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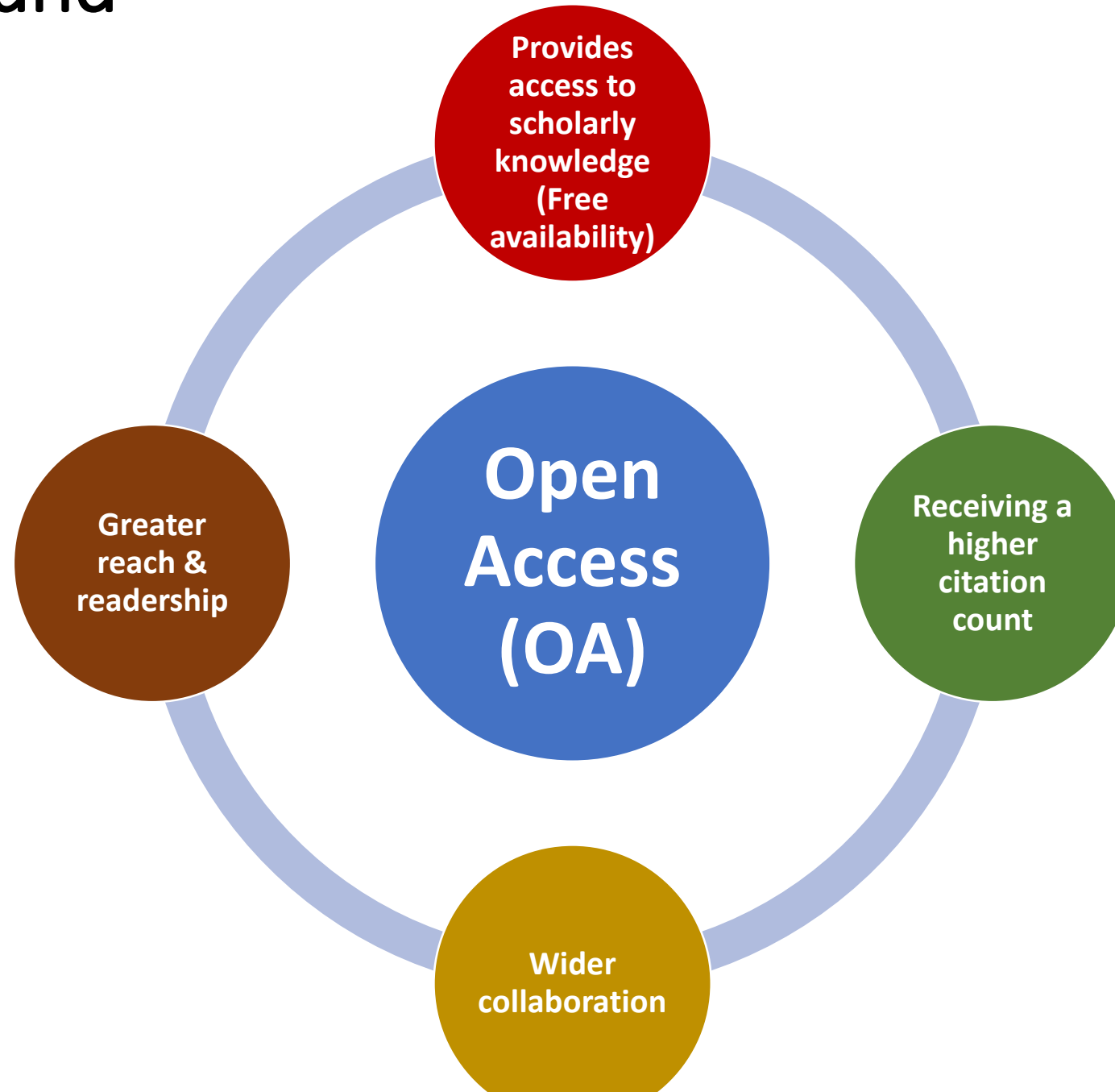
Mapping and visualizing the Arab region's contribution to global environmental research through open access publishing

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Background





Cited more

1.6x more citations of OA articles than non-OA articles across all subjects



Downloaded more

4x more downloads of OA articles than non-OA articles



Greater impact

2.5x more Altmetric attention. OA articles attracted 1.9x more news mentions and 1.2x more policy mentions



* benefiting readers without access
* benefiting articles' authors

Metrics are increasingly taken into consideration when conducting performance evaluations of scientists, institutions, etc.

play an important role in scientists' professional advancement and status

OA: gaining a foothold in the publishing world

OA: deepening the inequalities (developed and developing countries)- in sharing scientific advances

OA: should promote equal opportunities for researchers worldwide

Arab world: a major producer of scientific information

Witnessed a significant increase in the production of open access knowledge content

Arab world region: characterized by its harsh and demand environment, high vulnerability to climate change

