Inventory and review of spectrum use: Evaluating the Efficiency of Spectrum Use - Overview

Presentation to EC Workshop

Brussels, 10th May 2012

Phillipa Marks, Plum Consulting Ltd

wik CONSULT

ÆGIS systems limited

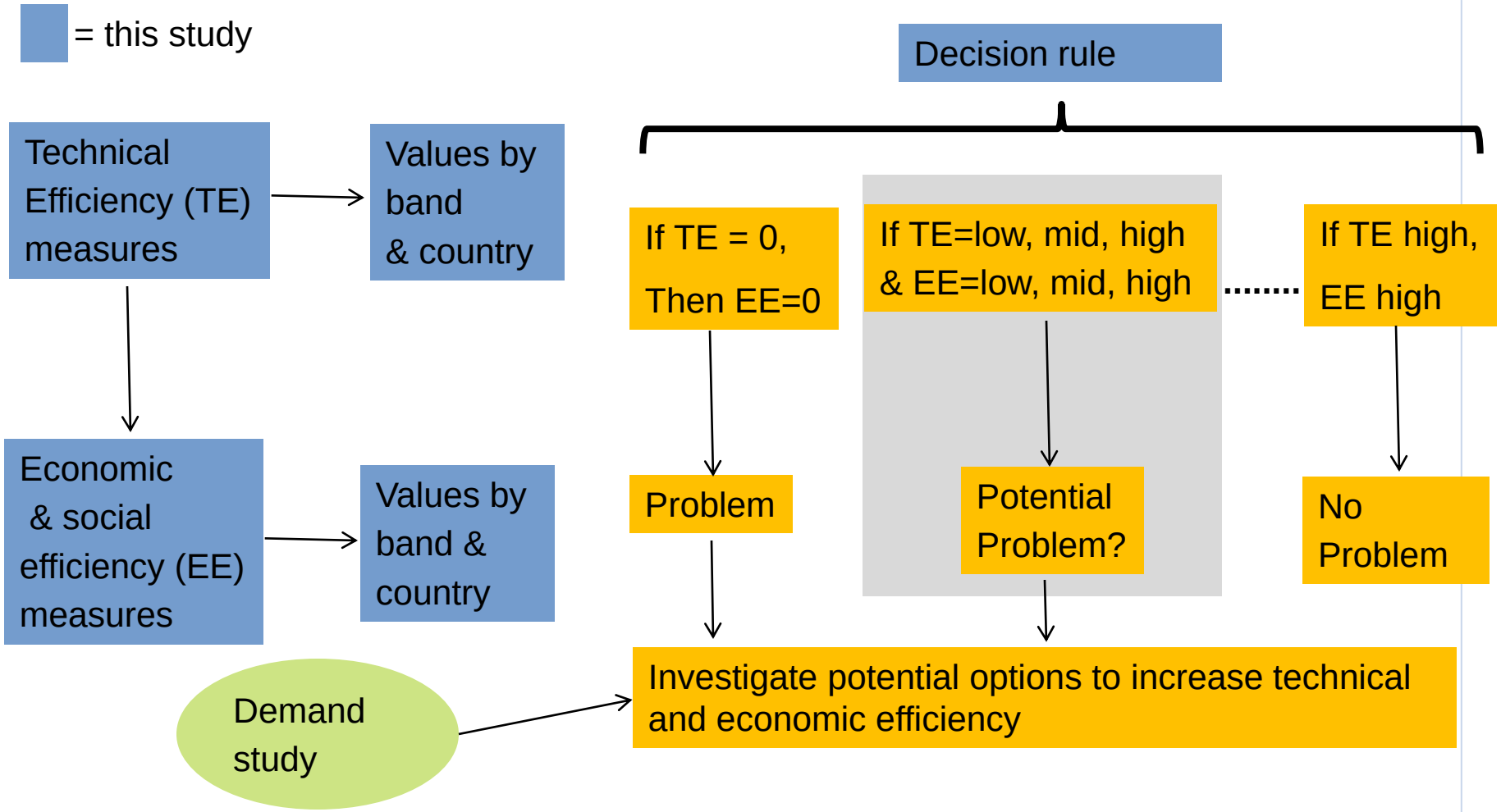
IDATE

plum

Scope of the work

- Identify metrics for efficiency of spectrum use and ways of using them:
  - Technical efficiency.
  - Economic and social efficiency.
- Consider how to treat applications that meet specific social goals.
- Identify indicators for possible measures to improve the efficiency of spectrum use.

