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UNDERSTANDING THE ENVIRONMENTAL AND CLIMATE ELEMENTS OF EU SPACE POLICY

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Abstract

In line with the European Union's (EU) commitment to the United Nations mandated sustainable development, implementation is under way across various policy sectors. An example of this is the mainstreaming of environmental concerns and the integration of environmental aspects in non-environmental policy fields. This article considers the status of environmental concerns in EU policy on outer space. Despite the EU's complex institutional setup, the cooperation within the space policy sector indicates that EU space policy making adheres to the principle of sustainability and that space activities can contribute to the implementation of environmental protection objectives in other policy sectors.

Key words**:** *European Union, Environmental Policy, Space Policy, Sustainable Development, Environmental Integration*

INTRODUCTION

Since the *Brundtland Report* was published in 1987, sustainable development has substantially advanced in the international discourse. The Brundtland Commission defined sustainable development as a "*process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs*" [United Nations 1987]. Underpinning this, and more importantly, is the idea that environmental protection, economic growth and social development constitute mutually supporting objectives, not contradictory ones [United Nations 1987]. Hence, sustainable development provided a platform for the European Union's (EU) strategic actions, emphasising the convergence of EU policies with environmental concerns.

The idea of environmental integration re-emerged in the EU during the Cardiff Process[1], aimed at triggering *Article 6* of the *Treaty establishing the European Community* [Unfried 2002], which states that *"[e]nvironmental protection requirements must be integrated into the definition and implementation of the Community policies and activities … in particular with a view to promoting sustainable development*" [EU 1997]. Since then, consistent with its rhetoric and commitment to these principles, the EU has adopted a plethora of strategic documents and action programmes related to sustainable development and environmental protection.

Moreover, the European Commission has outlined areas in which environmental integration could be feasibly applied, such as cohesion policy, development policy, transport or internal market policies [European Commission 2021b]. In our paper, we consider a rather unconventional and unmapped policy area – space policy. The aim is to analyse and assess the status of the environmental and climate policy elements and their potential integration in EU space policy. Methodologically, we take EU space policy sector as our case study and assess the implementation of the policies, programmes and strategies in this field. By adopting a qualitative approach and performing a content analysis of the relevant documents, we hope to identify the status of environmental concerns in outer space policy making.

1. UNPACKING THE ENVIRONMENT-SPACE NEXUS

The outer space environment has changed in the last decade. New types of actors and scientific and technological developments have brought new types of challenges [Bajzová et al. 2021]. On the other hand, outer space technologies may help to tackle diverse challenges on Earth, such as migration flows, natural disasters, border controls, climate change and sustainable development issues.

Outer space exploration has a remarkable impact on other fields and policies. Some of the biggest impacts, positive or negative, may be observed in environmental and climate policies. For example, Earth observations provide new data on environmental consequences and early warning systems, where the launch of such technologies and

[1]European Council Summit in Cardiff in 1998.

use of systems leaves an environmental footprint on Earth, in the atmosphere or even in orbit [Klinger 2019].

The EU understands space policy to be a response to the social, economic and strategic challenges that greatly affect the well-being of European citizens, which are related to the unprecedented growth and development of society. For the EU, combating climate change and protecting the environment are pressing social factors, and a coherent space policy may help it tackle these.

European citizens hold a very similar view, as is evident in the Special Eurobarometer findings. The Special Eurobarometer [European Commission 2014] conducted in 2013 focused on Europeans' attitudes towards space activities and found that 73% of respondents thought that investing in Earth observations could improve our understanding of the consequences of climate change. Respondents were asked in which areas they thought space activities would play an important role in 20 years' time; energy (37%) and the environment (33%) were the two most frequent answers. Furthermore, 72% of respondents thought that space technologies could contribute to better environmental protection and more efficient agriculture.