Environmental issues: top-most priorities

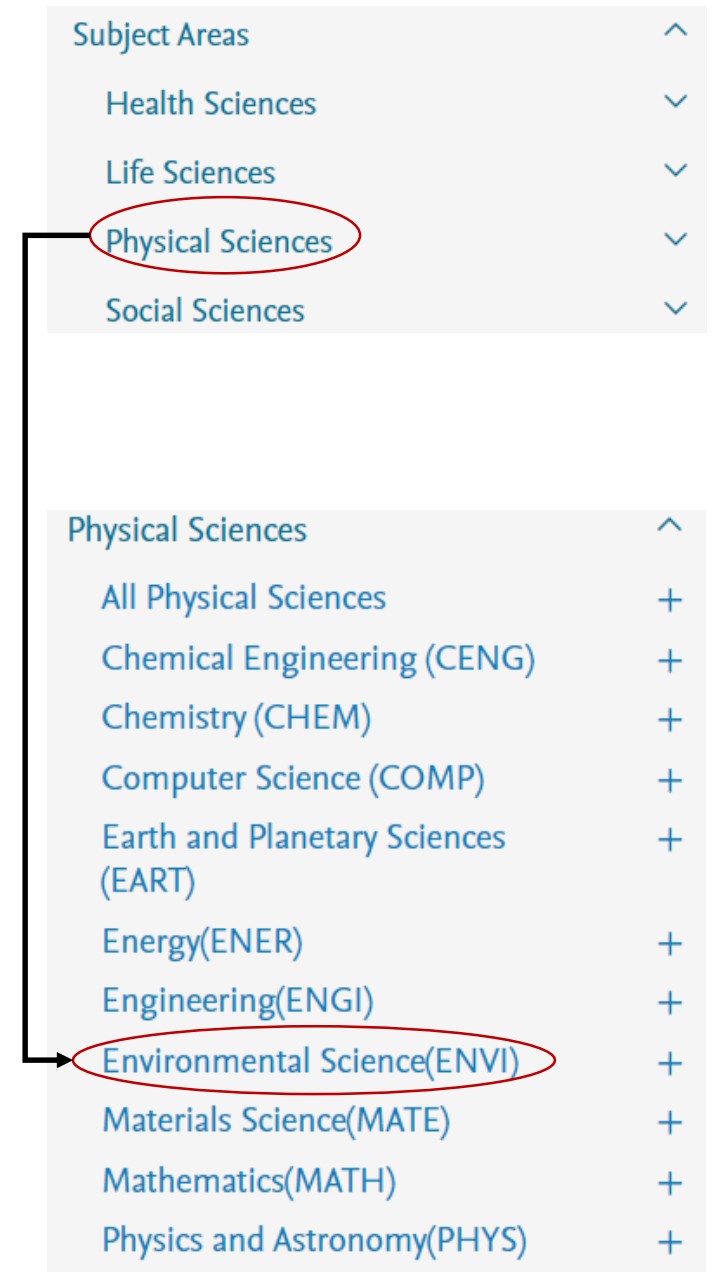
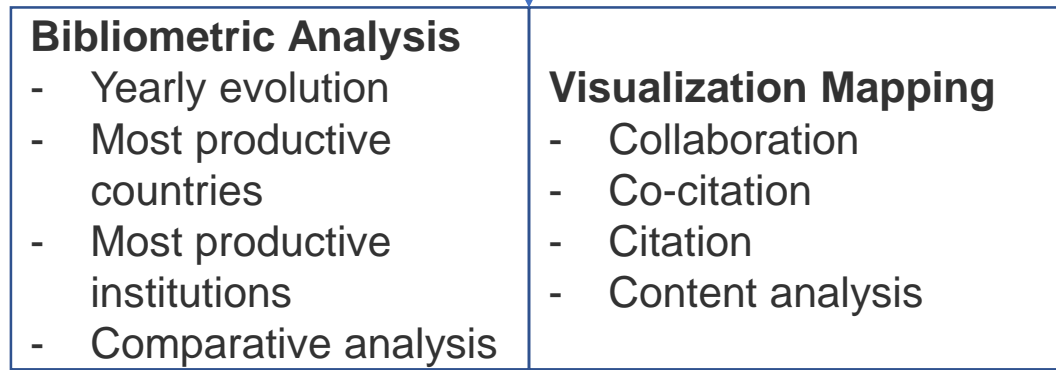
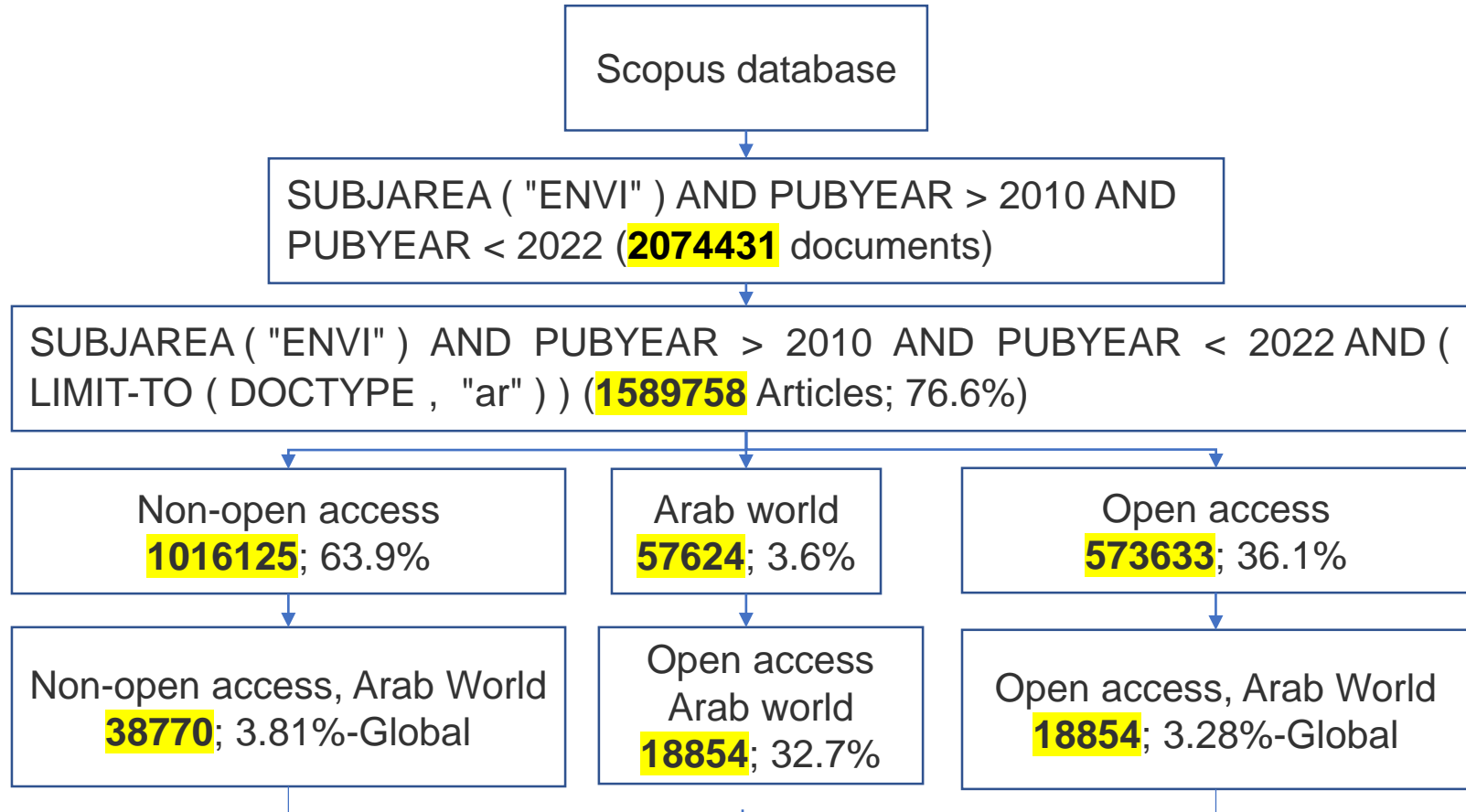
To guarantee the sustaining of economic growth and social developments

