

Strategic Review of Satellite and Space Science use of Spectrum

Space Science workshop
10 July 2015

Agenda

09:30 – 10:00	Arrival and refreshments
Opening Remarks	Philip Marnick (Head of Spectrum Group)
10:00 – 10:30	Introduction (Charles Jenne – Director Spectrum policy)
10:30 – 12:00	Stakeholder presentations European Space Agency (ESA) – Edoardo Marelli EUMETSAT – Markus Dreis Catapult - Prof Nick Veck
12:00 – 12:45	Lunch
12:45 – 14:30	CFI Questions

INTRODUCTION

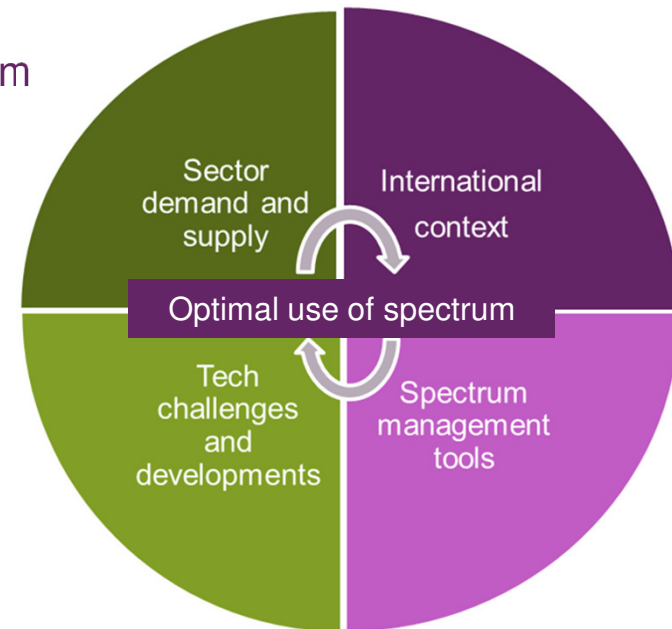
Context of competing demands

- Requirements for wireless services are likely to increase for many spectrum uses.
- This will lead to **growing competing demands** for key spectrum resources.
- Adopting **technologies that enable more efficient use** of spectrum will be crucial.
- There will still be **increased pressures on spectrum**, especially in concentrated geographical locations.
- Competing demands will need to be addressed by a mix of new and existing tools
 - **spectrum re-purposing** to higher value uses and
 - greater use of **spectrum sharing**.



Ofcom's overall spectrum strategy

- **Get more out of spectrum** by promoting 'better spectrum neighbours'
 - New and existing forms of spectrum sharing
 - Focus on coexistence challenges
 - Promote improved radio performance standards
- **Achieve the UK's objectives by playing a leading role in international spectrum debates**
- **Help markets to work**
 - Make more information on spectrum use available
 - Liberalise spectrum use where possible
- **Prioritise our efforts on specific sectors / bands**
 - Analyse supply and demand



We undertake strategic reviews to inform future priorities and policy in context of competing demands

