the effective and efficient use of spectrum, the MCA attaches numerous conditions with the right of use for particular frequency bands. These conditions address the technical and the operational factors that will govern the use of the individual frequency band. As per Directive 2009/140/EC, spectrum assignment is technology and service neutral. Individual licenses do not dictate which technology is deployed by the service provider.

Future initiatives that will be undertaken by the MCA

- **Establish a Spectrum Assignment and Management methodology that suits the demands set by the evolving networks;**
- **The 5G Action Plan;**
- **Safeguarding spectrum for the near future applications (SRD, Drones, Gigabit Society, National Broadband Plans);**
- **Implementation of the EC Decisions concerning the 5G pioneer bands (700MHz, 3.6GHz, 26GHz);**
- **Ongoing Review of NFP, Review of SRDs (399.40)**
- **Action items from WRC15 and preparatory work for WRC19.**

Notwithstanding this, service providers still need to consult with the MCA prior to deploying a technology within a particular band which they are assigned.

In order to cater for future developments, and harvest fruit from it, the new spectrum assignment and management framework might need to adapt and adopt new management principles. A number of license conditions present in some of the existing license assignments, such as license duration, coverage obligations and handback conditions, may need to reflect current and future developments.

4.2 Spectrum Pricing *Does a theoretical ideal price for spectrum exists?*

Spectrum, like any other resource, has a monetary value associated with it. This value is led by demand and by the service providers' willingness to pay for exclusive rights to use radio frequencies.

New social phenomena of 'always on' requirements, paired with the fact that broadband speeds are constantly increasing (as are the number of objects connected to the Internet) pose significant spectrum demand on service providers. Technologies are operating within different frequency bands in order to meet with the ever challenging targets being set. Also, new standards are evolving that bind nascent frequency bands with ones that are already being used. Pricing concepts, therefore, need to be revised in order to reflect these developments. The monetary value associated with specific frequency bands will reflect the nature of use for such frequencies.

A considerable amount of spectrum is reserved for the provision of end user connectivity and commercial services. In addition, spectrum is retained for services of social and economic value.

Currently, the prices for the use of spectrum are established under S.L.399.28. The prices for the specified frequencies reflect mostly the potential value which the frequencies might generate. Such figures are established once a number of operational factors for the band in question are taken into consideration. The bandwidth available, the frequency band position within the radio spectrum, and any attached technical conditions are prime factors that affect the price paid for spectrum. This approach creates different price ranges for the various frequency bands. So, although the usage might be approximately the same, the prices will defer. One practical issue associated with such a pricing mechanism is that frequency band prices are fixed. They do not fluctuate to reflect a change in the value of spectrum. They, conversely, remain stagnant reflecting the prices established during the drafting process. The MCA is considering studying a price model that aptly adapts to the scenario being presented by current and future technologies. In doing so, the MCA would safeguard competition by offering a regulatory framework that remains current with market developments.

4.3 Spectrum Monitoring *Why is it necessary to monitor spectrum use?*

On a global scale, the use of wireless telecommunications services has incessantly increased. Wireless telecommunications have become an essential commodity. The emergence of new applications such as automation, drones and Internet of Things is on the rise, exerting additional needs for radio spectrum. The dependence (conscious or unconscious) on the ever evolving wireless communications networks necessitates the need for the MCA to have a clear overview of the industry, anticipate the social developments and, intervene if necessary. This may necessitate the possible expansion, or even changes, in the set of regulatory instruments that are available for the management and monitoring of the use of radio spectrum.

The need for a spectrum strategy is therefore, in the MCA's opinion, essential for the effective and efficient use of such a resource. The strategy shall identify any direct (such as spectrum sharing) and indirect (such as a mobile QoS framework) dependencies that spectrum may have.

The ever increasing use of spectrum may generate complex interference scenarios amongst the significant number of devices that make use of radio spectrum. Mitigation of such interference can be accomplished by the use of the proper radio equipment - implementing the essential requirements as established in the Radio Equipment Directive. Changes in spectrum usage cause the electromagnetic environment to alter too. These adjustments need to be appropriately anticipated. They might trigger the need to modify spectrum usage and equipment requirements in order to prevent an unacceptable level of interference and/or network degradation. Such levels of interference may, if unaddressed, lead to spectrum inefficiency. They may also hinder the security, integrity and continuity of services offered over wireless access networks.

