



Understanding the Digital Dividend

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ITU Deliverables on Digital Dividend



- ITU Report. **Digital Dividend. Insights for spectrum decisions, 2012**
- Report ITU-R SM.2353. **The challenges and opportunities for spectrum management resulting from the transition to digital terrestrial television in the UHF bands, 2015**
- Report ITU-R BT.2302. **Spectrum requirements for terrestrial television broadcasting in the UHF frequency band in Region 1 and the Islamic Republic of Iran, 2014**
- Report ITU-R M.2290. **Future spectrum requirements estimate for terrestrial IMT, 2014**
- Chapter 4 **Use of released spectrum to implement new services and applications** of the Report on Question 8/1.



What is Digital Dividend?

Currently, different objectives and practices around the world lead to several approaches to the definition of the digital dividend.

- **Particular definition.** As for particular definition “First Digital Dividend”, and “Second Digital Dividend” have become widely used. It means the portions of spectrum in upper part of 470-862 MHz frequency range to be refarmed from broadcasting to mobile service.
- **General definition.** Considering the fact that in some countries the Digital Dividend has a different meaning, a general definition that explicitly incorporates the diversity of use is therefore considered to be more appropriate. By that definition **Digital dividend is the spectrum that becomes available over and above that required to accommodate the existing analogue television services in a digital form in the UHF bands**



ITU Terms and Definitions database



In 2016, Russian Federation sent contribution to ITU-R SG 1 and CCV contained proposed definition of Digital Dividend as follows: **The spectrum that becomes available over and above that required to accommodate the existing analogue television services in a digital form.**

After the consultations between SG 1 and SG 6 as like as between representatives of Russian Federation and Italy, final definition was sent to CCV as follows: **The improved efficiency in the use of the spectrum, consequential to the digital switchover Particular definition.**

This definition was approved by CCV to be included in ITU Terms and Definitions database.





Digital Divide



Digital Divide is the inequality in the access to digital radiocommunication services between different countries, regions of one country and also various social groups of the population.

It arises from differences in the level of social and economic development of the countries and regions, and also from well-being of various groups of the population.

In the scope of the issue of Digital Dividend realization, it is appropriate to consider the divide between the urban and rural areas (suburbs, villages and townships) and the divide between different regions within separate countries (regional digital divide).





Prospective ways to allocate Digital Dividend



Major prospective ways to allocate freed spectrum resource:

- **Digital television (DTV)**: more standard-definition channels (SDTV), high-definition television (HDTV), mobile television (DVB-H), 3D-television, additional services (for example, Video-on-Demand)
- **Mobile networks (4G LTE)**: better coverage (very important for rural places), better network capacity, additional services (for example, video call)
- **Combined option.** This option supposes sharing the Digital Dividend between digital terrestrial television and mobile communication.





Determination of the total amount of the Digital Dividend



For determination of the Digital Dividend it's necessary to use the frequency-site plan (FSP) which should be made on the base of decisions of the Regional Radiocommunication Conference (for Europe and CIS) for planning of the digital terrestrial broadcasting service in countries of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz (RRC-06) and limitation due to the presence of the governmental radio applications into these bands.

There are 3 categories of potentially released channels regarding EMC conditions:

- **Category A** channels can be used by digital TV broadcasting as well as by mobile communications without any limitations;
- **Category B** channels can be used within some limitations as it concerns relevant frequency allotment area.
- **Category C** channels cannot be assigned for needs of mobile communications and digital broadcasting without carrying out conversion of the spectrum.





Calculation technique of the total amount of the Digital Dividend



The calculation technique for the size of the digital dividend is based on the following essential steps:

1 Quality determination for digital TV transmission, being the full substitute for TV programmes transmitted in the television system (NTSC, PAL, SECAM) keeping in mind the following:

1.1 Evolutions of viewers' requirements;

1.2 Applicable initial formats of TV programme production;

1.3 Technical characteristics and special aspects of TV programme playback by modern TV receivers;

1.4 Applicable standards for video signal compression.

2 Determination of the number of TV programmes in standard or high definition to be transmitted for adequate substitution of the analogue TV broadcasting with the quality preserved and adequate development of modern technologies.

3 Calculation of the total digital bit rate required to transmit all digital TV programmes.

4 Determination of the target type of reception: fixed, mobile or portable.





Calculation technique of the total amount of the Digital Dividend (continue)



- 5 Determination of the digital transmission specification for the applied broadcasting system that provides the coverage as good as the analogue broadcasting stations with the same transmit antenna height and spectral power density in the band of radio frequency channel (6, 7 or 8 MHz).
- 6 Calculation of the digital bit rate per radio frequency channel corresponding to the technical characteristics of transmission determined in step 1.4.
- 7 Determination of the number of digital multiplexes required to achieve the total digital bit rate determined in step 1.2 with 10% margin for programme distribution losses between the multiplexes and for service transmissions.
- 8 Determination of the number of radio frequency channels pursuant to the existing frequency plans required to arrange one digital broadcasting multiplex with the coverage equal to the analogue TV stations operated in the relevant area.
- 9 With the outcomes of step 4 for the different areas and territories considered, to determine the overall bandwidth (in MHz) required for operation of the number of multiplexes determined under step 7 for 75%, 95% and 99% territory of the country.
- 10 Obtain the size of the digital dividend in MHz for the corresponding % of territories.





