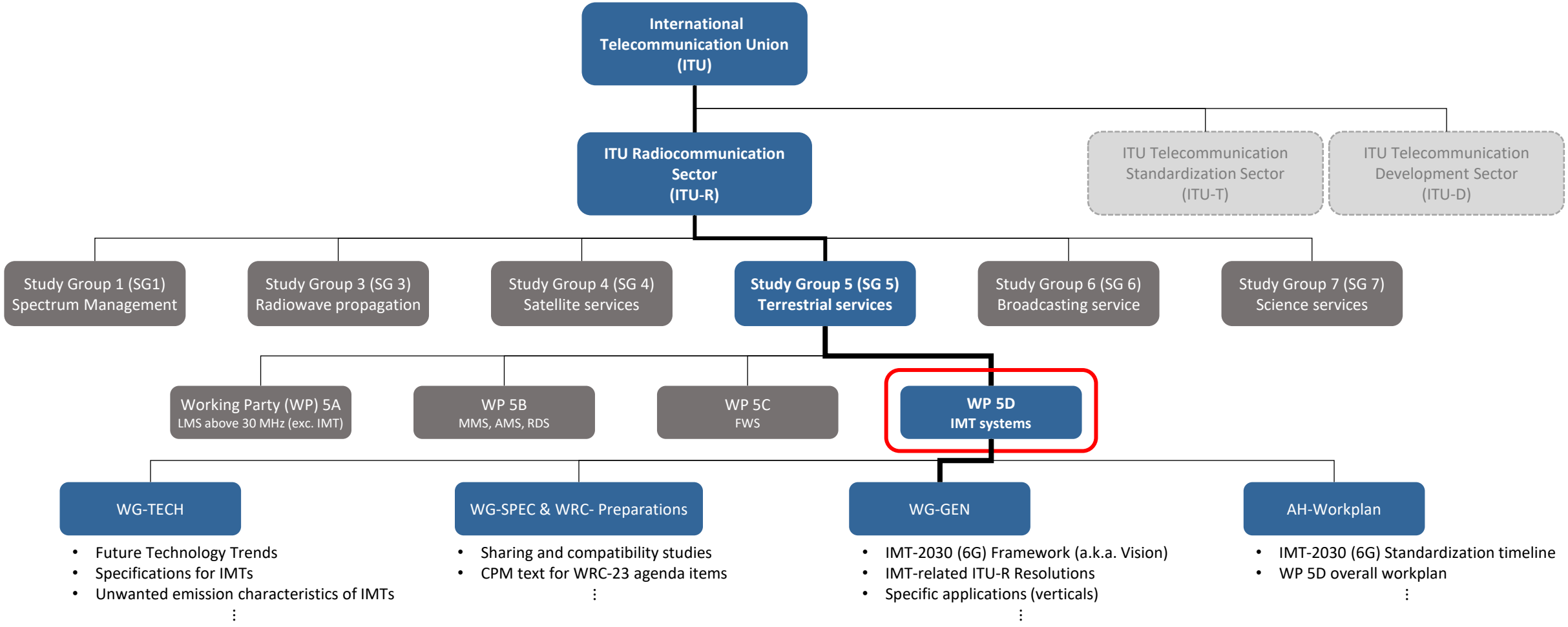
The ITU-R Framework for IMT-2030

Recommendation ITU-R M.2160

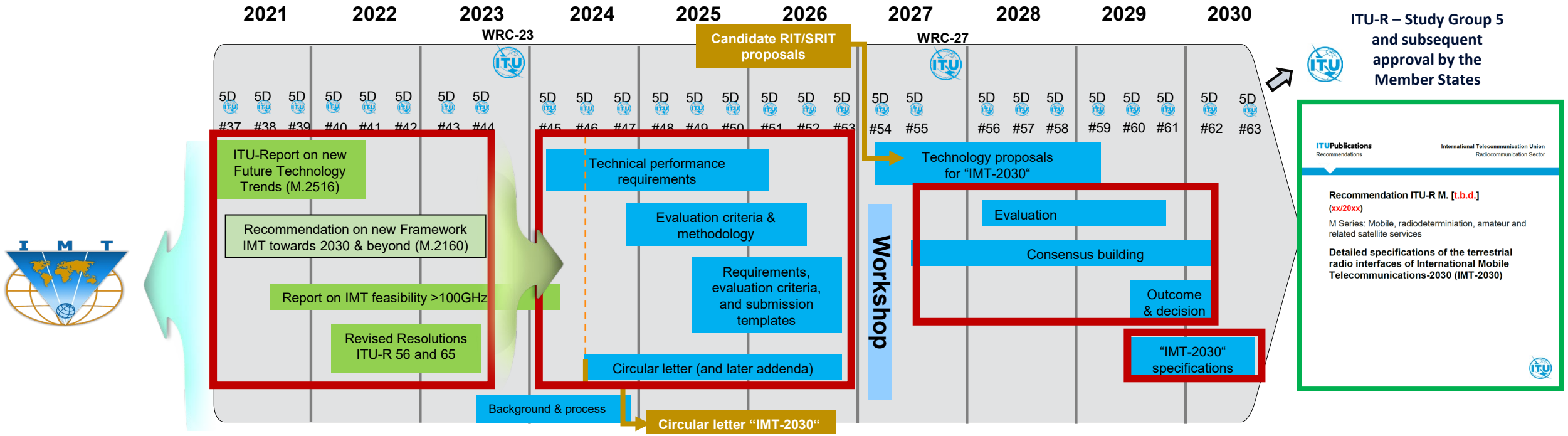
Updated February 2024

ITU-R Working Party 5D

WP 5D is responsible for the overall radio system aspects of the terrestrial component of International Mobile Telecommunications (IMT) systems, comprising the current IMT-2000, IMT-Advanced and IMT-2020 as well as IMT-2030.



ITU-R Timeline and Process



