Bibliometric-Analysis.R

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```
# Bibliometric Analysis (Findings Part 1)

#### Setting up the script ####
# Loading required packages
library(bibliometrix)
```

```
## Please note that our software is open source and available for use, distributed under the MIT licens
## When it is used in a publication, we ask that authors properly cite the following reference:
##
## Aria, M. & Cuccurullo, C. (2017) bibliometrix: An R-tool for comprehensive science mapping analysis,
##                          Journal of Informetrics, 11(4), pp 959-975, Elsevier.
##
## Failure to properly cite the software is considered a violation of the license.
##
## For information and bug reports:
##                          - Take a look at https://www.bibliometrix.org
##                          - Send an email to info@bibliometrix.org
##                          - Write a post on https://github.com/massimoaria/bibliometrix/issues
##
## Help us to keep Bibliometrix and Biblioshiny free to download and use by contributing with a small d
##
##
## To start with the Biblioshiny app, please digit:
## biblioshiny()
```

```
library(igraph)
```

```
##
## Attaching package: 'igraph'
```

```
## The following objects are masked from 'package:stats':
##
##     decompose, spectrum
```

```
## The following object is masked from 'package:base':
##
##     union
```

```
library(stringr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:igraph':
##
```

```
##     as_data_frame, groups, union
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(xtable) # converts tables to latex tables
library(kableExtra)
```

```
##
## Attaching package: 'kableExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     group_rows
```

```
# Convert cleaned data to data frame
M <- convert2df(file="savedrecs.txt", dbsource="wos",format="plaintext")
```

```
##
## Converting your wos collection into a bibliographic dataframe
##
## Done!
##
##
## Generating affiliation field tag AU_UN from C1:  Done!
```

```
# Reformat the row names (names of the review articles)
#input_string <- rownames(M)
#output_string <- gsub("([^,]+)\\s[^,]*,\\s(\\d+).*", "\\1 \\2", input_string)
#output_string[26] = "SHARIFI EI 2016"
#output_string[27] = "SHARIFI RSER 2016"
#rownames(M) = output_string

#### Descriptive Statistics ####

# Main bibliometric results of the articles
results = biblioAnalysis(M)
findings = summary(results,verbose=T)

# Most cited references
CR = citations(M,field="article",sep=";")
a=data.frame(cbind(CR$Cited[1:20])) # top 20 most cited references
colnames(a)[1] = "Number of Times Cited"
a %>%
  kbl(caption = "Top 20 Most Cited References") %>%
  kable_classic(full_width = F, html_font = "Cambria")
```

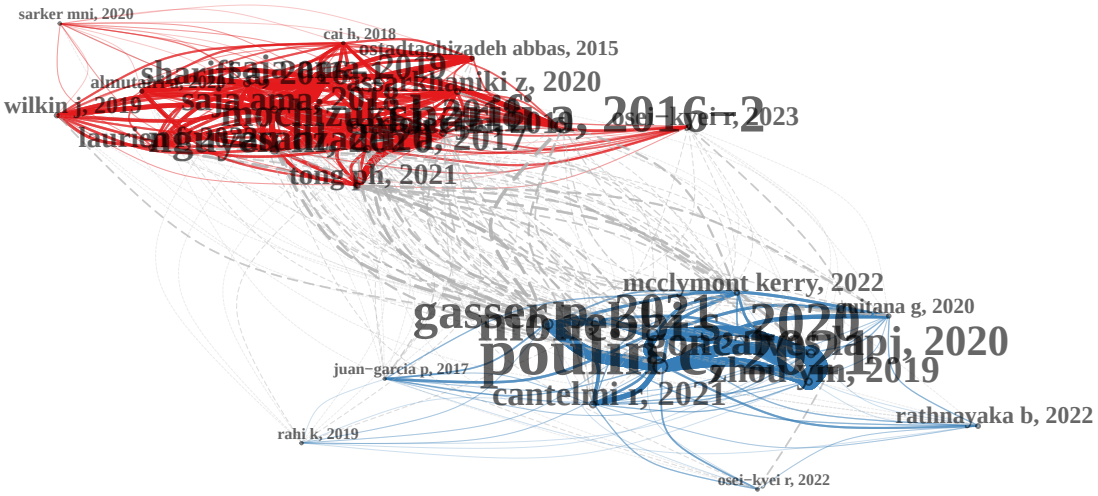
```
# xtable(a,auto=TRUE) #This produces Latex table

