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SPECTRUM REGULATING ORGANISATIONS AND PROCESSES

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Introduction

1. Radio Frequency **(RF)** spectrum is a scarce limited natural resource wherein spectrum management and regulatory mechanisms are key elements for ensuring efficient and interference free spectrum usage. RF spectrum transcends geographical and political boundaries, hence coordination at the international level, regarding the efficient, rationale and need based use of spectrum is the hallmark of spectrum management. To achieve the same, there are certain organisations and processes for regulating spectrum, at the global and regional levels. Wireless Planning Committee (WPC) under Ministry of Communications & Information Technology (MoC&IT) in the country plays the role of Spectrum Manager while TRAI plays the role of Regulatory Authority, creating a fine balance in meeting the strategic requirements of Defence/ Government agencies as well as the commercial requirements, both of which are in Nations interest. It is thus imperative to have an understanding of the organisations and processes for regulating spectrum, at the global, regional and national levels, for optimal projection of the spectrum requirements of the Armed Forces .

2. **Historical Background**. By the middle of the 19th century, the telegraph was transforming communications across Europe and North America, as well as extending its reach around the world. However, barriers could occur when a message had to cross from one national jurisdiction to another. To overcome this, agreements were made between countries. In 1865, 20 European states signed a treaty to harmonise telegraph services: this was the birth of the International Telecommunication Union (ITU), which last year celebrated 150 years. ITU is based in Geneva, Switzerland. Today, the organisation is the United Nations' specialised agency for information and communication technologies. Its members

include 193 countries and almost 800 private-sector companies and academic institutions. One of ITU's most important tasks is to allocate and coordinate the global use of radio spectrum and orbits for satellite use. A key part of this work is organising the World Radio-communication Conference (WRC) every four years. The next one will take place in 2019. While ITU itself has a long history, the WRC format was born in 1992. Prior to that, periodic World Administrative Radio Conferences (WARCs) were conducted to cover specific agenda items concerning particular radio services. However, from 1992 onward, changes in the ITU constitution were made to convene regular conferences every three to four years. The change was made to keep up with rapid technological developments. This resulted in opening the door for new applications. Certain milestones in this path were :-

(a) 1865 20 European states sign a treaty to harmonise telegraph services

(b) 1992 WRC format is born

(c) 2015 ITU celebrates 150 year anniversary

(d) 2019 The next WRC

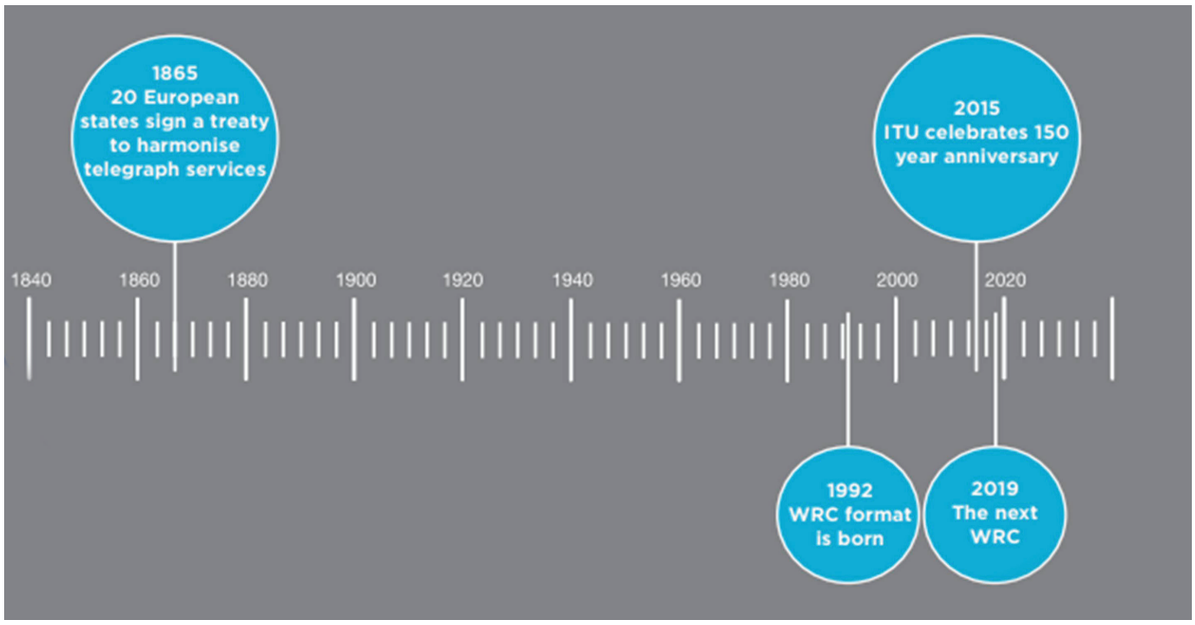

Fig 1 : Important Milestones

World Radio-communication Conferences (WRC)