Note 1: WP 5D #59 will additionally organize a workshop involving the Proponents and registered Independent Evaluation Groups (IEGs) to support the evaluation process

Note 2: While not expected to change, details may be adjusted if warranted. Content of deliverables to be defined by responsible WP 5D groups

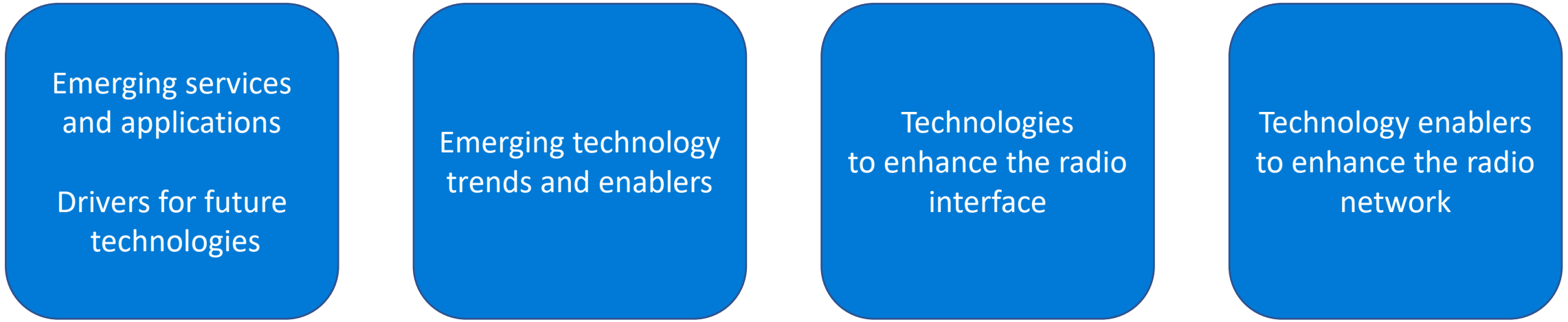
Framework → **Requirements and Evaluation criteria** → **Evaluation and Consensus building** → **Specification** → **Approval**