Specific features impacting on Digital Dividend allocation



There are some specific features, which impacts on Digital Dividend allocation:

- huge territory;
- large number of regions and frequency allotment areas;
- great population density discontinuity;
- various degrees of the broadcasting and mobile communication network penetration in different regions;
- various value of available frequency resource in different regions. It is necessary to also consider a possibility of released spectrum allocation at different levels)





Levels of allocation



There are 3 allocation level. The allocation level means the following:

- at the **federal** level it is a minimum value of released frequency channels in all frequency allotment areas of the country;
- at the **regional** level it is a minimum value of released frequency channels in frequency allotment areas of a region;
- at the **local** level is a value of released frequency channels in each frequency allotment area





How to distribute Digital Dividend



Distribution of Digital Dividend is directly related with national spectrum distribution regime set for certain country.

There are 3 main regimes: administrative, semi-administrative and market-based.

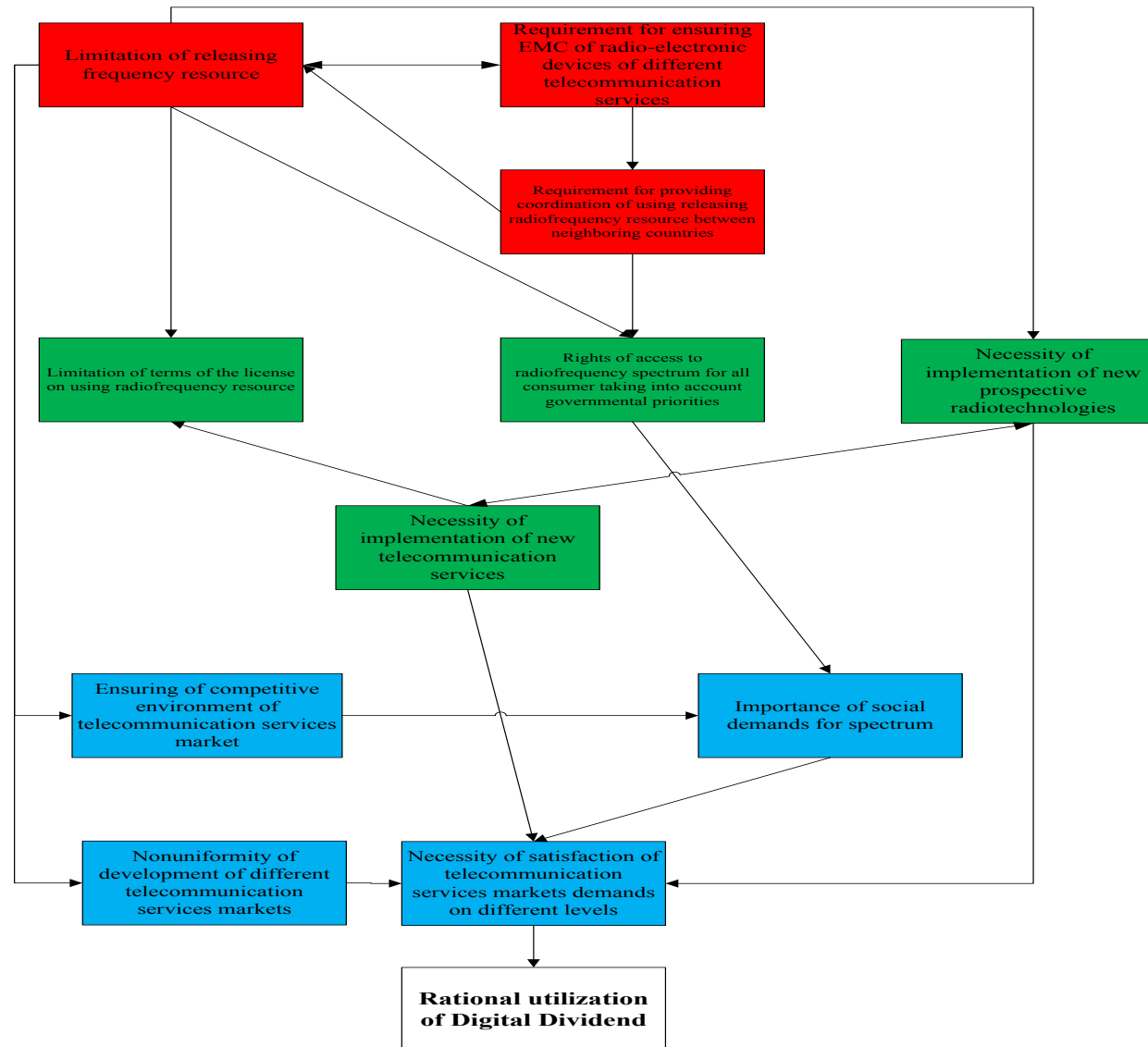
The administrative regime is the old-fashioned one. By that regime, regulator decides how to distribute spectrum on its opinion without consideration of market and social-economic demands.

