

EuCNC & 6G Summit 2023

6G for sustainability: the enablement effect

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TIM



TIM - About us



- We are the number one telecommunications company in Italy and through our technologies and innovative services we are leading the charge in the digital transition in Italy and Brazil
- **TIM** offers to individuals and families **services and products of mobile and fixed-line telephony** for communication and entertainment and accompanies small and medium enterprises towards digitalization through a portfolio which is personalized to their needs
- In developing our business, we have adopted a sustainability strategy based on the objectives of climate strategy, the circular economy, digital growth and gender equality and aims to become **carbon neutral in 2030** and achieve **zero net emissions by 2040**



Source: [TIM Group | About us \(gruppotim.it\)](https://www.gruppotim.it)

6G for sustainability: the enablement effect



ITU-T L.1410¹ refers to three levels of environmental effects for ICT:

- 1) **first order** effects, often referred to as footprint, associated with the existence of ICT equipment throughout its **lifecycle**
- 2) **second-order** effects associated with the induced effects created by the usage of ICT in non-ICT sectors
- 3) **Other effects** including rebound and indirect effects associated with **behavioral** and societal changes induced by the widespread adoption of ICT

~~A positive second-order effect is often referred to as the enablement effect~~

The **enablement effect** is typically associated with solutions or services that could help other sectors of the economy to reduce or avoid their own GHG emissions

6G can certainly offer potential **enablement effects**

Assessing the Enablement Effect (I)

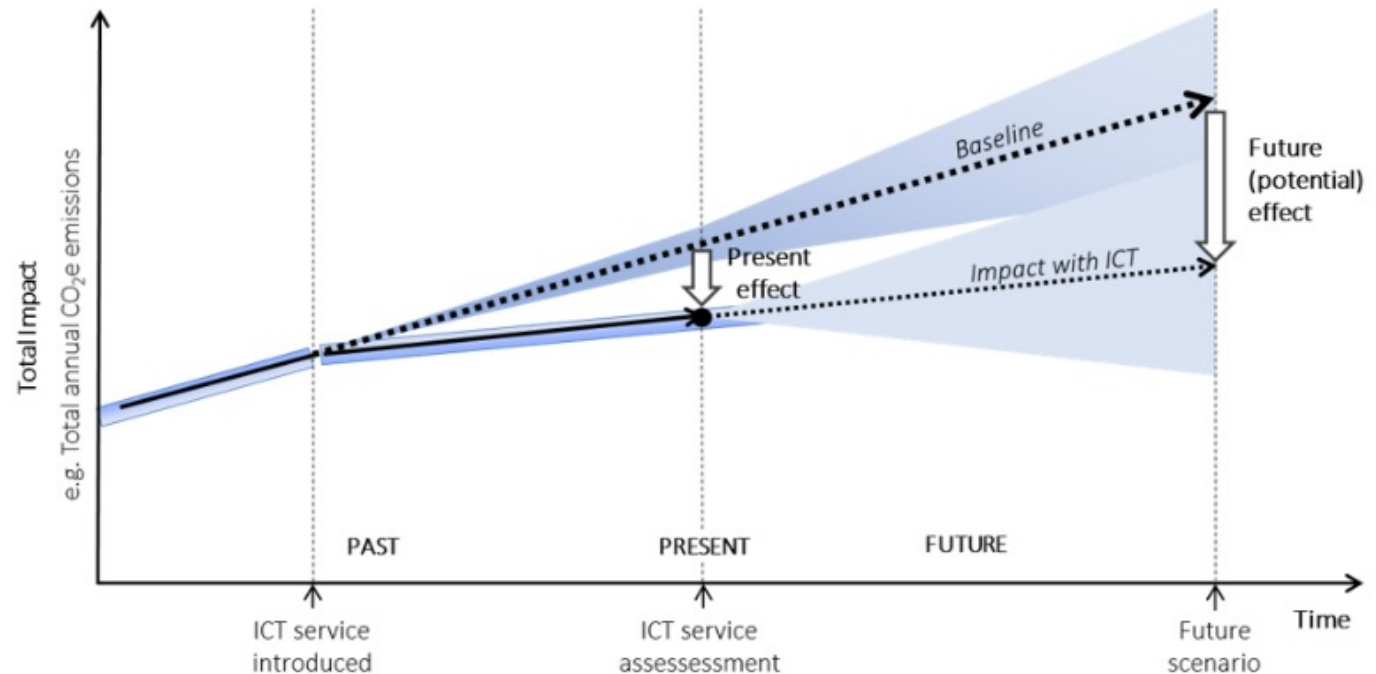
Definition of the approach



To **assess** the reduction of emissions permitted by an ICT solution, two scenarios must be considered:

1. the reference scenario, or the **baseline**, considers the emissions of a reference activity without the ICT/6G solution in place
2. the ICT/6G scenario, where the emissions are those occurring in a scenario with the ICT/6G solution

It is noted that the comparison is necessarily hypothetical since the two considered scenarios cannot coexist simultaneously



Assessing the Enablement Effect (II)

A difficult task for 6G at this stage...