IMT Family History

	IMT-2000 (3G)	IMT-Advanced (4G)	IMT-2020 (5G)	IMT-2030 (6G)
Report (FTT) — **Future Tech Trends (FTT)**	-	-	Rep. ITU-R M.2320	Rep. ITU-R M.2516
	-	-	Nov 2014	Nov 2022
Recommendation (Vision/Framework) — **Vision**	Rec. ITU-R M.687 & M.816	Rec. ITU-R M.1645	Rec. ITU-R M.2083	Rec. ITU-R M.2160
	Feb/Mar 1992 → 1997	June 2003	September 2015	November 2023
Reports (Requirements, evaluation methodology and submission template) — **Technical Performance Requirements**	Rec. ITU-R M.1034	Rep. ITU-R M.2134	Rep. ITU-R M.2410	Future work
	Feb 1997	2008	2017	
Submission Template	8/LCCE/47 + Add	Rep. ITU-R M.2133	Rep. ITU-R M.2411	
	1998	2008	2017	
Evaluation Methodology	Rec. ITU-R M.1225	Rep. ITU-R M.2135-1	Rep. ITU-R M.2412	
	Feb 1997	2009	2017	
Recommendation (Radio Interface Tech.) — **RIT Specifications (1st release)**	Rec. ITU-R M.1457	Rec. ITU-R M.2012	Rec. ITU-R M.2150	
	May 2000	Jan 2012	Feb 2021	

Future Technology Trends: Report ITU-R M.2516

- This Report provides a broad view of future technical aspects of terrestrial IMT systems considering the timeframe up to 2030 and beyond, characterized with respect to key emerging services, applications trends and relevant driving factors.



- The technology trends of terrestrial IMT systems described in Report ITU-R M.2516 are applicable to radio interfaces, mobile terminals, and radio access networks by considering the timeframe up to 2030 and beyond.

Framework Recommendation – overall

(a.k.a. Vision in previous technologies)

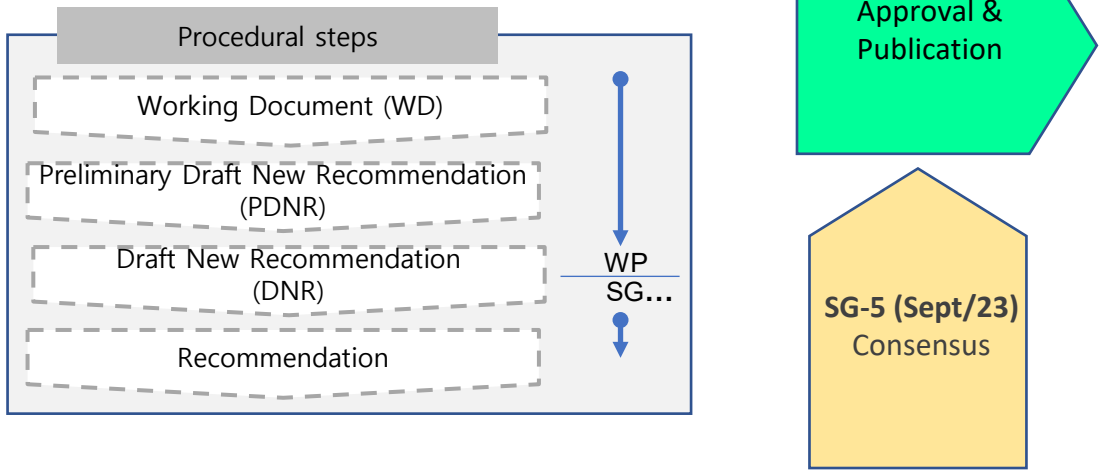
- **Recommendation ITU-R M.2160 - Framework and overall objectives of the future development of IMT for 2030 and beyond***

❖ Framework and overall objectives of the future development of IMT for 2030 and beyond

SWG IMT-2030

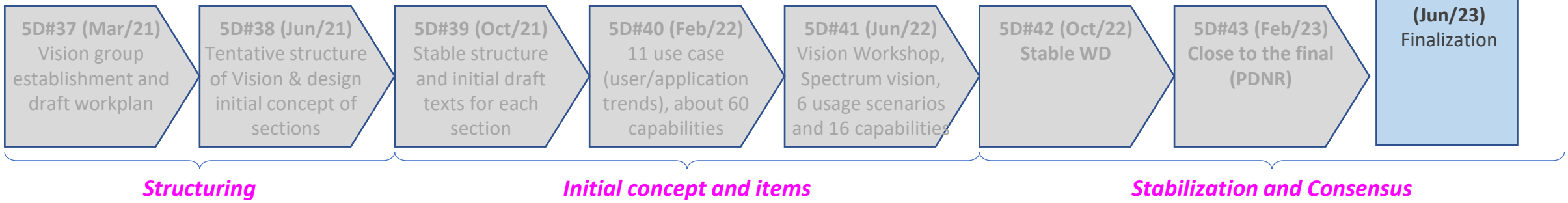
DRAFT NEW RECOMMENDATION ITU-R M.[IMT.FRAMEWORK FOR 2030 AND BEYOND]

