

Research Performance of Shell Scientific Publications During 2017-2019 Years. Bibliometric Analysis and Mapping

Start date of this research: 10 May 2019

Why Shell:

Royal Dutch Shell ...is one of the six oil and gas "supermajors" and the fifth-largest company in the world measured by 2018 revenues (and the largest based in Europe) https://en.wikipedia.org/wiki/Royal_Dutch_Shell

- Income for the period was \$23.9 billion in 2018, compared with \$13.4 billion in 2017. Earnings on a current cost of supplies basis increased to \$24.4 billion, compared with \$12.5 billion in 2017.
- ...new projects, including the completion of an important chemical plant expansion in China and starting production from a deep-water development in the US Gulf of Mexico a year ahead of schedule. Overall, our production averaged 3.7 million barrels of oil equivalent a day in 2018, unchanged from 2017. STRATEGIC REPORT SHELL ANNUAL REPORT AND FORM 20-F 2018

Objectives: Mapping of bibliometric data of Shell petroleum company scientific publications during 2017-2019 years. Topic Mining and clustering.

Bibliometric and citation **databases** of scientific literature: OnePetro, Scopus, Web of Science

Used tools: VOSviewer - a software tool for constructing and visualizing bibliometric networks - <http://www.vosviewer.com/> Bibliometrix - An R-tool for comprehensive science mapping analysis - <http://www.bibliometrix.org/> Typora - a markdown editor - <https://typora.io/> Notepad++ - a free source code editor - <https://notepad-plus-plus.org/> SmoothCSV - a powerful CSV file editor - <https://smoothcsv.com/2/>

OnePetro

Queries to OnePetro: search for affiliation:"shell" has returned 7 446 results search for affiliation:("Shell"), published between 2014 and 2019 has returned 1 633 results - all search for affiliation:("Shell"), published between 2014 and 2019 has returned 1 404 results - **conference papers** search for affiliation:("Shell"), published between 2014 and 2019 has returned 121 results - **articles** search for affiliation:("Shell") in **peer reviewed** articles, published between 2014 and 2019 has returned 105 results

Remark:

- Conference papers is more concerned to business needs then articles
- We use OnePetro as starting point for our further research and building queries in Scopus and WoS
- 300 - 400 publications are sufficient for good bibliometric maps

So we use query: affiliation:("Shell"), published between **2017 and 2019** that has returned 566 results - **conference papers**

VOSviewer RIS files 21980 terms, 408 meet 10 min number of occurrence **245** - 60% used for further analysis.

Table 1 Top keywords (terms) occurrences in titles and abstracts of 245 conference papers, based on file OnePetro-KW-title-abstract-245.tsv.

term	occurrences	relevance score
model	212	0,3499
operation	145	0,3735
project	139	0,4065
cost	121	0,3174
effect	101	0,5207
uncertainty	99	0,2722
parameter	90	0,5571
management	82	0,4577
property	82	0,7241
facility	79	0,5519
simulation	72	0,633
team	72	0,6711
operator	69	0,5118
plan	69	0,4208
location	68	0,6572
range	68	0,3892
workflow	68	0,5142
recovery	67	0,3656
requirement	63	0,675
activity	59	0,3149
history	58	0,4232
completion	57	0,3305
company	56	0,5277
distribution	56	0,6843

