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Exploring the planetary health equity governance supercluster complex

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A B S T R A C T

The global planetary health equity (PHE) governance architecture can shape government responses to the interrelated challenges of the climate crisis, economic inequality, and poor health. The structure of this architecture has yet to be examined. Using network analysis, we provide the first mapping of the PHE topology and show that the PHE governance architecture is highly centralized and dominated by economic governance organizations.

1. Introduction

Global governance institutions are failing to ensure the equitable enjoyment of good health and wellbeing in a sustainable ecosystem – what we refer to as Planetary Health Equity (PHE). Any reader of *Earth System Governance* will be aware of the catastrophic impacts posed by anthropogenic climate change for our planet and our species. At the same time, economic and social inequities are escalating while levels of preventable illnesses and premature deaths are increasing, especially amongst the most socially and economically disadvantaged populations (Friel, 2019). These issues are interconnected – driven by the common global consumptogenic system – and solutions to them cannot be siloed (Friel et al., 2022).

Government policies that influence PHE are shaped by participation in global governance arrangements (Biermann et al., 2020; Keohane and Victor, 2011). Despite substantive changes in the global governance architecture over the last thirty years (Zürn, 2018) – including the rise of highly influential NGOs (Wenham et al., 2023) and private transnational regulatory organizations (Abbott et al., 2016) – International Organizations (IOs) remain central PHE governance actors. IOs are increasingly tackling issue areas adjacent to their core mandate. The expansion in the number and mandates of IOs has resulted in a sprawling governance architecture for PHE.

In this *Perspective*, we provide a novel mapping of the topology of the PHE governance system. We identify this architecture as a massive 'supercluster complex' (Kim and Morin, 2021) which, working from the micro to the macro levels of global governance, is composed of individual regimes, regime complexes, and superclusters. When individual IOs govern a common issue area and share a set of norms, rules or governing principles, they form a regime (Orsini et al., 2013). For example, the United Nations Framework Convention on Climate Change (UNFCCC) together with the Intergovernmental Panel on Climate Change (IPCC) and the Global Environment Facility (GEF) form the UN climate change regime. When regimes overlap and interact – for example, the climate change regime and club organizations such as the G20 or APEC – they form a regime complex (Keohane and Victor, 2011). In turn, a cluster of regimes – such as the regime complex for climate change and the regime complex for energy – forms a supercluster. The interaction of at least two superclusters forms a supercluster complex. In our research the supercluster complex for PHE is made up of the climate, health, and economic governance superclusters.

Although there is a voluminous literature on IOs in general and the roles of IOs in specific domains such as climate change, little is known about the interlocking governance structures that characterise the population of IOs that make up the PHE supercluster complex and how that supercluster complex is structured. This understanding is necessary because the patterns of relationships between IOs enable or constrain their behaviour (Biermann et al., 2020). Fundamentally, understanding the constellation of PHE IOs is critical to enabling policy actors to affect interventions that promote the equitable health of people and the planet.

Using tools drawn from network science, this exploratory analysis provides a first mapping of the topology of the neighbourhoods of the superclusters that underpin the supercluster complex. The topology of the PHE governance network is likely to have an impact on its performance. Understanding how this network is structured is a necessary first step in optimizing global governance to support the achievement of PHE. A detailed explanation of how this network was constructed, its actors, and the network measures employed is in the **Supplementary Methods**.

Fig. 1a presents the PHE supercluster complex and highlights the ties between individual IOs. Individual nodes represent IOs while the size of each node is a function of the number of ties it possesses to other nodes

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in the network. Data on IOs and their ties to one another was drawn from the Yearbook of International Organizations (Union of International Associations, 2023) – the most comprehensive source of data on IOs (Reinalda, 2011). We included all substantive ties between IOs in our analysis including formal agreements, observer status to partner meetings, collaborative relationships or joint bodies, or funding arrangements.