2. ENVIRONMENTAL AND CLIMATE POLICY INTEGRATION IN THE EUROPEAN UNION

Environmental policy integration (EPI) has been identified as a crucial component of sustainable development, underlining that the environmental sector alone would not be able to achieve the environmental objectives and tackle the challenges [Lafferty et al. 2003]. One of the principles behind EPI is to stimulate the implementation and institutionalisation of the Sustainable Development Goals (SDGs) [Lenschow 2002]. As conceptualised by Lafferty and Hovden, EPI denotes the "*incorporation of environmental objectives into all stages of policy making* ***in non-environmental policy sectors*** [emphasis added]" and the prioritisation of these objectives in achieving coherence between environmental and sectoral policies [Lafferty et al. 2003]. Thus, under the sustainable development paradigm, acknowledging and incorporating environmental objectives should be the guiding principle in policy making in all sectors. It is particularly relevant to consider the EPI in the context of the European Union, given its normative basis [Manners 2002] or role conception [Holsti 1970] is to promote and uphold sustainable development both domestically and externally.

Two EPI dimensions can be distinguished relating to the focus of integration – the horizontal and the vertical dimension – and these complement one another. The starting point of the analysis in this article is horizontal integration and cooperation. In horizontal integration, the emphasis is on the central authority (in this case the European Commission) and its cross-sectoral policy for incorporating EPI [Lafferty et al. 2003], as it is the Commission that holds overall responsibility for the implementation of the sustainable development agenda. As part of the EU's institutional setup and structure, "*the horizontal coordination that is the key to EPI requires that the DGs*

in the Commission … work with their respective colleagues in other areas" [Lenschow 2001]. It corresponds to the notion of environmental mainstreaming, aimed at environmental sustainability across all EU policy sectors. This can be seen in the overarching strategies the EU has adopted. Van der Leyen's Commission is continuing this holistic approach to sustainable development (primarily environment-friendly mechanisms) and commitment to the UN SDGs [Mokrá et al. 2019], most notably in the form of the *European Green Deal* [European Commission 2020b], *Annual Sustainable Growth Strategy* [European Commission 2019] or *A Farm to Fork Strategy* [European Commission 2020a].

While outlining the logic behind the EU's horizontal EPI, the primary focus of this paper is on vertical EPI, that is, environmental inclusion in one particular policy sector. Vertical EPI "involves the degree to which sectoral governance has been 'greened'; the extent to which it has merged environmental objectives with its characteristic sectoral objectives" [Lafferty et al. 2003]. This particular dimension has been the subject of academic attention in various EU policy fields, such as agriculture [Alons 2017], energy [Nilsson 2005] and the Arctic [De Botselier et al. 2018]. In this paper, we consider EU space policy within the framework of sustainable development, particularly environmental policy integration in this sector. We do not anticipate the environment becoming the guiding principle in the set of space policy objectives at this stage, and nor do we expect an extreme form of "active integration" [Lenschow 1999] to be adopted in the form of ambitious environmental targets. Nevertheless, based on earlier indications of a cross-sectoral horizontal EPI, we do expect the "defensive integration" process, which does "*not explicitly challenge the traditional priorities in other fields, but calls upon policymakers to assess the environmental impact of all policy initiatives and to limit environmental side effects*" [Lenschow 1999], to spill over into space policy as well.

Furthermore, we examine the penetration of environmental considerations into EU space policy and EPI to take place along two parallel lines. In both of these, EPI is regarded as policy output, focusing on the substantive outcome of that process and whether it leads to a "positive sector environmental impact" [Persson 2007]. The first aspect could be described as *passive* policy output, meaning that there is a level of coherence/discrepancy between the specific policy objectives and broader environmental goals. In other words, it is about if and how the environmental considerations were taken into account when designing sectoral policies that could have a potentially negative impact on the environment. The second dimension is *active* policy output. As outer space is often associated with the technological innovation discourse [Olla 2009], *active* policy output assesses the direct instrumental attributes of a particular sectoral policy, that is, whether and how it contributes to environmental protection, or to advancing particular environmental objectives.

