Assessing “Green” Digital Policies:

Policy Analysis Use Case with Agentic AI and Vibe Coding (Work in progress)

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Why this research ?

Motivation is anchored in the 2024 UNCTAD Digital Economy Report

- Single best report released by the UN in 2024 - must read for policy makers working on sustainability of digital policy

- **Gap in the report:**
  - How green are existing digital policy frameworks at the national level ?
  - What are the key issues and gaps ?
  - How can the UN help build capacity to green digital frameworks ?

- **Research goals:**
  - Develop a green assessment framework for digital policy
  - Use multi-agent approach / agentic AI
  - Use vibe coding for customized analysis

A green assessment framework for national digital policies

Method Overview

National Digital Policy Frameworks:

Digital Transformation Strategies (240)

Artificial Intelligence Strategies (88)

Data Strategies (33)

Collect all three frameworks for every country

Three Tiers of Environmental Effects:

Environmental impacts of digital technology (**Direct** effects)

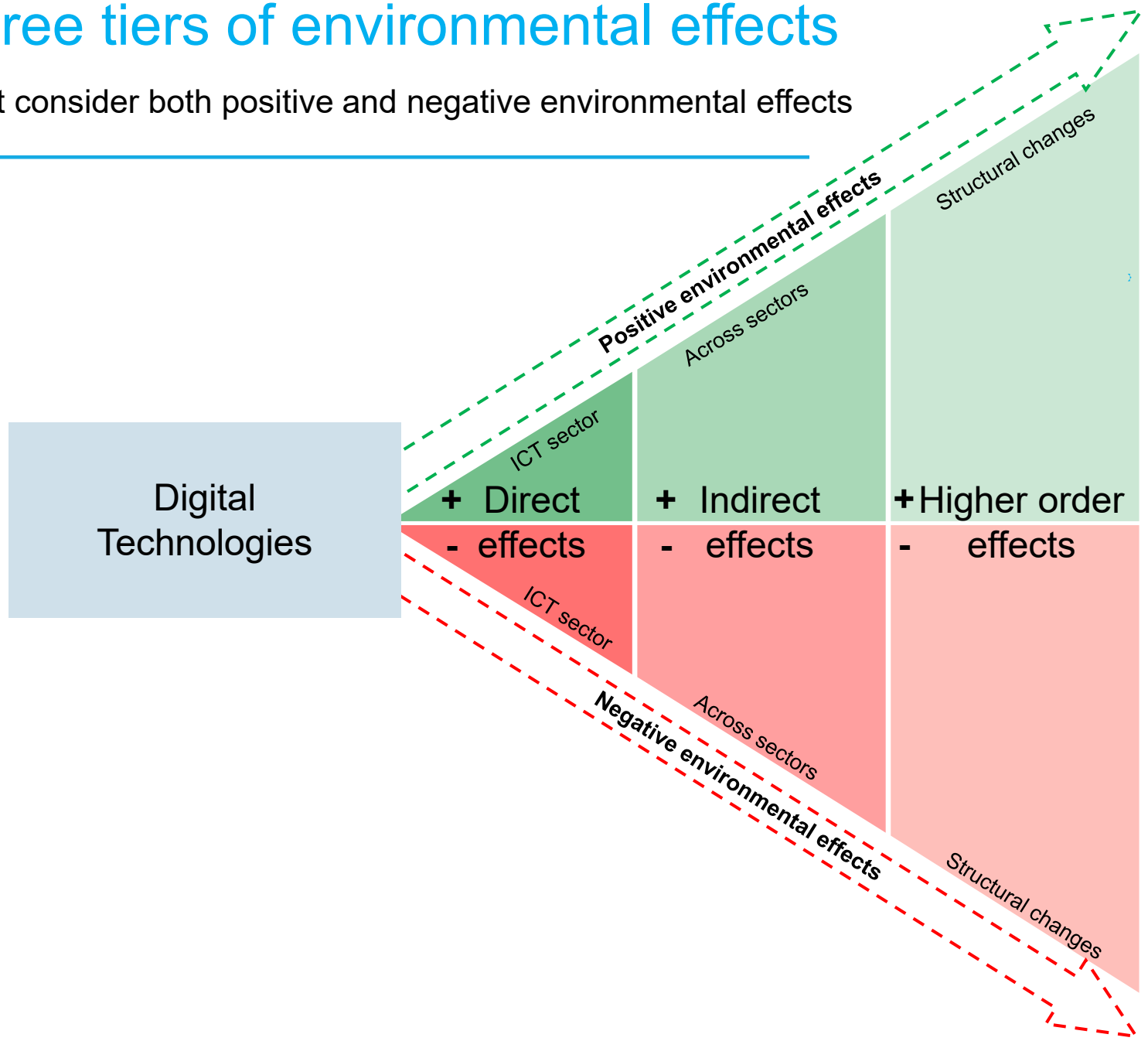
Sectoral applications of digital technologies (**Indirect** effects)

Sustainability Outcomes (**Higher-order** effects)

Use AI to assess how each dimension is reflected in the digital frameworks (positive / negative)