The topology of the PHE governance supercluster complex is composed of a tightly integrated core – dominated by economic governance organizations – bordered by more loosely connected environmental, health, and 'club'[1] organizations. To more precisely determine variation in structural organizational power across the supercluster complex, we calculated a series of centrality measures (Kinne, 2013; Easley and Kleinberg, 2010). In terms of the connections that each organization has to the rest of the network, we found that the supercluster complex follows a highly skewed distribution – an indicator of centralization and hierarchy (see Supplementary Material). Economic governance organizations – which includes IOs from the trade, development, and finance regime complexes – predominate amongst the most highly connected organizations, with health and environmental organization comparatively underrepresented. The United Nations Development Programme (UNDP) was the most highly connected actor in the PHE supercluster complex. Five other economic governance organizations are represented in the top 10 most highly connected organizations.[2] Although highly connected in degree terms, only two environmental or climate organizations[3] and two multi-sectoral organizations[4] were found in the top 10. The World Health Organization (WHO), the core of the health regime supercluster, occupies roughly the same structural position as the International Civil Aviation Organization (ICAO) and the World Customs Organization (WCO) in terms of overall access to the rest of the PHE network.

Why does this matter for planetary health equity? Those IOs that are highly connected may possess a higher degree of social power given their enhanced ability to access, share, or withhold information, norms, or financial resources (Hafner-Burton et al., 2009). More specifically, those IOs that occupy structurally privileged positions may be able to shape debates, structure agendas, and diffuse policy norms and ideas across governance systems (Beckfield, 2003). There is a wide body of literature that convincingly argues that IOs use a variety of mechanisms to socialize states (Strang and Meyer, 1993; Finnemore and Sikkink, 1998; Finnemore, 1993; Keck and Sikkink, 1998; Simmons and Elkins, 2004). Assuming that this is indeed the case, it is reasonable to hypothesise that IOs can deploy similar tools in their interactions with one another. One would expect that those IOs with higher levels of social power will be able to deploy the tools of socialization more effectively. For example, Finnemore shows that, due to its privileged position within the economic governance architecture, the World Bank was able to diffuse new norms of around poverty alleviation to IOs including the ILO, regional development banks, and the OECD (Finnemore, 1996).

Degree centrality is not the only metric of social power (Everett and Borgatti, 2005). Brokerage and closeness – the capacity to influence other actors by virtue of connections to highly influential actors or power emanating from a connection or bridge between different actors or groups respectively – are other important aspects of social power (Hafner-Burton et al., 2009). The strong ties of the WHO and International Atomic Energy Agency (IAEA) to well-connected actors in the

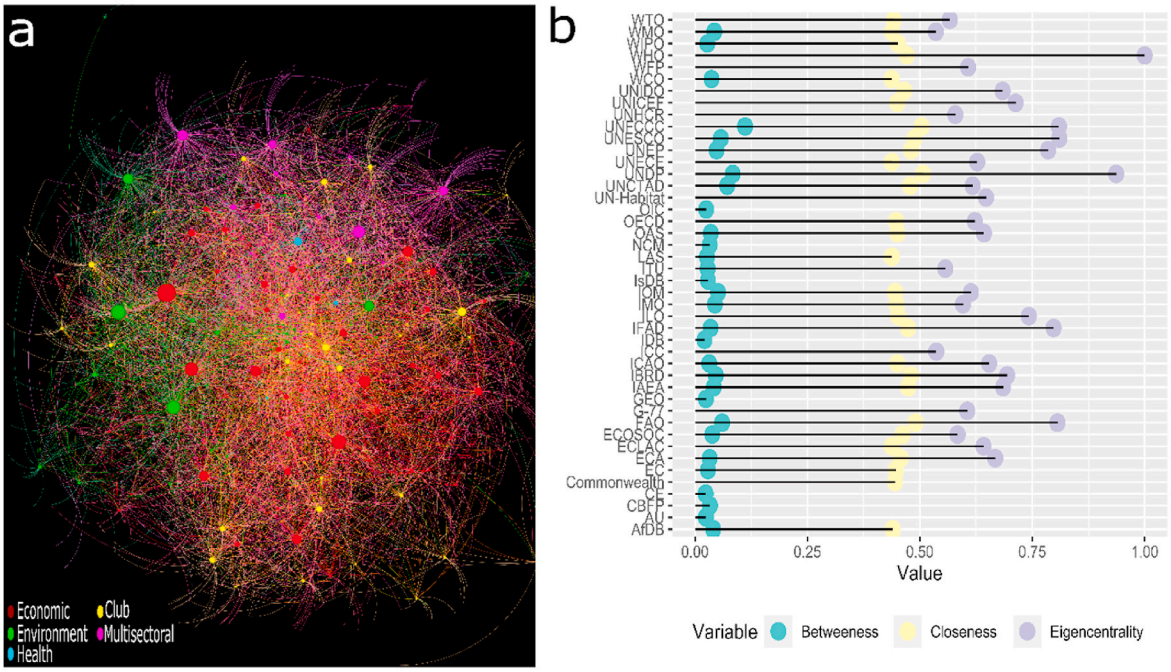

Fig. 1. The PHE supercluster complex.

