Network Analysis of Goal 14 within the PD4SDG Database

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Introduction

- Research project underway to investigate how networks promote regimes formation

- It seeks to understand whether an increase in cooperation will transform sustainable development from a soft law principle to a regime

- The working hypothesis is that dense networks are a necessary condition for regime formation

Background Information

- The research project uses the World Commission on Environment and Development definition of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

- The United Nations (UN) currently assess progress towards sustainable development through the 2030 Agenda for Sustainable Development.

2030 Agenda for Sustainable Development

- The UN articulated 17 Goals with 169 targets intended to help countries lower poverty, increase environmental quality, and secure a more equitable society for disadvantaged peoples.

- The UN seeks to highlight attention to the 2030 Agenda through the Partnership Data for Sustainable (PD4SDG) Database.

PD4SDG

- The PD4SDG database tracks voluntary commitments to the sustainable development goals.

- Any entity that wishes to post a project may do so.

- Additionally, the UN has encouraged entities to make contributions at major environmental conferences.

- Consequently, the growth of the projects within the database can be used as a proxy to track the acceptance of sustainable development principles.

Goal 14 - Oceans

- The research project focuses on Goal 14 - Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

- The original dataset included 1,359 with 2,735 distinct organizations.

- Goal 14 includes 36.5% of the projects registered to date.

Regime Theory

- Regime theory studies order in the international system.

- Krasner (1983:2) provides the classic definition of a regime.

- "Regimes can be defined as sets of implicit and explicit principles, norms, rules and decision-making procedures around which actors' expectations converge."

- In short, regimes are institutions with agreed upon rules about a singular issue area.

Regime Formation

- Scholars have asserted that regime proponents assist regime formation.

- Research concludes that various groups contribute to regime formation including
  - States
  - Economic interests
  - International organizations
  - Nonstate actors
  - Epistemic communities
  - Transnational advocacy networks

Key Questions Within Regime Theory

- How do issue areas emerge?

- Why do actors cooperate to find solutions?

- Why are some issues easier/quicker to solve while others take longer/harder?

- What does it mean to have an effective regime?

- Do regimes, once established, keep the same shape and function?

- How/Why do regimes change?

Questions for this project

- Which actor type is most important?

- How dense is the network activity among sustainable development proponents?

- Does network activity confirm existing literature that the European Union is a leader and the United States is a laggard?

Current Hypotheses

- Rather than focusing on actor type, we focus on the nature of the connectivity between the actors.

- We argue that dense proponent networks are a necessary precondition for regime formation.
  - Widespread geographical coverage
  - Variety of entity types connected to each other
  - Connections to other entities
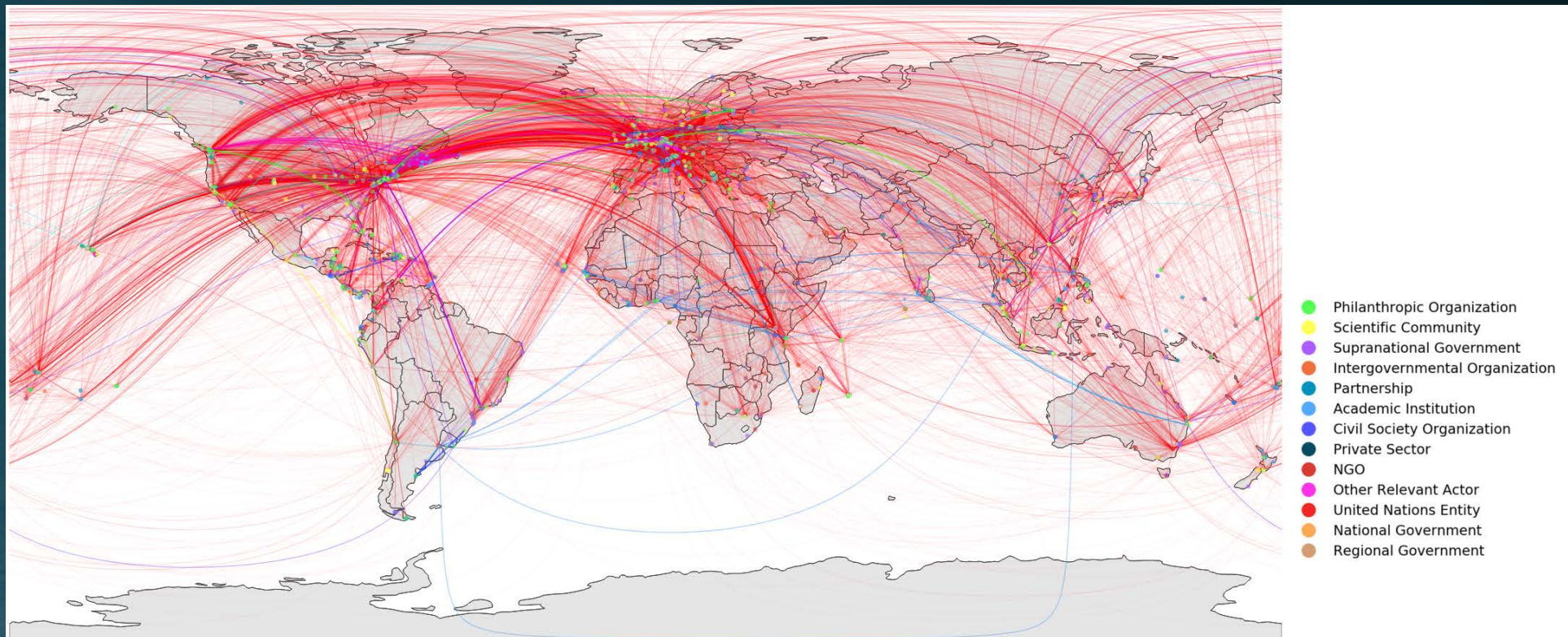 - Network cannot be separated at any one point