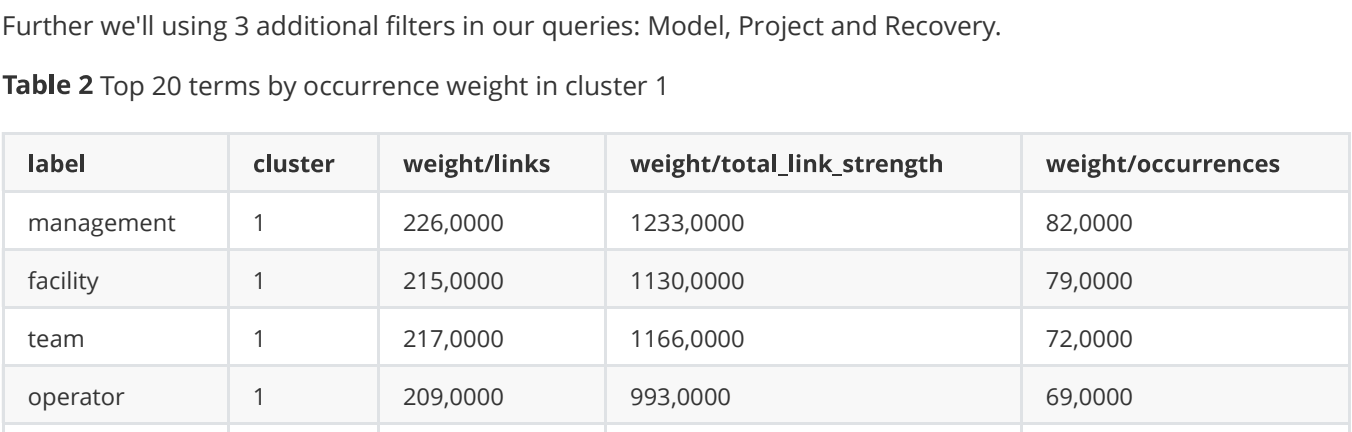


Fig. 1 Terms map based on titles and abstracts of 245 conference papers, (file OnePetro-KW-title-abstract-245.png)

Remark

5 clusters: Project-Operation-Management; Model-Parameter-Uncertainty; Recovery-Effect-Injection; Monitoring-Presentation; Kuwait

Further we'll using 3 additional filters in our queries: Model, Project and Recovery.

Table 2 Top 20 terms by occurrence weight in cluster 1

label	cluster	weight/links	weight/total_link_strength	weight/occurrences
management	1	226,0000	1233,0000	82,0000
facility	1	215,0000	1130,0000	79,0000
team	1	217,0000	1166,0000	72,0000
operator	1	209,0000	993,0000	69,0000
plan	1	216,0000	1018,0000	69,0000
requirement	1	218,0000	884,0000	63,0000
activity	1	223,0000	835,0000	59,0000
completion	1	208,0000	829,0000	57,0000
company	1	212,0000	824,0000	56,0000
opportunity	1	225,0000	840,0000	56,0000
experience	1	192,0000	688,0000	52,0000
practice	1	211,0000	762,0000	51,0000
execution	1	205,0000	761,0000	50,0000
life	1	200,0000	680,0000	50,0000
platform	1	184,0000	697,0000	49,0000
equipment	1	185,0000	703,0000	48,0000
shell	1	199,0000	713,0000	48,0000
asset	1	178,0000	612,0000	45,0000
integrity	1	193,0000	638,0000	44,0000
safety	1	170,0000	610,0000	44,0000

Table 3 Top 20 terms by occurrence weight in cluster 2

label	cluster	weight/links	weight/total_link_strength	weight/occurrences
uncertainty	2	234,0000	1522,0000	99,0000
parameter	2	224,0000	1224,0000	90,0000
property	2	217,0000	1131,0000	82,0000
simulation	2	199,0000	938,0000	72,0000
range	2	217,0000	950,0000	68,0000
workflow	2	208,0000	996,0000	68,0000
history	2	217,0000	891,0000	58,0000
distribution	2	203,0000	798,0000	56,0000
interpretation	2	205,0000	786,0000	55,0000
permeability	2	183,0000	750,0000	54,0000
observation	2	215,0000	734,0000	53,0000
prediction	2	201,0000	670,0000	53,0000
function	2	184,0000	650,0000	49,0000
modeling	2	205,0000	679,0000	47,0000
sample	2	179,0000	584,0000	47,0000
interval	2	194,0000	669,0000	44,0000
log	2	181,0000	611,0000	43,0000
estimation	2	179,0000	559,0000	41,0000
basin	2	183,0000	550,0000	40,0000
modelling	2	196,0000	556,0000	39,0000