Three tiers of environmental effects

Must consider both positive and negative environmental effects



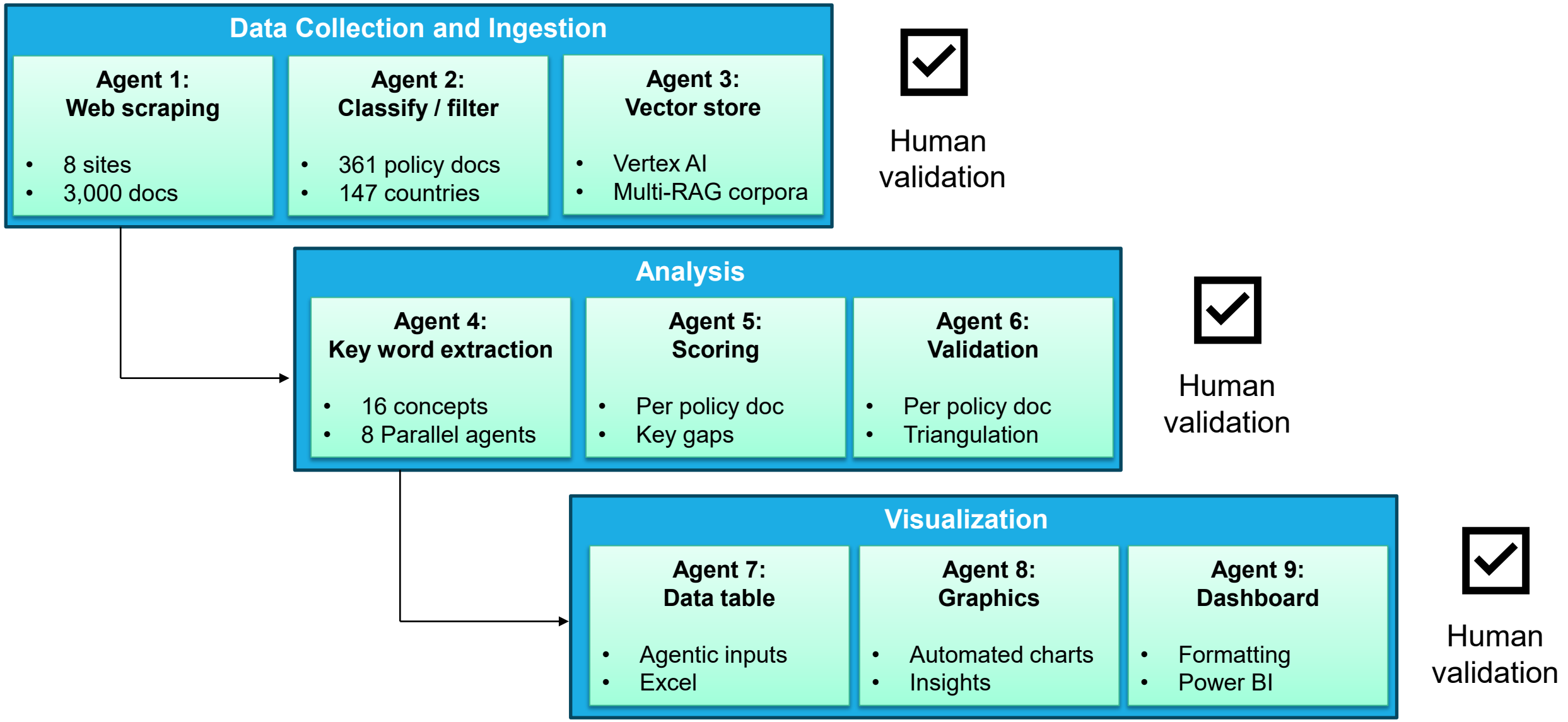
Search Concepts (Presence)

Energy consumption
GHG Emissions
Water Consumption
Land Use
Critical Minerals
E-waste

Natural Resources
Environmental Sustainability
Early Warning
Environmental Monitoring
Circular Economy
Dematerialization
Sustainable Consumption
Climate Action
Nature Protection
Pollution Prevention