Framework for assessing efficiency of spectrum use



wik CONSULT

AEGIS systems limited

IDATE

plum

Fairness issues

- We obtain efficiency metrics for 27 Member States – should we aggregate these measures?
- The political process will ultimately determine how to address differences between countries.

Criteria for the metrics

- Transparent and repeatable process:
  - Quantitative or qualitative metrics.
  - Objective and verifiable values.
- Avoid over-simplification
  - Metrics are likely to need to be tailored to the band or to the application.
  - Use multiple metrics to capture different aspects of the efficiency that we are seeking to measure.

The real world!

- There are no precedents for devising technical and economic/social efficiency metrics for the full range of bands and applications that will be considered by the inventory.
- Data for the things that we would ideally like to measure is incomplete or not available.
- Data accuracy is questionable in some cases.
- But the proposed process aims to provide metrics that indicate opportunities for *significant* improvement in efficiency of use.

Inventory and review of spectrum use: Evaluating the Economic and Social Efficiency of Spectrum Use

Presentation to EC Workshop

Brussels, 10th May 2012

Phillipa Marks, Plum Consulting Ltd

wik CONSULT

AEGIS systems limited

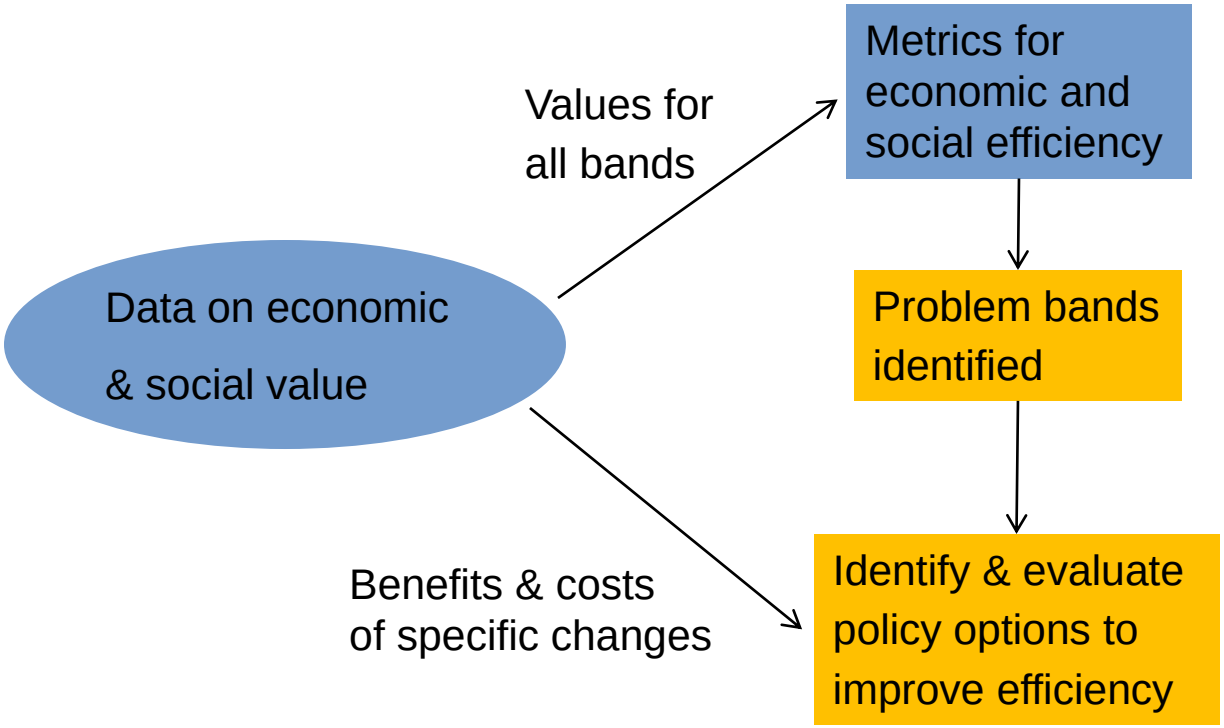
IDATE

plum

Why do economic and social efficiency matter?