Methodology

- Historically, regime theory has utilized the case study to conduct research.

- Detailed information about network connectivity is limited to attendance lists and formal negotiation sessions.

- The PD4SDG database is unique in that it gives us the ability to look at the connectivity of regime proponents outside of the formal negotiating sessions at the UN.

Results – Widespread geographical coverage

Philanthropic Organization
Scientific Community
Supranational Government
Intergovernmental Organization
Partnership
Academic Institution
Civil Society Organization
Private Sector
NGO
Other Relevant Actor
United Nations Entity
National Government
Regional Government

Initial Observations – Geographical Coverage

- Connections are the most dense between the United States and Europe and this is expected given that UNDP and the GEF headquarters are within the United States.

- Latin America appears to be underrepresented and this is surprising.

- The Middle East also appears to be underrepresented and this is expected.

- The South Pacific is probably overrepresented and this appears to be a function of the issue area in that ocean projects are concentrated in this location.

Results – Variety of entity types connected to each other

- 🟢 Philanthropic Organization
- 🟡 Scientific Community
- 🟣 Supranational Government
- 🟠 Intergovernmental Organization
- 🔵 Partnership
- 🔵 Academic Institution
- 🔵 Civil Society Organization
- ⚫ Private Sector
- 🔴 NGO
- 🟣 Other Relevant Actor
- 🔴 United Nations Entity
- 🟠 National Government
- 🟤 Regional Government

Summary Data

- 2,735 Entities
- 1,359 Projects
- 233 Connected Networks
- 23,028 distinct connections between entities
- 1 super connected network that contains 79.12% of the entities

| Type	Number of Entity	Percent
Academic Institution	304	11.12
Civil Society Organization	202	7.39
Intergovernmental Organization	126	4.61
NGO	727	26.58
National Government	244	8.92
Other Relevant Actor	15	0.55
Partnership	45	1.65
Philanthropic Organization	61	2.23
Private Sector	488	17.84
Regional Government	168	6.14
Scientific Community	239	8.74
Supranational Government	1	0.04
United Nations Entity	115	4.20
Total	2, 735	100%

Initial Observations – Network Shape

- One dense network exists along with multiple smaller networks.

- The size of the scattered networks is larger than anticipated given that these entities actively promote sustainable development.

Network Analysis Metrics

Degree is the number of connections to other entities that an entity has.