Table 4 Top 20 terms by occurrence weight in cluster 3

label	cluster	weight/links	weight/total_link_strength	weight/occurrences
recovery	3	206,0000	968,0000	67,0000
injection	3	205,0000	737,0000	51,0000
presence	3	202,0000	628,0000	47,0000
behavior	3	198,0000	609,0000	45,0000
temperature	3	191,0000	607,0000	45,0000
experiment	3	166,0000	517,0000	43,0000
mechanism	3	178,0000	519,0000	43,0000
state	3	173,0000	372,0000	30,0000
concentration	3	140,0000	376,0000	29,0000
concern	3	159,0000	357,0000	27,0000
producer	3	164,0000	407,0000	27,0000
pilot	3	155,0000	415,0000	26,0000
corrosion	3	116,0000	297,0000	25,0000
density	3	153,0000	358,0000	25,0000
injector	3	164,0000	414,0000	24,0000
stability	3	147,0000	335,0000	24,0000
product	3	160,0000	324,0000	23,0000
viscosity	3	125,0000	274,0000	21,0000
validation	3	136,0000	263,0000	20,0000
brine	3	118,0000	220,0000	19,0000

Remark:

- The full list of terms by clusters are in file: OnePetro-KW-title-abstract-245-clusters.tsv
- The list was constructed from GML file exported from VOSviewer by using regex

Scopus

Queries to Scopus:

AFILORG (shell) AND PUBYEAR > 2016 1,662 doc

- (AFILORG (shell) AND AFFILCOUNTRY (russia)) AND PUBYEAR > 2016 0 docs
- (AFILORG (shell) AND AFFILCOUNTRY (china)) AND PUBYEAR > 2016 73 docs
- (AFILORG (shell) AND AFFILCOUNTRY (canada)) AND PUBYEAR > 2016 102 docs
- (AFILORG (shell) AND AFFILCOUNTRY ("united states")) AND PUBYEAR > 2016 795 docs
- (AFILORG (shell) AND TITLE-ABS-KEY (model)) AND PUBYEAR > 2016 613 docs
- (AFILORG (shell) AND TITLE-ABS-KEY (project*)) AND PUBYEAR > 2016 214 docs
- (AFILORG (shell) AND TITLE-ABS-KEY (recovery)) AND PUBYEAR > 2016 171 docs

Remarks

There is no direct affiliations between Shell and Russian publications

Model, Project and Recovery are significant themes for Shell according Scopus (as well as OnePetro)

Table 5 The number of documents by type

Document type	number of docs
Conference Paper	880
Article	678
Book Chapter	32
Review	32

Remark: Conference papers are more important for industry than articles

Table 6 The number of documents by subject areas

SUBJECT AREA	number of docs
Earth and Planetary Sciences	801
Energy	667
Engineering	365
Chemical Engineering	177
Environmental Science	167
Chemistry	146
Materials Science	94
Physics and Astronomy	82
Mathematics	62
Computer Science	59
Agricultural and Biological Sciences	48

More in file: Scopus-1662-Analyze-Subject.csv

Table 7 The number of documents by authors affiliations

AFFILIATION	number of papers
Royal Dutch Shell	672
Delft University of Technology	94
Shell Oil Company	81
Shell International Exploration and Production Inc.	79
Shell Exploration and Production Company	60
Imperial College London	54
Kuwait Oil Company	39
Shell International Exploration and Production Inc.	34
University of Oxford	33
Rice University	29
Texas A and M University	25
Shell International Exploration and Production Inc.	24
Shell Petroleum Development Company	23
Shell International Exploration and Production	23
University of Texas at Austin	23
Utrecht University	22
Technische Universiteit Eindhoven	21
Petroleum Development Oman	21
Nederlandse Aardolie Maatschappij BV	21
Shell U.K. Limited	20
University of Manchester	20
Exxon Mobil Corporation	19

More in file: Scopus-1662-Analyze-Affiliation.csv

Table 8 The number of documents by funding sponsors

Funding sponsor	number of papers
Shell	63
Shell Exploration and Production Company	25
Engineering and Physical Sciences Research Council	19
Shell United States (Shell)	19
U.S. Department of Energy	16
National Natural Science Foundation of China	15
Deutsche Forschungsgemeinschaft	14
National Science Foundation	13
Nederlandse Organisatie voor Wetenschappelijk Onderzoek	13
Government of Alberta	12
Government of Canada	12
Natural Sciences and Engineering Research Council of Canada	11
Chevron	9