Additionally, in this context, climate policy integration (CPI) is conceptually derived from the EPI, narrowing the 'what' (climate objectives) and 'where' (policy sector, e.g.

energy) of integrating the environmental agenda into the given policy sector [Adelle et al. 2013], and plausibly providing a more tangible approach than EPI. Nevertheless, the exploratory nature of this encouraged us to implement the concept of environmental policy integration, so as not to exclude non-climate environmental considerations (as climate is part of EPI *per se*) in the chosen sectoral policy.

3. SUSTAINABLE DEVELOPMENT, ENVIRONMENT AND EU SPACE POLICY

According to European Union law, space is a shared competence between the Union and the Member States [EU 2012]. However, the academic discussion is concerned with whether the space competence is not sui generis in character because Article 4(3) *Treaty on the Functioning of the European Union* defines space as an area in which, although the EU has competences, it cannot prevent Member States from exercising their competences. Therefore, classifying it as a 'parallel competence' is a better representation of the actual status of space policy competences [von der Dunk 2011]. EU competence in this area includes drafting the European Space Policy, promoting joint initiatives and coordinating the efforts required for space exploration and exploitation.

The idea of a European space policy was first mooted in 2007, but it did not become institutionalised until 2016. Basically, it coordinates the EU's approaches, activities and programmes, the Member States, the European Space Agency (ESA) and other organisations, such as the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). EUMETSAT is responsible for operating the Copernicus Sentinel series of satellites, namely Sentinel-3 and Sentinel-6, and will deliver the Sentinel-4 and Sentinel-5 satellites as well. It is also responsible for the operational management of another EU flagship programme, Galileo, operated by the European Global Navigation Satellite System Agency (GSA).

ESA is a partner organisation of the EU and plays a crucial role in many EU-led space activities. It was established in 1975 by seven European states as a separate, independent institution from what was then the European Communities. ESA is predominantly a technical agency with expertise and capabilities, but it lacks political power. It initiated Europe's first space programmes that ended the dominance and virtual monopoly of the United States. Its first mission was the launch of the rocket carrier *Ariane, Meteosat* and the telecommunication satellites. Furthermore, in the last decade ESA has developed the *VEGA* launcher used for launching the Galileo satellites into orbit in cooperation with Soyuz. The European Commission recognises the integral role of the ESA in the enlargement of the European Space sector and independence of Europe's space infrastructure. Galileo, its flagship project, is a good example of successful EU–ESA cooperation. EU–ESA cooperation is directed at avoiding the redundant duplication of efforts and focuses on complementary or reinforcing activities, whilst respecting their mutual independence. ESA provides the space infrastructure; hence, it is the EU's implementing agency to meet service requirements [Hörbert 2016].

Space policy implementation includes a broad range of other policy domains, such as fisheries, transport, agriculture, research and the environment. Additionally, these areas function better thanks to space applications. In terms of competences, the EU has no legal institutional framework for 'governing' European Space policy. Nevertheless, the European Commission bears the major responsibility for shaping space policy. The European Commission's right to initiate is accompanied by the co-decisions of the European Parliament and Council of the European Union. This is a change to the situation in the late 1990s, when space programmes were the exclusive competence of Member States and intergovernmental organisations, such as ESA. The European Commission has incorporated outer space into other policy events, such as the Kyoto Protocol on environmental protection, so as to gain political legitimacy for space activities. Additionally, several security issues led the Commission to promote the development of EU space assets as a response to global changes and to reflect competition in the field. However, the European Commission has only an implicit lead on European Space policy (e.g. agenda-setting) and needs assistance from other bodies or agencies owing to its limited scope of expertise and personnel. It focuses instead on drafting proposals and framing policy priorities and consequently, technical and scientific expertise is delegated to ESA, for instance [Marta et al. 2016].