3. World Radio-communication Conferences (**WRC**) are held every three to four years. It is the job of WRC to review, and, if necessary, revise the Radio Regulations(**RR**), the international treaty governing the use of the radio-frequency spectrum &the geostationary-satellite and non-geostationary-satellite orbits. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into account recommendations made by previous world radio-communication conferences.The general scope of the agenda of world radio-communication conferences is established four to six years in advance, with the final agenda set by the ITU Council two years before the conference, with the concurrence of a majority of Member States.Under the terms of the ITU Constitution, a WRC can:-

(a) Revise the RR and any associated Frequency assignment and allotment Plans;

(b) Address any Radio-communication matter of worldwide character;

(c) Instruct the Radio Regulations Board (RRB) and the Radio-communication Bureau, and review their activities;

(d) Determine Questions for study by the Radio-communication Assembly and its Study Groups in preparation for future Radio-communication Conferences.

4. In essence WRCs decide what and how spectrum and satellite orbits can be used by all radio-communication services, including mobile networks (or International Mobile Telecommunications (**IMT**)). Favourable decisions regarding access to spectrum for mobile services help lay the groundwork for connecting millions more. For example, World Radio-communication Conference 2015 (WRC-15) decided to make 700 MHz a globally harmonised band. This was a key step in making mobile broadband available to millions more.

5. On the basis of contributions from administrations, the Radio-communication Study Groups, and other sources (see Article 19 of the Convention (Geneva, 1992)) concerning the regulatory, technical, operational and procedural matters to be considered by World and Regional Radio-communication Conferences, the Conference Preparatory Meeting (CPM) shall prepare a consolidated report to be used in support of the work of such conferences.WRCs are organized by the International Telecommunications Union (ITU). These are held every 4-5 years for about 3-4 weeks and attended by over 3000 delegates. It is job of WRC to review and revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and satellite orbits

6. **Radio Regulations(RR)**. The Radio Regulations are the end product of the WRCs. They are international treaties that **are binding to ITU member states**. They define frequency allocations, technical and regulatory conditions for use of spectrum by a given service. Procedures for coordination are included in the regulations, which helps ensure compatibility. The Radio Regulations help prevent and resolve cases of harmful interference.

The International Telecommunication Union (ITU)

7. ITU was Founded in 1865 . It is an international organisation , an organ of the UNO, within which governments and the private sector coordinate global telecommunication networks and services. It has a General Secretariat and three wings or Sectors which are:-

(a) Radio-communication Sector (**ITU-R**) or (Secretariat BR), which looks into Standardization and global spectrum management.

(b) Telecommunication Standardisation Sector (**ITU-T**) or (secretariat TSB) which addresses Network and service aspects.

(c) Telecommunication Development Sector (**ITU-D**) or (secretariat BDT) which looks into assisting implementation and operation of telecommunications in developing countries.

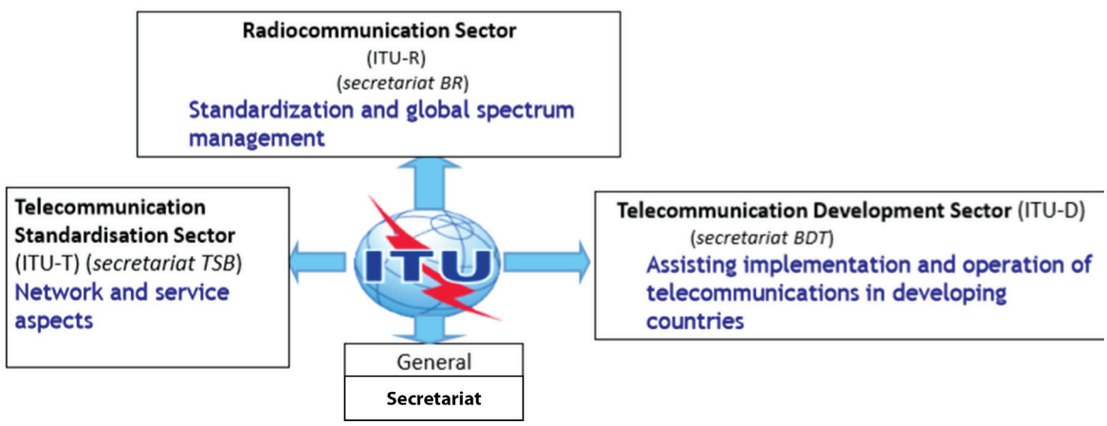

Fig 2 : Structure of the International Telecommunication Union (ITU)

ITU World Radio Conferences Process

8. The WRCs are both the end of a cycle and the beginning of a new one. The agenda for the WRC is decided at the previous conference together with a preliminary agenda for the subsequent one. It's open to as many issues as agreed on by the participants. Here we take a look at the most important part of the preparation.