Delta Connected Component is the change in the number of connected components after removing an entity from the network.
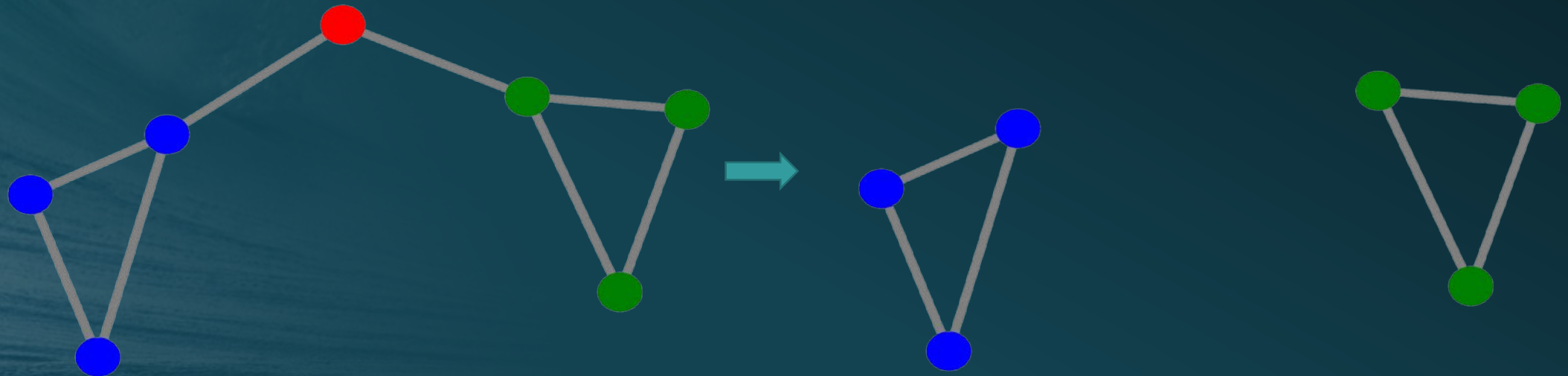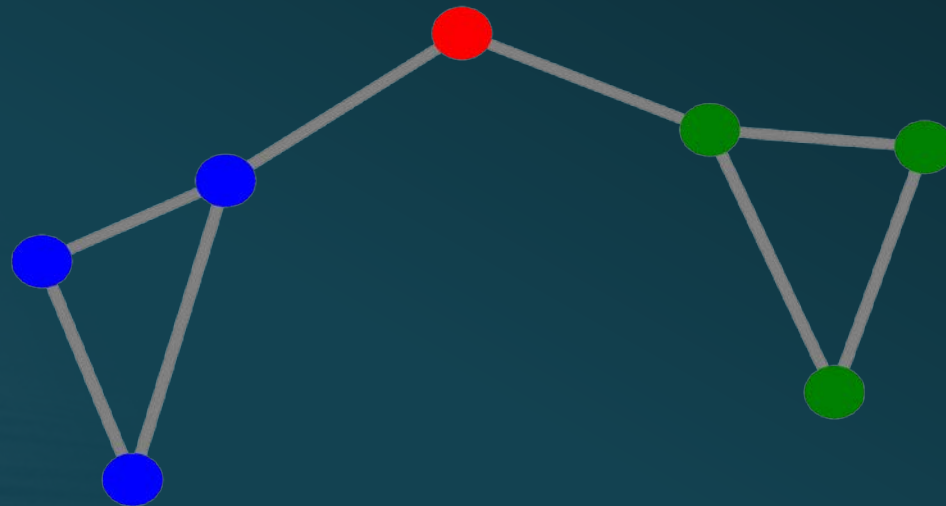
Results – Top Entities | Degree

Rank	Entity	Type	Degree	Delta Connected Component
1	United Nations Environment Program	United Nations Entity	483	4
2	United Nations Development Program (UNDP)	United Nations Entity	348	7
3	Conservation International	NGO	314	1
4	International Union for Conservation of Nature	NGO	280	2
5	Food and Agriculture Organization	United Nations Entity	277	0
6	United States	National Government	262	2
7	Global Environment Facility	United Nations Entity	256	7
8	World Wildlife Fund	NGO	241	1
9	Sweden	National Government	215	3
10	Secretariat of the Pacific Regional Environment Program	Intergovernmental Organization	198	2
11	UNESCO	United Nations Entity	187	0
12	Australia	National Government	176	2

Network Analysis Metrics

Betweenness Centrality measures the extent to which an entity acts as a bridge of connection between other entities.

$$BTW\_C[e] = \frac{Number\ of\ shortest\ paths\ go\ through\ e}{Total\ number\ of\ shortest\ paths}$$