The MCA needs to ensure effective, and fair, distribution of spectrum amongst all interested parties. Indeed, the MCA has a dual role, namely, to monitor and to enforce, whilst facilitating the investment and innovation in electronic communications networks and services.

The MCA is also tasked with monitoring the public exposure to electromagnetic fields (EMF) from electronic communications sources. People all over the world are constantly exposed to both environmental and

man-made EMF to varying degrees. Ever-advancing technologies, the reliance on electronic devices for our daily chores and changes in social behaviour will eventually result in more artificial sources of EMF. Not all sources of EMF are of an electronic communications nature. Power lines, household electrical appliances, lasers and visible light, including that of the sun, are examples of non-electronic communications sources which fall outside MCA's remit. Such fields, which are found in the non-ionising part of the electromagnetic spectrum (between 0Hz to 300GHz) are different to ionising radiations, such as X-rays and gamma rays, which have enough energy to break molecular bonds.

MCA's remit in this regard is to ensure that the levels of non-ionising radiation from the radio frequency transmission sources which fall under its oversight are within the levels applicable in Malta as determined by the relevant competent authorities. These levels refer to those of ICNIRP, the International Commission on Non-Ionising Radiation Protection. It is to be noted that the ICNIRP levels are referenced in the Subsidiary Legislation 399.40 of the Laws of Malta. The same levels have also been adopted by the European Commission in its Recommendation 1999/519/EC.

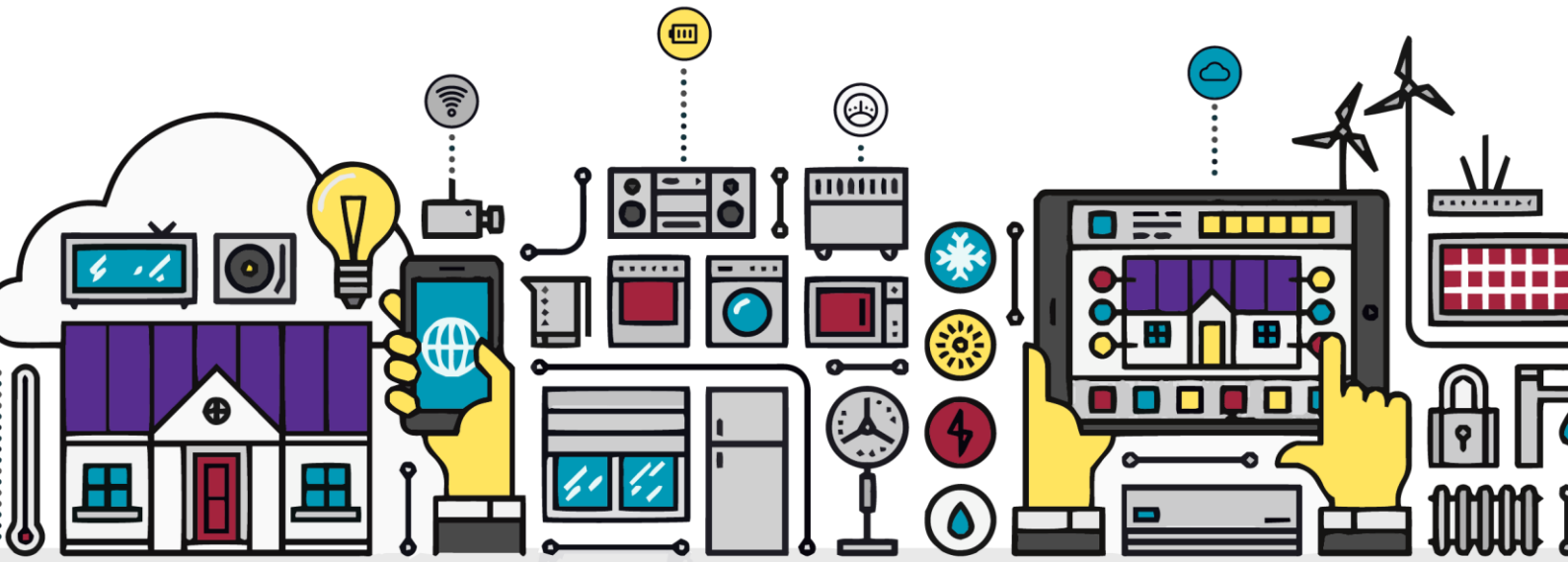
The MCA, as part of its rigorous routine audit programme, monitors and publishes the levels of EMF at various public locations around Malta and Gozo. A summary of the EMF measurement results are publicly available on the MCA's web portal.