9. **The Conference Preparatory Meetings (CPM)**. The preparatory process starts and ends with a Conference Preparatory Meeting. They are there to make the decision-making at World Radio-communication Conferences as informed as possible. The 'Final Report' of the CPM outlines options for supporting or opposing the various WRC agenda items under consideration. The CPM Management Team and CPM Steering Committee make sure the work goes according to plan. The first meeting takes place immediately following each WRC and the second one takes place about six months before the next conference. It goes without saying that the content of the Final Report plays a key role in what gets decided at the WRCs. For the World Radio-communication Conference 2019 (WRC-19) cycle, CPM19-1 was held in Geneva from 30 November to 01 December 2015. Participants from about 85 member states and sector members met to organise and coordinate the conference preparatory studies for WRC-19. CPM19-2 will be held in 2019, in advance of WRC-19.

10. These studies undertaken by ITU-R Study Groups serve as inputs for compiling the ITU-R Reports & Recommendations and for the CPM Report. In addition to this there are Proposals (submitted by individual administrations or nations) Common Proposals (submitted by Regional Bodies) & the Directors Report. All these serve as inputs to the WRC (World Radio Conference), where decision-making is arrived at by consensus. The Revised International Treaty (Radio Regulations) or RR is then published. The chart below gives the schematic description of the World Radio Conferences Process at the ITU. Studies on various topics are undertaken by ITU-R Study Groups, explained as under:-

(a) SG-1 - Spectrum Management
(b) SG-3 -Propagation
(c) SG-4 -Satellites
(d) SG-5 -Terrestrial Services
(e) SG-6 - Broadcasting
(f) SG-7 -Science Services

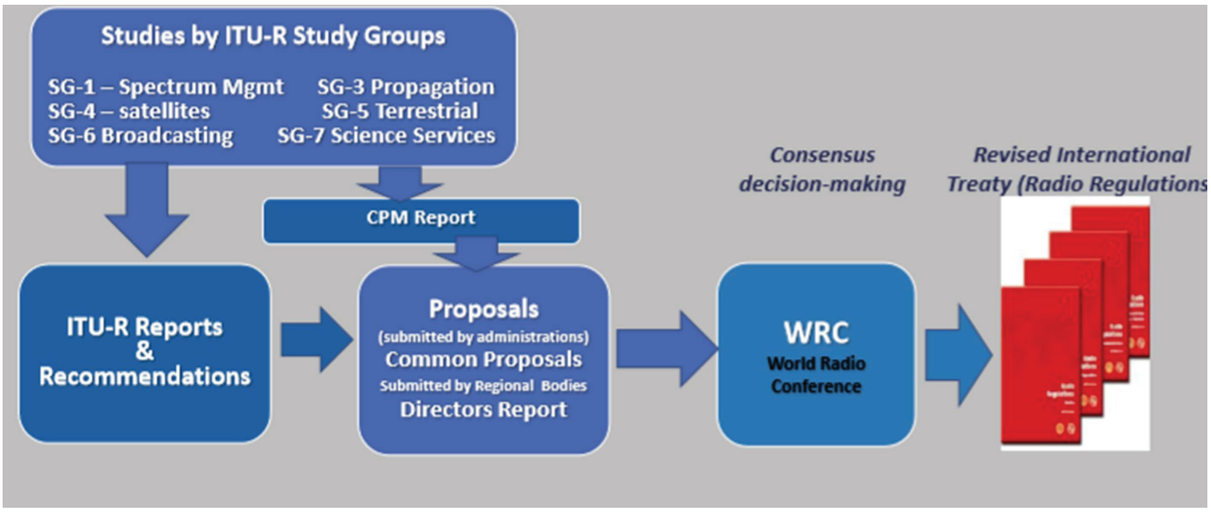

Fig 3: Description Of The World Radio Conferences Process At The ITU

11. **ITU-R Technical Study Groups**. The ITU-R Study Groups play a key role in the preparatory process. They guide the work done to ready the technical bases for decisions at the WRCs. There are six groups that cover different areas. According to the ITU, more than 4,000 specialists from administrations, the telecommunications industry as a whole and academic organisations across the world, participate in the work done by these groups.

