



# Regulator-to-Regulator Dialogue on Approaches to Licensing of Large Constellations

June 21, 2022

London, United Kingdom

*On June 21, 2022 Secure World Foundation, in cooperation with the United Kingdom Space Agency, convened a regulator-to-regulator dialogue on approaches to the licensing of large constellations. Large non-geostationary orbit (NGSO) constellations pose a number of unique challenges for regulatory processes that are primarily designed to administer spectrum access, coordination, and interference matters. This Dialogue brought together national regulators from multiple countries to discuss with each other these challenges, with a case focus on the topic of orbital carrying capacity. The Dialogue was held under Chatham House rule and was hosted at the offices of the UK Department for Transport. This report briefly summarizes the themes and major discussion points of this Dialogue.*

## Context

The Dialogue began with a series of panel discussions and presentations to outline the current context and regulatory framework for large constellations. Participants noted that the current environment is one in which administrations are seeing a large increase in the level of satellite spectrum access filing activity from the historical level of activity in the last decades. Satellite operators are requesting access to very large amounts of spectrum, and while some of this activity might be speculative, participants in the Dialogue noted that most of the filings are driven by legitimate interests and thus represent a real change in the nature of activity. It was also noted that some spectrum filings and constellation plans might be driven by national sovereign interests in addition to commercial business plans.

Regulators noted that this activity is being largely driven by filings for NGSO constellations. One regulator described a “step change” increase in the amount of licensing activity running through their office and further described need to shift from a focus on single satellite licensing to updating their processes to address constellation-based filings.

Regulators that participated in the Dialogue represented both spectrum regulators and space activities regulators. Although national regulatory structures differ in most jurisdictions the spectrum regulator is a different authority than entity responsible for regulation of space activities. Regulators noted that their roles are generally concerned with public interest, safety of operations, upholding of international obligations and – for those involved in spectrum – management of radiofrequency allocation and coordination. Most regulators participating in the Dialogue noted that their remit does not extend to regulation of economic competition. The role of the International Telecommunications Union (ITU) was also discussed. It was noted that the ITU is not a regulator, its role is to set international standards and coordinate between various national regulators. Furthermore, the ITU doesn’t manage physical slots or number of satellites in constellations, as the ITU framework is based around spectrum management. For the ITU the current challenge is characterized by the increase in the number of operators, and the associated amount of spectrum filings, more so than by the number of satellites under any one operator.

Participants also discussed the space sustainability challenges that large constellations might pose. These include how to scale the capacity of the regulatory system to match the increase in

filing activities; how to ensure coordination of regulatory principles across jurisdictions; how to increase and manage spectrum sharing approaches; how to address the space debris and collision risks of large constellations; and how to manage the negative impacts of constellations on radio and optical astronomy. It was noted that, from an astronomy perspective, the concept of aggregate effects is really important: “one satellite by itself may not be a problem, but 10,000 of them might be a huge problem.”

Participants also discussed the need to consider equity of access to orbit, and to the potential benefits of space applications, as a key challenge in updating the regulatory framework to address large constellations. Participants also raised the idea that large constellations will require regulatory frameworks to account for different types of risk. It was noted that the trend towards large constellations might result in a situation where a relatively few number of operators are responsible for the majority of satellites. In this situation should how should regulatory frameworks balance consideration of per-system risk (i.e. consideration of failure risk in an individual constellation) vs aggregate risk (i.e. risk to the overall operating environment)? What metrics and thresholds should be used to define risk?

It was suggested that, in thinking about these challenges, NGSO should be considered as scarce global resource, as geostationary orbit already is. In fact, the UN COPUOS Guidelines for the Long-term Sustainability of Outer Space Activities already identify that “the Earth’s orbital space environment constitutes a finite resource.” It was also suggested that market access requirements, an existing part of the spectrum regulatory framework at the national level, might be used as tool to manage large constellations. Participants generally noted a growing recognition that we need to think about our collective use and management of space differently.