Measurement results are sent to the relevant health authorities for them to take any action they deem necessary. The national competent authority with regard to the EMF effects on health is the Environmental Health Directorate.

Further initiatives that will be undertaken by the MCA

- Quality of Service attached to spectrum licences;
- Spectrum needs for the provision of commercial DTT services;
- Review of spectrum needs for Aeronautical & Maritime use;
- Spectrum Derivatives for Space & Satellite systems;
- Ensuring the incessant operation of wireless devices by the elimination of intentional & unintentional interference sources;
- Ensuring continued compliance to the EMF limits;
- A study of the evolution of wireless backhaul and access networks and the necessary regulatory frameworks required to ensure competition;
- Monitoring and Enforcement including the upgrading of monitoring equipment;
- Review of certain radio communication equipment licensing

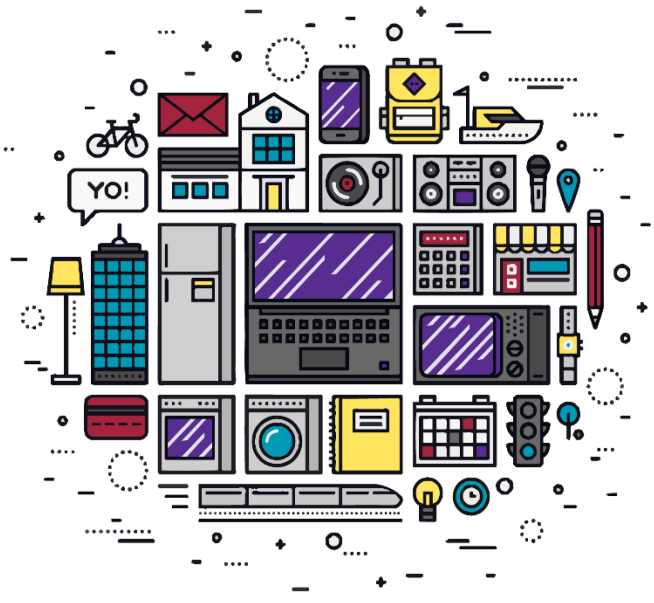
5
Conclusion



Conclusions Drawn

The last few years saw big paradigm leaps in terms of technology advancements and Internet demand. Social and market perceptions and values have also changed.

This paradigm leap in terms of technology advancements and Internet demand has created a vacuum in the existing Radio Spectrum Policy. The latter did not cater for the present, and future, exigencies. Consequently, the MCA reckoned it an appropriate time to revisit its Spectrum Policy.



Interesting, yet challenging, times lie ahead. One question prevails. What should come first - regulation or technology? Strict regulatory measures might hamper technological innovation. Conversely, the absence of regulations might curb social and economic wellbeing and development. The MCA constantly endeavors to achieve the appropriate balance between the two. The MCA will achieve this aim through the way in which spectrum managed, in line with the mandates as laid out in national and international regulations concerning electronic communications.