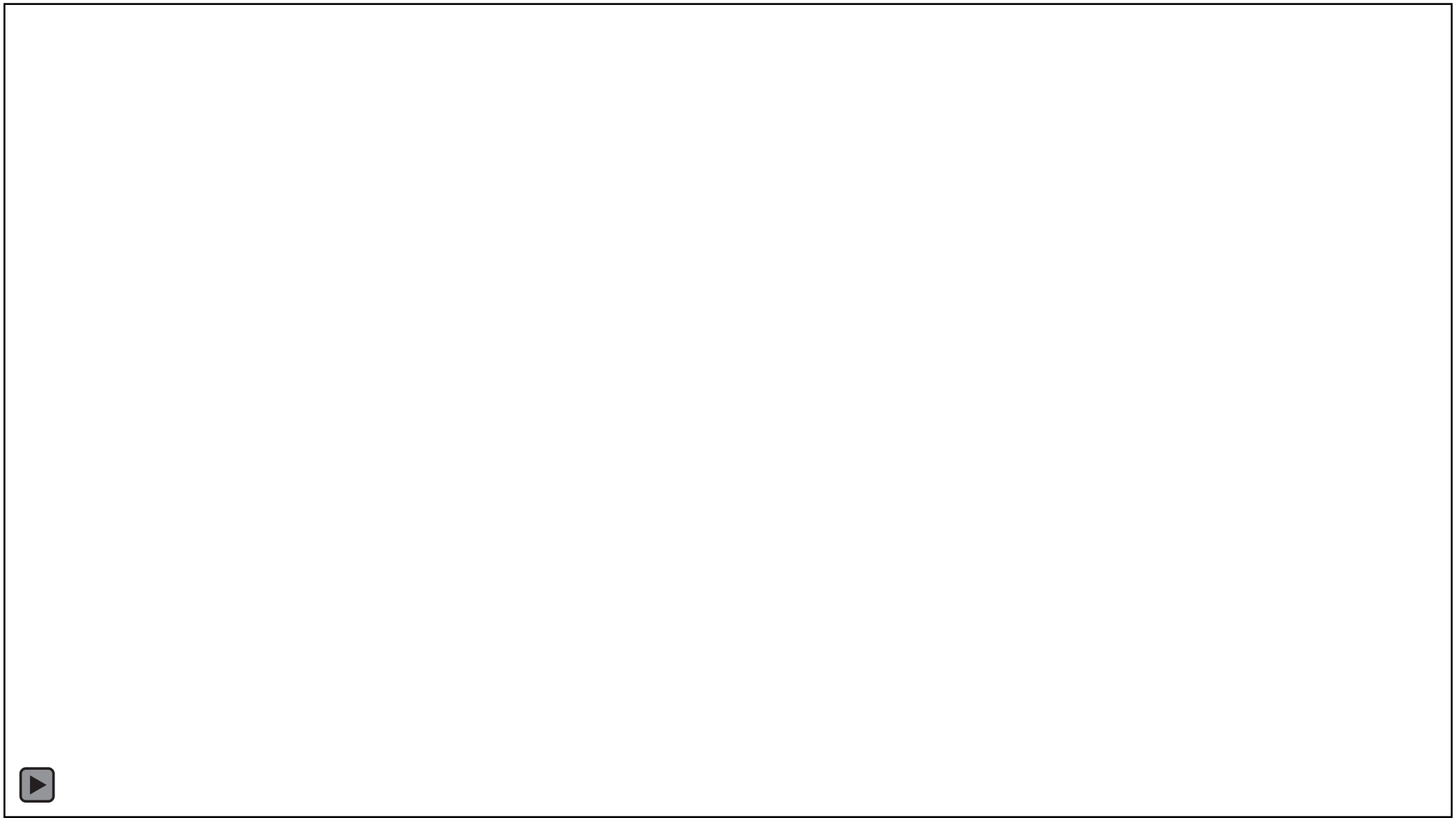
Agentic Workflow

Main steps to complete the analysis: multiple AI agents used with vibe coding (Google Gemini 2.0 with Vertex AI and ADK)