The semi-administrative regime is characterized by the main method of spectrum distribution – comparative tender also known as “beauty contest”. By this method, a special commission within regulator with the participation of certain stakeholders sets a bundle of criteria with the same or different weightings. Operators set their offers, which are then evaluated by a special commission. The winner of the tender is selected on the base of summarized result of set criteria, usually the highest weighting.

The market regime is characterized by the main method of spectrum distribution – spectrum auction. Similarly, as in tenders, operators have alike criterion for participation, but in spectrum auction, it could be considered as an “entrance ticket”. The main criteria is auction payment.



System of principles of rational utilization of Digital Dividend





Principles of rational utilization of Digital Dividend (Technical)



Principles	Groups	Description
Limitation of released frequency resource.	Technical	Radiofrequency spectrum is a limited natural resource with a set of features. It means that in some cases (like Digital Dividend) it is impossible to satisfy all of spectrum demands of telecommunication services market. This fact leads to the requirement of sharing radiofrequency resources between telecommunication services or choosing the more important one for the allocation of released spectrum.
Requirement for ensuring EMC of radio-electronic devices of different telecommunication services.	Technical	Allocation of spectrum to different services leads to the necessity of ensuring EMC between radio-frequency devices of different telecommunication services. Disregarding the EMC principle can cause from lower quality of services to full failure of service rendering.
Requirement for providing coordination of using releasing radiofrequency resource between neighboring countries.	Technical	Radiofrequencies resources of the same frequency range can be utilized for different telecommunication services in different countries. Particularly, the Digital Dividend can be used for DTV and IMT. This fact leads to necessity of providing coordination planning for the utilization of the Digital Dividend in bordering territories of neighboring countries. Disregarding that principles can cause the same problems as disregarding the EMC-principle.





Principles of rational utilization of Digital Dividend (Regulatory)



Principles	Groups	Description
Limitation of terms of the license on using radiofrequency resource.	Regulatory	This principle is a result of the limitation of spectrum resources. This principle should be considered during the allocation of the Digital Dividend and its decision-making process due to the fact that this limitation stimulates a competitive environment in the telecommunication market and also the development and implementation of new telecommunication technologies.
Rights of access to radiofrequency spectrum for all consumers taking into account governmental priorities.	Regulatory	Respect to this principle is key for the provisioning of governmental duties such as national defense, law-and-order and disaster management. Moreover that principle ensures social rights for equal access to telecommunication services.
Necessity of implementation of new prospective radiotechnologies.	Regulatory	Fulfilling governmental policy for the implementation of new radio technologies which use radiofrequency resources more effectively is the key factor of new resources such as the Digital Dividend. Also new technologies can be a bridge for important new services which otherwise could not be provided by current technologies.
Necessity of implementation of new telecommunication services.	Regulatory	A consequence of the previous one. The telecommunication services market is a fast-growing field, which should be filled by new prospective services that stimulate competition and also provide increased spectrum efficiency.



Principles of rational utilization of Digital Dividend (Regulatory)

Principles	Groups	Description
Ensuring of a competitive environment on telecommunication services market.	Social-economic	Market competition for the rights for using limited radiofrequency resources, considering governmental priorities and the limitations of the terms of the license, ensure the adherence of the principle of necessity of implementation of new telecommunication services and upgrading the current ones.
Importance of social demands for spectrum.	Social-economic	This principle is a consequence of the principle of governmental priorities and is necessary for providing different telecommunication services in conditions of non-uniformity access and demand for them i.e. non-uniformity of development of different telecommunication services markets.
Non uniformity of development of different telecommunication services markets.	Social-economic	Non-uniformity access to telecommunication services, the so-called Digital Divide, can appear on different levels: cross-country level (countries with better access to services-countries with worse access), inland level (territories inside country with better access to services- territories inside country with worse access) city-rural level. Uncertainty in the use of the Digital Dividend to bridge the Digital Divide either by the DTV and IMT services is possible. Some regions can have high demand for DTV but low for IMT, some other regions inversely. Considering that it is possible to state that the principle of prioritization of social demand leads to necessity of satisfaction of telecommunication services markets demands on different levels such as regions or administrative areas.
Necessity of satisfaction of telecommunication services markets demands on different levels.	Social-economic	This principle is the resulted principle on a base of that Digital Dividend allocation decision should be done to maximize social-economic effect of the utilization of the released frequency resource.



**Thank you very much for your
kind attention!**