The EU and ESA signed a Joint Statement [ESA 2016] on their shared vision for outer space, in which they agreed on the importance of the space sector and on contributing to other sectorial policies, priorities and purposes of space mission. However, the Joint Statement does not propose any direct environmental incentives for the future, focusing mainly on cooperation and the common recognition of space policy aspects. Through its key space documents, the EU recognises the impact of the space sector on other policies, repeatedly highlighting environmental protection and climate change mitigation. Furthermore, the EU is committed to long-term monitoring through the Copernicus and Galileo programmes as well as conducting high quality measurements using its space assets to address various environmental issues. The intention behind the EU's space programmes is to help close the environmental implementation gap and advance knowledge on the Sustainable Development Goals [European Commission 2018].

The European Commission is exploring possible dual-usage synergies and space programme interactions/cooperation to achieve better (combined) effects rather than separate ones. It is also promoting its role in ensuring the demands of other EU agencies in need of space solutions are met to provide more accurate outcomes, such as the European Environment Agency (EEA), the European Fisheries Control Agency (EFSA), the European Border and Coast Guard Agency and the European Maritime Safety Agency (EMSA). The EEA uses space technologies to deliver vast amounts of environmental and climate data and combine these with traditional sources of information, such as in-situ monitoring data [EEA 2020].

The EU's Space Strategy is aimed at ensuring a safe and secure environment for

sustainable outer space activities. The European Commission, in particular, supplements the efforts of the other European space entities (ESA, Member States, etc.) to incorporate innovative approaches to mitigate the environmental impacts of space programmes, such as the reusability of material and launchers [European Commission 2016].

3.1. Copernicus

One of the European Union's flagship programmes is Copernicus (formerly Global Monitoring for Environment and Security), the most advanced Earth observation system in the world. Copernicus benefits a variety of users in different ways. These can be divided into six categories [European Commission 2021a]. Two categories directly relate to climate and environmental policies: *Atmosphere* and *Climate Change*. *Marine* (focusing on climate and the environment, partly in terms of coastal and marine environment, and weather forecasting and climate), and *Emergency* (early-warning systems, flood awareness, forest fire information and drought observation) are similarly aimed at environmental or climate degradation prevention and awareness. *Land* and *Security* are also about prevention but are not explicitly climate integration policies. Copernicus targets a variety of non-space domains with climate or environmental benefits policy outcomes that have spillover effect on other policies, for example the energy sector, through solar power production monitoring.

3.2. Galileo – a negative or positive environmental impact?

Galileo is the EU's Global Navigation Satellite System, a leading flagship programme that is exclusively under civilian control. It generates, for example, data concerning positioning, navigation or the timing required for emergency response services. It rivals the US GPS system but provides more accurate data. Currently, Galileo consists of 26 satellites already placed in orbit, and the EU expects the full constellation to be 30 satellites. The programme comes under the overall responsibility of the European Commission, including implementation on behalf of the EU, and a managing and controlling role. ESA was mandated to provide the general technical development of the infrastructure required for the Galileo satellites [European Commission 2021c]. The aim of Galileo is not environmental, as is the case with Copernicus, but covers the impact of satellite deployment. In cooperation with Copernicus, Galileo can generate useful data that is suitable for use in environmental protection, but that is not its primary purpose. Furthermore, given the launch of 26 Galileo satellites, there are questions regarding its environmental footprint.

3.3. ESA activities

The European Space Agency is an independent intergovernmental organisation with 19 EU member states and three non-EU member states. ESA cooperates with the EU on various space programmes. Its activities may be coordinated with the EU, but

some are independent because some of its members are not EU member states. Furthermore, ESA initiated formal cooperation with all EU Member States, even those that are not ESA members. There are different types of cooperation, under the general Cooperation Agreement as a European Cooperating State (ECS), or through Associate Membership.

The Plan for European Cooperating State (PECS) prepares states seeking to join the organisation, initially as an associate member and later as a full member. During this preparatory stage, applicant states contribute 1.4 million euros a year for a period of five years, enabling them to take part in procurement and space activities and consolidate their knowledge and further develop their own space industry [ESA 2021a, ESA 2021b].