Overall Spectrum Management Strategy

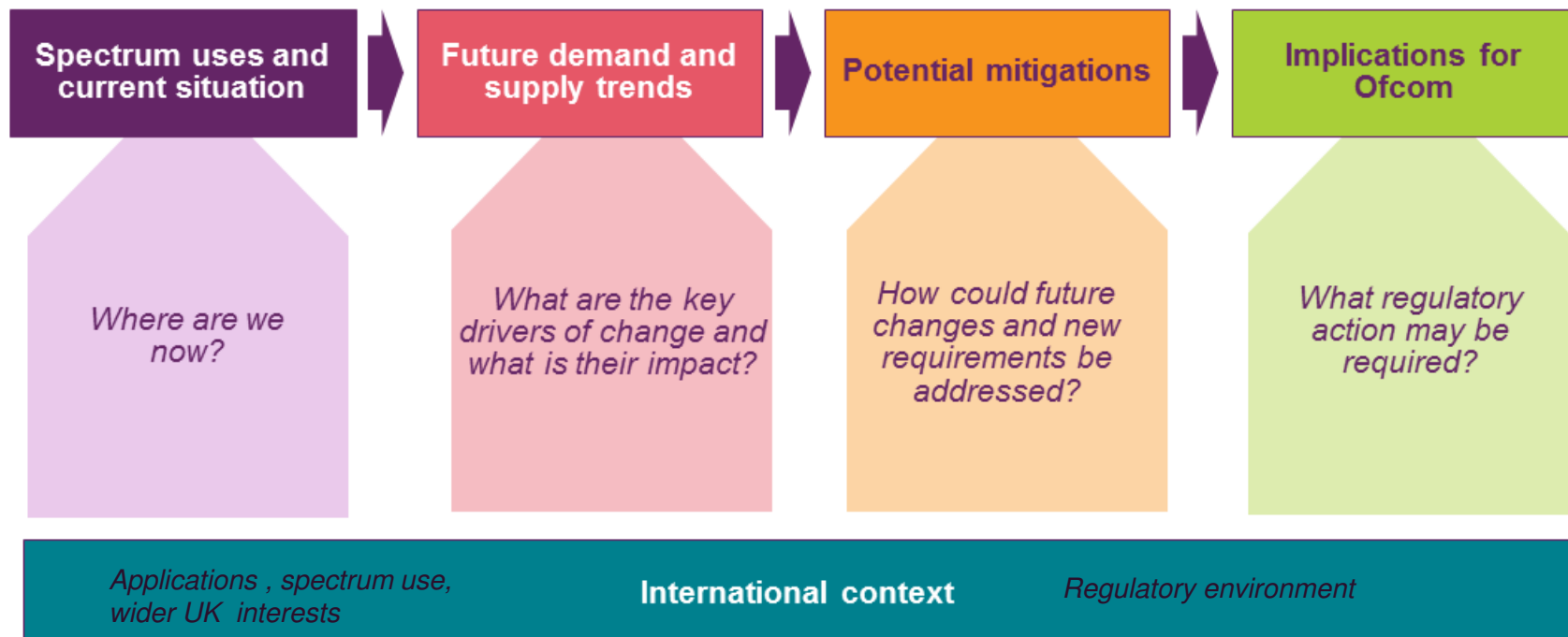
What's their purpose?

- Refine our understanding of:
 - specific sectors / bands
 - future **trends**
 - implications for spectrum **supply** and **demand**
- In order to inform our future:
 - **priorities**
 - **policy** decisions

What are we doing?

- *Satellite and Space Science*
- UHF bands 1 & 2 (420-470 MHz)
- Programme Making and Special Events (PMSE)
- Mobile Data

Our approach to the satellite and space science strategic review



Scope of the space science sector strategic review

(Including Earth exploration & Metrological satellites, space research and radio astronomy)



Space science value chain



Applications (from both active and passive use of the spectrum)

Weather forecasting & warnings (end users include general public, aviation, transport, utility companies etc.)