## Key Discussion Topics

A number of topics emerged from the discussion at the Dialogue as considerations in thinking differently in the management of the space domain. These include:

- Addressing the scope of challenges posed by large constellations will require coordination and communication across different organizational and technical boundaries, even within a single national jurisdiction. Experience and practices from space law, spectrum administration, national security consideration, and environmental management are all likely to be relevant. However, participants noted that achieving a whole of government approach to oversight of large constellations will require political leadership to establish the needed responsibility and expertise sharing mechanisms within a national regulatory framework.
- It was noted that, generally, the community has done a good job of raising visibility of space sustainability as an issue, but that there is now a need to move from concern to actually having definitions on what is meant by sustainability. Participants suggested that, in order to most effectively manage large constellations, it is first necessary to be able to both track and measure what’s going on in space and the impact of that activity on the space environment. In this regard, some participants raised the need to have more consistent sources for funding for research into space environment management.
- Some participants also suggested that measurement is the key to enabling governance approaches – and that this might start by defining the boundaries of the domain that we’re talking about when referring to “space environment.” These participants suggested that in order to measure, evaluate, and encourage behavior through either incentives or regulation there is a need to have consistent and defined metrics for that behavior and its impact. In this regard the Space Sustainability Rating (SSR) was noted as a possible



emerging tool. Other participants noted here that business and economic motivations behind some of the trend towards large constellations may also provide incentives for behavior, and should be considered.

- Participants also asked how governance discussions and approaches should consider the question of equitable access. Specifically, participants asked how to ensure that developing countries have the ability to be not only customers for broadband constellation services but also launch their own constellations? It was noted here that different countries might have different definitions of, or approaches to, public interest and benefit, and that thus determining an internationally consistent approach to this question might be difficult.

## Carrying Capacity Focus

The Dialogue included a specific focus on orbital carrying capacity as a potential approach to defining, measuring and then managing access to, and use of NGSO. One participant at Dialogue noted that “if one company wanted access to all the spectrum, they would be laughed at because there’s a recognition that they need to share the resource.” Orbital carrying capacity can be loosely described as a quantification of the amount of activity specific orbital regions can sustain. The Dialogue aimed to consider whether the concept might be a useful tool towards managing orbits as a resource.

During the Dialogue an overview of current research and approaches to defining orbital carrying capacity was presented. This presentation identified six broad conceptual elements of assessing and applying orbital carrying capacity:

- Environmental: What is the overall long-term impact on the environment?
- Astrodynamics: How many active satellites can we closely pack together?
- Impact to Operations: How do we minimize costs to current satellite operations?
- Metrics: How can we measure the impact of a satellite and/or constellation?
- Norms: What behaviors should we encourage or discourage?
- Economics: How might different incentives affect operator behavior?

Participants in the Dialogue were asked to consider and discuss how useful would a broad view of carrying capacity be for a national regulator if available as a consistent model? A number of viewpoints were raised in response:

### *Potential Role of Carrying Capacity as a Regulatory Tool*

- Many participants noted that a unified model for carrying capacity would be hugely useful to both regulators and operators (and some pointed to the role of global weather forecast models as an analog) but however also noted that that capability is a long way from being operationally available, and that pace of constellation deployment is moving faster than maturing orbital capacity modeling.
- Regulators also stated that the value of such a tool would also depend on whether it is based on physical or spectrum coordination considerations. It was noted by some participants that spectrum harm or interference is reversible and “bad” decisions can be undone, whereas physical effects are more difficult or impossible to undo, so that there is more incentive to coordinate to get it right.
- Referring back to the question of equity and benefit, some regulators expressed the viewpoint that a physical environment model may not be sufficient. There may be a need to have an “overlay of national perspectives” in addition to physical aspects so that public interest concerns and responsibilities of the national regulators can be considered.



Participants raised the question of if countries would be willing to impose restrictions/costs when it means their own companies are put at a disadvantage (or they have sovereign considerations)?

### *Challenges and Limitations on the Utility of the Concept in a Regulatory Context*

- Some participants also raised concern that carrying capacity could change over time (e.g. go up with technological or operational improvements) which might limit how useful it is as a tool for making long-term decisions. At the same time, it was discussed that there might be need to put more focus on near-term operational impacts of capacity into modelling efforts.
- Participants also raised a concern that orbital carrying capacity might require a high level of technical competence from the regulator in order to be used effectively. This competence might be difficult to build, even in countries with established spacefaring activities and regulatory practice.
- Some participants noted that certain national regulators may have a requirement to do any technical assessments or modelling activities in-house, limiting their ability to use a hypothetical external model as part of licensing practice.