Boost the efforts of addressing and mitigating the environmental risks

Major objectives

- Trace the growth and development of environmental research originating from the Arab world,
- and is disseminated through open-access publishing
- Explore different bibliometric indicators, quantitative and qualitative, associated with these publications
- Compare these indicators with other works published in the subscription model

Methodology



Results & Discussion

Table 1: Productivity, Arab world, OA

#	COUNTRY/TERRITORY	No. of documents (open)	%
1	Saudi Arabia	5701	30.2
2	Egypt	4481	23.8
3	Iraq	2044	10.8
4	Morocco	1436	7.6
5	Tunisia	1420	7.5
6	Algeria	1363	7.2
7	United Arab Emirates	1180	6.3
8	Jordan	826	4.4
9	Qatar	749	4.0
10	Lebanon	581	3.1
11	Oman	432	2.3
12	Kuwait	358	1.9
13	Sudan	244	1.3
14	Syrian Arab Republic	229	1.2
15	Palestine	220	1.2
16	Libyan Arab Jamahiriya	175	0.9
17	Yemen	142	0.8
18	Bahrain	133	0.7
19	Mauritania	13	0.1
20	Somalia	4	0.0

Table 2: Productivity, Arab world, Non- OA

#	COUNTRY/TERRITORY	No. of documents (non- open)	%
1	Egypt	10646	27.5
2	Saudi Arabia	9129	23.5
3	Tunisia	3848	9.9
4	Algeria	3667	9.5
5	Iraq	3594	9.3
6	Morocco	3498	9.0
7	United Arab Emirates	2279	5.9
8	Jordan	1624	4.2
9	Qatar	1069	2.8
10	Oman	1042	2.7
11	Lebanon	957	2.5
12	Kuwait	852	2.2
13	Palestine	414	1.1
14	Sudan	353	0.9
15	Syrian Arab Republic	338	0.9
16	Yemen	282	0.7
17	Libyan Arab Jamahiriya	218	0.6
18	Bahrain	58	0.1
19	Mauritania	15	0.0
20	Djibouti	3	0.0

Table 3: Productivity, Arab world, OA using Adjustment Index (AI)

#	COUNTRY/TERRITORY	No. of documents (OA)	%	Population Size	Total GDP	Adjustment Index (AI)	Rank
1	Saudi Arabia	5701	30.2	35340680	833541236.6	242	7
2	Egypt	4481	23.8	104258327	404142766.1	1156	1
3	Iraq	2044	10.8	41179351	207889333.3	405	2
4	Morocco	1436	7.6	37344787	132725261.5	404	3
5	Tunisia	1420	7.5	11935764	46840042.94	362	5
6	Algeria	1363	7.2	44616626	167983141.7	362	4
7	United Arab Emirates	1180	6.3	9991083	358868765.2	33	13
8	Jordan	826	4.4	10269022	45243661.97	187	11
9	Qatar	749	4.0	2930524	179570783.6	12	17
10	Lebanon	581	3.1	6769151	18076624.84	218	8
11	Oman	432	2.3	5223376	85868626.53	26	15
12	Kuwait	358	1.9	4328553	105960225.7	15	16
13	Sudan	244	1.3	44909351	34326058.56	319	6
14	Syrian Arab Republic	229	1.2	18275704	21445775.36	195	10
15	Palestine	220	1.2	4922749	18036800	60	12
16	Libyan Arab Jamahiriya	175	0.9	6958538	41879579.68	29	14
17	Yemen	142	0.8	30490639	21061691.63	206	9
18	Bahrain	133	0.7	1748295	38868663.03	6	20
19	Mauritania	13	0.1	4775110	8227580.74	8	19
20	Somalia	4	0.0	16359500	7292721.82	9	18

Source of population size and Total GDP: World Bank, <https://data.worldbank.org/>

Adjustment Index formula = (Total number of publications for the country/GDP per capita of the country)

where GDP per capita is the country's GDP divided by its population

Table 4: Productivity, Global, OA

#	COUNTRY/TERRITORY	# of documents	%
1	United States	132471	23.1
2	China	84729	14.8
3	United Kingdom	63797	11.1
4	Germany	37127	6.5
5	Spain	33897	5.9
6	Australia	29340	5.1
7	France	29044	5.1
8	Italy	27357	4.8
9	Canada	25682	4.5
10	Brazil	24323	4.2
11	India	22931	4.0
12	Netherlands	21510	3.7
13	Japan	20165	3.5
14	Poland	16600	2.9
15	South Korea	16331	2.8
16	Sweden	16172	2.8
17	Switzerland	14886	2.6
18	Russian Federation	12164	2.1
19	Norway	11497	2.0
20	Denmark	10071	1.8

Table 5: Productivity, Global, Non-OA

#	COUNTRY/TERRITORY	# of documents	%
1	China	298607	29.4
2	United States	164323	16.2
3	India	70320	6.9
4	Germany	43318	4.3
5	Canada	42865	4.2
6	Australia	39793	3.9
7	United Kingdom	33766	3.3
8	Spain	32742	3.2
9	Iran	32335	3.2
10	Italy	31423	3.1
11	Brazil	29135	2.9
12	South Korea	29120	2.9
13	France	26705	2.6
14	Japan	26112	2.6
15	Russian Federation	22038	2.2
16	Turkey	19574	1.9
17	Poland	16403	1.6
18	Malaysia	15918	1.6
19	Netherlands	13997	1.4
20	Taiwan	13657	1.3

