

<sup>1</sup>Department of Agricultural, Forest and Food Sciences  
(DISAFA), University of Turin

<sup>2</sup>Stirling University Management School

---

# *Ecosystem services: a public opinion analysis of Twitter users*

---

Authors:

**Stefano Bruzzese<sup>1</sup>**, Wasim Ahmed<sup>2</sup>, Simone Blanc<sup>1</sup>, and Filippo Brun<sup>1</sup>

*ICEP 2023 International Conference on Environmental Psychology Aarhus, Denmark – June 20-23, 2023*

# THE CONTEXT

“The ecosystem services are the multiple benefits an ecosystem provides to humans” (MEA, 2005)



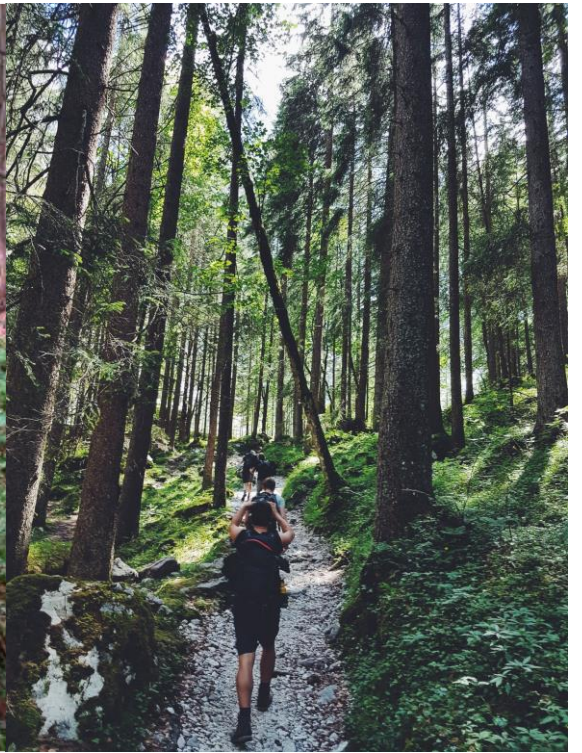