[1] Club organizations refers to organizations that are not multilateral and which may be either formal or informal in nature. Examples include the Group of 20 (G20) and the Group of 7 (G7), formerly the Group of 8 (G8) prior to Russia's withdrawal in 2018.

[2] The United Nations Conference on Trade and Development (UNCTAD), the Food and Agricultural Organization (FAO), the International Bank for Reconstruction and Development (IBRD)/World Bank, the International Fund for Agriculture and Development (IFAD), and the UN Economic and Social Council (ESOSOC).

[3] The UN Environment Programme (UNEP) and UN Framework Convention on Climate Change (UNFCCC).

[4] The International Maritime Organization (IMO) and UN Educational, Scientific and Cultural Organization (UNESCO).

supercluster complex give them noticeably higher eigenvector scores (a measure of closeness) relative to their total number of connections (Fig. 2b). This suggests that the WHO and IAEA are potentially more effective vectors for the transmission of new norms and ideas to highly connected organizations such as the UNFCCC and UNDP than their comparatively low degree centrality scores would indicate. Several non-economic organizations – UNFCCC, UNESCO, and the International Organizations for Migration (IOM) – have higher levels of bridging power relative to their degree scores. Similarly, several smaller 'club' organizations – including the Nordic Council of Ministers and the League of Arab States – may have a greater capacity to constrain or facilitate flows of information or ideas to or from the rest of the network than their small degree size would suggest.

Node size in 1a is a function of their connections within the supercluster complex. 45 total organizations are included in 1 b made up of the 30 organizations with the highest individual scores across the three variables. Degree centrality provides a measure of access that a given node has to other nodes in a network, i.e. degrees of separation (Wasserman and Faust, 1994). Eigenvector centrality measures the extent of a node's connections to popular partners/nodes (Borgatti and Lopez-Kidwell, 2014). Closeness centrality estimates how quickly a node can distribute information or resources within a network (Borgatti et al., 2009). Betweenness centrality captures the 'bridging' potential of a node, which can be used to determine the extent of control that a node has over flows within a network (Wasserman and Faust, 1994). If an organization's variables score is not displayed, it is because it did not feature amongst the 30 highest scores for a given variable.

Next, we examined the topology of the local neighbourhoods of the three governance superclusters that compose the supercluster complex (Fig. 2a). Of the ten most connected organizations within the climate governance supercluster, only two possess a climate or environmental mandate (UNFCCC and UNEP), two are multisectoral (UNESCO and the IMO), and the remaining organizations are drawn from the development or trade regime complexes of the economic governance supercluster (Fig. 2c). The IPCC plays a central bridging role in the climate supercluster despite its comparatively limited number of total connections (Fig. 2d).

Node size in 2a is a function of the number of connections within the local neighbourhood of a given supercluster and not total connections within the entire supercluster complex. In 2 b the share of edges and nodes was calculated at level 1 – i. e the number of connections within the local neighbourhood. In 2 d the betweenness score were not normalized as the local neighbourhood were treated as ego networks.

The centralization metrics also indicate that the most connected organizations within the economic governance supercluster are those with an economic mandate. The betweenness centrality scores reveal that the International Monetary Fund and the Bank of International Settlements (BIS) – the bank of central banks – serve as important bridges between the monetary and financial regime complexes and the rest of the economic governance supercluster, which is composed primarily of trade and development organizations. By the same token, the IMF and BIS are largely separated from the rest of the economic governance network and are particularly far removed from the handful of climate and health organizations present in the economic governance supercluster (Fig. 2a). Similarly, two clubs[5] and two development banks[6] serve as important bridges between regional organizations and the rest of the supercluster.