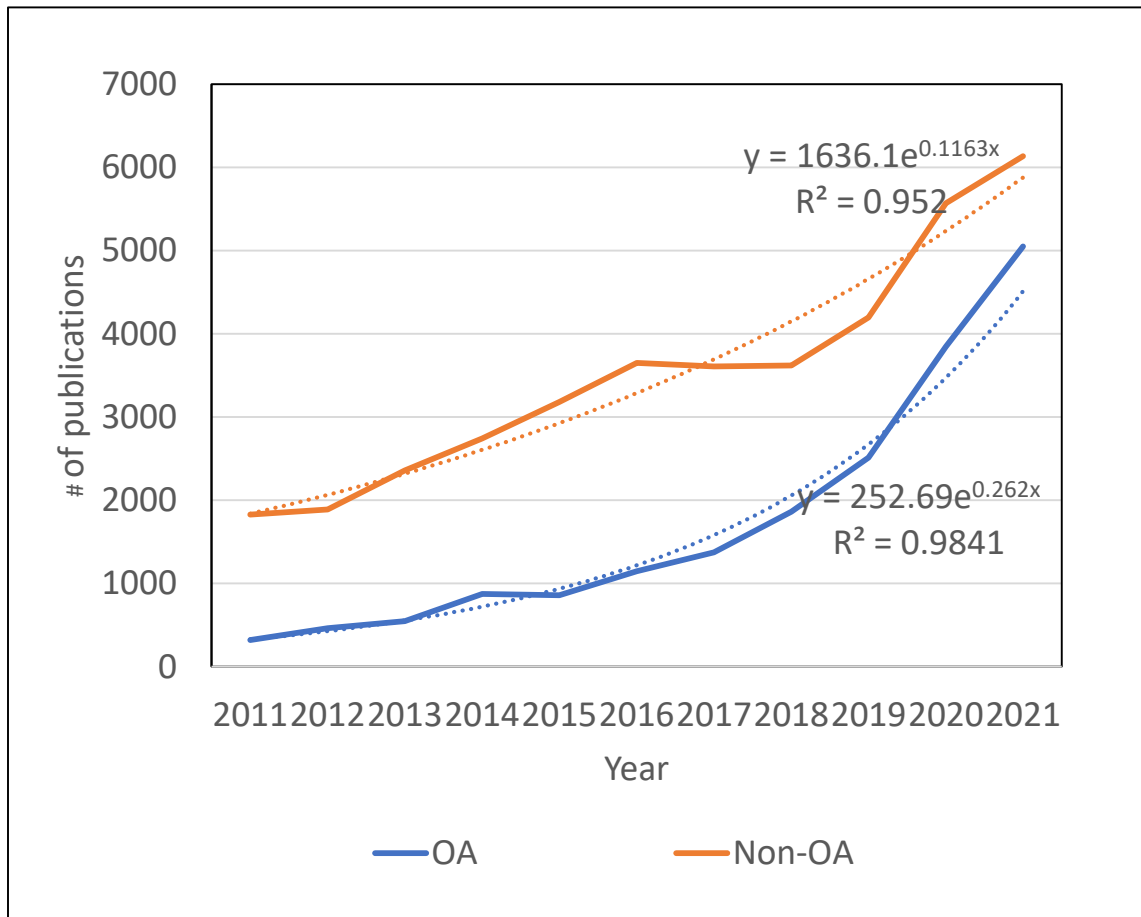


Fig.1. Yearly evolution of publications /Environmental, Arab world: OA & Non-OA

Table 6: Yearly evolution of publications, Arab world, OA & Non-OA

YEAR	OA	Non-OA	Total	% OA/Total
2011	320	1827	2147	14.905
2012	462	1888	2350	19.660
2013	548	2359	2907	18.851
2014	873	2742	3615	24.149
2015	859	3179	4038	21.273
2016	1147	3648	4795	23.921
2017	1374	3608	4982	27.579
2018	1861	3621	5482	33.947
2019	2512	4197	6709	37.442
2020	3847	5569	9416	40.856
2021	5051	6132	11183	45.167

