Inventory and review of spectrum use: Assessment of the EU potential for improving spectrum efficiency

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7th Annual European Spectrum Management Conference 2012

Overview of Presentation

- Overview of the project
- Measures of efficiency
- Technical efficiency in Europe today
- Findings

The Radio Spectrum Policy Programme (RSPP)

- Per Article 9 of the RSPP, the Commission
  - The Commission is “to develop practical arrangements and uniform formats for the collection and provision of data by the Member States to the Commission on the existing uses of spectrum.”
  - The Commission is also “to develop a methodology for the analysis of technology trends, future needs and demand for spectrum in Union policy areas covered by this Decision, in particular for those services which could operate in the frequency range from 400 MHz to 6 GHz, in order to identify developing and potential significant uses of spectrum...”

Objectives of the project

- A *prototype implementation* to determine what is achievable, and what is useful.
- Gather detailed information on current spectrum use 400 MHz – 6 GHz in EU Member States.
- Define and analyse efficiency using technical, economic, social and any other relevant criteria.
- Identify candidates for improved efficiency.
- Conduct two stakeholder workshops.
  - May 10: Preliminary workshop
  - July 6: Final results

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A Decision Support System (DSS)

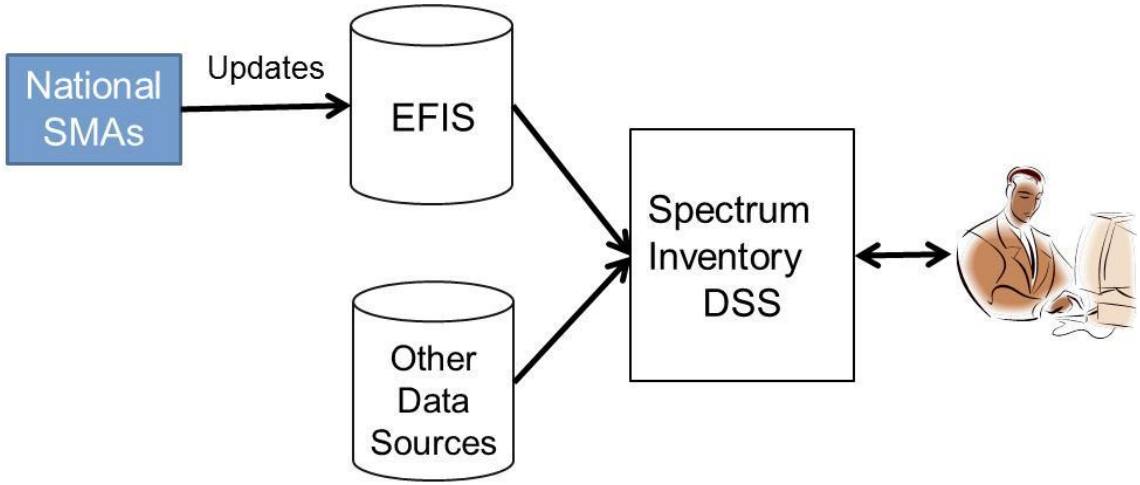
- Some problems are *unstructured*, while others are *fully structured*.
- In a semi-structured problem, many relationships can be identified in advance, and many can be fully understood, but not all.
  - There is no realistic prospect of a fully automated solution for determination of the optimal result.
  - A *Decision Support Systems (DSS)* could however provide automated assistance to human planners.

A Decision Support System (DSS)

- The inventory can thus be thought of as a DSS that attempts:
  - to help the spectrum analyst to identify candidate bands and geographies for improvement, and
  - to further assist the analyst in evaluating likely costs and benefits of potential interventions.
- This implies the need for:
  - Data storage and management;
  - Graphical tools to identify clusters and trends;
  - Aids to analysis.

Data and the relationship to EFIS

- Existing data sources contain crucial data, but no everything that is needed.
- It is important to avoid duplicate effort.



E.g. sensitive commercial and military data.

Interviews

- **Spectrum management authorities (regulatory bodies, ministries)**

Countries	Stakeholders
Austria	RTR/Bmvit
Belgium	BIPT
Bulgaria	MTITC
Cyprus	MCW
Czech Rep	CTU
Denmark	ERST
Estonia	To be arranged
Finland	FICORA
France	ANFr
Germany	Bnetza BMWi
Greece	EETT
Hungary	NMHH and Ministry
Ireland	COMREG DCMNR
Italy	Ministry of Economic Development

Countries	Stakeholders
Latvia	Electronic Communications Office; Ministry of Transport; Ministry of the Environmental protection and Regional development; SPRK
Lithuania	RRT
Luxembourg	ILR
Malta	MCA
Netherlands	Agentschaptelecom
Poland	UKE
Portugal	Anacom
Romania	Ancom
Slovak Rep	Teleoff
Slovenia	APEK
Spain	Ministerio de Industria, Turismo y Comercio
Sweden	PTS
United Kingdom	OFCOM MoD

Interviews

- **International organisations**

In addition, we approached international organisations to gather supplementary information that was not supplied by national SMAs (e.g. information on changing sector needs and technology or equipment innovations that may facilitate efficiency enhancement in the future).