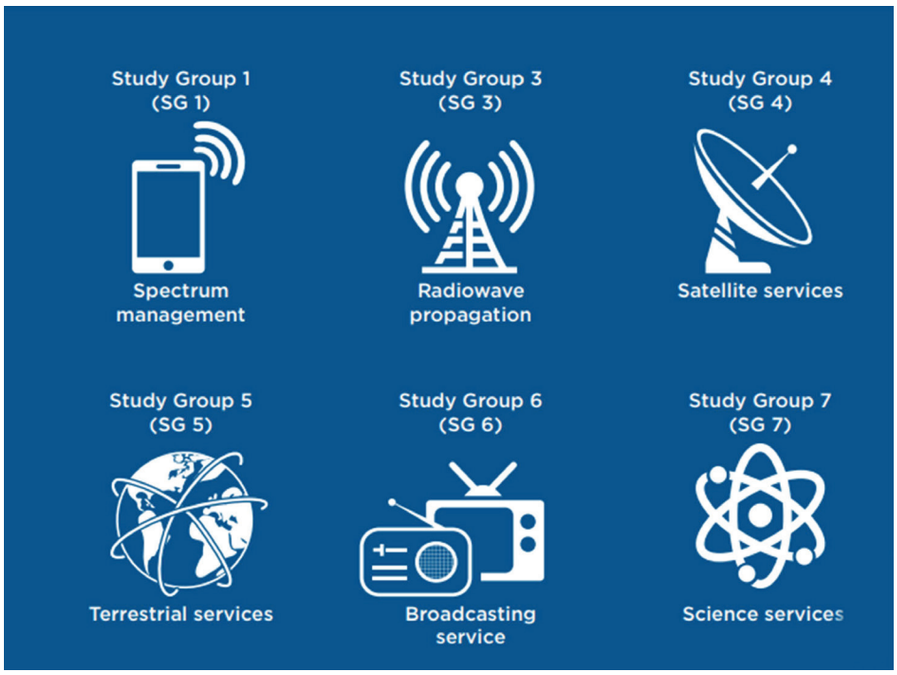

Fig 4: Scope and Charter of Various Study Groups

Study Group 5 (SG-5)

12. SG-5 focuses on Terrestrial Services and is **of special significance to the Armed Forces.**It is currently split into three Working Parties (**WPs**) and one Task Group (**TG**).WPs are regular parts of this study group, while the TGs are formed with a specific purpose. Once the task is completed, they are disbanded. TG 5/1 was formed to carry out studies on WRC-19 agenda item 1.13, which considers mobile allocations for certain frequency bands above 24 GHz. The addition of mobile allocations for high spectrum bands will help increase speeds significantly, but short propagation makes them a challenging proposition. It may also improve the opportunity for sharing between different technologies.

13. The task group will conduct sharing and compatibility studies, to see how well a mobile network in these bands could exist alongside, for example, satellite. Based on the studies, it will also write the section of the CPM report to provide technical bases on this important topic. The group met for the first time in May 2016 to agree on a structure, develop a work plan and consider contributions. The structure is made up of four working groups that focus on different bands within the range covered by Agenda Item (AI) 1.13. To complete the work, TG 5/1 had met a further three times in 2017 & once or twice in 2018.

Importance of Regional Bodies in WRC Process

14. The six regional groups (APT, ASMG, ATU, CEPT, CITEL and RCC) all play an important part in the work. For anyone who wants to influence the decisions made at the WRC, national and regional preparations are important. Regional groups feed into the majority of the work completed ahead of each conference. These six regional bodies are:-

(a) APT - Asia-Pacific Telecommunity
(b) ASMG -Arab Spectrum Management Group
(c) ATU -African Telecommunications
(d) CEPT -European Conference of Postal and Telecommunications Administrations
(e) CITEL - Inter-American Telecommunication Commission
(f) RCC -Regional Commonwealth in the field of Communications