A suggestion was made that one approach was that countries might coordinate on a regional or partner basis to manage orbital capacity through common multilateral market access requirements. Concern was expressed from some participants that this process would exclude some countries and that other countries would be unlikely to participate in a such a process. However other participants raised the examples of similar coordination through trade treaties and the precedent of World Trade Organization based open market access for foreign satellite systems as indications that such a multilateral market access approach might be possible.

During discussion many of the regulators participating in the Dialogue noted that while their agencies may have been initially focused on authorization licensing a shift is occurring with the increased activity to focus more on oversight (or supervision) activities for licensees. This could include putting into place means to monitor satellite operations to ensure that they are complying with the conditions of licenses. Regulators also expressed a need to figure out how to deal with filings that change from when they were first submitted and what impact those changes might have on the original licensing conditions. Some participants in the meeting expressed a viewpoint that carrying capacity assessment could potentially be a useful tool as a metric to assess change in ongoing operations relative to the overall environment.

## **Conclusion**

This Dialogue was an initial meeting and was not anticipated to produce immediate findings. Indeed, much of the discussion during the session emphasized the needed for more coordination and interaction between regulators, in particular between regulators responsible for authorization of space activities and those responsible for spectrum authorization and coordination. As one of the participants noted during discussion: “one of the big values of a meeting like this is not only the networking and talking to other regulators but also having time to think through what problems we each face and how we might jointly address those.”

In the discussion of those jointly-faced problems relating to large constellations three key central themes ran through the discussion at the Dialogue, beyond the simple need for more interaction between regulators:

- Agreement that the visibility of space sustainability has grown but that there is both need to continue to raise the political visibility of the topic and to move to operationally relevant solutions. This includes an acknowledgement that political leadership will likely be required to implement large scale changes or updates to regulator practice.
- A recognition that regulation of large constellations will be most likely and most effectively implemented at the national level, but at the same time recognition of a need to ensure consistency across national administrations. Participants suggested that this should start with international engagement and discussion of best practices, and include giving emerging regulators specific example and directions. Tools such as multilateral market access policies and the development of a model law for regulation of the physical management of large constellations (analogous to the model law that exists for spectrum management) were suggested.
- Discussion of the key role that equity consideration – of access to orbit for both emerging space countries and for future generations – should play in management of orbital capacity. Participants widely recognized the importance of this factor but at the same time acknowledged the difficulty of addressing it with concrete proposals.

Any of these three themes could be the focus of future discussion. For its part, Secure World Foundation views this dialogue as the first in an ongoing series of regulator-to-regulator workshops.



## Addendum: Meeting Agenda

Time (BST)	Session / Topics
0830-0900	Gather and Informal Networking Light refreshments and coffee & tea will be available
0900-0930	Workshop Introduction and Objectives
0930-1030	Panel Discussion: Current Regulatory Frameworks for NGSO Constellations A panel composed of regulators to present current approaches to, and gaps in, regulation of large NGSO Constellations.
1030-1100	Break
1100-1200	Summary Presentation & Discussion: Concepts of Orbital Carrying Capacity An overview presentation on various concepts for understanding orbital carrying capacity, based on findings from workshop conducted by Secure World Foundation in March 2022. To be followed by discussion, subject matter experts will be in attendance.
1200-1330	Luncheon <u>Keynote Address</u> : Perspective from a satellite operator
1330-1430	Panel Discussion: Challenges of NGSO Constellations Moderated discussion with technical experts to present an overview of sustainability and regulatory challenges posed by large constellations.
1430-1500	Break
1500-1645	Moderated Discussion: Steps Towards Increasing Regulatory Capacity for Large NGSO Constellations Using orbital carrying capacity as the focus, this session will be a moderated discussion of how to improve the capacity of the regulatory system to regulate large NGSO constellations in a sustainable and ongoing manner. <b>[closed session: government participants and hosts only]</b>
1645-1700	Wrap-up and Conclude