Concept Paper/ White Paper

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Current Usage and Future Planning of Radio Spectrum in Nepal

Nepal Telecommunications Authority

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Contents

Current Usage and Future Planning of Radio Spectrum in Nepal

1. Background

The Telecommunications Act, 2053 vested responsibility to Nepal Telecommunications Authority to grant license, regulate and systematize telecommunications services. In addition, the Authority is also empowered to perform the functions relating to the frequency in accordance with the policy determined by the Radio Frequency Policy Determination Committee (RFPDC). The Telecommunications Regulation, 2054 stipulates that the Authority shall assign the spectrum for Telecommunications services on the basis of allocation made by the RFPDC. Furthermore, the Authority is also sanctioned the power to specify the terms and conditions for the usage of radio frequency spectrum.

2. Objectives

This concept paper is published by the Authority in order to

- Highlight the present status of spectrum assignment in Nepal;
- Forecast the future demand of spectrum by cellular services; and
- Formulate a plan for the allocation and assignment of spectrum.

3. Methodologies

Following approaches are taken for the formulation of this document:

- Consideration of the existing legal frameworks and planned amendments thereof;
- Study of present status and growth trends of the cellular services;
- Discussion with/ inputs from mobile service operators; and
- Consultation with the stakeholders.

4. Status of Spectrum Allocation and Assignment

The following table lists different frequency bands that are allocated for mobile technology. The same table shows the size of assigned and unassigned spectrum.

Table 1: Allocated, assigned and unassigned frequencies for Mobile Technologies

Frequency Bands	Frequency Range	Duplexing	Bandwidth	Assigned Bandwidth	Remaining Bandwidth
700 MHz Band	703-748 MHz paired with 758-803 MHz	FDD	2×45 MHz	-	2×45 MHz
800 MHz Band	852-862 MHz paired with 811-821 MHz	FDD	2×10 MHz	2×10 MHz	-
850 MHz Band	824-834 MHz paired with 869-879 MHz	FDD	2×10 MHz	2×3.75 MHz	2×6.25 MHz
900 MHz Band	880-915 MHz paired with 925-960 MHz	FDD	2×35 MHz	2×24.2 MHz	2×10.8 MHz
1800 MHz Band	1710-1785 MHz paired with 1805-1880 MHz	FDD	2×75 MHz	2×52 MHz	2×23 MHz
2100 MHz Band	1920-1980 MHz paired with 2110-2170 MHz	FDD	2×60 MHz	2×25 MHz	2×35 MHz
2300 MHz Band	2300-2400 MHz	TDD	100 MHz	10 MHz	90 MHz
2600 MHz Band*	2500 - 2570 MHz paired with 2620 -2690 MHz	FDD	2x70 MHz	-	2x70 MHz
	2570-2620 MHz	TDD	50 MHz	-	50 MHz
3500 MHz Band	3300-3800 MHz	TDD	500 MHz	-	500 MHz

** 60 MHz spectrum in this band is provided for 5G trial.*

5. Status of Spectrum Usage

The status of the frequency bands that are yet to be assigned for mobile applications are as follows:

- The spectrum band 700 MHz is unassigned and completely vacant.
- 60 MHz spectrum in 2600 MHz band is provided for 5G trial purpose (non-commercial use). The trial period ends before January 01, 2024. This band is not assigned for any commercial mobile services.
- The spectrum band 3500 MHz is unassigned for mobile technologies. However, the spectrum range 3400-3800 MHz is partially in use for broadcasting (satellite) services.

For the frequencies assigned to different service providers, the status of spectrum usage is as follows:

Table 2: Status of Usage of Assigned Spectrum

Frequency Bands	Assigned Bandwidth	Used Technologies	Used Bandwidth	Assigned but Unused Bandwidth
800 MHz Band	2×10 MHz	LTE	2×10 MHz	-
850 MHz Band#	2×3.75 MHz	CDMA	2×1.25 MHz	2×2.5 MHz
900 MHz Band	2×24.2 MHz	GSM, UMTS, LTE	2×19.2 MHz	2×5 MHz
1800 MHz Band	2×52 MHz	GSM, LTE	2×40 MHz	2×12 MHz
2100 MHz Band	2×25 MHz	UMTS, LTE	2×25 MHz	-
2300 MHz Band	10 MHz	WiMAX	10 MHz	-

#Technology neutrality principle is not adopted in this allocation.