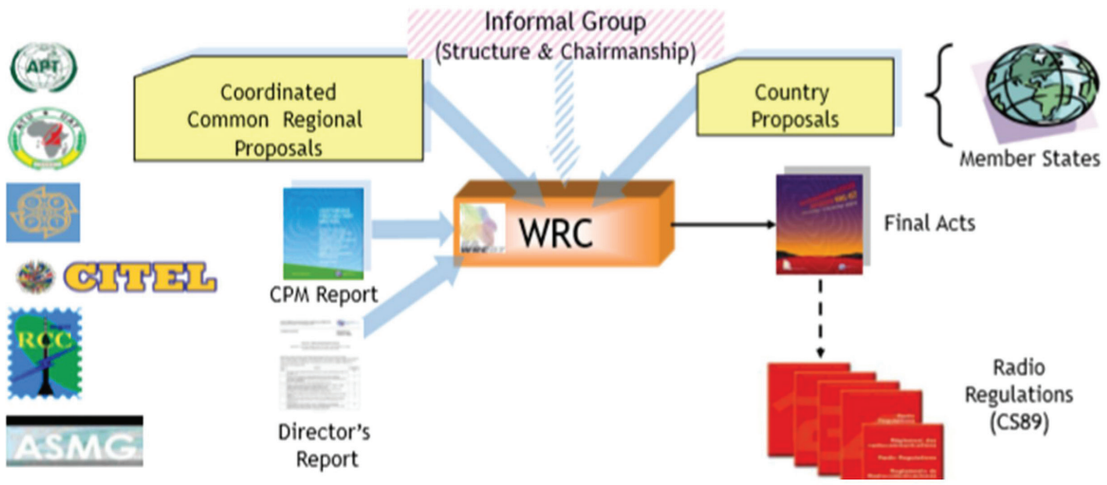

Fig 5: Role of Regional bodies in WRC Process

15. **National and Regional Preparations**. The positions of regional groups are informed by the work done at a national level. **Views of the Indian administration** are put up to the Asia-Pacific Telecommunity (**APT**)and from there they are sent to the ITU. This is how Swedish regulator Post - ochTelestyrelsen (PTS) presents its preparatory meetings on the organisation's website:

"Representatives from governments, businesses and organisations are all invited to participate, to submit information and views on the positions and proposals of each item on the WRC agenda. All interested parties are welcome to attend the meetings. The results of these meetings are used for developing Swedish positions and proposals for the European preparations. To sum up, here are three reasons why getting involved on a national basis, at an early stage, is a good idea:

• You can submit proposals via countries or to regional groups. The latter of which tends to have a lot more weight than individual country proposals;

• You participate in national discussions with other stakeholders, making it easier to anticipate discussions at the ITU and regional groups; and

• At the end of the day, the **votes of individual countries determines the decisions at the WRC.** For industry participants, access to national delegations gives them a chance to influence national positions as well as have "behind-the scenes" discussions.

16. **The ITU-R Inter-regional Workshops**. Another integral part of preparations ahead of the WRC is the Inter-regional Workshops. Participants exchange views and hopefully a better understanding of the common views, positions and/or proposals. Each WRC cycle includes workshops organised annually, with the last one taking place just before the conference.

Attending the WRC: How Decisions Are Made

17. The preparatory process is a means to an end; to get ready for the WRC meeting. The participating countries have four weeks to reach a consensus on the different agenda items.To understand how WRC decisions are made, it is important to understand the conference structure. The structure as well as the chairmanships are discussed within an **'informal group'** in the run up to the conference. Anyone can take part in this process, but usually people who are really involved in the process take part. It's called an 'informal group' because the participants express their views as individuals and not as representatives of a country.

18. **Conference Structure**. The Chairs and Vice Chairs for the committees are proposed in this informal group based on factors such as background, experience and where the candidates are from, with a balance between different regions in mind. The 'informal group' produces a document that gets discussed and approved with or without changes by the heads of the country delegations on the eve (usually a Sunday) of the conference. The chairman of the WRC is confirmed at this meeting together with the structure of the WRC. There are normally six committees, ranging from the Steering Committee chaired by the conference chair to others which deal with the agenda items, conference budget issues and credentials of the member states.

19. The chairman of the conference is responsible for the outcome of the WRC and chairs the plenary. The actual WRC workload is divided among a number of committees and working groups. The Steering Committee coordinates all matters connected to the smooth execution. It plans the order and number of meetings. There are also committees that handle budget control and credentials.However, the most important ones are the committees that handle the actual agenda items. At WRC-15 there were three, with each one split into smaller working groups to handle the agenda items more efficiently. Keeping track of these is important because participating in working groups and committee meetings is the most effective method of influencing conference outcomes.

20. Once the official structure has been decided, the main work of the WRC begins through the Working Groups, Sub-Working Groups (**SWGs)** and sometimes smaller Drafting Groups**(DGs)**; the number growing larger as the Conference goes on. Weekends and evenings are largely forgotten. Industry lobbying groups, regional meetings and sub-regional meetings all take up time in a high-pressure month. Daily country delegation meetings each morning are crucial for coordination. Deals are done over coffee and in corridors as well as in the main meetings. Towards the end of the Conference, the plenary meetings – full of thousands of people – go on late into the night; vital breaks in between them are used for rapid coordination between key countries to find vital harmonised consensus.