More in file: Scopus-1662-Analyze-FundingSponsor.csv

For more information see next files on Figshare:

- Scopus-1662-Analyze-Country.csv
- Scopus-1662-Analyze-Author.csv
- All scopus-Shell KW.tsv

Made by VOSviewer:

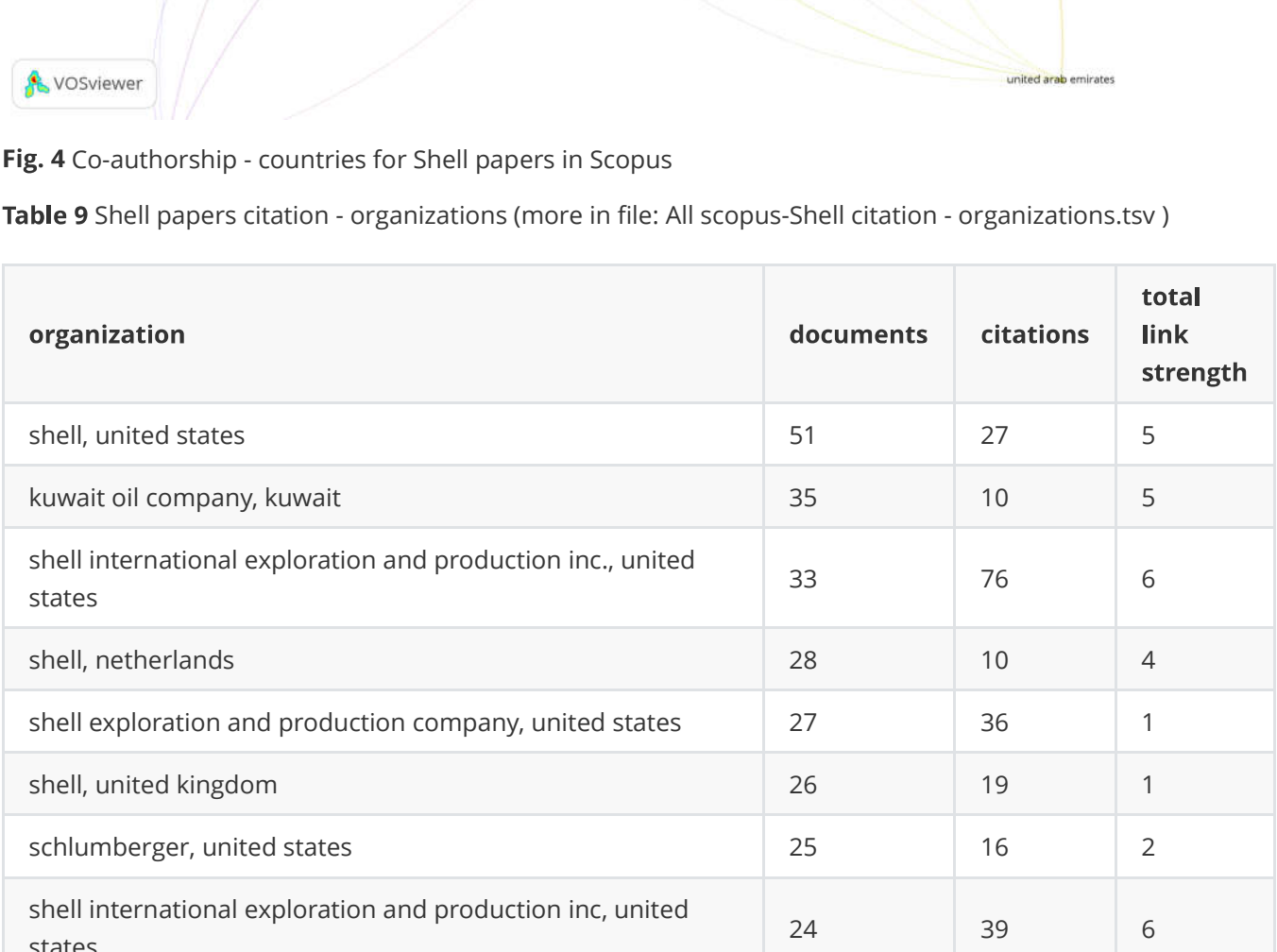


Fig. 2 Keywords co-occurrence for 1662 papers



Fig. 3 Keywords co-occurrence overlay for 1662 papers



Fig. 4 Co-authorship - countries for Shell papers in Scopus

Table 9 Shell papers citation - organizations (more in file: All scopus-Shell citation - organizations.tsv)