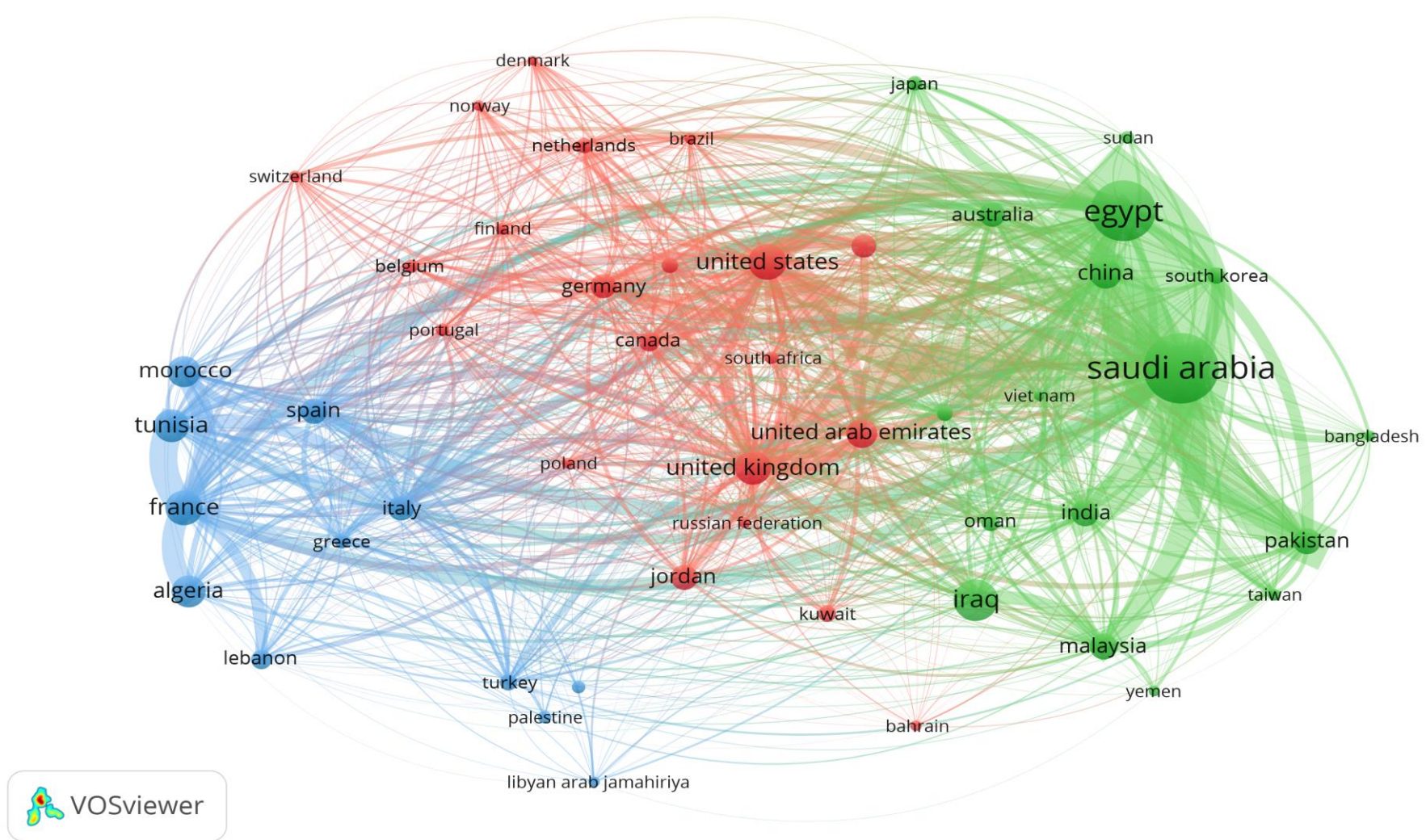


Fig.2. Network visualization map of country collaboration. A minimum of 100 documents per the country was set as a threshold, and 50 countries meet the threshold out of 296 countries. The thickness of the link between any two countries is an indicator of the strength of collaboration between the two countries. The volume of the circle around the item is an indicator of the contribution of the item (i.e., the larger the circle, the higher the contribution of country in terms of co-authorship). The items with same color indicate that these items are related to each other (i.e., within the same cluster)

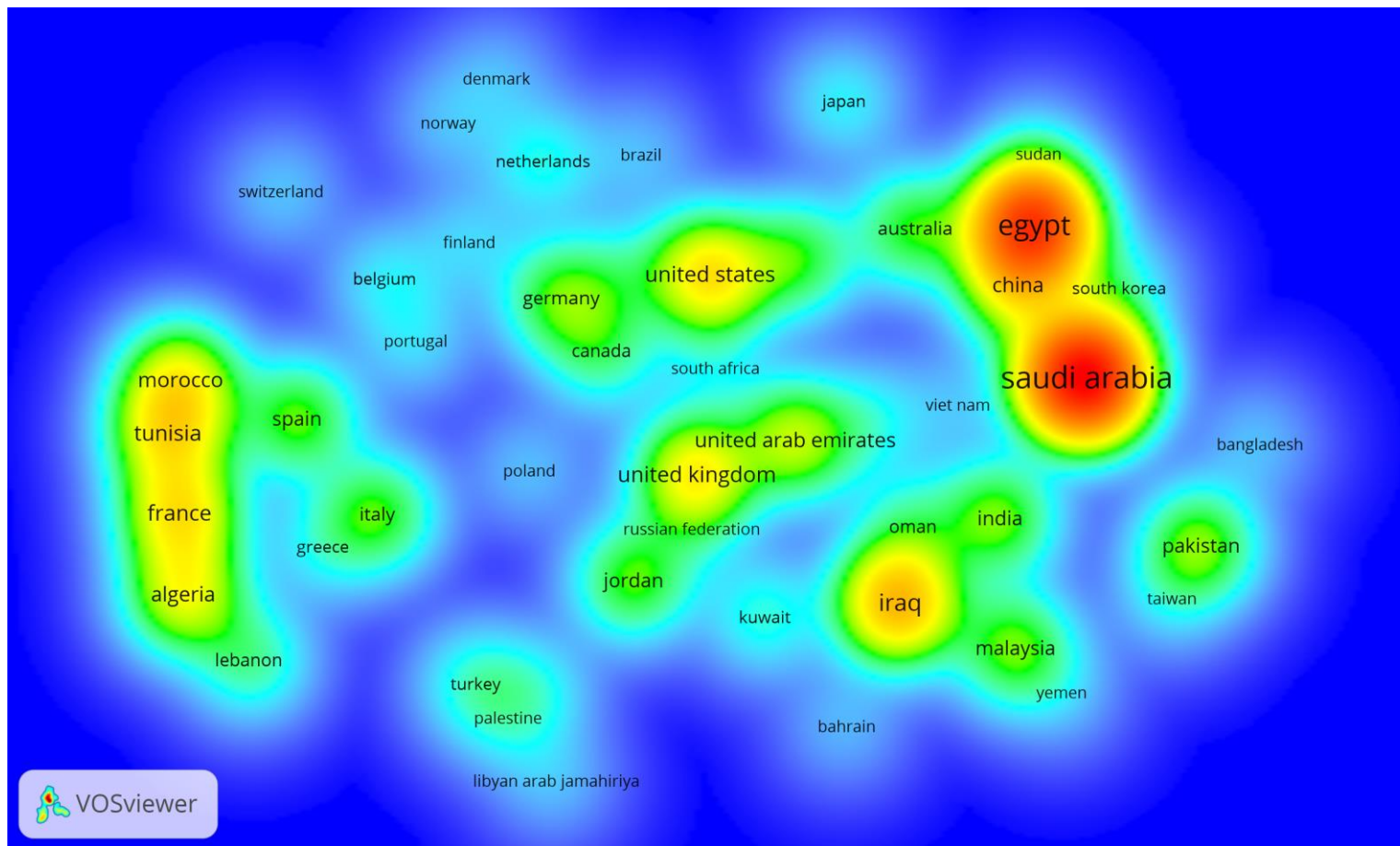


Fig.3. Density visualization map of country collaboration. A minimum of 100 documents per the country was set as a threshold, and 50 countries meet the threshold out of 296 countries.