In early 2013, ESA recognised the impact of space asset construction and launched its *Clean Space* initiative. ESA's action plan set out its approach to becoming a model organisation practising clean, sustainable and responsible activities in outer space. It is pioneering an environmental impact study for the space sector, focusing on European launchers and supply chains, and aimed at drawing up a framework for European space agencies, corporations, companies and research entities. The idea is to collect the necessary information about the materials and manufacturing processes used in space, and their origins and environmental impact [ESA 2014].

The environmental awareness and knowledge transfer from ESA to countries may enable them to replicate the necessary pattern of responsible supply chains and manufacturing processes that may have an impact on national space policies, or European Space policy as such. Furthermore, this joint action by ESA and the EU or individual Member States may help reduce the number of launches and prevent mission duplication [Durrieu et al. 2013].

CONCLUSION

Sustainable development has become integral to the European Union and its agenda over the last few decades, and this is in addition to the universal obligations arising from the MDGs, and later the SDGs. The principle of sustainable development, building on the values of justice and solidarity, has been "widely used in the EU framework" and, accompanied by the principle of responsibility (particularly in the environmental policy area) [Lucarelli 2006], is shaping the EU's political stance. Hence, the environmental paradigms [Mokrá 2021] have gained considerable momentum and are being implemented across the various sectors of EU policy. The synergy between the environment and space policy may be underestimated at first sight; nevertheless, the two are connected. The objective of this article was to assess the performance of the EU space policy sector through the prism of environmental policy integration (EPI). Having acknowledged that EPI has a horizontal dimension, the focus was on the vertical 'greening' of space policy and assessing the corresponding policy outputs.

In its space policy, the European Union conducts two different set of activities within

the framework of environmental policy integration. The establishment of the flagship space programmes has an impact on other policy sectors, mainly environmental and climate action [Wertlen et al. 2020]. The Copernicus programme is directly incentivised to produce high resolution Earth-observing data for helping tackle environmental issues, such as air pollution, maritime safety, climate change, land degradation and many more. In combination with Galileo, it can even accurately track the position and timing of key aspects of environmental protection. The EU incorporated these two sectors as the primary target of space actions in its strategic documents, and the European Commission was assigned the leading role in shaping European Space policy. For this purpose, the Commission closely cooperates with EU agencies and intergovernmental organisations such as ESA. ESA is an independent organisation responsible for the technical aspects of European Space missions, such as launching Galileo satellites into orbit. ESA introduced an initiative called Clean Space that tracks supply chains, materials used in space modules and launchers, and manufacturers, to reduce the environmental impact of space activities on Earth, the atmosphere or in orbit. As a result of this initiative and ESA's responsibility for manufacturing processes, the EU performs the technical side of its space programmes with minimal environmental impact. Galileo is still ongoing and a few satellites have yet to be placed into orbit, so it is very hard to assess the environmental footprint it will leave.

Furthermore, the findings ascertained within the scope of the theoretical and methodological framework, indicate that environmental issues [Mokrá 2021] do indeed resonate within EU space policy. To a certain extent both the active and passive policy outputs of the EPI relate to this sector – 1) the EU flagship space programmes are designed to directly contribute to monitoring and data collection in the context of environmental protection and climate change mitigation [Mokrá et al. 2019]; 2) in pursuit of various space policy objectives, its recognition of the sustainable and environment-friendly 'way of doing things' provides a platform to build on in the future. This underlines how space policy provides opportunities in other policy sectors and how space policy generally can contribute to sustainable development and environmental protection.

Nevertheless, based on the comparison with similar activities in space, we may conclude that the ongoing EU space programmes raise serious environmental awareness concerns, which have to be considered in relation to the European Union's activities in the space sector. The sustainability of the outer space environment and minimisation of the risks of the potential negative impact on space should form an integral part of the relevant strategies, programmes and decisions adopted by the EU or its Member States.

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