Results – Top Entities | Betweenness Centrality

Rank	Entity	Type	Betweenness Centrality	Delta Connected Component
1	United Nations Environment Program	United Nations Entity	96.18	4
2	United Nations Development Program (UNDP)	United Nations Entity	73.32	7
3	United States	National Government	51.38	2
4	Conservation International	NGO	51.21	1
5	Global Environment Facility	United Nations Entity	41.94	7
6	World Wildlife Fund	NGO	41.38	1
7	International Union for Conservation of Nature	NGO	40.95	2
8	Sweden	National Government	31.62	3
9	Food and Agriculture Organization	United Nations Entity	28.58	0
10	UNESCO - IOC	United Nations Entity	26.60	1
11	European Union	Supranational Government	24.40	2
12	The Nature Conservancy	NGO	22.14	1

Network Analysis Metrics

PageRank is an algorithm used by Google Search to rank websites' relevance or importance. One distinct feature of this metric is that it rewards the popular among popular.
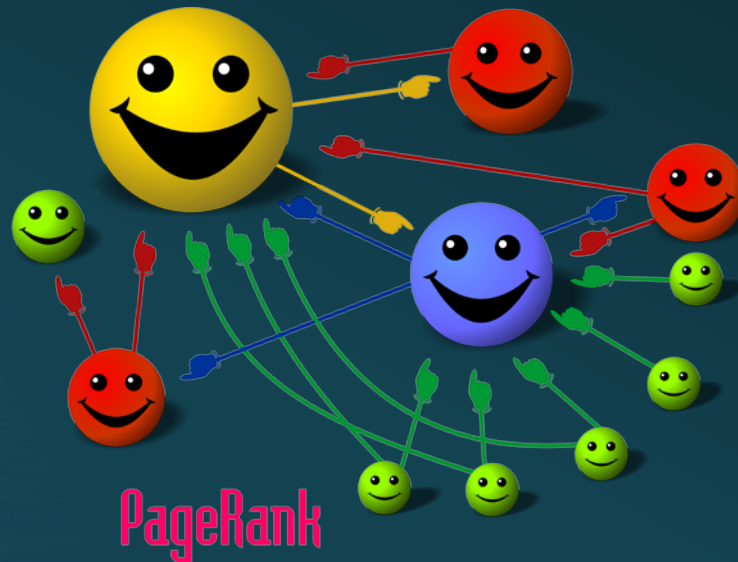
Results – Top 12 Entities | PageRank