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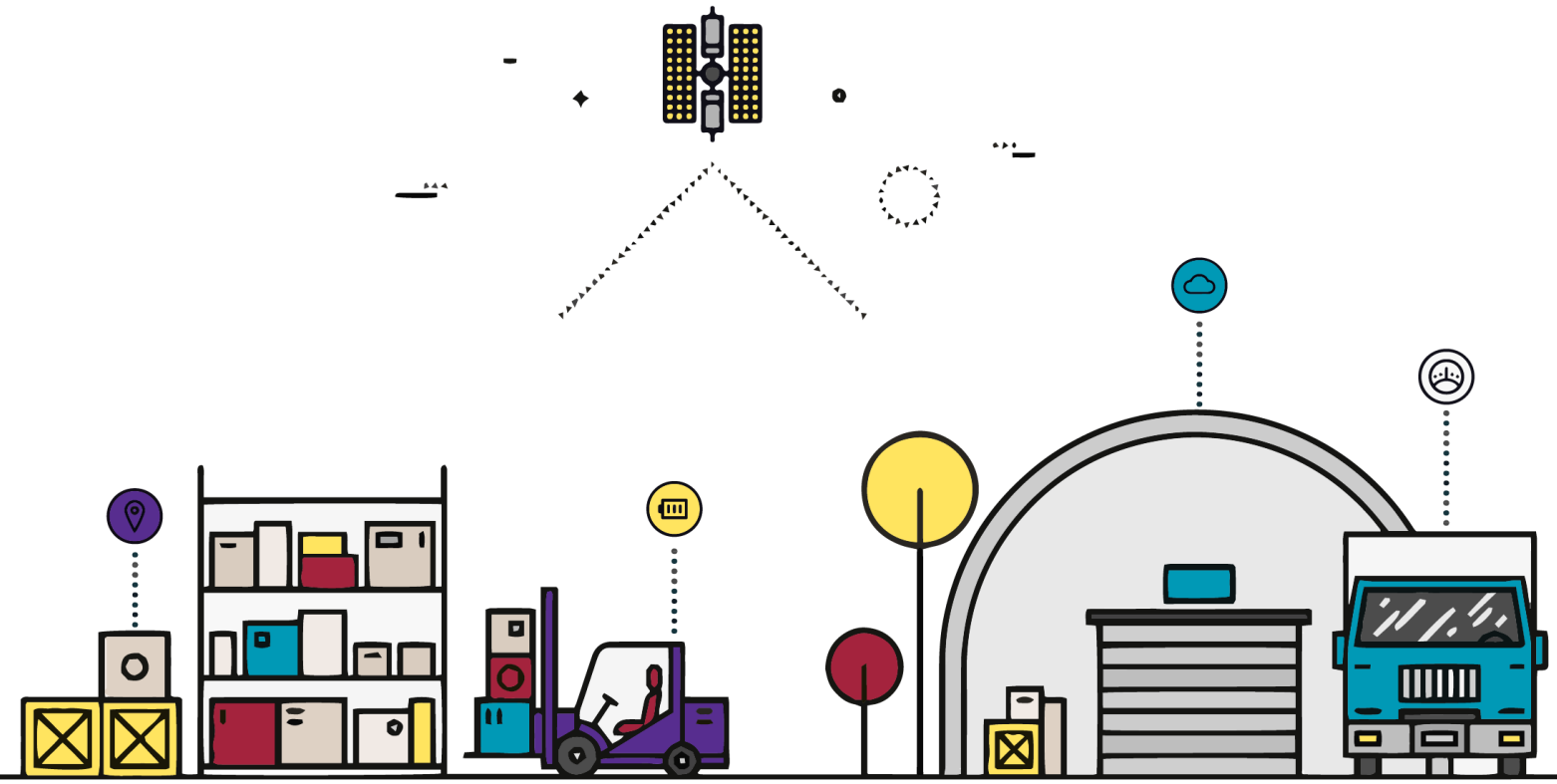
Annexes



Annex 1

National Regulations Related to Spectrum

Cap. 418	Malta Communications Authority Act
Cap. 399	Electronic Communications (Regulation) Act
S.L.319.28	Electronic Communications Networks And Services (General) Regulations
S.L.399.40	General Authorisations (Radiocommunications Apparatus) Regulation
S.L.399.42	Radiocommunications Apparatus Exemption Order
S.L.319.44	Authorisation of Frequency Use (Provision of 2GHz Mobile Satellite Services) Regulations
S.L.35.01	Fees leviable by Government Departments Regulations