21. **Reaching Consensus**. Decisions are made when consensus on an issue has been reached through a delicate balance of compromise by differing countries. Each agenda item is discussed by the working groups in order to bring differing views closer together. This is then brought through the committees until a balanced agreement has been reached. The final sign-off is given by the plenary. If a conference chair thinks a certain issue is especially complicated, he or she can decide to manage it directly by creating an ad-hoc group of the plenary. The starting point for discussion is the ***input documents from the six regional groups***, which is why it is so important to get involved in the regional preparations. If the influence is positive in this part of the decision-making process, a lot of the work is already done. In addition to regional documents, single countries or a group of countries can join forces to submit their own input. This is an opportunity for individual countries to make their voices heard, which is particularly significant if their views differ from the regional groups they participate in.

22. Private sector members and organisations can contribute information papers. The papers are also allowed to be presented at the conference, as long as the chair of the committee agrees to it. Again, the

input documents are where the discussion to reach consensus starts. At the conference, for each agenda item, each region appoints rapporteurs which present his or her region's take. On the side lines, the regional groups negotiate and compromise on their respective positions. Member states, supported by industry, work throughout the month to achieve harmony and consensus. This is vital to support many communications services, including mobile. Where differences remain, issues are escalated to higher level meetings. And while the end of the WRC is always a busy time trying to find balanced consensus, the meetings have enjoyed high success rates over their history.

23. The Final Acts are a record of the decisions taken at the WRC. They are made up of new and revised provisions of the Radio Regulations as well as the new and revised *Resolutions and Recommendations* approved by the conference. A few tips on how to succeed in reaching consensus, as listed in the ITU website are :-

(a) Advocate positions as much as possible at national and regional levels before the conference;

(b) Find as much consensus as possible before the conference, and present that to regulators (as opposed to operators or vendors going to regulators individually);

(c) Familiarise yourself with the process and structure of the conference to make it easier to follow the agenda items;

(d) Know who you can ask for help on important issues;

(e) Keep track of who is on your side and even more importantly who is not, on each issue; Getting to know the opposition and what can be offered is key;

(f) Have fall-back positions ready if the optimum outcome can't be reached;

(g) Don't assume that decisions are just rubber stamped by the plenary during the last couple of days; and

(h) Manage energy levels. The WRC is a marathon, not a sprint: prioritising is key to a successful outcome.

Activities Post WRC

24. As important as Radio Regulations are, they are only the first step. **National Band Plans** are needed to dictate how the frequencies can be used. Spectrum is a finite resource essential for so many vital communication services, but it holds no value until its use is fuelled by investment. Timing is key to a successful spectrum roll-out. Too slow, and the market can't access the spectrum in a timely manner, and consumers will suffer. Too quick, and the ecosystem won't be ready and the financial investment will be difficult to manage for mobile operators. To help regulators and governments assign spectrum detailed by the radio regulations, the GSMA's Spectrum Group suggests a process by which this can happen. The process is split into four steps:-

(a) **Strategic Analysis**. The evolution of consumer and technology trends impacts spectrum requirements and needs to be taken into account when thinking about spectrum demands;

(b) **Spectrum Roadmap**. A spectrum roadmap aids planning to support mobile broadband expansion and evolution;

(c) **Implementation Guidelines**. Practical implementation guidelines are needed for each band; and

(d) **Spectrum Award Policy.** Spectrum policy impacts the coverage, capacity and cost of mobile services. A sound policy is needed for mobile services to flourish.