Disaster prediction and management / Environment & security monitoring

Climate change research

Space research (man and unmanned missions) / space weather forecasting

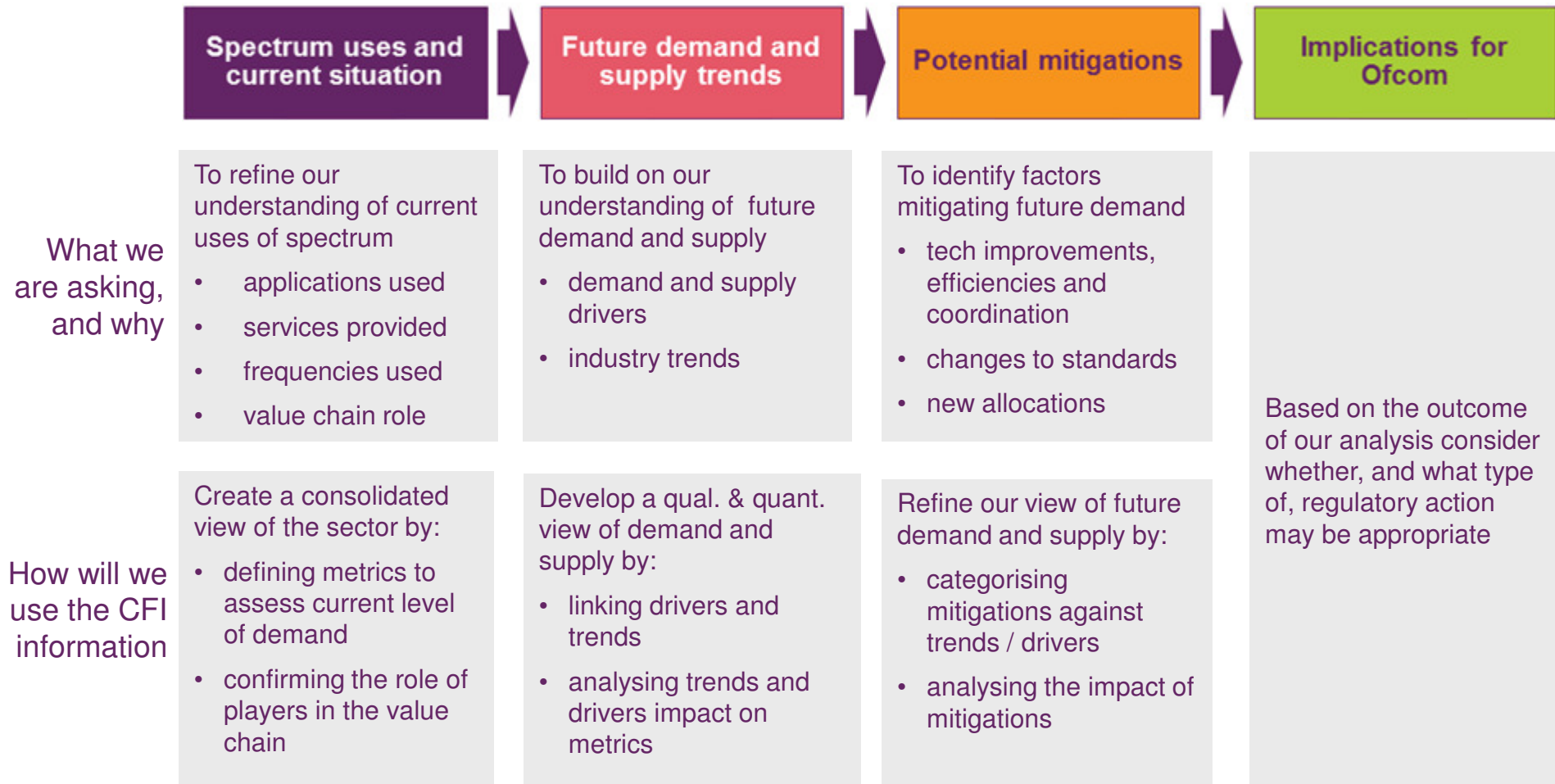
Radio astronomy research

Benefits to UK citizens and consumers

International context (including benefit to wider UK interests)

Context to our CFI questions

Current situation, future trends, mitigations & implications



STAKEHOLDER PERSPECTIVE

ESA usage of the RF spectrum

Edoardo Marelli – European Space Agency (ESA)