Some service providers don't have operational network and service, but spectrum is assigned to them. As a result, some of the assigned spectrum is unused.

The current growth in data consumption is continuously increasing the capacity utilization of the mobile operators. Spectrum in 900 MHz band assigned to the operational mobile service providers is nearly saturated and service providers are running concurrent GSM/LTE and GSM/UMTS services. Other spectrum bands are also starting to experience congestion. The current spectrum allocation is expected to get saturated by the start of 2024. Growth of new applications such as Machine-to-Machine Communication, Augmented Reality/ Virtual Reality, High Resolutions Games and Videos etc. will only increase the bandwidth demand. Evidently, there is demand for more spectrum, such demand differs for different spectrum bands.

6. Demand of Spectrum

As the service providers are witnessing continuous growth in data usage, they require more spectrum to meet the demand. Ideally, service providers expect more spectrum in their existing allocation so that the existing equipment can be operated at higher capacity. Minimum additional capital investment from service providers is required in such cases. But new

equipment may be necessary if the existing ones are operating at maximum capacity. Also, it is also highly probable that the users can experience higher throughput service using the existing handsets. In this regard, additional spectrum in 800 MHz, 900 MHz, 1800 MHz and 2100 MHz band is demanded by the mobile operators. The demand for more spectrum in 800 MHz and 900 MHz band is for experience enhancement of the rural users and the demand in 1800 MHz and 2100 MHz band is for higher capacity network in densely populated areas. 700 MHz band and 2300/2600 MHz bands are alternatives to the aforementioned coverage and capacity bands.

Likewise, one operator is conducting 5G trial in 2600 MHz band with 60 MHz spectrum. The handset market of Nepal is evolving, and many smartphones imported lately support 5G services. Based on global technological advancements and data traffic per user per month in Nepal, significant progress is expected to be seen by the end of 2024. As reported by the mobile operators, 5G services are expected to be launched in 2600/2100 MHz bands and expanded to 700 MHz band (for coverage) and 3500 MHz Band (for capacity).

7. Authority's Plans and Readiness

Spectrum audit and revocation of unused spectrum

The Authority is going to perform the audit of the assigned cellular spectrum. The audit will provide information on level of usage of each frequency bands by different operators. For spectrum bands that are approaching the saturation level, plan will be made to provide additional spectrum in same or similar (coverage/ capacity) spectrum band.

Similarly, the Authority is planning to revoke the assigned spectrum that remain unused for more than a specific duration. Such spectrum will be assigned to existing or new service providers as per the provisions of the Frequency Policy.

Promoting VoLTE and shutting down legacy network

As of now, mobile service providers are operating multiple networks [CDMA, GSM (2G), IMT 2000 (3G), IMT Advanced (4G), IMT 2020 (5G) etc.]. Although the newer generations provide services with better quality and security provisions, the OPEX of the service providers is higher as they are operating older generations as well.

- For mobile data services, 4G networks are reliable, affordable and provide higher throughput. The Authority is studying the possibility of shutting down other types of

mobile data networks so that the costumers have access to better services. Users of legacy technologies; ROI, OPEX and revenue from the legacy networks, handset support; coverage and capacity of 4G network etc. shall be analyzed during the study.

- Service providers have started VoLTE service recently. So, the mobile voice telephony is mostly dependent on 2G and 3G networks. The Authority encourages network operators to avail VoLTE service in their LTE network. Availability of VoLTE will slowly migrate the circuit-switched voice users to high definition voice calls. Such move will help to create a matured ecosystem for VoLTE calls and create a basis for shutting down legacy networks in the future.

Introduction of New Market Player

The duopoly in Nepali telecommunications market is much talked and criticized about. Lately, the effect of such scenario is reflected in the quality of experiences too. Many have the opinion that a capable third mobile operator is essential to ensure quality oriented competition between the service providers. Through prevailing legal frameworks, the Authority is planning a Frequency Auction in which entities without an existing License can participant. Winner of such auction will not only be awarded the spectrum, but also the License of Mobile Broadband Service Provider. Such service provider will be licensed to offer any services that are opened by the Authority till date.