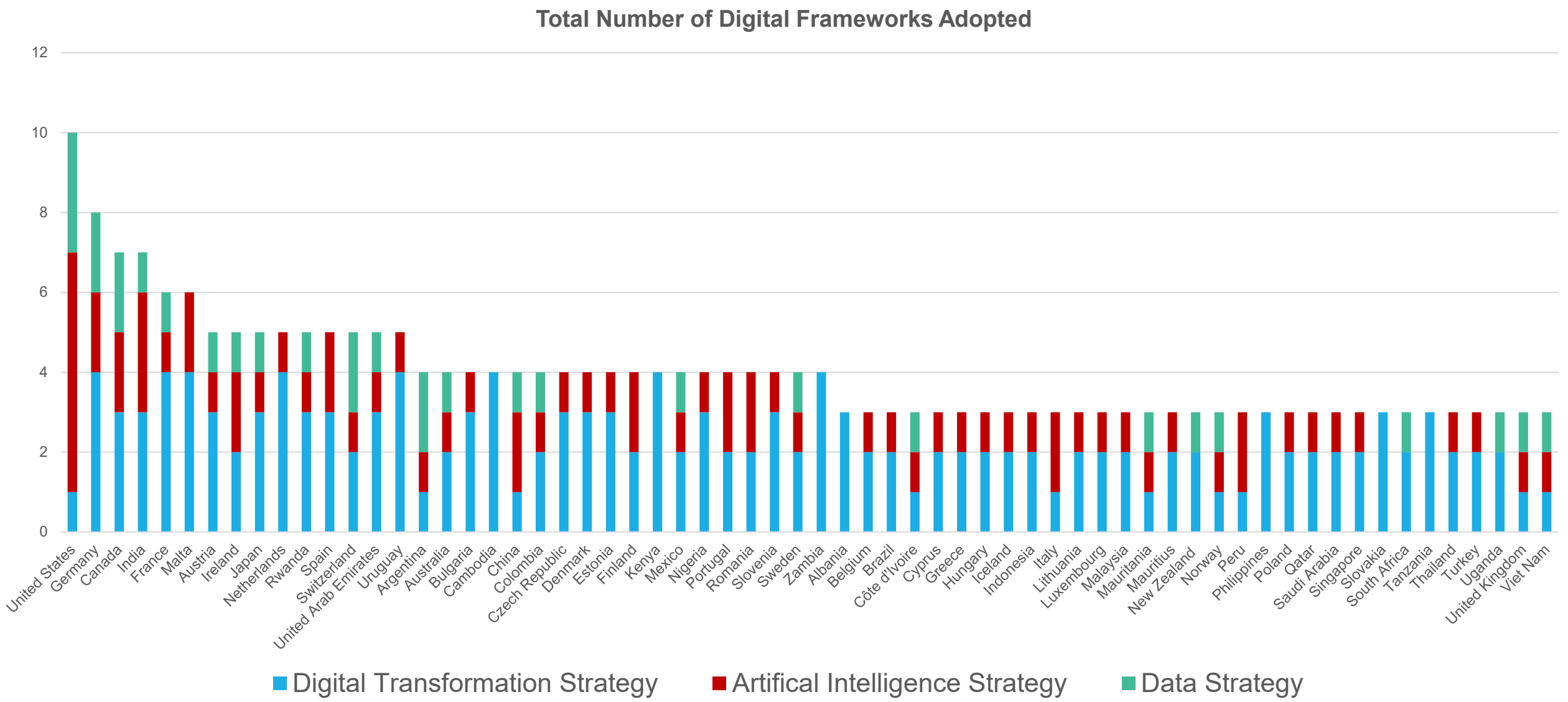
Vibe Coding

Revolution in coding for non-coders: generates full code using natural language based on user intent



Initial findings

Digital Policy Frameworks: 361 cumulative frameworks adopted



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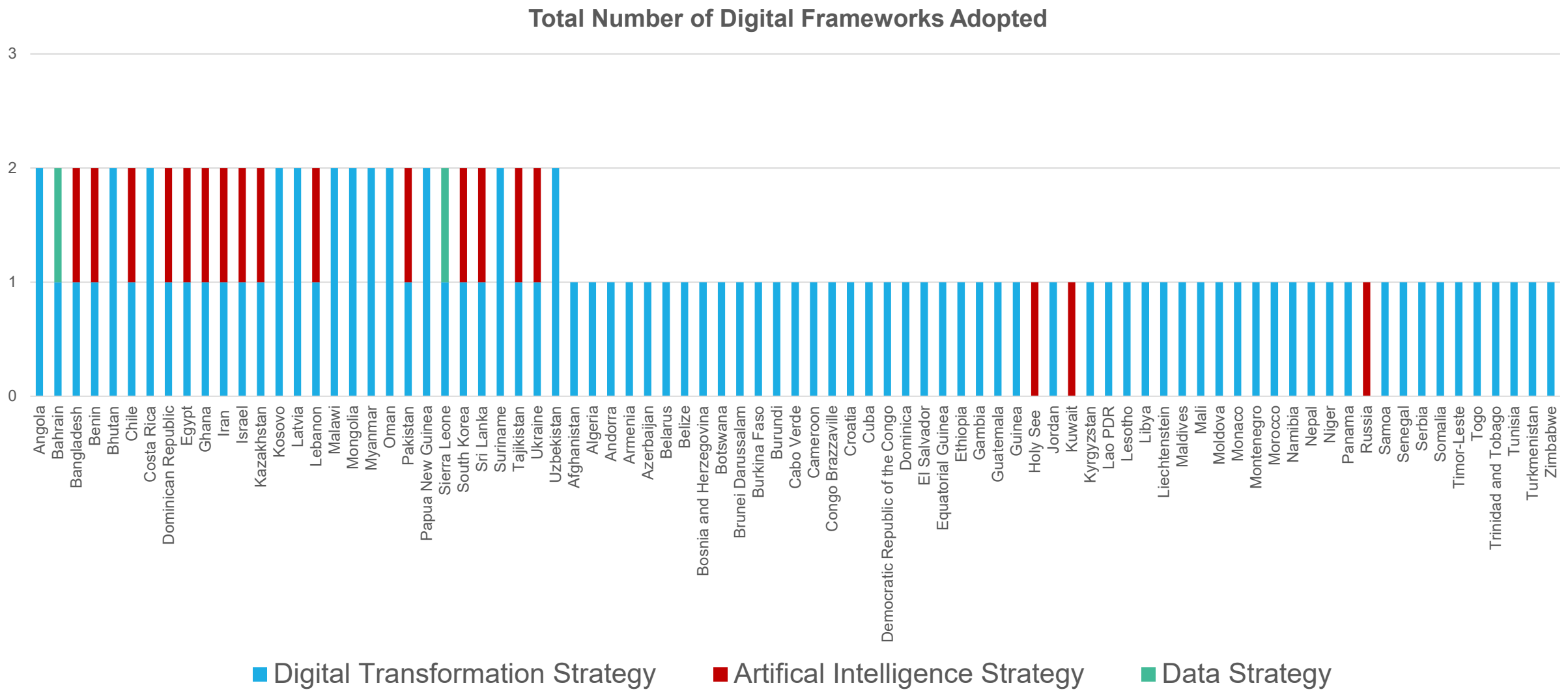

Initial findings

Digital Policy Frameworks: 51 countries / territories have not adopted digital policies (available online)