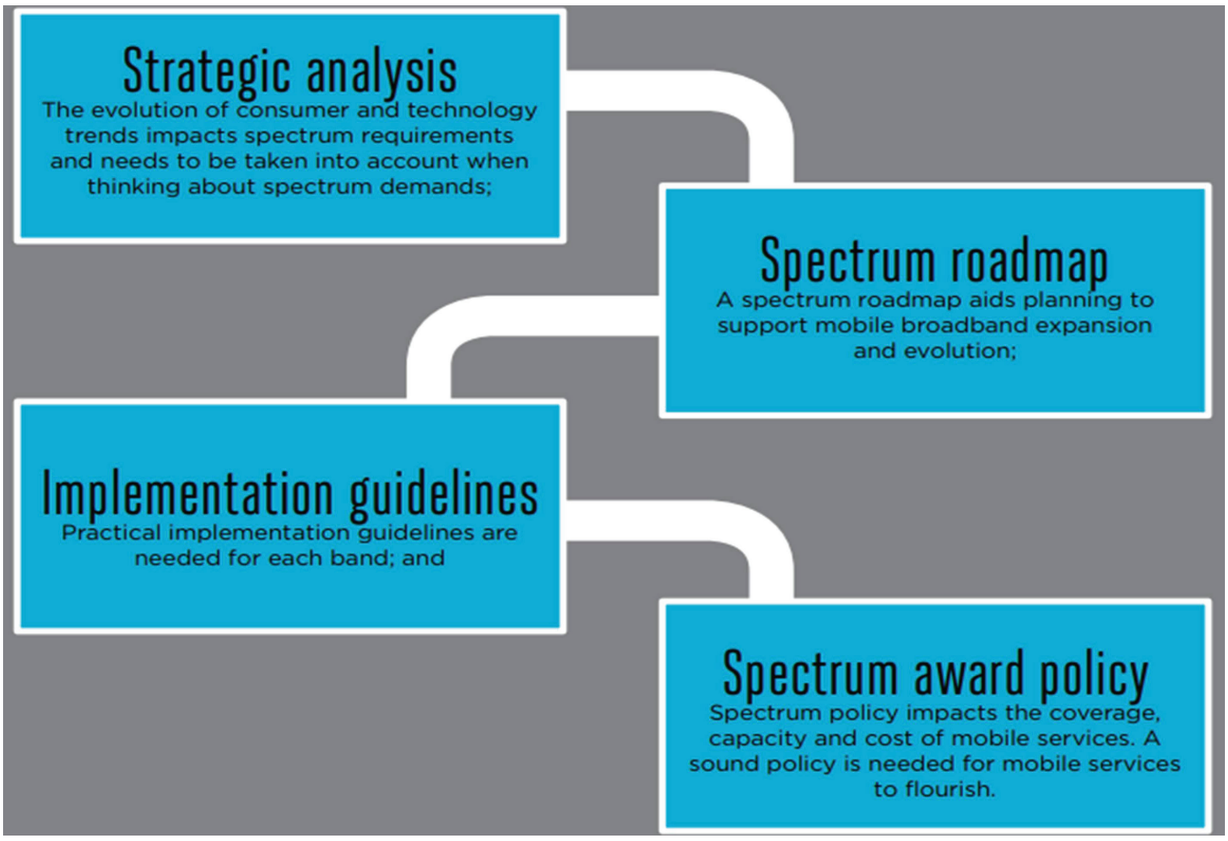

Fig 6: Suggested Steps for Evolution of National Band Plan

Importantance of WRCs

25. Rapidly increasing data usage is putting pressure on spectrum availability; thus planning is needed to make sure we have sufficient spectrum for the future. The outcome of the WRC is the single most important factor determining the future availability of spectrum. The WRC will make decisions on how spectrum is used during the next couple of decades. Spectrum identified at the WRC will not become available immediately. In some cases its commercial use has taken ten years or more. Where countries have an IMT/mobile broadband identification, its use is optional. However, countries should make efforts to give themselves that flexibilty by identifying those bands for IMT use, after safeguarding theessential services impinging on the security and sovereignity of the nation/ administration. To the extent possible, governments and national stakeholders in the WRC process should try to ensure the mobile industry in their country is supported to maximise broadband, ICT and thus economic growth and leaverage the same to enhance the modernisation of it's Armed Forces.

World Radio Conference 2019 (WRC-19)

26. WRC-19 will be held at Sharm-al-Sheikh In Egypt from October 28 2019 to November 22-2019. It is expected to be attended by over 3500 regulators, Ministers and Wireless Industry leaders from around the world. A strong Indian participation, estimated at over 20-30 delegates from Industry and government is expected to participate in the WRC-19. The same must have representation from the Defence also. The final Preparatory meeting for the conference was held in Geneva, Switzerland from 18-28 February 2019 which finalized the CPM report. The Asia pacific Telecommunity held it's4th Preparatory meeting in Busan Korea from 7th to 12th January 2019 to update APT preliminary views and also propose changes to the Draft CPM report.