SUPPORTING



PROVISIONING

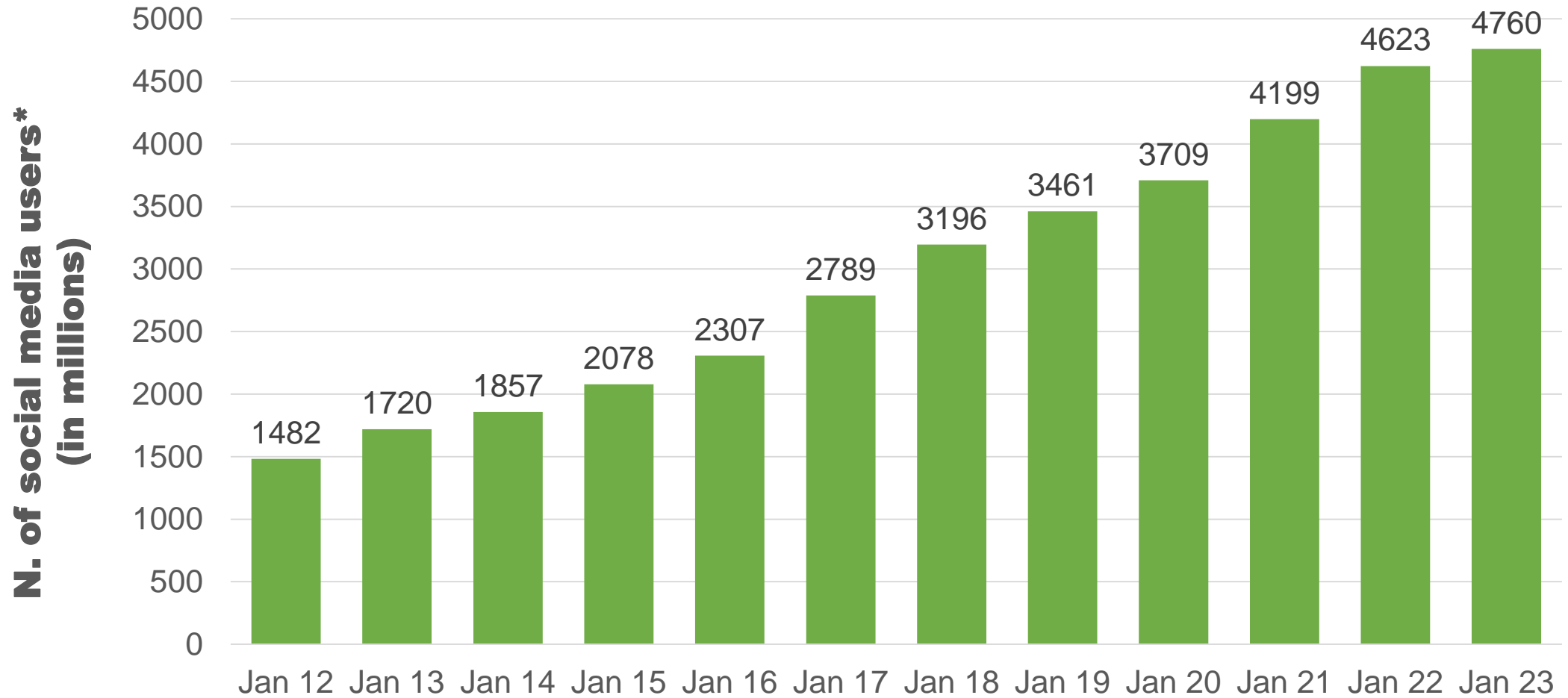


REGULATING



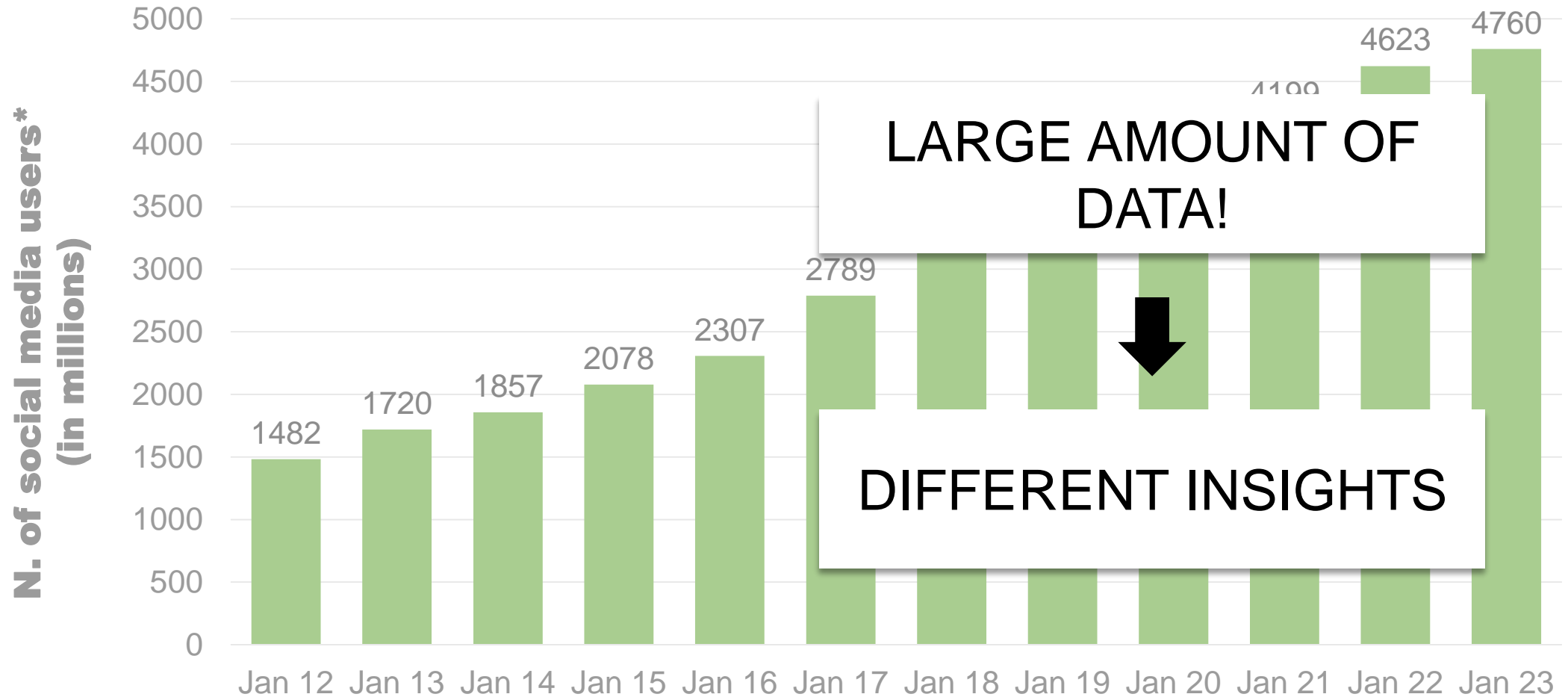
CULTURAL

# WHY SOCIAL MEDIA?



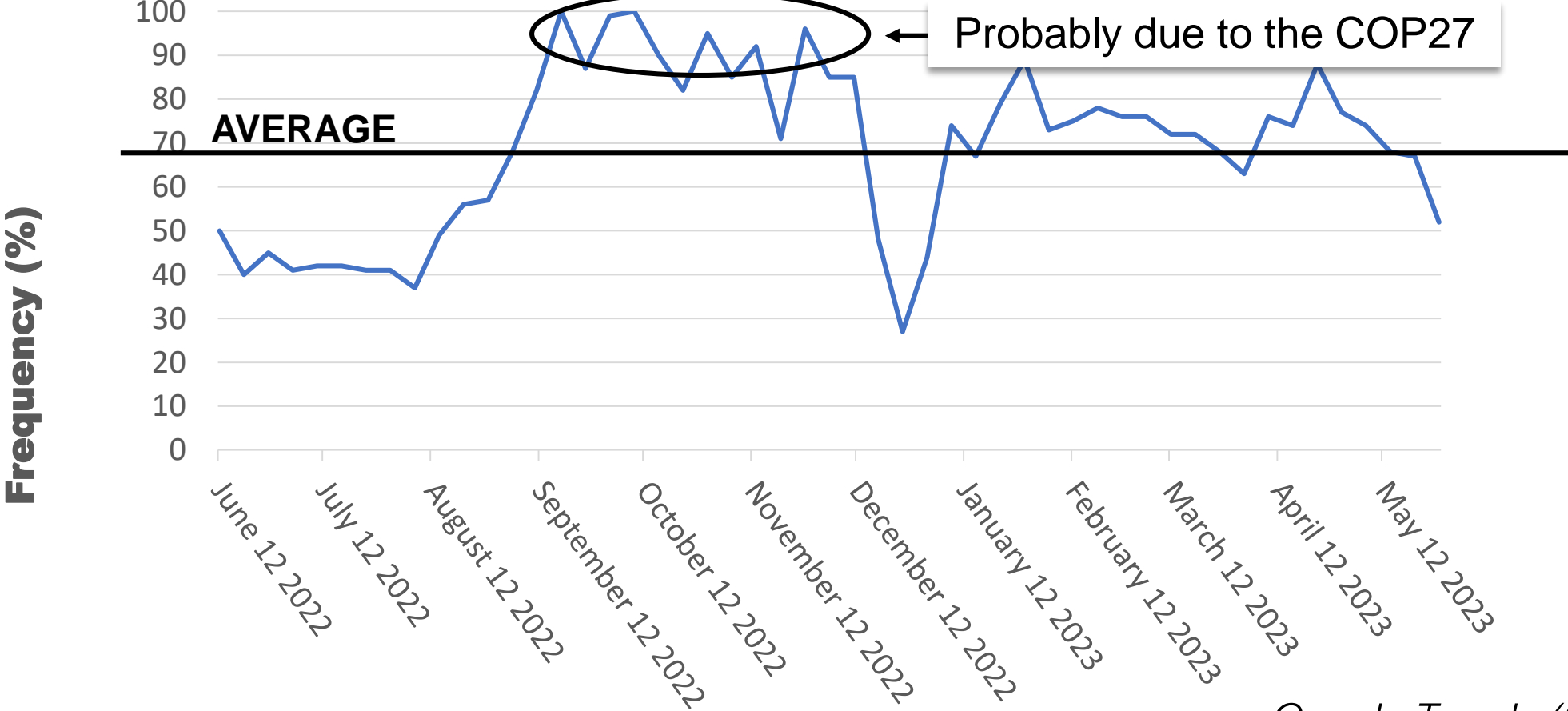
\*Users may not represent unique individuals. *Digital 2023 Global Overview Report (2023)*