Framework and overall objectives of the future development of IMT for 2030 and beyond[1]



- **Workplan**

❖ The responsible SWG was established at the 37th meeting of WP 5D (March 2021)



* Approved November 2023 at ITU-R Radiocommunication Assesmbly (RA-23)

Structure of Framework Recommendation

Main body (Preamble)

Scope

Keywords

Abbreviations/Glossary

Related documents

The ITU Radiocommunication Assembly,

considering

considering further

recognizing

recommends

that the Annex should be considered as the framework and the overall objectives to guide the future develop ment of IMT-2030.

Annex

Table of Contents

1 Introduction

2 Trends of IMT-2030

- 2.1 Motivation and societal considerations
- 2.2 User and application trends
- 2.3 Technology trends
- 2.4 Envisaged frequency bands
- 2.5 Spectrum Harmonization
- 2.6 Studies on technical feasibility of IMT in bands above 100 GHz

Why is IMT-2030 (6G) needed?
IMT-2030 expected benefits

Trend and prospect of 6G features/technology/spectrum in around 2030

3 Usage scenarios of IMT-2030

Guidance of 6G features

4 Capabilities of IMT-2030

Guidance of 6G capabilities to fulfil usage scenarios

5 Considerations of ongoing development

- 5.1 Relationships
- 5.2 Timelines
- 5.3 Focus areas for further study

Relationship with existing IMTs and other access systems
Roadmap for technology/standardization/ deployment/spectrum

Trends

§ 2.1 Motivation and societal considerations

IMT-2030 is expected to be an important enabler for achieving the following characteristics, among others:

- Inclusivity
- Ubiquitous connectivity
- Sustainability
- Innovation
- Enhanced and resilience
- Standardization and interoperability
- Interworking

§ 2.2 User and application trends

- 9 trends

Ubiquitous intelligence

Ubiquitous computing

Immersive multimedia and multi-sensory interactions

Digital twin and virtual world

Smart industrial applications

Digital health and well-being

Ubiquitous connectivity

Integration of sensing and communication

Sustainability

§ 2.3 Technology trends

§ 2.3 Technology trends

"Summary of Future TECH Trends (FTT)"

- Emerging technology trends and enablers
- Technologies to enhance the radio interface
- Technology enablers to enhance the radio NW