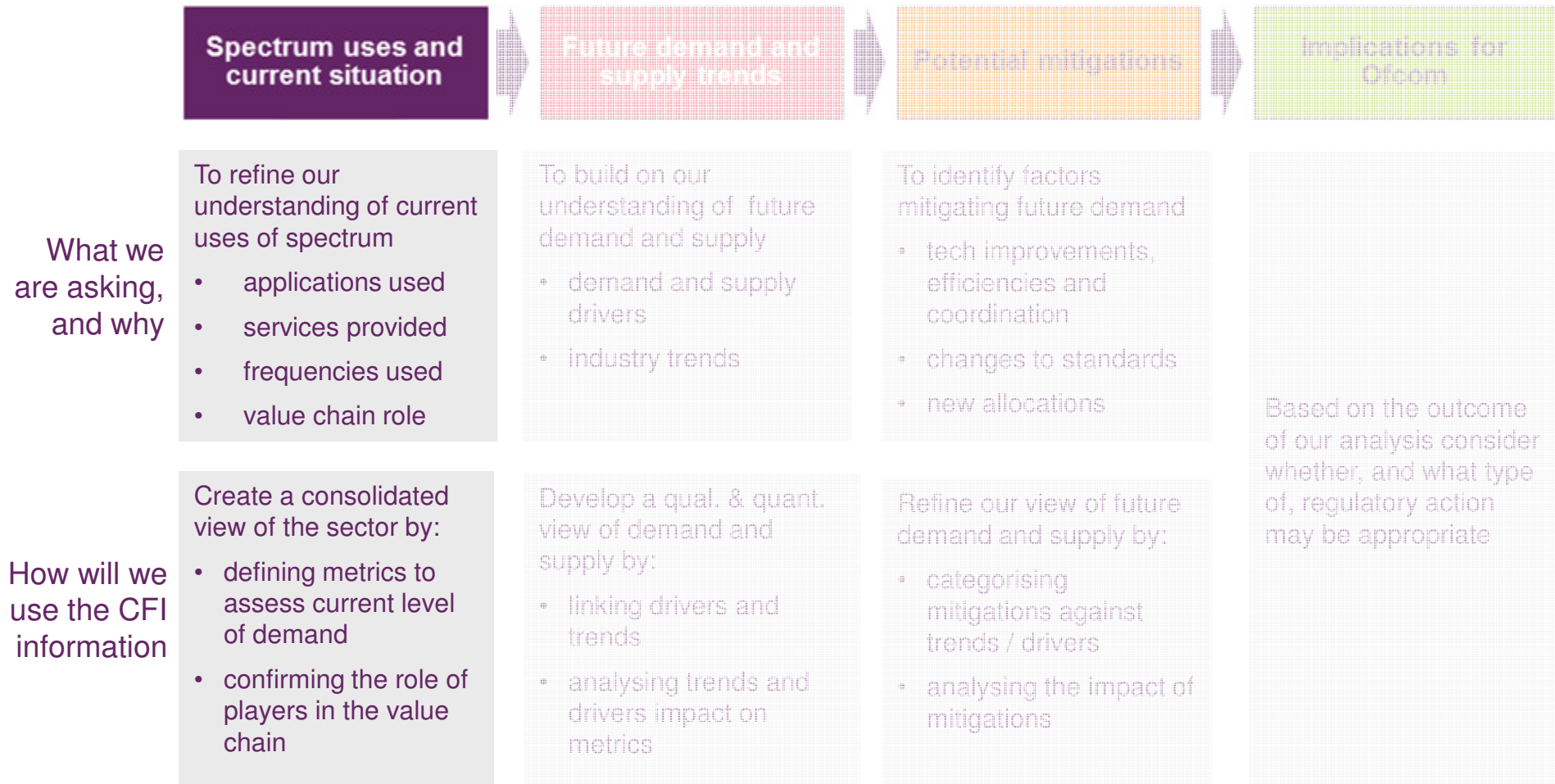
EUMETSAT and its current and future spectrum use and requirements

Markus Dreis – EUMETSAT

Prof Nick Veck – catapult

OVERVIEW OF QUESTIONS

Current situation (Questions 1,3,14,15,16 and 17)



Spectrum uses and current situation

Future demand and supply trends

Potential mitigations

Implications for Ofcom



- **Question 1:** Do you have any comments on our approach to this review?
- **Question 3:** Do you have any comments on our broad overview of the space science sector? In particular, do you have comments on the completeness of the list of applications, their definitions and their use of the relevant radiocommunications service(s)?

Passive applications

- Passive earth sensing
- Passive space sensing /Space-based radio astronomy
- Ground based Radio astronomy

Active applications

- Active earth sensing
- Active space sensing
- Telecommand, Telemetry and Control (EESS/MetSat/SRS satellites)
- Data a communications (Space Research / Earth explorations / Meteorological

End users/services

Weather forecasting & warnings (end users include general public, aviation, transport, maritime, utility companies etc.)

Disaster prediction and management

Environment & security monitoring

Climate change research

Space research (man and unmanned missions) /

space weather forecasting

Radio astronomy research

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Question 14: Do you have any comments on our representation of the value chain for the space science sector? How do you think industry revenues are broken down between players at different positions in the chain?

Question 15: What is the extent of your organisations' role(s) in the value chain? Which space science applications (as summarised in Table 2 in section 3) does your organisation:

- use;
- provide: or
- help to deliver?