organization	documents	citations	total link strength
shell, united states	51	27	5
kuwait oil company, kuwait	35	10	5
shell international exploration and production inc., united states	33	76	6
shell, netherlands	28	10	4
shell exploration and production company, united states	27	36	1
shell, united kingdom	26	19	1
schlumberger, united states	25	16	2
shell international exploration and production inc, united states	24	39	6
delft university of technology, netherlands	21	42	8
shell global solutions international b.v., grasweg 31, amsterdam, 1031 hw, netherlands	18	29	5
shell global solutions international, netherlands	18	18	3
shell global solutions, united kingdom	17	88	9
shell petroleum development company, nigeria	16	2	0
sarawak shell berhad, malaysia	14	1	0
shell global solutions (us) inc., united states	14	27	4
shell global solutions, united states	14	21	7
shell international exploration and production, united states	14	11	0
shell global solutions international b.v., rijswijk, netherlands	13	63	6
halliburton, united states	12	5	0
shell global solutions international bv, netherlands	12	20	5
shell global solutions international, united states	12	21	9
shell international exploration and production inc., houston, tx, united states	12	58	4
shell global solutions international b.v., amsterdam, netherlands	11	54	2

The keywords/terms from file: All scopus-Shell KW cooccurr GML.tsv (get from All scopus-Shell KW cooccurr GML.gml by using regex)

Table 10 Top 20 terms by occurrence weight in cluster 1

label	cluster	weight/links	weight/total_link_strength	weight/occurrences
seismology	1	245,0000	956,0000	143,0000
geophysical prospecting	1	110,0000	266,0000	60,0000
stratigraphy	1	183,0000	486,0000	58,0000
seismic waves	1	171,0000	444,0000	56,0000
porosity	1	188,0000	451,0000	51,0000
seismic prospecting	1	131,0000	304,0000	50,0000
shale	1	173,0000	353,0000	42,0000
velocity	1	132,0000	268,0000	40,0000
rocks	1	157,0000	291,0000	39,0000
geology	1	168,0000	305,0000	37,0000
hydrocarbon reservoir	1	176,0000	320,0000	37,0000
reservoirs (water)	1	155,0000	291,0000	32,0000
lithology	1	144,0000	238,0000	30,0000
seismic response	1	129,0000	250,0000	30,0000
atlantic ocean	1	105,0000	196,0000	29,0000
deformation	1	115,0000	172,0000	29,0000
deposition	1	115,0000	194,0000	29,0000
numerical model	1	104,0000	160,0000	28,0000
shear flow	1	110,0000	197,0000	28,0000
permeability	1	146,0000	278,0000	27,0000

Table 11 Top 20 terms by occurrence weight in cluster 2

label	cluster	weight/links	weight/total_link_strength	weight/occurrences
infill drilling	2	237,0000	696,0000	101,0000
gas industry	2	282,0000	643,0000	87,0000
oil field development	2	194,0000	516,0000	61,0000
cost effectiveness	2	188,0000	415,0000	48,0000
digital storage	2	203,0000	385,0000	48,0000
offshore oil wells	2	173,0000	362,0000	48,0000
petroleum prospecting	2	148,0000	290,0000	44,0000
oil fields	2	161,0000	320,0000	43,0000
costs	2	158,0000	370,0000	42,0000
data acquisition	2	158,0000	318,0000	41,0000
offshore oil well production	2	169,0000	286,0000	40,0000
surveys	2	123,0000	229,0000	37,0000
decision making	2	137,0000	236,0000	33,0000
greenhouse gases	2	128,0000	280,0000	33,0000
reservoir management	2	129,0000		