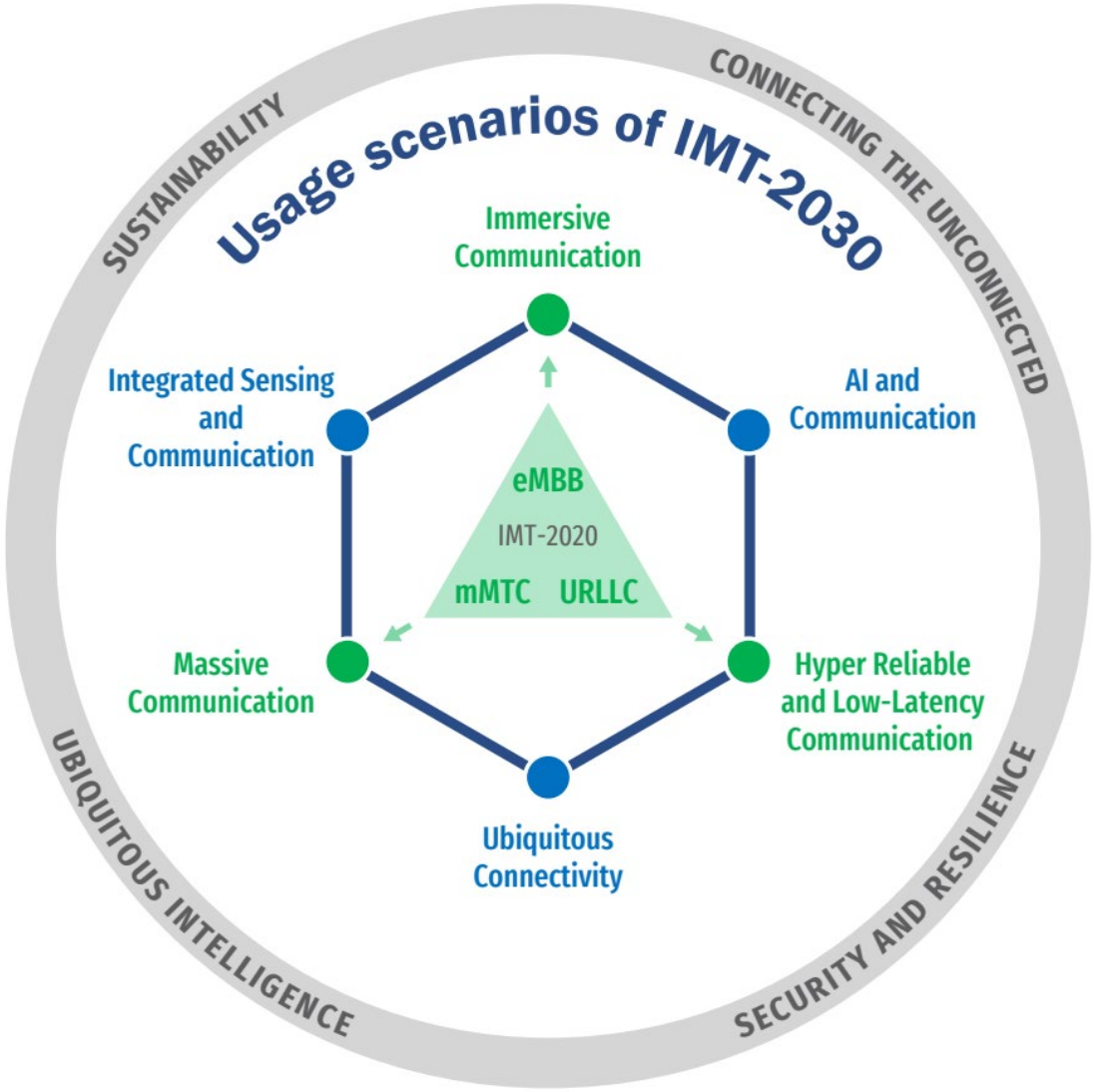
§ 2.4 Envisaged frequency bands and § 2.5 Spectrum harmonization

- § 2.4. Multiple frequency ranges will be needed to meet the capacity and coverage requirements of IMT systems and to serve the emerging services and applications. New generations of IMT may expect new spectrum for increasing data rates, capacity, new applications and to provide for new capabilities. IMT-2030 is envisaged to utilize a wide range of frequency bands ranging from sub-1 GHz up to frequency bands above 100 GHz. Low bands will continue to be crucial to enable nationwide coverage, in particular addressing the digital divide and expandin
- § 2.5. The benefits of spectrum harmonization include facilitating economies of scale, enabling global roaming, reducing complexity of equipment design, improving spectrum efficiency including potentially reducing cross border interference. Harmonization of spectrum for IMT would lead to increased commonality of equipment and is desirable for achieving economies of scale and affordability of equipment, thus promoting digital inclusion.

§ 2.6 IMT in bands above 100 GHz

The development of IMT for 2030 and beyond is expected to enable new use cases and applications with high data rate and low latency, which will benefit from large contiguous bandwidths of tens of GHz. This suggests the need to consider spectrum in higher frequency ranges above 92 GHz as a complement to the use of lower frequency bands.

Usage scenarios and overarching aspects of IMT-2030



So called “Wheel diagram”

Usage scenarios

Extension from IMT-2020 (5G)

- eMBB ➡ Immersive Communication
- mMTC ➡ Massive Communication
- URLLC ➡ HRLLC (Hyper Reliable & Low-Latency Communication)

New

- Ubiquitous Connectivity
- AI and Communication
- Integrated Sensing and Communication