Please list all applications that apply and your role in each in your response.



Question 16 : For each of the space science applications you use, provide or help deliver (as identified in Question 15), and taking into account your role in the value chain, where applicable please provide:

- the specific spectrum frequencies used, distinguishing between the frequencies used for the science application (i.e. sensing etc.), the frequencies use for downlinking data and, for TT&C;
- whether the application is limited to use of specific frequencies and why (e.g. due to fundamental characteristics of the phenomena being measured and/or availability of technology designed for that frequency);
- whether the applications use continuous or intermittent measurements;
- the typical resolution and associated measurement bandwidths, including an indication of any implication for spectrum requirements ;
- the geography this use extends over (e.g. land or sea, and regional or global);
- the location of the gateway station(s) for TT&C and downlinking data;
- the estimated number of users.

Spectrum uses and current situation



Future demand and supply trends



Potential mitigations



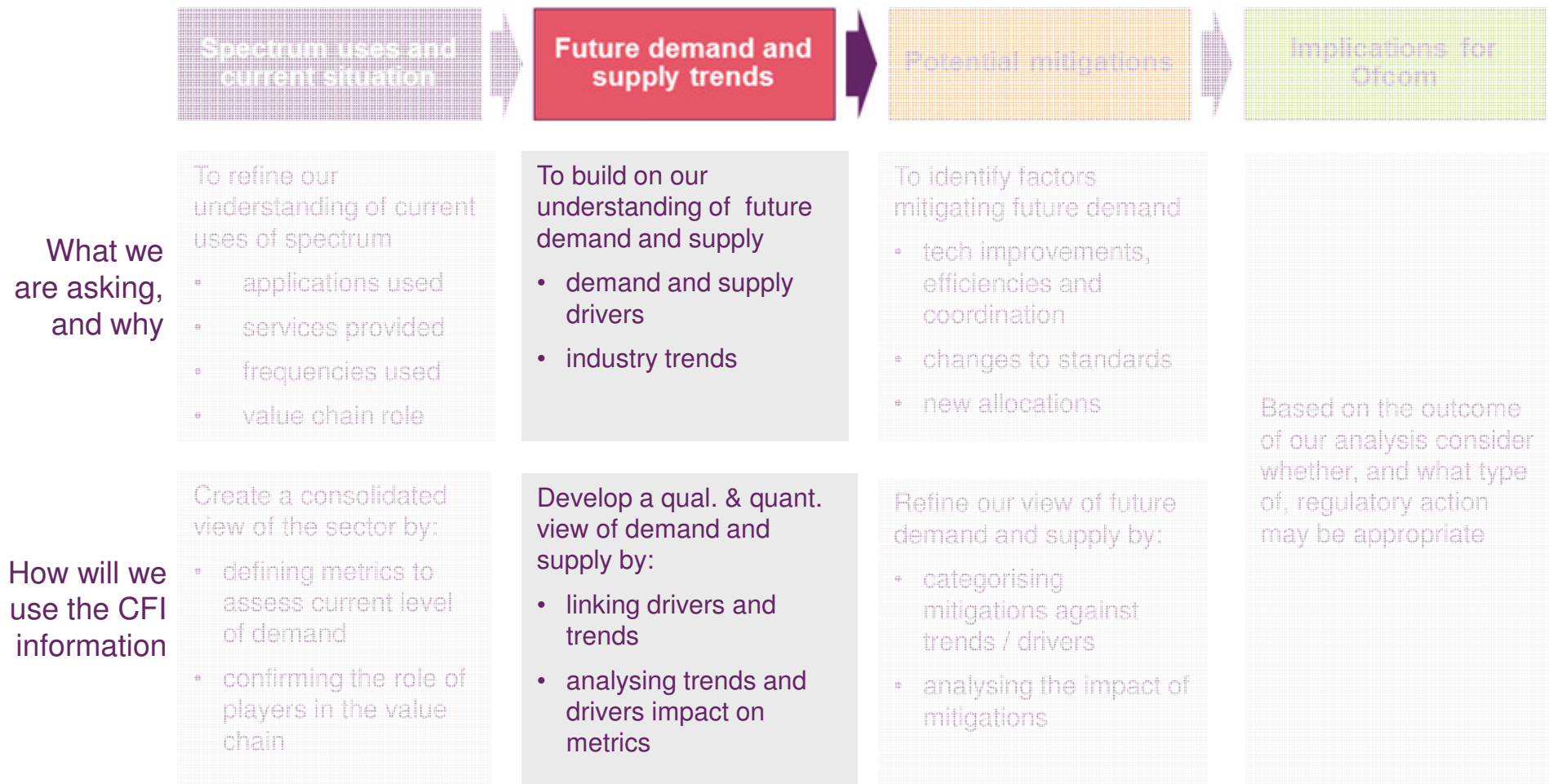
Implications for Ofcom



Question 17: For each of the space science applications you provide, please could indicate how UK consumers and citizens benefit from their use?

Where possible please also provide an indication of the scale of the benefits (either qualitatively or quantitatively).

Future trends (Questions 18,19,20 and 21)





Question 18: From your perspective, what high level trends will affect the space science sector in the coming years?

I.e. increase in number of future missions leading to more spectrum requirement for data downlink and control etc.

Spectrum uses and current situation

Future demand and supply trends

Potential mitigations

Implications for Ofcom



Question 19: For each of the space science application(s) your organisation uses or provides, what are the a) current trends; and b) likely future drivers of demand for spectrum?

Please include in your response:

- the scale of the demand drivers ;
- the reason for additional demand (e.g. higher resolution radar data rates/bandwidth required) and whether this increased demand is for data delivery or for the taking of measurements;
- whether increased demand can only be met at specific frequencies and why;
- - any variations in demand drivers by geography (i.e. regional or global), and why;
- whether future demand is expected to be temporary or intermittent, and the reasons for this.

In your response, please provide any evidence which supports your position on the drivers of demand (e.g. forecasts, studies and statistics).

Spectrum uses and current situation



Future demand and supply trends



Potential mitigations



Implications for Ofcom