1. Antigua and Barbuda
2. Bahamas
3. Barbados
4. Bolivia
5. Central African Republic
6. Chad
7. Comoros
8. Cook Islands
9. Djibouti
10. Ecuador
11. Eritrea
12. Eswatini
13. Fiji
14. Gabon
15. Georgia
16. Grenada
17. Guinea-Bissau
18. Guyana
19. Haiti
20. Honduras
21. Iraq
22. Jamaica
23. Kiribati
24. Kitts and Nevis
25. Liberia
26. Madagascar
27. Marshall Islands
28. Micronesia
29. Mozambique
30. Nauru
31. Nicaragua
32. Niue
33. North Korea
34. North Macedonia
35. Palau
36. State of Palestine
37. Paraguay
38. Saint Lucia and the Grenadines
39. Saint Vincent
40. San Marino
41. Sao Tome and Principe
42. Seychelles
43. Solomon Islands
44. South Sudan
45. Sudan
46. Syria
47. Tonga
48. Tuvalu
49. Vanuatu
50. Venezuela
51. Yemen

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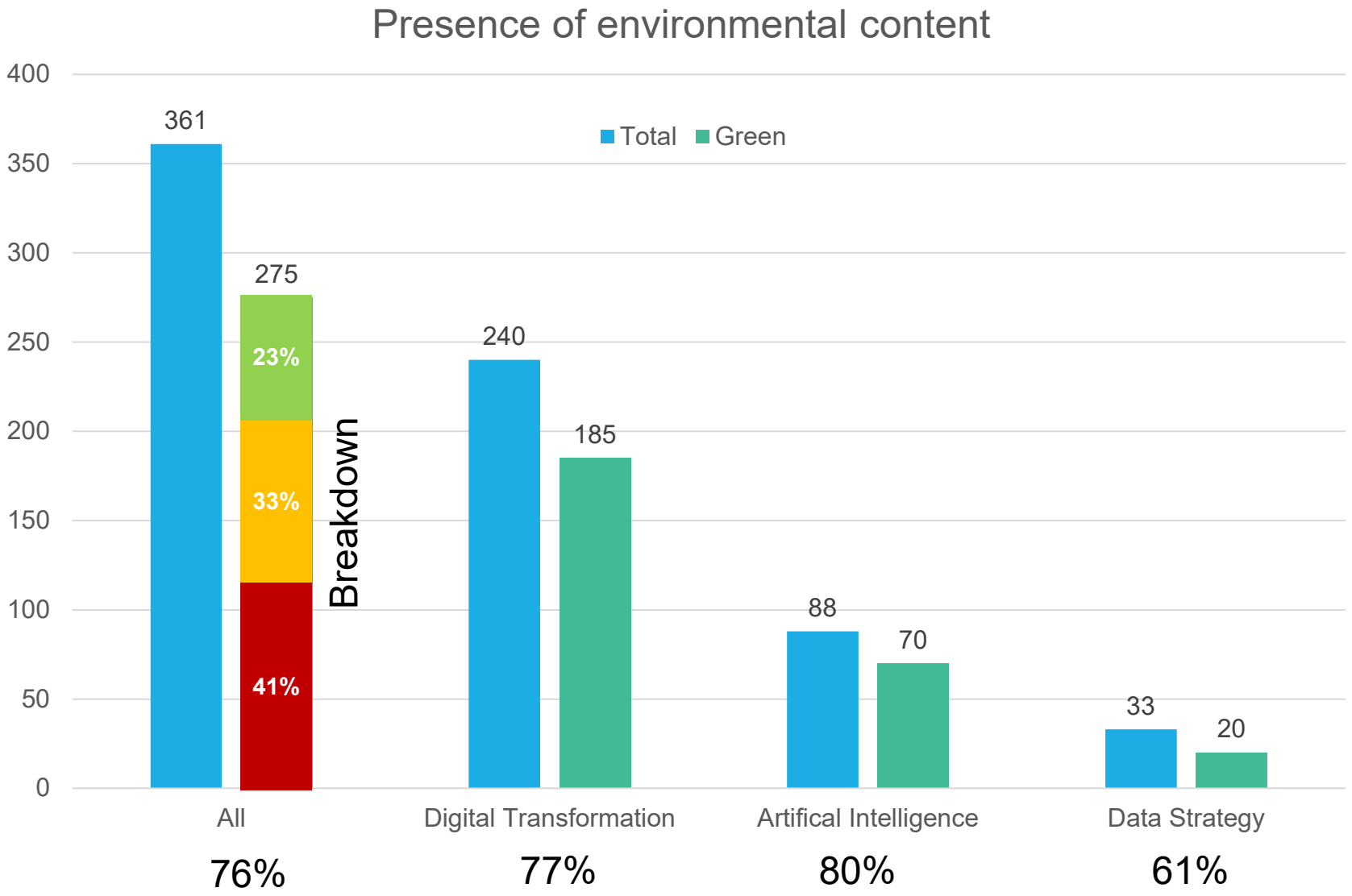
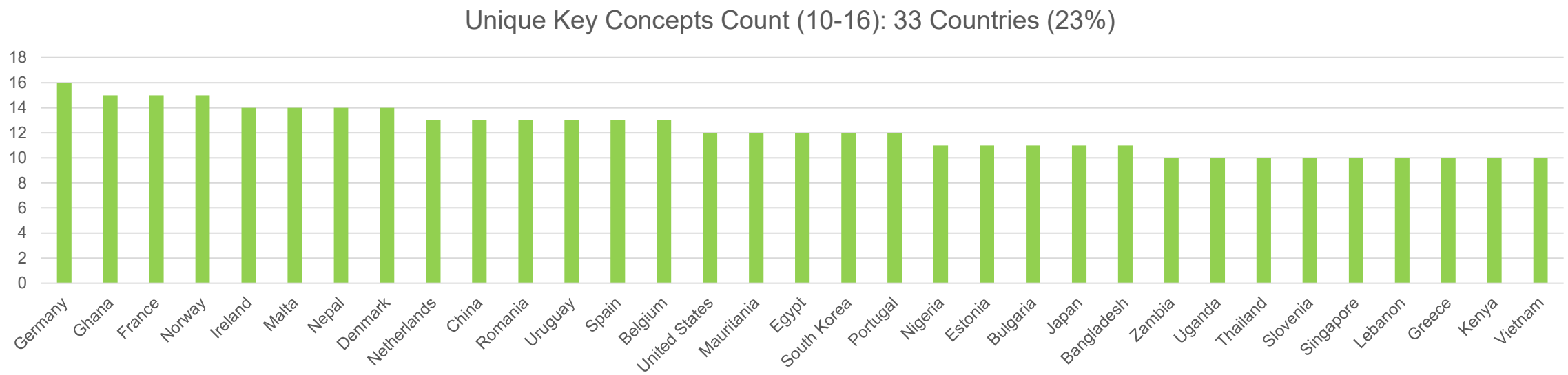
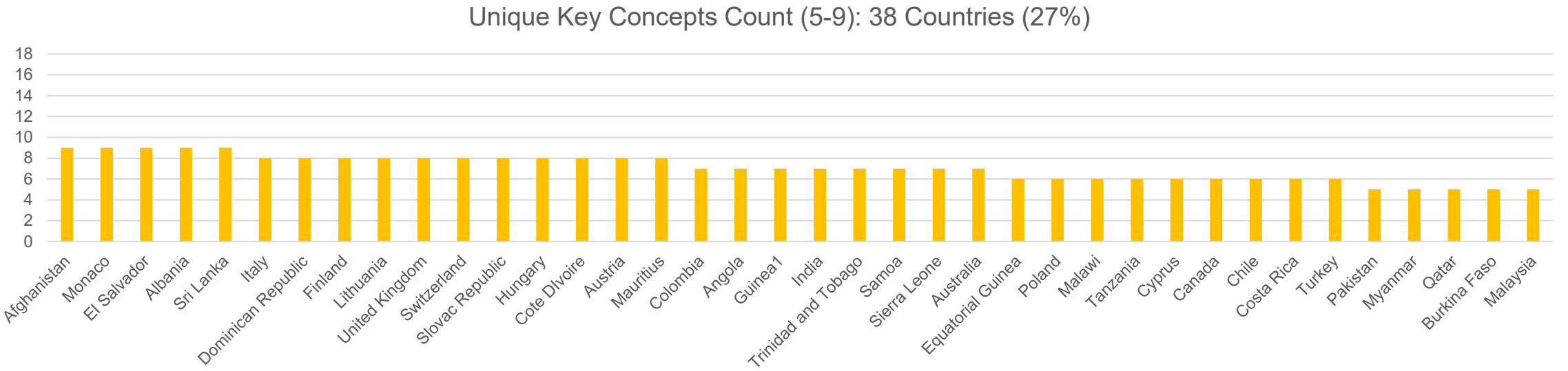