We discovered that the health governance supercluster was the most compact and dense of the three superclusters (Fig. 2b). The small size of the supercluster may be due to the traditional primacy accorded to economic governance and increasingly climate change, relative to global health, by states and the international community at large. The topology of the health governance supercluster suggests that organizations in the WHO's local neighbourhood are in closer contact with one another relative to the economic or climate governance superclusters. This dynamic may be a function of the size of the supercluster – there is evidence that network size is negatively associated with density (Valente, 2010). Unlike the economic and climate governance superclusters, the health governance supercluster possesses a diverse range of highly connected organizations ranging from development-focused organizations such as UNDP to the International Atomic Energy Agency (IAEA). This diversity may facilitate the exchange of relevant information and resources and reduce the recycling of redundant information (Burt, 2000).

Given the inability of a single government to manage the global collective challenges facing humanity, there is a pressing need to understand the governance structures that will be needed. This exploratory analysis indicates that the PHE supercluster complex that structural power within the supercluster complex is not evenly distributed. A handful of central organizations, predominantly economic in orientation, occupy the commanding heights of the supercluster complex – this dominance is most clearly seen in the climate governance supercluster. The structural dominance of economic organizations within the PHE governance constellation suggests that solutions to addressing planetary health inequities will be channelled through the lens of economic rationalism which has dominated discourses in the trade, investment, and development regimes. This is potentially problematic as the pursuit of economic growth as a primary goal is not necessarily aligned with combatting climate change or pursuing public health goals (Raworth, 2017).

Furthermore, the structural distance between key economic organizations – such as the BIS and IMF – from environmental and public health organizations may undermine the incorporation of climate and health concerns into the development of macroeconomic policy. By contrast, the diversity of the health supercluster bodes well for its performance given the role of diversity in fuelling new norms and ideas. Similarly, the connections of the WHO to the most central actors in the supercluster complex could help to facilitate the incorporation of new health-focused norms into non-traditional health domains.

Put another way, network structure may have considerable implications for the efficacy of IOs in either promoting or hindering PHE goals. In a best-case scenario, the structure of the PHE governance architecture will push IOs to adopt policies, norms, and frameworks that enhance PHE. In a worst-case scenario, network forces will push IOs down suboptimal pathways – such as prioritizing market-based solutions relative to alternatives. It is beyond the scope of this piece to examine the conditions under which IOs end up in a PHE-enhancing or degrading position. However, it is likely the direction of change will be a partial function of the mechanics of diffusion processes which, in turn, are conditioned by network topology. For example, it is plausible that the degree of internalization of a pro-PHE norm or policy by an IO (a partial function of that IOs position within the PHE architecture) has an impact on that IOs willingness and capacity to diffuse that norm or policy, accept additional pro-PHE norms or policies, or reject anti-PHE norms or policies.

This *Perspective* highlights the utility of network analysis as a useful tool for examining PHE governance and opens the door for future research focused on optimizing global governance systems to advance PHE objectives. A potential fruitful avenue for follow-up research could focus on the drivers – both exogenous and endogenous – of topological differences between superclusters as well as the influence of topological variation on governance outcomes. Understanding this variation could help IO elites, national policymakers, and civil society organizations to enhance collaboration and cooperation within the PHE governance architecture. Relatedly, a deeper understanding of the connections between non-IO actors – such as states, NGOs, and private sector

[5] The Organization for Economic Cooperation and Development (OECD) and the Organization of American States (OAS).

[6] The African Development Bank (AfDB) and the Asian Development Bank (ADB).

Fig. 2. Local neighbourhoods of the climate, economic, and health superclusters.

organizations – and the PHE governance architecture could assist socially-orientated actors to maximize their impact by navigating the supercluster complex more efficiently.

CRediT authorship contribution statement

Nicholas Frank: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Sharon Friel:** Conceptualization, Funding acquisition, Project administration, Supervision, Writing – review & editing. **Megan Arthur:** Conceptualization, Writing – review & editing.

Declaration of competing interest

We note that Sharon Friel receives an Australian Research Council Laureate Fellowship grant (FL210100044) and other grants from the Australian Research Council and National Health and Medical Research Council all to her university, consulting fees from WHO to her university, and is on the Board of Directors of the non-profit Health Justice Australia, which is an unpaid position. Nicholas Frank consults for the International Trade Centre and the Organization of Economic Cooperation and Development. Megan Arthur declares no competing interests.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.esg.2024.100207.

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