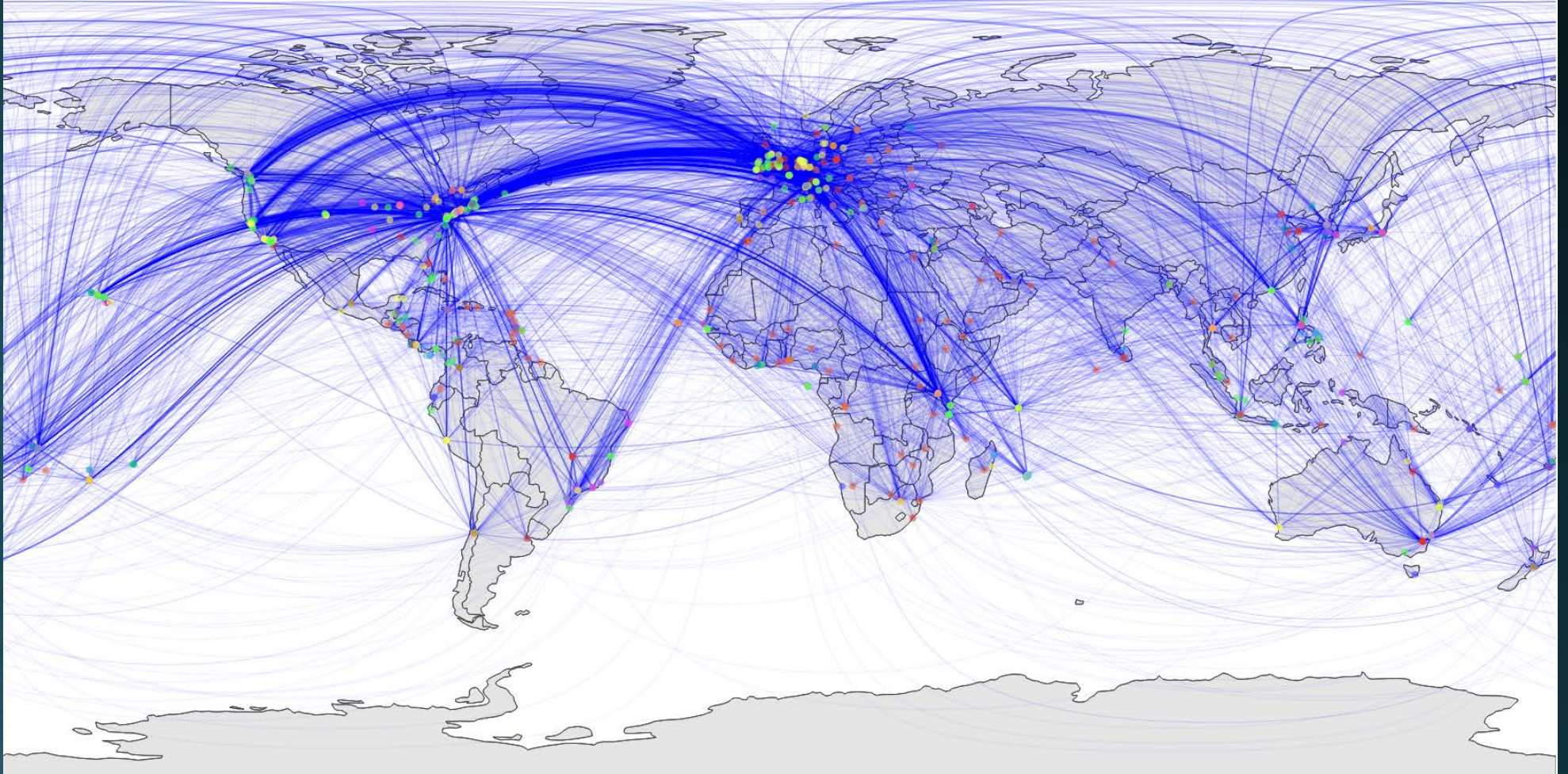| Rank	Entity	Type	PageRank Score	Delta Connected Component
1	United Nations Development Program (UNDP)	United Nations Entity	90.97	7
2	United Nations Environment Program	United Nations Entity	86.08	4
3	Conservation International	NGO	64.70	1
4	Global Environment Facility	United Nations Entity	60.52	7
5	World Wildlife Fund	NGO	55.90	1
6	International Union for Conservation of Nature	NGO	54.95	2
7	United States	National Government	46.61	2
8	Food and Agriculture Organization	United Nations Entity	42.28	0
9	Sweden	National Government	38.46	3
10	Secretariat of the Pacific Regional Environment Program	Intergovernmental Organization	38.00	2
11	European Union	Supranational Government	37.90	2
12	UNESCO - IOC	United Nations Entity	34.52	1

Initial Observations – Top 12 Entities

- UNEP, GEF, IUCN, and WWF were expected to rank highly in all metrics.

- The UNDP in first place by page rank along was surprising. This may have to do with the structural interconnectivity between the GEF's Small Grant Program and UNDP.

- The United States is frequently described as a laggard in its support of sustainable development and it is shocking to see it place above the European Union in all methods.

- The network is frail. Removing funding from the GEF Small Grant Program dramatically decreases the size of the dense network. It cuts the network into 8 distinct pieces.