- **5G** technology still **under deployment** and **6G not defined** yet: it is difficult to identify the baseline scenarios and relevant levers to reduce emissions
- Lack of **standardized methodologies** (at least until very recently: see next slide), specifically for new technologies
- Broad **model uncertainty** and **unavailability of data**
- Assumptions could be possible, but each would be somehow **arbitrary**, and would result in significant **uncertainties**

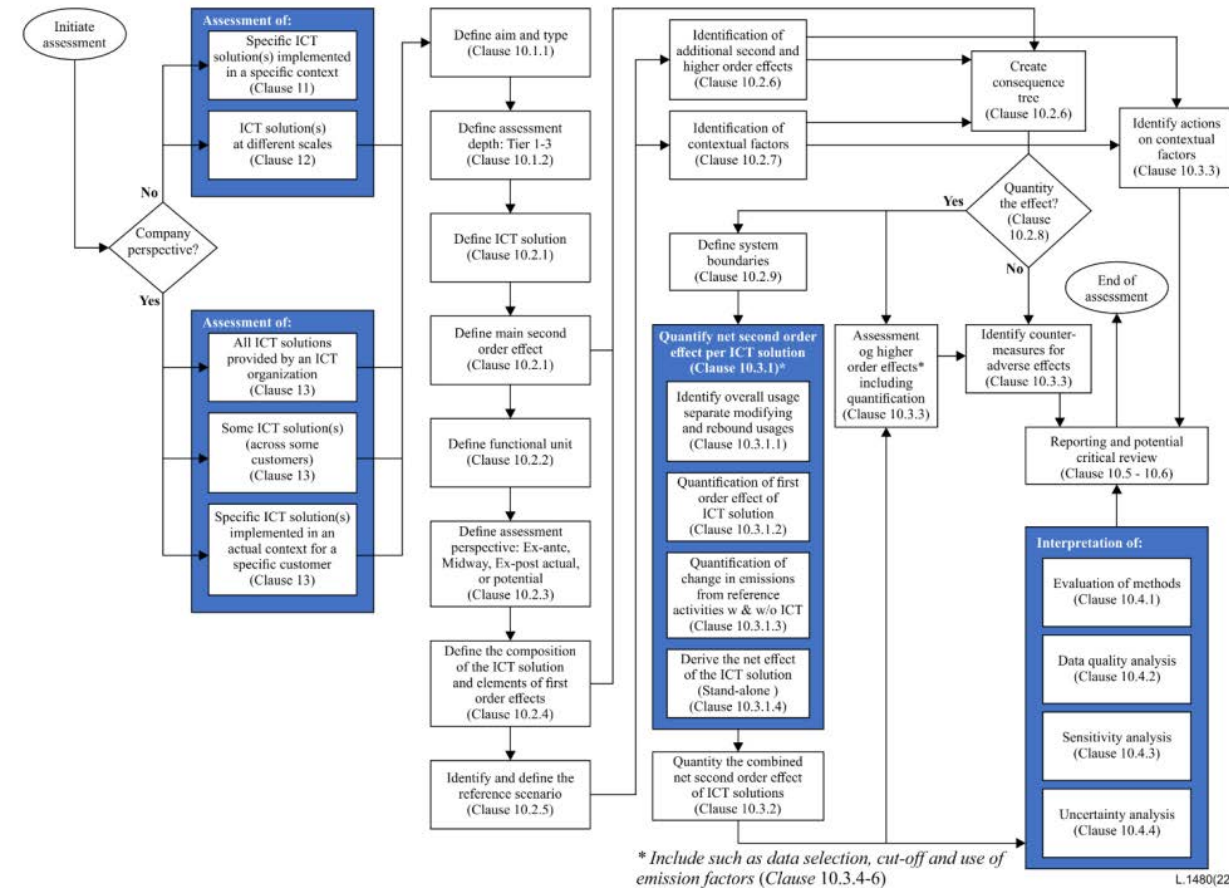
A **thorough assessment** of the enablement effect for 6G is very hard to achieve at this stage Any obtained quantitative value could **hardly** be considered technically **robust**

Assessing the Enablement Effect (III)

The ITU-T L.1480¹ methodology



- Introduced in late 2022, ITU-T L.1480 brings **transparency, consistency, and comprehensiveness** to **enablement assessments** of ICT solutions
- ITU-T L.1480 offers **methodological foundation** for the analysis of the enablement effect
- ITU-T L.1480 covers the **net second order effect** (i.e., considering the footprint of the ICT solutions), and other effects such as **rebound**
- ITU-T L.1480 provides **detailed instructions** for the assessment procedure; it specifies **different assessment depths** (tier 1-3) and different **scale levels** (organization, city, country, worldwide)



How to apply ITU-T L.1480 to future 6G technologies?

Strategies to unleash enablement



- Literature highlights that in order to unleash enablement **technology itself is not sufficient: it should be accompanied by suitable strategies and policies to promote cultural change and new personal behaviours**
- As an **example**, previous studies on flexible work in Switzerland* show that, even with 5G, only a **small portion** of the theoretical enablement potential can be **exploited**: a possible gain between 72 ktCO₂e and 876 ktCO₂e was estimated, against a **potential** of 3999 ktCO₂e
- **Organizations** and companies in all sectors should **not only develop, implement and adopt innovative ICT solutions** and services capable of reducing CO₂ emissions and footprints **but also widen and drive** their **adoption through policies, incentives and appropriate labor organization and management**; this should be **supported by policy makers** through suitable campaigns

- The **enablement effect** is typically associated with solutions or services that could help other sectors of the economy to reduce or avoid their own GHG emissions
- A **thorough quantitative assessment** of the enablement effect for 6G is very hard to achieve at this stage due to broad **model uncertainty** and **unavailability of data**
- Until recently, the process also suffered the lack of **consolidated standardized methodologies**: this situation improved with the adoption of **Rec. ITU-T L.1480** at the end of 2022
- This ITU-T Recommendation provides guidance for assessing how the use of ICT solutions impacts **GHG emissions of other sectors**, using a **robust and sound methodology**
- Literature highlights that in order to unleash enablement **technology itself is not sufficient: it should be accompanied by suitable strategies and policies to promote cultural change and new personal behaviours**