27. The WRC-19 preparation milestones and the WRC-19 Preparatory Activities in Asia Pacific by APT are as shown below:-

Fig 7 : WRC-19 Preparation Milestones

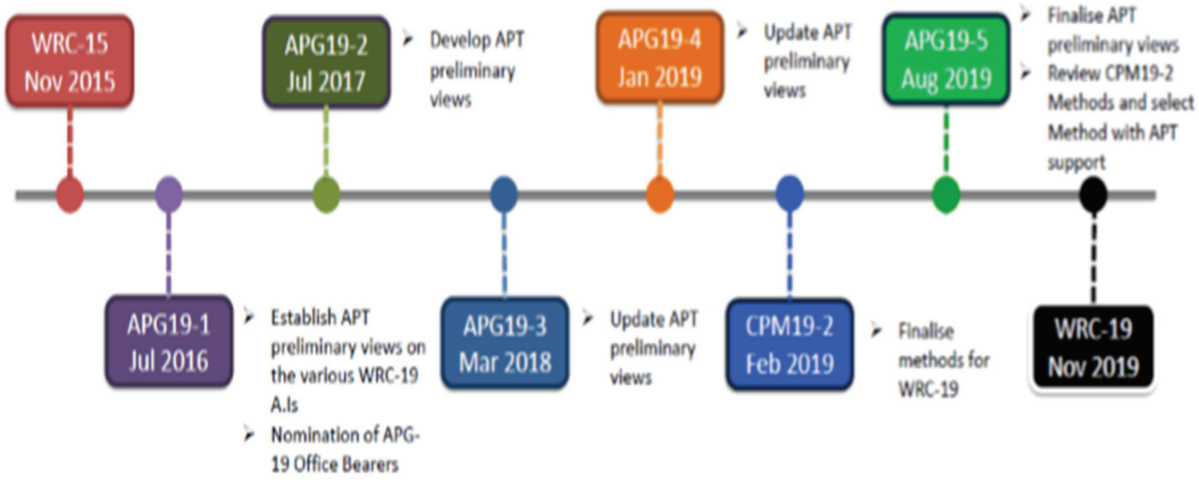

Fig 8 : WRC-19 Preparatory Activities in Asia Pacific by APT

28. **Key Issues For WRC-19**. Though there are over 30 agenda items in the CPM Report submitted for the WRC- 19, yet the important issues for the conference are listed as under:-

(a) Spectrum for 5G in mm wave bands above 24 GHz band.

(b) Spectrum for Earth stations in Motion (**ESIM**) on board ships, aircrafts, trains, etc.

(c) Global Aeronautical and Maritime Distress and Safety Systems (**GAMDSS).**

(d) Additional 5 GHz spectrum for WiFi.

(e) Spectrum for Met satellite and Earth exploration-satellite services in 400 MHz.

(f) Maritime Mobile-Satellite Service (**MSS**) allocations for VHF data exchange systems;.

(g) Spectrum needs for Telemetry, Tracking &Command **(TT & C**) in the space operation.

(h) Spectrum requirements for High-Altitude Platform Stations (**HAPS**).

29. **Structure of the CPM report to WRC-19**. The CPM Report includes summary of studies and methods to resolve each of the 30 agenda items . The CPM Report is structured in six chapters as listed below:-

Ser No	Chapters of draft CPM Report	WRC-19 Agenda Items
(a)	Land , Mobile and Fixed Services	1.11,1.12,1.14,1.15
(b)	Broadband applications in the mobile service	1.13,1.16, 9.1 (9.1.1, 9.1.5 and 9.1.8)
(c)	Satellite services	1.4, 1.5, 1.6 & 7 9.1 (9.1.2, 9.13 and 9.1.9)
(d)	Science Services	1.2, 1.3, 1.7
(e)	Maritime, Aeronautical and Amateur services	1.1, 1.8, 1.9.1 and 1.9.2 1.10, 9.1 (9.14)
(f)	General Issues	2.4, 9.1(9.1.6, 9.1.7), 10

Conclusion

30. The defence forces were holding majority of the spectrum till 2006. However, with the growing demand primarily for mobile telephony (especially 2G and 3G services) and digital TV broadcast, a need was felt to offset Spectrum currently held with defence forces for commercial use which led to review of National Frequency Action Plan (NFAP). The defence spectrum requirements needs to be judiciously managed and aligned at the national, regional and global levels, for ensuring efficient and interference free spectrum utilisation. In view of the ongoing contest for spectrum allocation for commercial applications, it is necessary that defence personnel at various levels must be aware of and have an understanding of the organisations and processes for regulating spectrum, at the global, regional and national levels, to ensure optimal projection of the spectrum requirements of the Armed Forces. Participation by defence representatives, in all these forums at the national regional and global levels, is also essential to ensure that the specific frequency spectrum related concerns of the Armed Forces are integrated and incorporated into the policy decisions being taken at all levels.

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