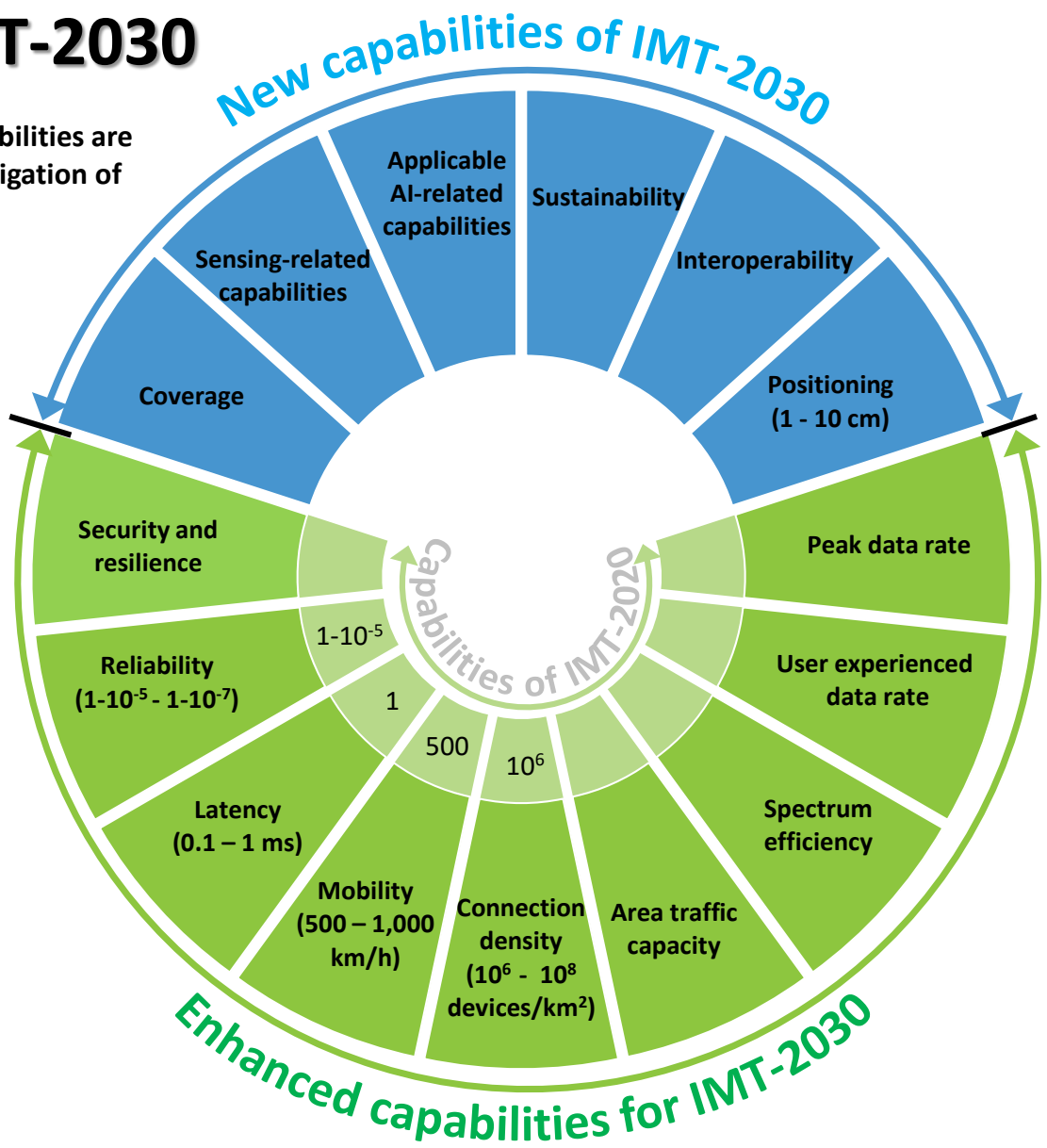
4 Overarching aspects:

act as design principles commonly applicable to all usage scenarios

Sustainability, Connecting the unconnected,
Ubiquitous intelligence, Security& resilience

Capabilities of IMT-2030

NOTE: The range of values given for capabilities are estimated targets for research and investigation of IMT-2030.



So called “Palette diagram”

The range of values given for capabilities are estimated targets for research and investigation of IMT-2030.

All values in the range have equal priority in research and investigation.

For each usage scenario, a single or multiple values within the range would be developed in future in other ITU-R Recommendations/Reports.