Initial findings

Frequency of 16 key terms by country across all policy types





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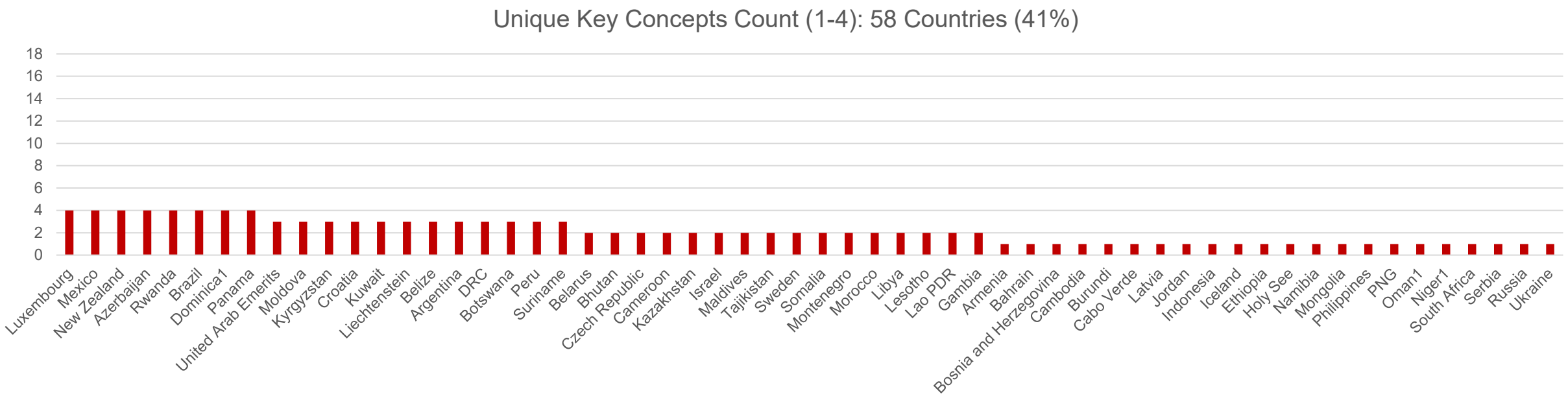
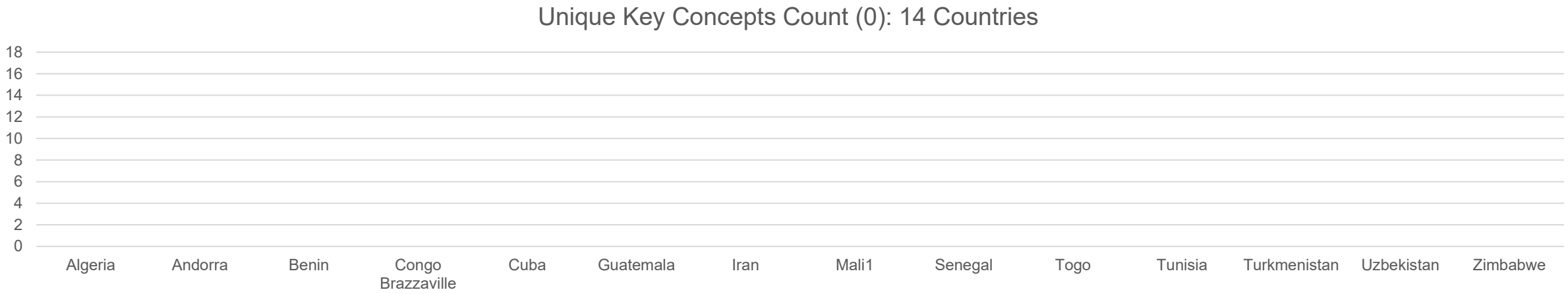
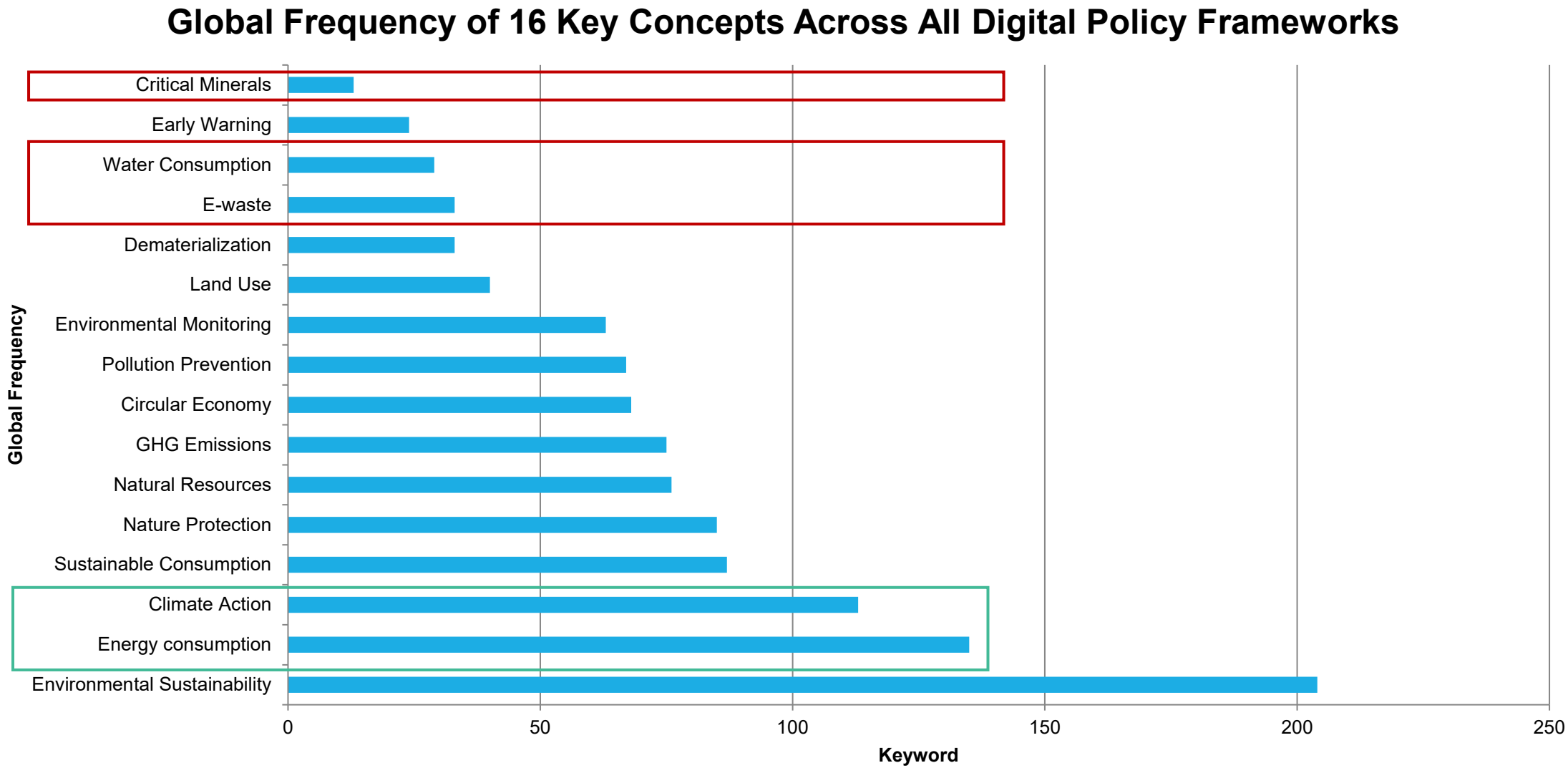