Top 3 Entities Network Connection

United Nations Development Program (UNDP), United Nations Environment Program, and Conservation International are directly connected to 32.21% of the network of entities.
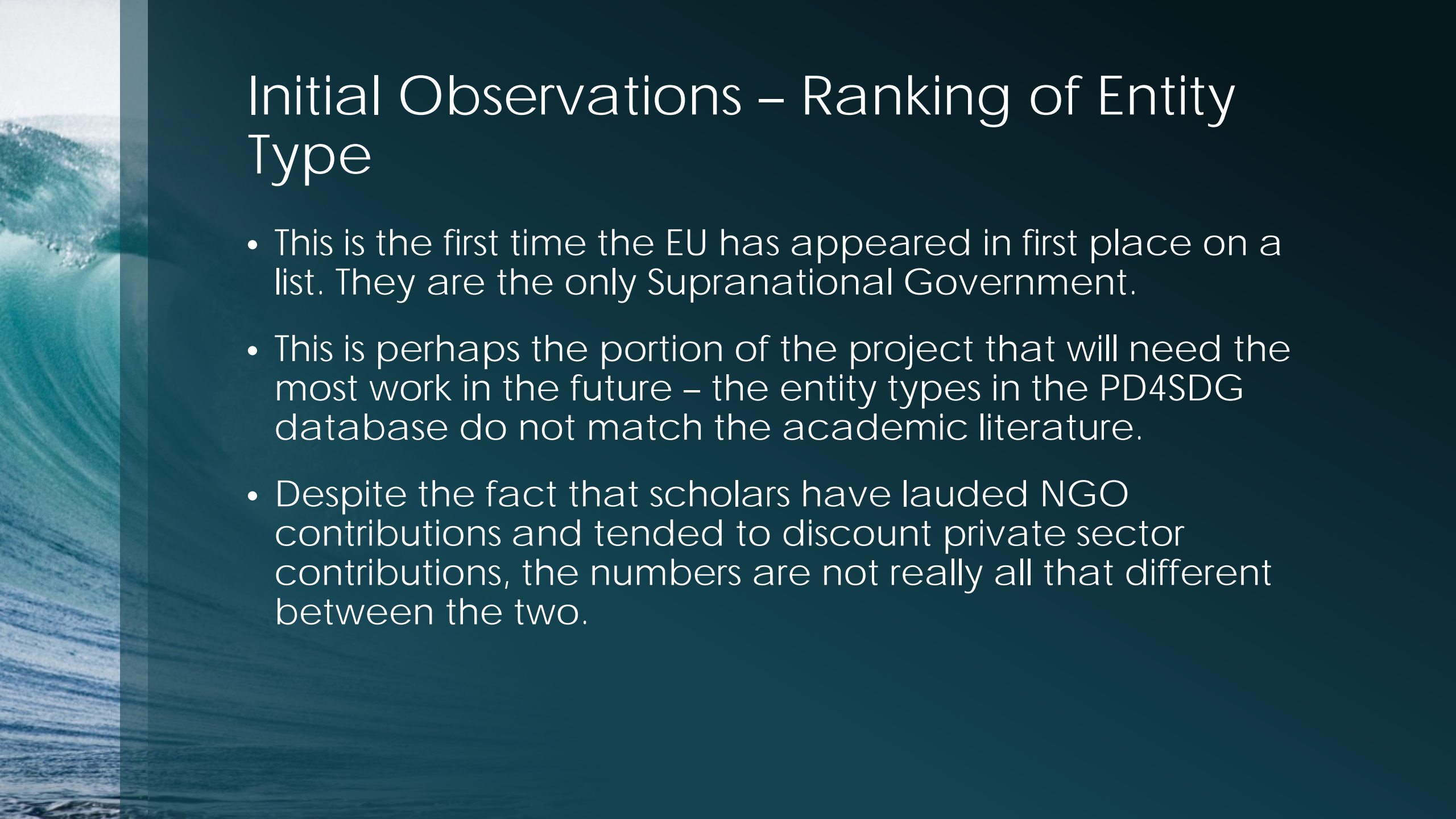
Initial Observations – Top 3 entities

- This graph suggests to me that there are a relatively small number of popular organizations holding the network together.

Results – Ranking of Entity Type

Rank	Type	PageRank Score	Betweenness Centrality	Degree
1	Supranational Government	37.90	24.38	169.00
2	National Government	7.29	2.00	39.94
3	United Nations Entity	5.97	2.68	30.75
4	Intergovernmental Organization	3.66	0.49	17.85
5	NGO	3.36	0.40	15.14
6	Scientific Community	3.18	0.34	15.49
7	Philanthropic Organization	3.15	0.23	12.66
8	Private Sector	3.11	0.05	14.65
9	Academic Institution	3.07	0.13	12.73
10	Partnership	2.97	0.02	11.78
11	Civil Society Organization	2.89	0.02	8.68
12	Other Relevant Actor	2.62	0.00	6.67
13	Regional Government	2.56	0.06	8.62

Initial Observations – Ranking of Entity Type

- This is the first time the EU has appeared in first place on a list. They are the only Supranational Government.

- This is perhaps the portion of the project that will need the most work in the future – the entity types in the PD4SDG database do not match the academic literature.

- Despite the fact that scholars have lauded NGO contributions and tended to discount private sector contributions, the numbers are not really all that different between the two.

Theoretical Insights

- There is dense network. However, there are also multiple disconnected networks. This does not preclude a completely inclusive network forming in the future.

- The network is shockingly fragile. It can be split into multiple networks at multiple locations.

- This dataset does not answer the question of which actor type is most important within regime formation. Different methodologies lead to a different conclusion.

Next Steps

- We intend to streamline data categories to more closely match academic literature.

- We will add in other goals to complete initial analysis.

Questions?