Relationship and Timelines

§ 5.1 Relationships

- § 5.1.1 Relationship between IMT-2030 and existing IMT

  Enhancements to existing IMT

  Interworking with existing IMT

- § 5.1.2 Relationship between IMT-2030 and other access systems

  Interworking between different access networks

  such as non-terrestrial network of IMT (including satellite, HIBS and UASs)

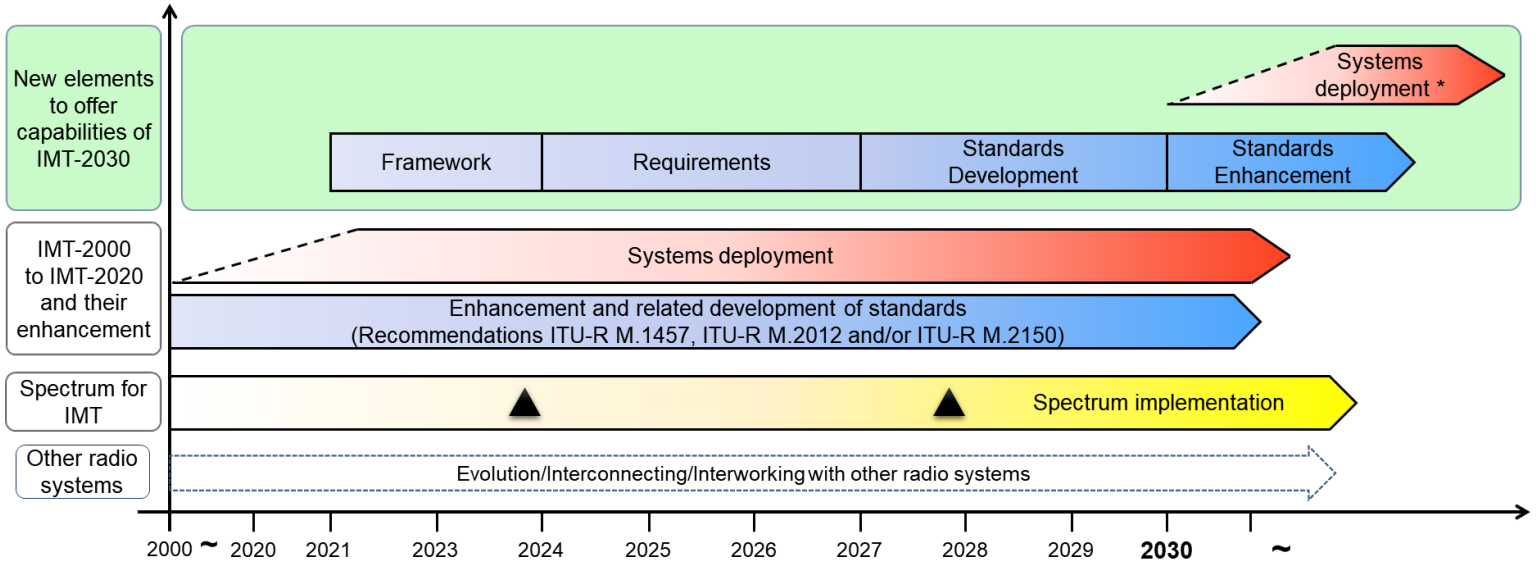
  as well as with other non-IMT terrestrial networks (including RLAN and broadcast)

§ 5.3 Focus areas for further study

- Radio interface(s) standards development
- Access network related issues
- Traffic characteristics
- Spectrum related issues

§ 5.2 Timelines

- Roadmap for technology/standard development, deployment and spectrum
- In addition, enhancement of existing IMTs and relationship with other radio systems



The sloped dotted lines in systems deployment indicate that the exact starting point cannot yet be fixed.

▲ : Possible spectrum identification at WRC-23, WRC-27 and future WRCs

* : Systems to satisfy the technical performance requirements of IMT-2030 could be developed before year 2030 in some countries.
: Possible deployment around the year 2030 in some countries (including trial systems)

Summary

- **The Future Technology Trends Report ITU-R M.2516 summarizes anticipated developments**
- **The new "Framework Recommendation" ITU-R M.2160 for IMT-2030 describes the overall objectives including use cases**
- **This marks the achievement of the initial phase, setting the basis for the development of IMT-2030. The next phase (2024-2027) will be the definition of relevant requirements and evaluation criteria for potential radio interface technologies (RIT) for IMT-2030.**
- **With the evolution of information and communications technologies, IMT-2030 is expected to support enriched and potential immersive experience, enhanced ubiquitous coverage, and enable new forms of collaboration. Furthermore, IMT-2030 is envisaged to support expanded and new usage scenarios compared to those of IMT-2020, while providing enhanced and new capabilities.**
- **Essential part of the IMT-process is liaison with External Organizations to receive contributions covering and elaborating future trends and new services …**

  … but also, internal liaison within ITU (other ITU-R Study Groups and ITU-sectors)