# WHY SOCIAL MEDIA?



\*Users may not represent unique individuals. *Digital 2023 Global Overview Report (2023)*

# GLOBAL ONLINE TREND IN ECOSYSTEM SERVICES

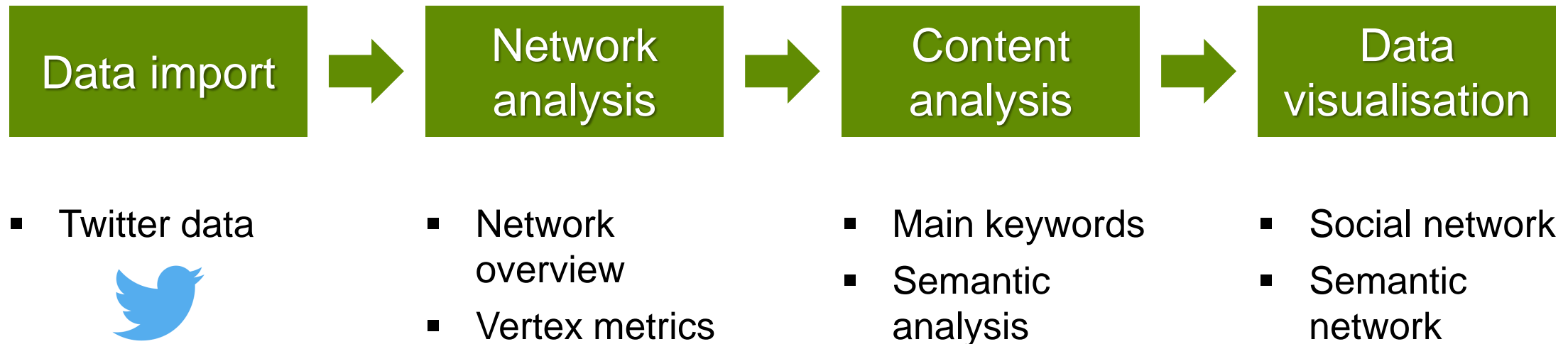


Google Trends (2023)

# OUR MAIN RESEARCH GOALS

- **RQ1:** What is the social network on Twitter behind the term ecosystem services?
  - H1:** A social network with few connections and few interactions
  - H2:** A social network with few connections but many interactions
  - H3:** A social network with many connections but few interactions
  - H4:** A social network with many connections and many interactions
- **RQ2:** What are the most discussed contents on Twitter regarding ecosystem services?
  - H5:** Environmental and ecological implications
  - H6:** Social implications
  - H7:** Economic implications
  - H8:** Political implications

# METHODOLOGICAL FRAMEWORK



NodeXL plugin was used for analysis

*Social Media Research Foundation (2022)*

# DATA IMPORT

SEARCH STRING: "ecosystem services OR #ecosystemsolutions"