- Overall objective of spectrum policy is to maximise benefits for European consumers and citizens and achieve specific policy goals.
- Low technical efficiency does not necessarily imply low benefits e.g.
  - Some high value applications may not be able to share easily or have unpredictable peaks in requirements.
- High technical efficiency does not necessarily imply high benefits e.g.
  - For applications that have many substitute bands.

What information is required?



How can we measure economic and social efficiency?

- Sum of economic and social welfare associated with the use of spectrum:
  - Economic welfare = consumer (of the end service) benefits plus producer (i.e. the spectrum user) benefits.
  - Social welfare = external welfare impacts (positive or negative).
- External impacts assessed after taking account of existing policy interventions.
- Standard metric is €/MHz/pop

Few available estimates - typically relate to specific policy decisions

- **Incremental economic and social value** gained/lost from changing spectrum allocations.
  - Value depends on the size of the increment.
  - Values for cellular/BWA and TV (EU and several MSs).
- **Average economic and social value of allocations**.
  - UK studies on Wifi, SRDs, cellular/BWA, broadcasting, fixed links, satellite links, PMR but some of these are old.

An alternative approach – value of spectrum to the user

- User values and economic and social welfare are related to each other under certain conditions:
  - Rational behaviour & good information.
  - No significant external effects given current policy interventions (e.g. regulation, taxes, public funding to meet policy goals).
- If value to user A is greater than value to user B then welfare A is greater than value B:
  - This is why we use markets (plus specific interventions) not central planning to decide most resource use.

Values to users – what data exists?

- Auction values/MHz/pop:
  - Cellular/BWA in harmonised bands in many MSs.
  - Other bands that have been auctioned e.g.
    - Denmark: 410MHz
    - Ireland: 870MHz, 1.7GHz
    - Norway: 10GHz, 11 GHz, 23 GHz
    - Sweden: 10GHz, 28GHz
    - UK: 400 MHz, 1.4 GHz, 10GHz, 28GHz, 32GHz, 40GHz
- Estimated opportunity cost values in UK: for bands used by broadcast TV, fixed services, PMR, aeronautical communications.

Relative incremental values/MHz/pop – indicated by current data

	400MHz -1 GHz	1-2 GHz	2-3 GHz	3-4 GHz	4-6 GHz
Cellular/BWA					?
Broadcasting (terrestrial)	?				
Fixed links					
PMR/PAMR		?	?		
PMSE	?	?			
Satellite (civil)	?	?			
SRDs					
WDTS (Wifi)					

Key: = 1 = 0.5 = 0.1 = 0.01 = 0.001 ?= very uncertain

Note: These are values at current allocations. If allocations change so will the relative values.

wik CONSULT AEGIS systems limited IDATE plum

What about other applications?

- Assume outputs are fixed by public policy goals for defence, PPDR, science services, aero/maritime safety, public service broadcasting etc.
- Focus on value of spectrum not value of final service.
- Value of spectrum to users depends on:
  - Availability of substitutes for meeting capability e.g. other bands, technologies, platforms.
  - Costs of using substitutes – need to recognise costs of possible loss of flexibility and possible global impacts.

Some examples of substitutes.....

- **Bands:** France MoD gave up 2.6 GHz band for a payment of €67m i.e. €0.353/MHz.
- **Geography:** UK radio astronomers gave up 606-614 MHz in return for funds to use Square Kilometre Array (Australia or South Africa).
- **Technology:** Aero VHF comms moved from 25 kHz to 8.33kHz channels down to FL195. Implied value of spectrum = €18m/MHz.
- Data is very patchy and highly specific to policy situation considered information – address in "solution" stage?

Issues to be considered further

- Can more data on value for commercial applications be readily gathered and/or developed?
- Will this data be sufficiently robust to help identify “problems”?
- How to use economic and social value metrics together with technical efficiency indicators in looking for:
  - “Problem” bands?
  - Potential solutions?