Organisations	**Sector**
NATO	Defence
ICAO (International Civil Aviation Organization)	Aeronautical
Eurocontrol	Aeronautical
DGAC	*Aeronautical*
EBU	Broadcasting
EUMETNET	Meteorology
Inmarsat	Satellite
ESA	Satellite
ESOA/SES	Satellite
CRAF	Radioastronomy
TETRA + Critical Communications Association	PPDR
APWPT	PMSE

Spectrum Efficiency (1)

- There are different forms of efficiency:
  - Technical efficiency
  - Economic efficiency
  - Social efficiency
- No single metric can fully capture efficiency in any of these dimensions.
- Measures of efficiency can collectively help to identify *candidates for improvement*.

Spectrum Efficiency (2)

- One needs to distinguish between:
  - The value or efficiency of a band or application; and
  - The cost of a policy intervention that changes how that application utilises frequency spectrum.
- A policy intervention typically represents a change in how an application is implemented, but not a total loss of the value of the application.
- Efficiency should therefore be assessed on its own merits. The analysis should not confuse the *problem* (inefficiency) with the costs and potential benefits of potential *solutions*.

Spectrum efficiency (3)

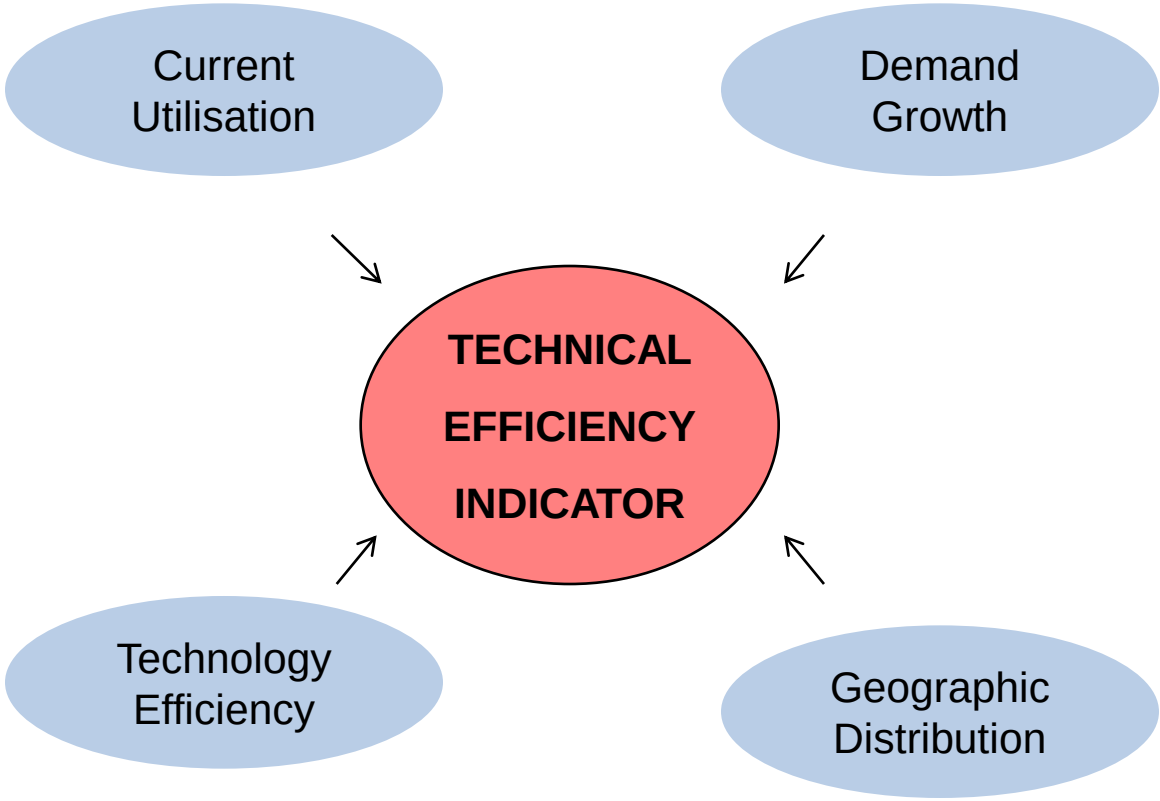
- Analysis of efficiency needs to reflect the complex structure of spectrum assignments.
  - A band may support multiple applications.
  - An application may span multiple bands.
- An efficiency metric must be understood in the context of the application for which it was designed. A metric that is useful for one application will not necessarily be relevant to a different application.