<b>Tweet type</b>	<b>25 January 2022</b>	<b>3 February 2022</b>
Tweet	221	244
Retweet	895	755
Replies to	88	71
Mentions	376	362
MentionsInRetweet	737	649
<b>Total</b>	<b>2,317</b>	<b>2,081</b>



# NETWORK ANALYSIS

	25 January 2022	3 February 2022
Twitter Users	1,427	1,359
Unique Relationships B/w Users	2,034	1,905
Relationships With Duplicates	283	176
Total Relationships B/w Users	2,317	2,081
Self-Loops	227	246
Diameter	14	11
Average Distance	5.68	4.44
Density	0.00097	0.00096
Modularity	0.82	0.84

- Poorly connected network but good dissemination of information within groups
- Good structure of network groups

# CONTENT ANALYSIS – MAIN HASHTAGS

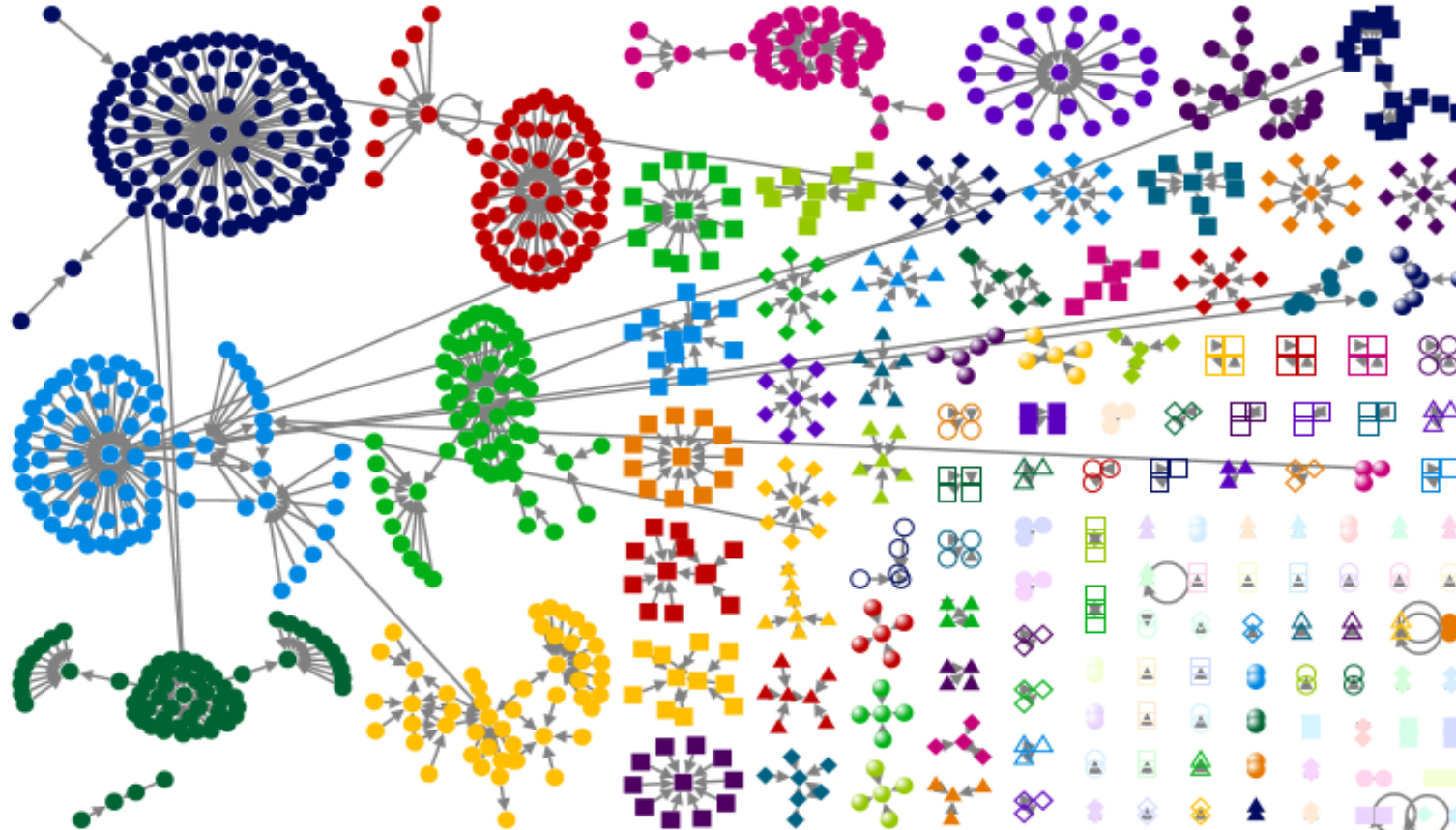
<b>25 January 2022</b>	<b>#</b>	<b>3 February 2022</b>	<b>#</b>
ecosystem services	158	worldwetlandsday	193
ecosystem	59	ecosystems-services	174
india	59	wetlands	125
tiger	58	biodiversity	120
agriculture	56	actforwetlands	75
morningpositives	54	generationrestoration	56
biodiversity	49	ecosystem	50
soil	45	worldwetlandday	39
groundedinsoil	45	climatechange	29
climatechange	44	nature	26