Table 7: Top productive institutions, Arab World- OA

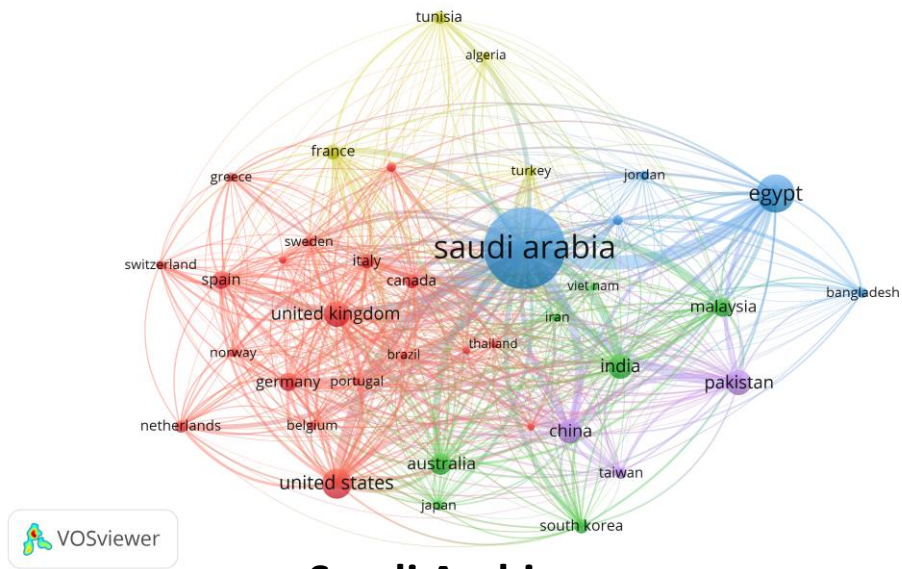
#	AFFILIATION	Country	# of documents	%
1	King Saud University	Sauid Arabia	1248	6.62
2	King Abdulaziz University	Sauid Arabia	998	5.29
3	King Abdullah University of Science and Technology	Sauid Arabia	953	5.05
4	Cairo University	Egypt	526	2.79
5	College of Sciences	Saudi Arabia	518	2.75
6	Qatar University	Qatar	456	2.42
7	Alexandria University	Egypt	451	2.39
8	National Research Centre	Egypt	403	2.14
9	Taif University	Saudi Arabia	374	1.98
10	University of Baghdad	Iraq	329	1.74
11	National Institute of Oceanography and Fisheries	Egypt	320	1.70
12	Agricultural Research Center	Egypt	296	1.57
13	Mansoura University	Egypt	290	1.54
14	Zagazig University	Egypt	287	1.52
15	Ain Shams University	Egypt	277	1.47
16	King Fahd University of Petroleum and Minerals	Saudi Arabia	276	1.46
17	Assiut University	Egypt	271	1.44
18	University of Carthage	Tunisia	265	1.41
19	United Arab Emirates University	United Arab Emirates	264	1.40
20	Al-Azhar University	Egypt	262	1.39

Table 8: Top productive sources, Arab World- OA

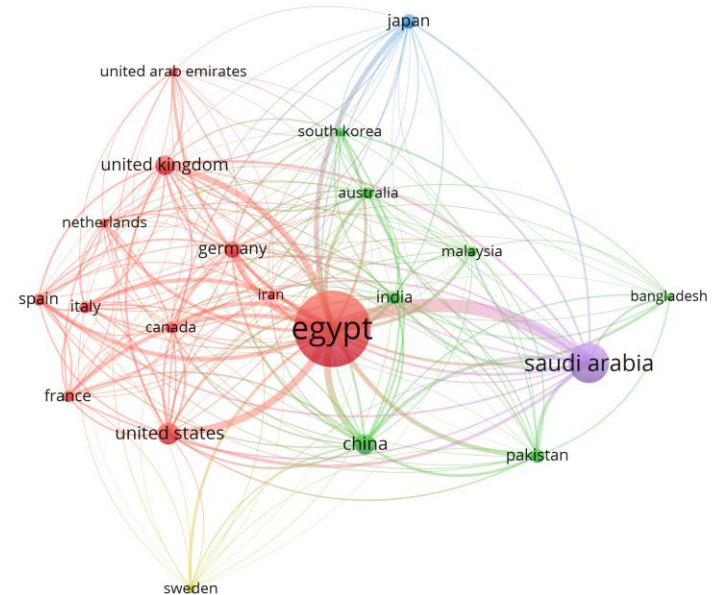
#	SOURCE TITLE	# of documents	%
1	Sustainability Switzerland	1692	8.97
2	International Journal Of Environmental Research And Public Health	892	4.73
3	Water Switzerland	525	2.78
4	Plants	496	2.63
5	SN Applied Sciences	426	2.26
6	Scientific World Journal	386	2.05
7	Egyptian Journal Of Aquatic Research	331	1.76
8	Indian Journal Of Forensic Medicine And Toxicology	316	1.68
9	Oriental Journal Of Chemistry	300	1.59
10	Wit Transactions On Ecology And The Environment	226	1.20
11	International Journal Of Engineering And Technology Uae	212	1.12
12	Ultrasonics Sonochemistry	209	1.11
13	Environmental Science And Pollution Research	203	1.08
14	Egyptian Journal Of Biological Pest Control	202	1.07
15	Science Of The Total Environment	200	1.06
16	Egyptian Journal Of Botany	161	0.85
17	Frontiers In Marine Science	155	0.82
18	Basrah Journal Of Agricultural Sciences	152	0.81
19	Civil Engineering Journal Iran	136	0.72
20	Water Science And Technology	131	0.69

Table 9: Comparative Analysis

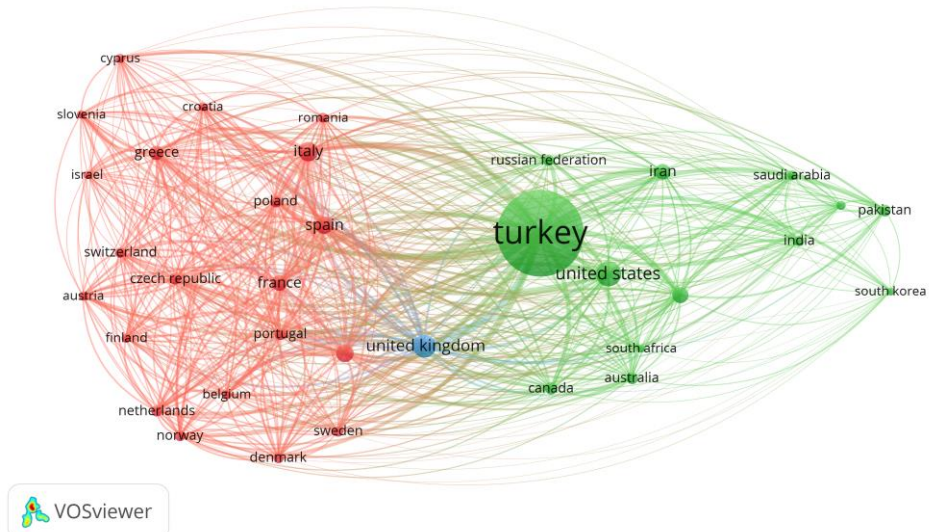
Item	Saudi Arabia	Egypt	Turkey	Iran
# of documents (Total); % Global	14830; 0.93%	15127; 0.95%	25632; 1.6%	40827; 2.6%
# of documents (OA)/%	5701 (38.4%)	4481 (29.6%)	6058 (23.6%)	8492 (20.8%)
# of collaborated countries	150	140	149	140
# of documents from collaboration, %	4555 (80.0%)	2852 (63.6%)	2434 (40.2%)	3595 (42.3%)
Most collaborated country	Egypt	Saudi Arabia	United States	United States
# of documents with most collaborated country, %	1270; 22.3%	1270; 28.3%	543; 9.0%	679; 8.0%
Most used journal	Sustainability Switzerland	Sustainability Switzerland	Sustainability Switzerland	Ultrasonic Sonochemistry
# of documents in the most used journal, %	902; 15.8%	385; 8.6%	490; 8.1%	500; 5.9%
Institution (most prolific)	King Saud University	Cairo University	İstanbul Teknik Üniversitesi	University of Tehran
# of documents-institution, %	1247; 21.9%	526; 11.7%	296; 4.9	1013; 11.9%
Funding sponsor	King Saud University	King Saud University	Funding Türkiye Bilimsel ve Teknolojik Araştırma Kurumu	Iran National Science Foundation
# of documents-Funding sponsor, %	687; 12.1%	187; 4.2%	363; 5.6%	225; 2.6%