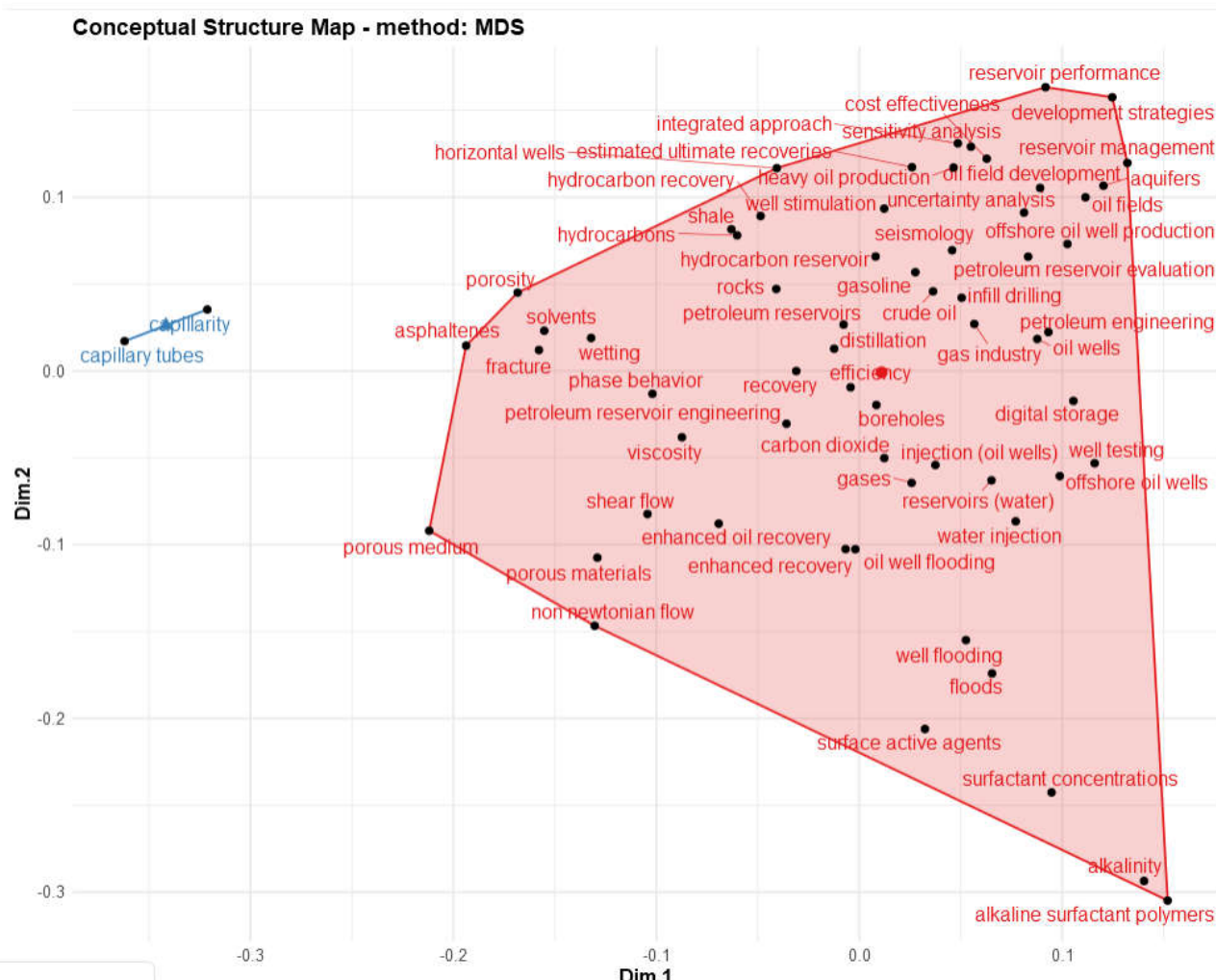


Fig. 24 (AFFILORG (shell) AND TITLE-ABS-KEY (recovery)) AND PUBYEAR > 2016 171 docs; file: Factorial Analysis MDS 171 docs.png