Competition promotion and revision of spectrum capping

The Authority is committed to make the telecommunication sector in Nepal more competitive by providing level playing field to the existing service providers as well as new entrants. One of such initiative is to make sure that the spectrum is distributed as rationally as possible. The Authority ensures to assign sufficient spectrum as required by the mobile operators for the accommodation of subscribers' demand and adoption of new technologies. However, such assignment will be through competitive procedure. Meanwhile, spectrum capping is applied such that there will be at least 3 mobile operators in prime frequency bands like 700 MHz, 900 MHz, 1800 MHz and 2100 MHz. The proposed spectrum capping is shown in the table below. The proposal is already forwarded to the RFPDC and will come into effect after approval. Spectrum capping for low, mid and upper bands instead of each individual band will be studied by the Authority.

Table 3: Existing and Revised (Planned) Capping of Spectrum

Frequency Bands	Bandwidth	Current Minimum Bandwidth	Current Maximum Bandwidth	Planned Minimum Bandwidth	Planned Maximum Bandwidth
700 MHz Band	2×45 MHz	2×5 MHz	2×15 MHz	2×5 MHz	2×15 MHz
800 MHz Band**	2×10 MHz	2×10 MHz	2×10 MHz	2×5 MHz	2×15 MHz
850 MHz Band	2×10 MHz	2×2.5 MHz	2×6 MHz	2×5 MHz	2×10 MHz
900 MHz Band	2×35 MHz	2×4.4 MHz	2×9.6 MHz	2×5 MHz	2×10 MHz
1800 MHz Band	2×75 MHz	2×9 MHz	2×20 MHz	2×10 MHz	2×20 MHz
2100 MHz Band	2×60 MHz	2×10 MHz	2×15 MHz	2×10 MHz	2×20 MHz
2300 MHz Band	100 MHz	5 MHz	30 MHz	20 MHz	100 MHz
2600 MHz Band##	2x70 MHz	5 MHz	15 MHz	20 MHz	100 MHz
3500 MHz Band	500 MHz	10 MHz	40 MHz	100 MHz	200 MHz

*** The bandwidth of this band will be increased to 2x15 MHz.*

This band will be made TDD only.

Assignment of coverage and capacity band spectrum

As the currently assigned spectrum resources are being saturated, the Authority is prepared to assign additional spectrum to the operators. Such allocation will be for both coverage and capacity perspective. Within the limits specified in the Frequency Policy, unassigned spectrum in all frequency bands will be distributed. To cater the demand of the telecom market, auction of new coverage band (700 MHz) and new capacity bands (2600 MHz, 3500 MHz) is planned.

Identification of New Spectrum Bands

The Authority is continuously studying new spectrum of frequencies with a view to make available for mobile services. The 26 GHz band (24.25-27.50 GHz) is already identified for mobile/ cellular services and will be official after approval from the RFPDC. The possibility of assigning 600 MHz, 6 GHz, and 28 GHz bands to mobile operators is also being studied.

Spectrum for Other Applications

The spectrum assigned on technology neutrality basis can be used for any standard applications such as International Mobile Telecommunication (IMT) and Internet of Things (IoT), after

approval from the Authority. As such, service providers can ask for consent to build Low Power Wide Area Network (LPWAN) for narrow-band IoT and serve the individual and enterprise users.

Timeline of Spectrum Distribution

Detailed information regarding spectrum distribution in all allocated bands will be presented in Spectrum Roadmap, scheduled to be published by the Authority soon.

8. Conclusion

Utilization of the cellular spectrum assigned to mobile service providers is nearing its saturation. The Authority is determined to provide more spectrum to the service providers to for continuity of existing and introduction of new services. Measures will be taken to ensure quality standards as specified by the Authority, one of such actions is to assign more spectrum.

To make the telecommunication sector in Nepal more competitive, the Authority is in the process of initiating Spectrum Auction in which entities without an existing license can take part. This process is expected to bring a new telecom operator in Nepali market and promote healthy competition in this sector.