# CONTENT ANALYSIS – SEMANTIC ANALYSIS

25 January 2022		Occurence	3 February 2022		Occurence
socio	ecological	103	climate	change	51
ecological	networks	95	wetlands	life	45
interactions	people	92	life	livelihoods	45
people	environment	92	livelihoods	wetlands	45
environment	socio	92	wetlands	health	45

Most frequent word-pairs are linked to the interaction between society and the environment

# DATA VISUALISATION – SOCIAL NETWORK



Dataset of 25 January 2022

COMMUNITY CLUSTER  
STRUCTURE



- Small-medium size groups
- Moderate connections

*In accordance with  
Smith et al. (2014)*

# DATA VISUALISATION – SEMANTIC NETWORK

SOCIO-  
ECOLOGICAL  
SYSTEMS (SES)

REGULATING  
SERVICES

NATURE-BASED  
SOLUTIONS (NBS)

SUSTAINABLE FOOD  
PRODUCTIONS

MARKET FOR  
ECOSYSTEM  
SERVICES (MES)

# CONCLUSIONS

---

- Poor interaction between users not supported by high re-sharing of content (excessive communication noise) -> H2
- Stable network clusters with different opinions about the topic (H5-H8) -> possible echo-chambers??
- PROs:
  - Analysis of user behaviour against stated intentions
  - Useful complementary methods to off-line analyses for outlining future participatory programmes and policies -> beware of fake news and false users
- CONSs:
  - Cross-sectional study
  - English-language tweets only



**Stefano Bruzzese**  
*PhD student in Forest  
Policy and Economics*



stefano.bruzzese@unito.it



Stefano Bruzzese

My ResearchGate profile:



---

**THANKS FOR THE ATTENTION!**

# REFERENCES

- Bruzzese, S., Ahmed, W., Blanc, S. & Brun, F. (2022). Ecosystem Services: A Social and Semantic Network Analysis of Public Opinion on Twitter, IJEPRH, Link: <https://www.mdpi.com/1660-4601/19/22/15012>
- Datareportal, We Are Social & Meltwater (2023). Digital 2023 Global Overview Report. Link: <https://datareportal.com/reports/digital-2023-global-overview-report>
- Google Trends (2023). Ecosystem services on a global scale. Link: <https://trends.google.es/trends/explore?q=Ecosystem%20services&hl=en-GB>
- Social Media Research Foundations (2022). Social Media Research Winter School 2022. Link: <https://www.smrfoundation.org/nodexl/nodexl-events/winter-school/>
- Smith, M. *et al.* (2014). Mapping Twitter Topic Networks: From Polarized Crowds to Community Clusters, Pew Research Center: Internet, Science & Tech. Link: <https://policycommons.net/artifacts/620393/mapping-twitter-topic-networks/1601593/> on 26 Apr 2022. CID: 20.500.12592/mphqsd