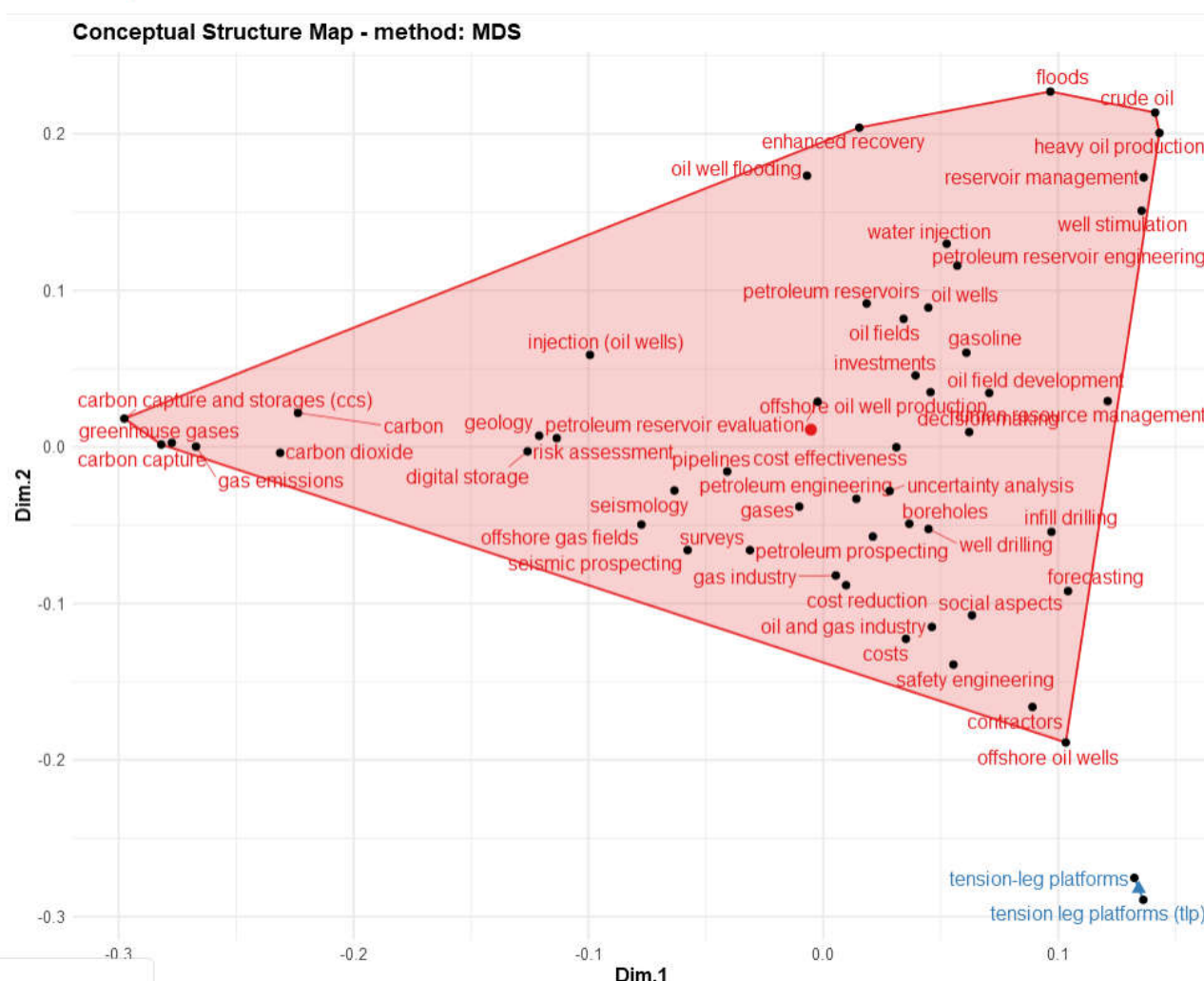


Fig. 25 (AFFILORG (shell) AND TITLE-ABS-KEY (project*)) AND PUBYEAR > 2016 216 docs; file: Factorial Analysis MDS 216 docs.png (newer date then for 214 docs)