Question 20: Taking into account the drivers you have identified in your response to Question 19 above, what (if any) challenges is your organisation concerned about in meeting potential future demand?

Please provide the information by application and band, along with any supporting evidence, if available.



Question 21: Are there any future developments, such as the radio astronomy SKA, that could reduce the demand for space science spectrum in the UK?

Potential mitigations (Questions 22 and 23)



What we are asking, and why

To refine our understanding of current uses of spectrum

- applications used
- services provided
- frequencies used
- value chain role

To build on our understanding of future demand and supply

- demand and supply drivers
- industry trends

To identify factors mitigating future demand

- tech improvements, efficiencies and coordination
- changes to standards
- new allocations

Based on the outcome of our analysis consider whether, and what type of, regulatory action may be appropriate

How will we use the CFI information

Create a consolidated view of the sector by:

- defining metrics to assess current level of demand
- confirming the role of players in the value chain

Develop a qual. & quant. view of demand and supply by:

- linking drivers and trends
- analysing trends and drivers impact on metrics

Refine our view of future demand and supply by:

- categorising mitigations against trends / drivers
- analysing the impact of mitigations

Based on the outcome of our analysis consider whether, and what type of, regulatory action may be appropriate



Question 22: Do you have any comments on the list of potential mitigations we have identified? What likely impact would each of the mitigations have on spectrum demand? To what extent do you believe that these mitigations apply only to certain applications?

- Improved sensor design & improved filtering (to improve adjacent band sharing)
- Signal process techniques (i.e. interference rejection etc.)
- Global database of science satellites (i.e. orbital info etc.)
- Coordination between science and commercial users (i.e. 24GHz/FSS/SRS in GHz)

Question 23: What other mitigation opportunities do you foresee that we should consider? For what applications are these likely to be applicable and what scale of improvement are they likely to deliver?

Implications for Ofcom (Question 24)



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Question 24 : Beyond the activities already initiated and planned for the space science sector (e.g. as part of WRC-15), do you think there is a need for additional regulatory action that may, for example, help your organisation to address the challenges it faces?

In your response, please indicate what type of action you consider may be needed and why, including any evidence to support your view.

Next steps

- Closing date for responses 13 August
- Develop our views on sectors, future trends and implications for spectrum
- Update on findings in early 2016