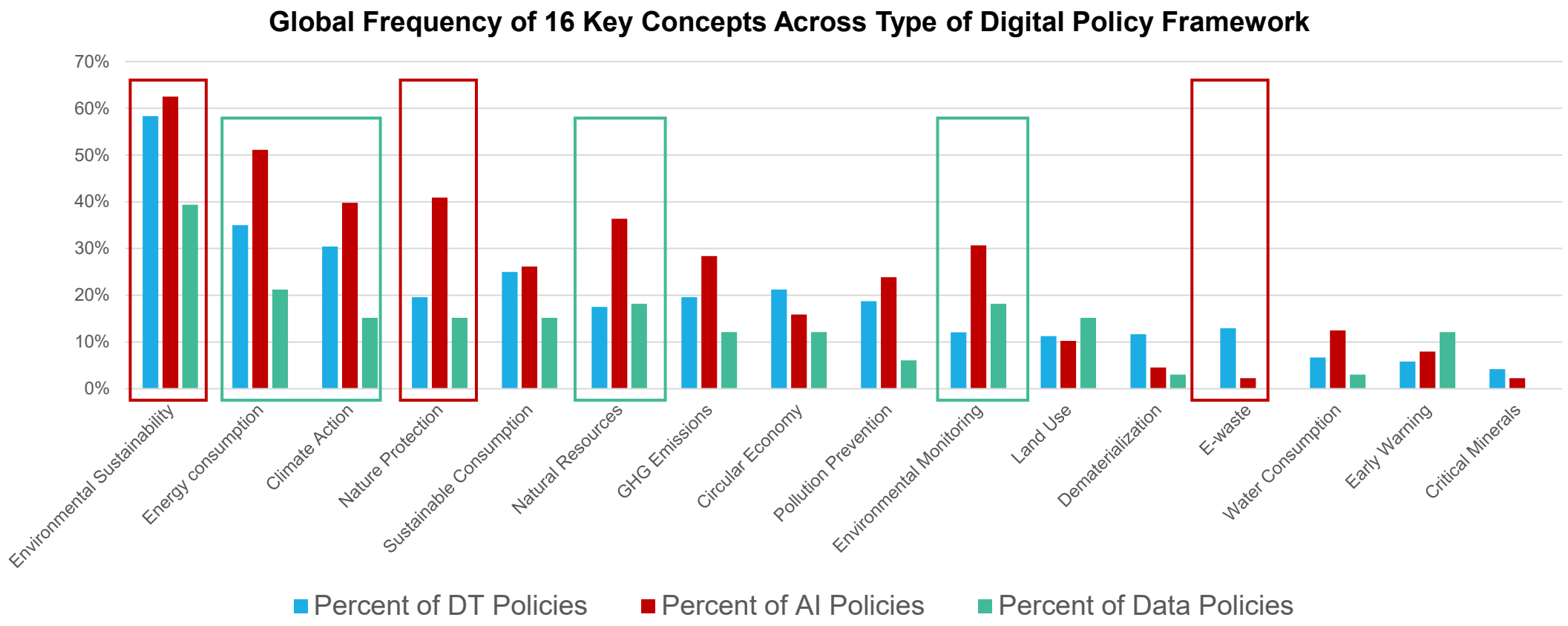
Initial findings

Frequency of 16 key terms by concept across all digital policy frameworks



Initial findings

Frequency of 16 key terms by type of policy (normalized)



Conclusions

1. Viable approach for conducting **global-scale multi-lingual environmental** policy analysis and monitoring
2. Human **validation** is still essential at each step
3. Better to establish **country-specific corpora** rather than single large corpus (for retrieval augmented generation)
4. Better to use **multi-agent workflow** compared to single prompt
5. Code takes around **2 hours to run / 2-3 days to write / 2 dollars in CPU costs** (Gemini / Google Vertex AI)
6. Easy identification of key issues and gaps with **high accuracy**
7. Difficult to determine **positive or negative environmental effects**
8. Direct effects can be **quantified**, **indirect and higher-order effects cannot** (but awareness is needed)
9. Can be easily applied to **other policy analysis use cases**
10. Can be transformed into a **custom LLM tool (chatbot)** for policy makers to retrieve best practices

Next Steps

1. Refine the scoring methods to look at **direct, indirect and higher-order** environmental effects
2. Refine the scoring methods to look at **positive** environmental benefits versus **negative** impacts
3. Refine the approach to compare **regional** content
4. Conduct similar analysis looking at digital integration within **environmental policy frameworks**
5. Collect **feedback** from **member states** and other stakeholders
6. Issue **guidance note** on best practices for greening digital policy frameworks
7. Test feasibility of a **custom LLM tool (chatbot)** to retrieve best practice in policy formulation

UN environment programme

Thank you

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