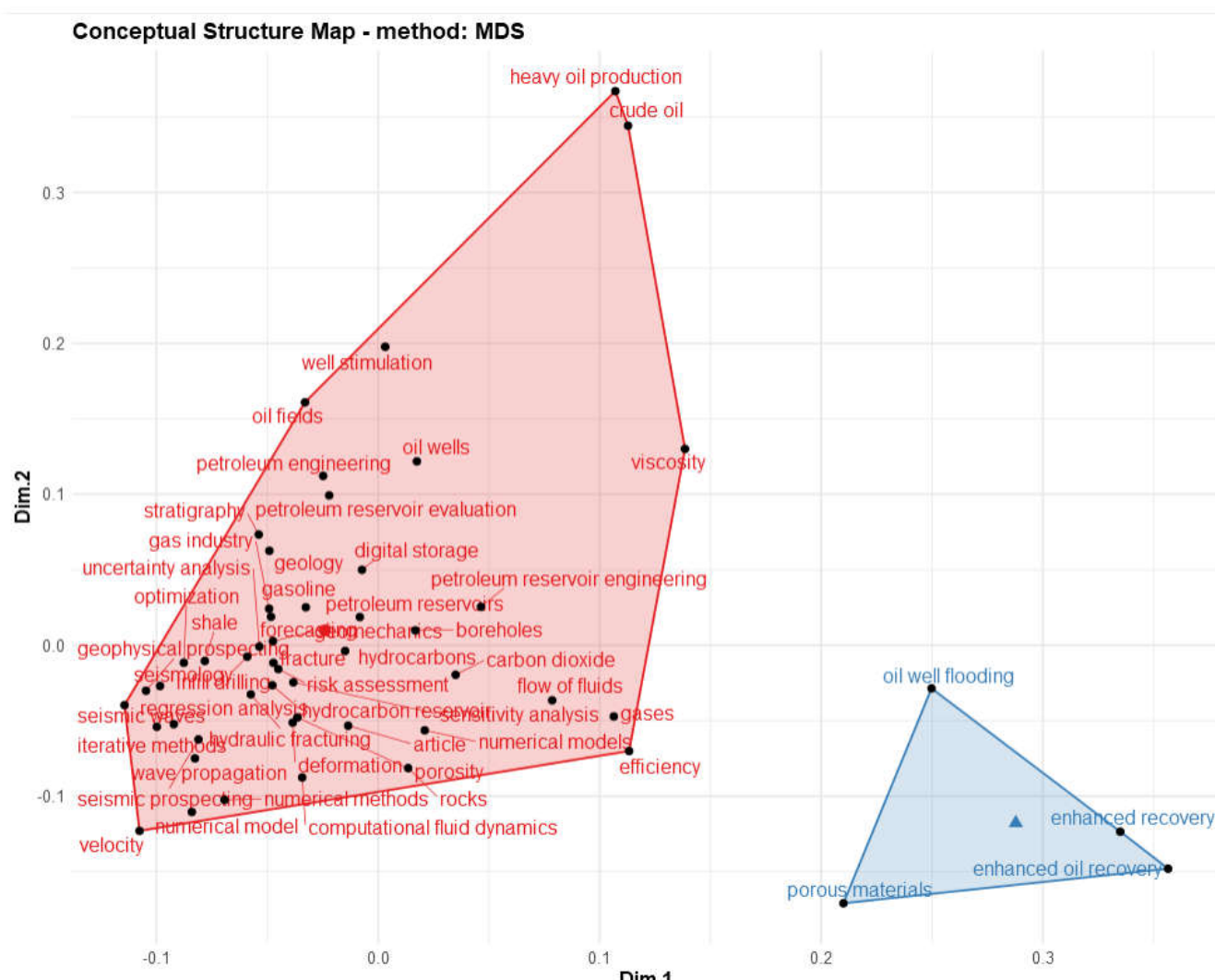


Fig. 26 (AFFILORG (shell) AND TITLE-ABS-KEY (model)) AND PUBYEAR > 2016 614 docs; file: Factorial Analysis MDS 614 docs.png (newer date then for 613 docs)

Remark: for future research: data preparation and choice of parameters need more attentions to get informative figs

References:

Aria, M. & Cuccurullo, C. (2017) bibliometrix: An R-tool for comprehensive science mapping analysis, *Journal of Informetrics*, 11(4), pp 959-975, Elsevier.

Van Eck, N.J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523-538.

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