Annex 2

Disclaimer

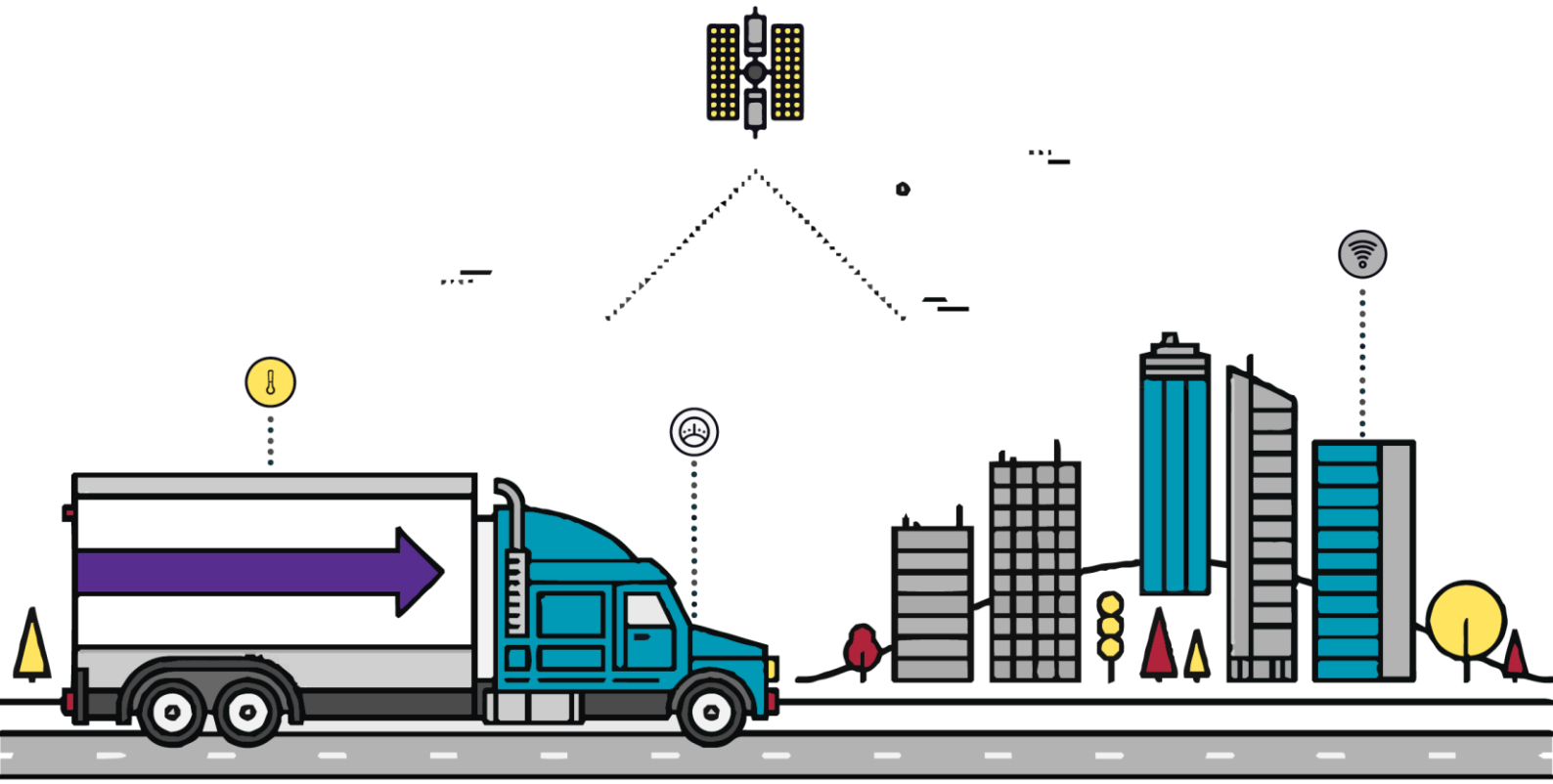
The material in this report is of a general nature and should not be regarded as legal advice or relied on for assistance in any particular circumstance or situation.

The MCA accepts no responsibility or liability for any damage, loss or expense incurred as a result of the reliance on information contained in this report.

This report has been prepared for consultation purposes only and does not indicate the MCA's commitment to a particular course of action. Additionally, any third party views or recommendations included in this report do not reflect the views of the MCA, or indicate its commitment to a particular course of action.

Radio Spectrum Policy Programme 2019 - 2023

Enhancing further the connected community



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