Technical Efficiency

- **4 substantially independent criteria identified**
  - ***– can be applied to each band in each country:***

1. **Utilisation:** How much of the available spectrum resource is *currently* being used and for how much of the time?
2. **Demand Trend:** Growing, Stable or Declining?
3. **Technology:** Relative spectrum efficiency of technology, compared to relevant state of the art benchmark.
4. **Geographic Extent:** Coverage or extent of national territory where the spectrum resource is being used.

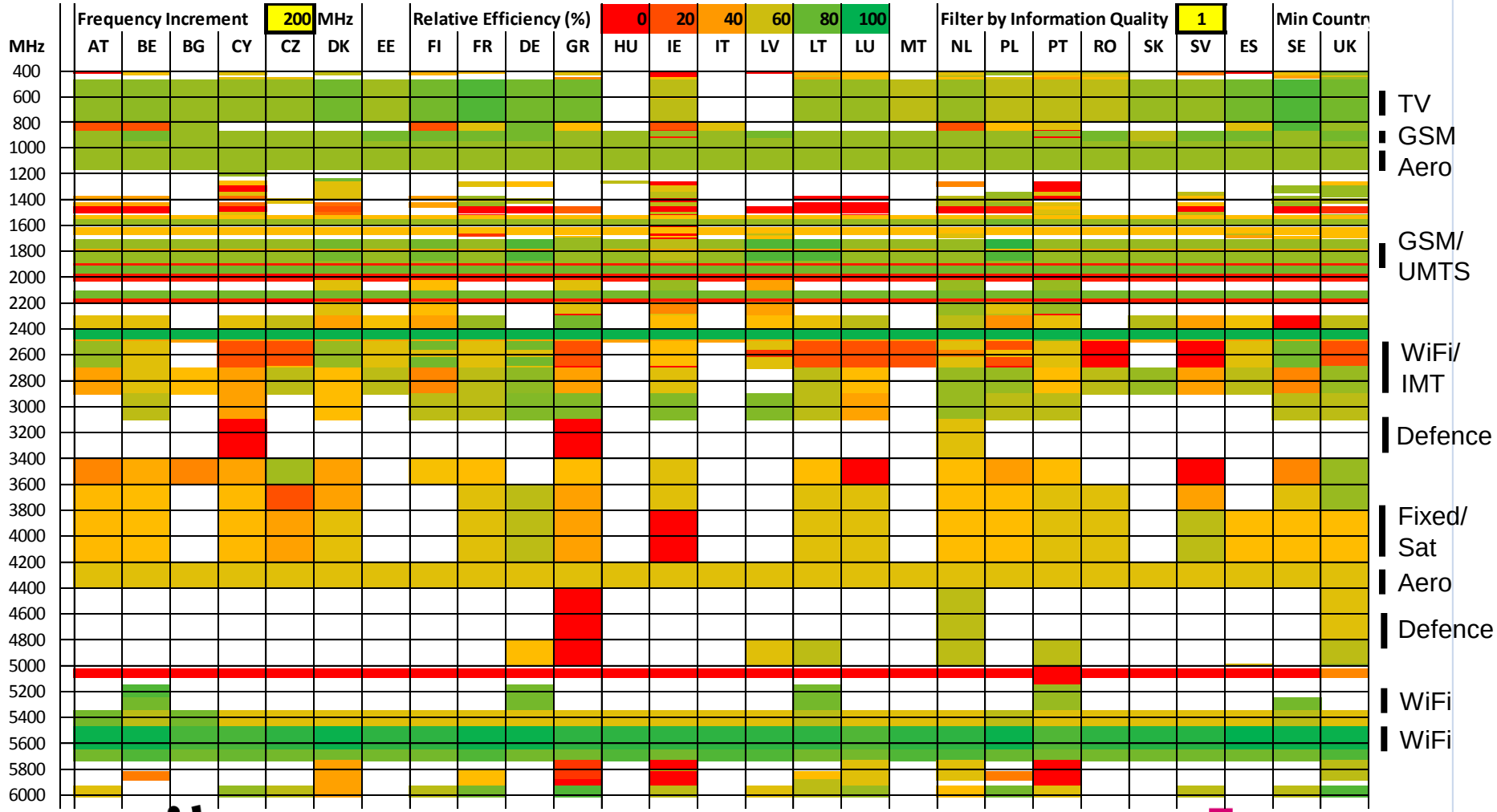
Technical Efficiency



Technical Efficiency

- Precise *quantification* of spectrum efficiency is unlikely to be practical and may be misleading
- A coarser indication of technical efficiency – based on *quantitative* data where available – is more feasible and meets our objective of helping to identify candidates for improvement.