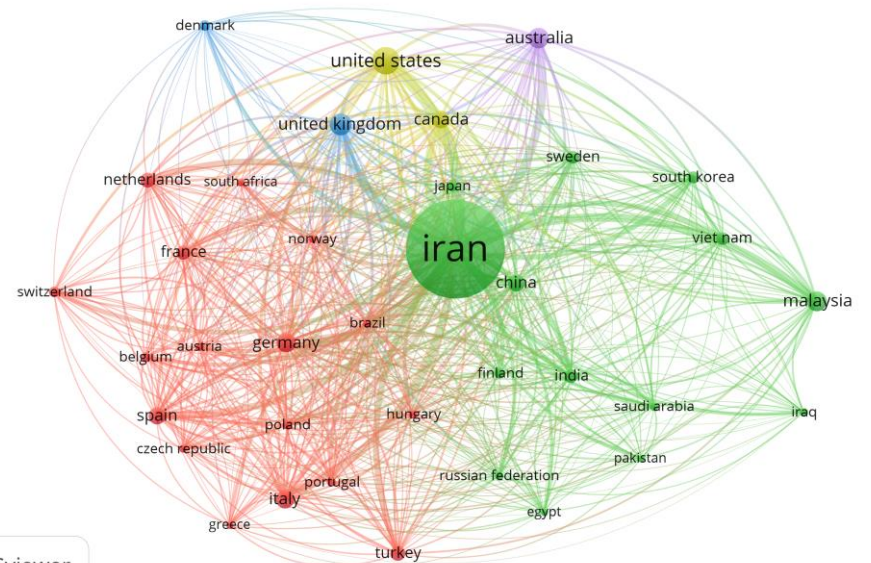
Saudi Arabia



Egypt

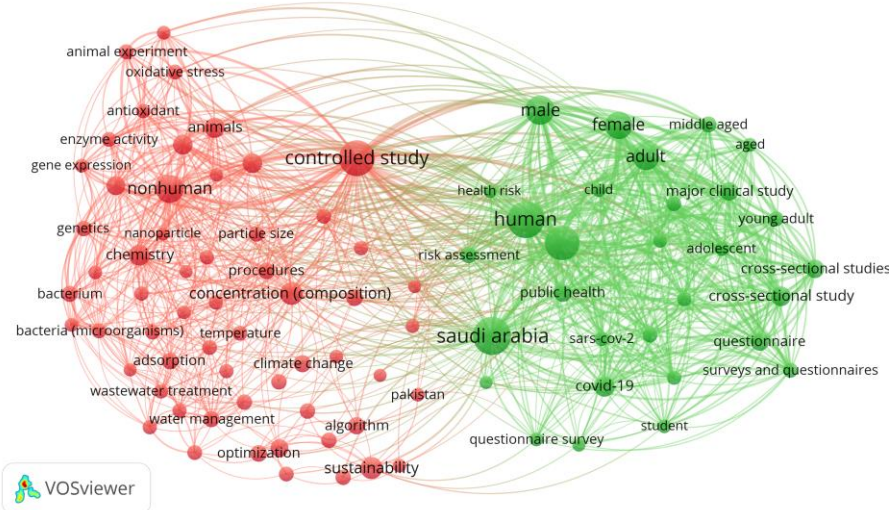


Turkey

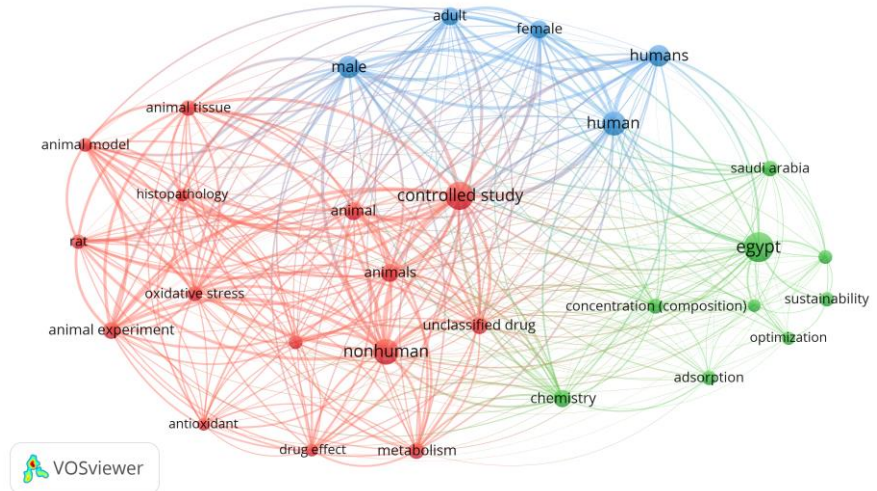


Iran

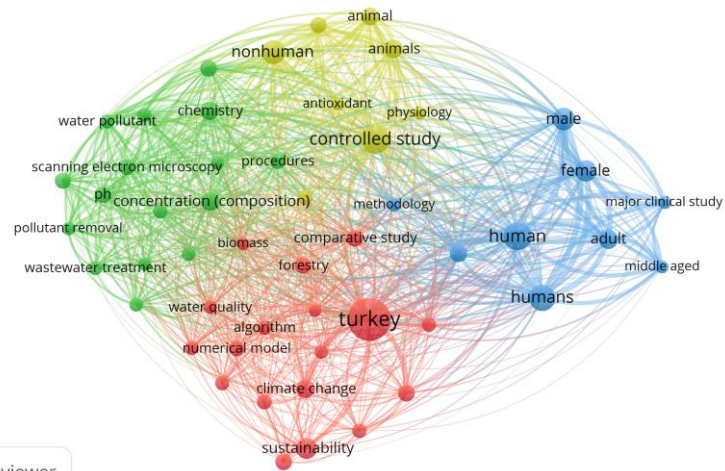
Fig. 5. Country Collaboration



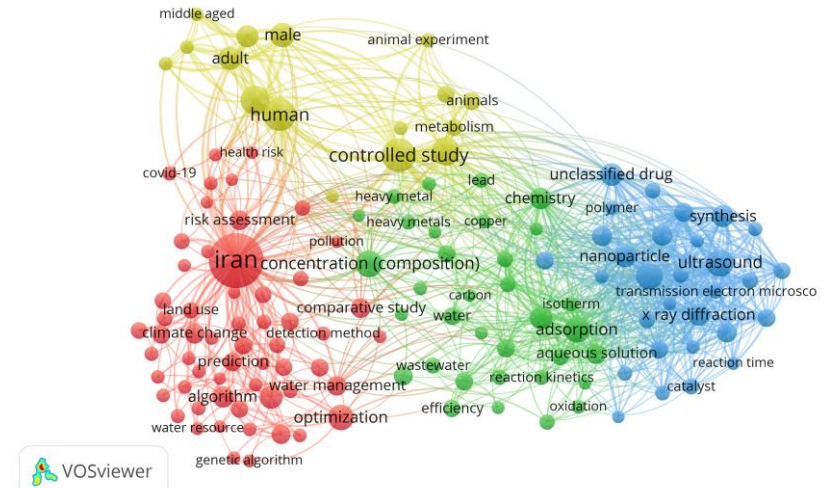
Saudi Arabia



Egypt



Turkey



Iran

Fig. 6. Keyword Co-occurrence

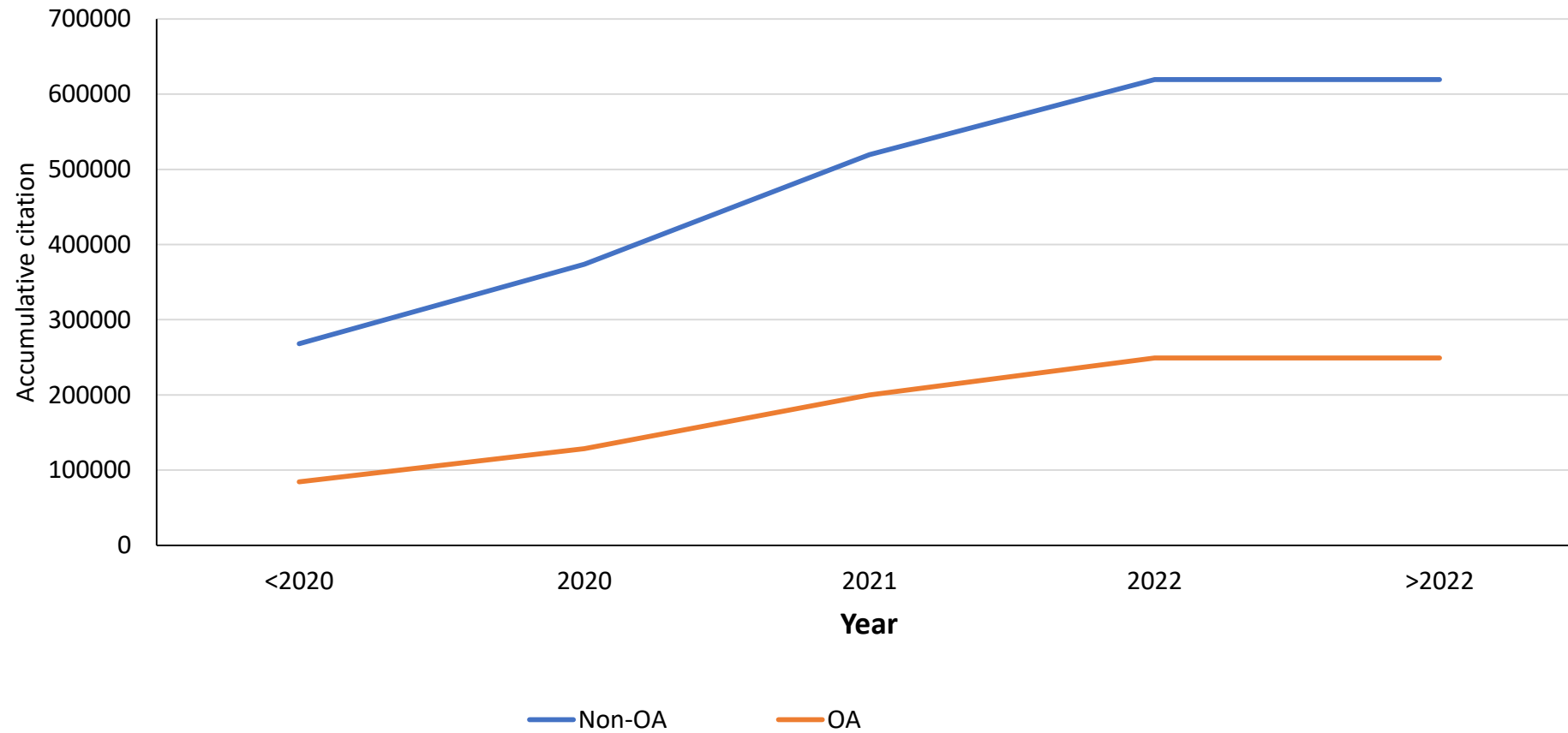


Fig. 7. Accumulative citations

Conclusions

- Open-access publishing practices in the Arab world is nearly like the global average
- There are differences among Arab countries with respect to Open-access practices, depend on:
 - No. of population
 - Wealth of country
 - Scientific experience & infrastructure
- Regional initiatives should be established to promote Open-access
- Much regional research collaboration is required