Technical Efficiency: Preliminary Results



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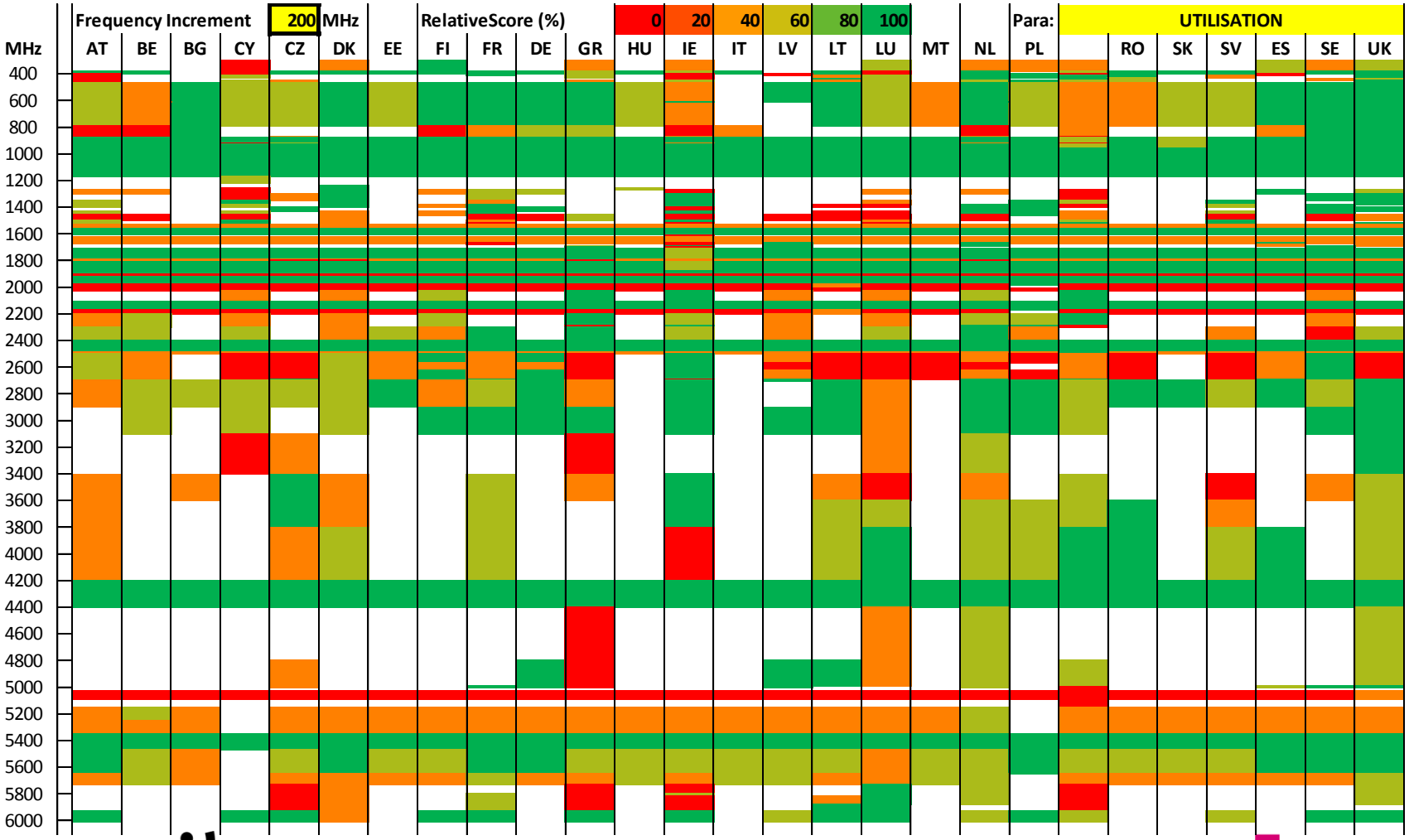
Preliminary Results: Utilisation



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Technical Efficiency Conclusions

- We have identified a number of bands where currently there is either no use at all, or substantial under-utilisation in most Member States.
  - 1.4 GHz former DAB band (40 MHz)
  - 2 GHz TDD and MSS bands (95 MHz)
  - 5 GHz MLS band (120 MHz)
- Apparent under-utilisation
  - 3400 – 3800 MHz (200 MHz)
  - 3800 – 4200 MHz (600 MHz)
  - 5725 – 5785 MHz (150 MHz)
  - 1.5 GHz MSS bands (?)

Overall conclusions

- There are substantial challenges in assessing technical, economic and social efficiency.
- Nonetheless, with careful analysis, it is possible to obtain useful results.