#### Bibliographic Coupling Network ####
NetMatrix <- biblioNetwork(M, analysis = "coupling", network = "references", sep = ";")
net=networkPlot(NetMatrix, Title = "Bibliographic Coupling Network", type = "auto", size.cex=TRUE, size=
```

Table 1: Top 20 Most Cited References

	Number o
BRUNEAU M, 2003, EARTHQ SPECTRA, V19, P733, DOI 10.1193/1.1623497	
CUTTER SL, 2010, J HOMEL SECUR EMERG, V7	
CUTTER SL, 2014, GLOBAL ENVIRON CHANG, V29, P65, DOI 10.1016/J.GLOENVCHA.2014.08.005	
HOLLING C.S., 1973, ANNUAL REV ECOL SYST, V4, P1, DOI 10.1146/ANNUREV.ES.04.110173.000245	
NORRIS FH, 2008, AM J COMMUN PSYCHOL, V41, P127, DOI 10.1007/S10464-007-9156-6	
HOSSEINI S, 2016, RELIAB ENG SYST SAFE, V145, P47, DOI 10.1016/J.RESS.2015.08.006	
CUTTER SL, 2008, GLOBAL ENVIRON CHANG, V18, P598, DOI 10.1016/J.GLOENVCHA.2008.07.013	
SHERRIEB K, 2010, SOC INDIC RES, V99, P227, DOI 10.1007/S11205-010-9576-9	
BURTON CG, 2015, ANN ASSOC AM GEOGR, V105, P67, DOI 10.1080/00045608.2014.960039	
CARPENTER S, 2001, ECOSYSTEMS, V4, P765, DOI 10.1007/S10021-001-0045-9	
CUTTER SL, 2016, NAT HAZARDS, V80, P741, DOI 10.1007/S11069-015-1993-2	
ADGER WN, 2000, PROG HUM GEOG, V24, P347, DOI 10.1191/030913200701540465	
FOLKE C, 2006, GLOBAL ENVIRON CHANG, V16, P253, DOI 10.1016/J.GLOENVCHA.2006.04.002	
FRAZIER TG, 2013, APPL GEOGR, V42, P95, DOI 10.1016/J.APGEOG.2013.05.004	
MEEROW S, 2016, LANDSCAPE URBAN PLAN, V147, P38, DOI 10.1016/J.LANDURBPLAN.2015.11.011	
ORENCIO PM, 2013, INT J DISAST RISK RE, V3, P62, DOI 10.1016/J.IJDRR.2012.11.006	
ROSE A, 2007, ENVIRON HAZARDS-UK, V7, P383, DOI 10.1016/J.ENVHAZ.2007.10.001	
AINUDDIN S, 2012, NAT HAZARDS, V63, P909, DOI 10.1007/S11069-012-0201-X	
ALEXANDER DE, 2013, NAT HAZARD EARTH SYS, V13, P2707, DOI 10.5194/NHESS-13-2707-2013	
JOERIN J, 2014, DISASTERS, V38, P540, DOI 10.1111/DISA.12058	

Bibliographic Coupling Network



```
# dotted lines means that there are still connections exist between papers, and the colored lines repre
summary(net) # Look at the net object
```

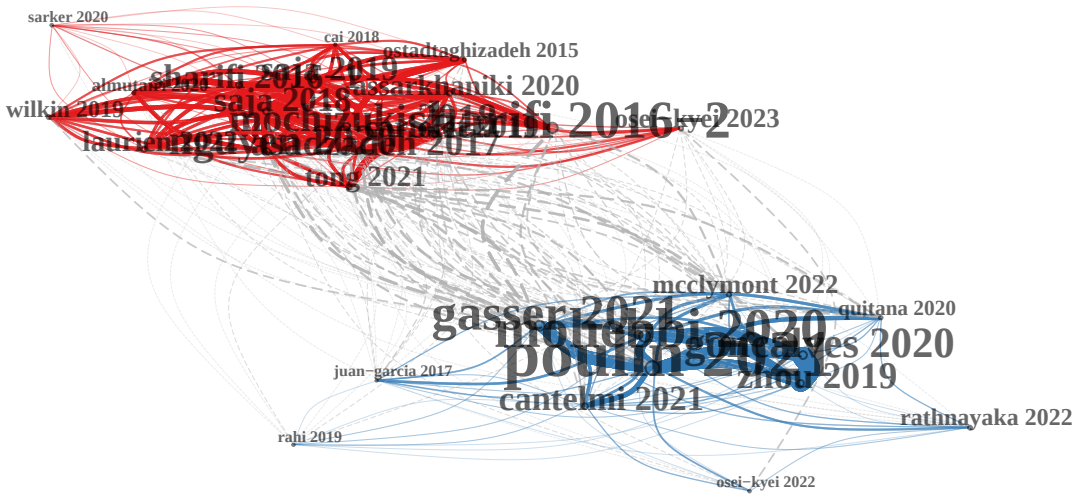
```
##               Length Class       Mode
## graph         29     igraph      list
## graph_pajek   29     igraph      list
## cluster_obj    2     communities list
## cluster_res    5     data.frame  list
## community_obj  2     communities list
## layout        58     -none-      numeric
## S              0     -none-      NULL
## nodeDegree     2     data.frame  list
## params         2     data.frame  list
```

```
bibnet = net$graph # extract the igraph object and name it bibnet
V(bibnet)$label == V(bibnet)$name # make sure it is all true.
```

```
##  [1] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [24] TRUE TRUE TRUE TRUE TRUE TRUE
```

```
nodenames = gsub(" [A-Za-z]+,", "", V(bibnet)$name) # transform the names/labels and make it a bit nice
V(bibnet)$label = nodenames
V(bibnet)$name = nodenames
plot(bibnet) # plot it!
```

Bibliographic Coupling Network




```
# summary(bibnet)

#edgelist = as_edgelist(bibnet) # Look at it in an edgelist.
```

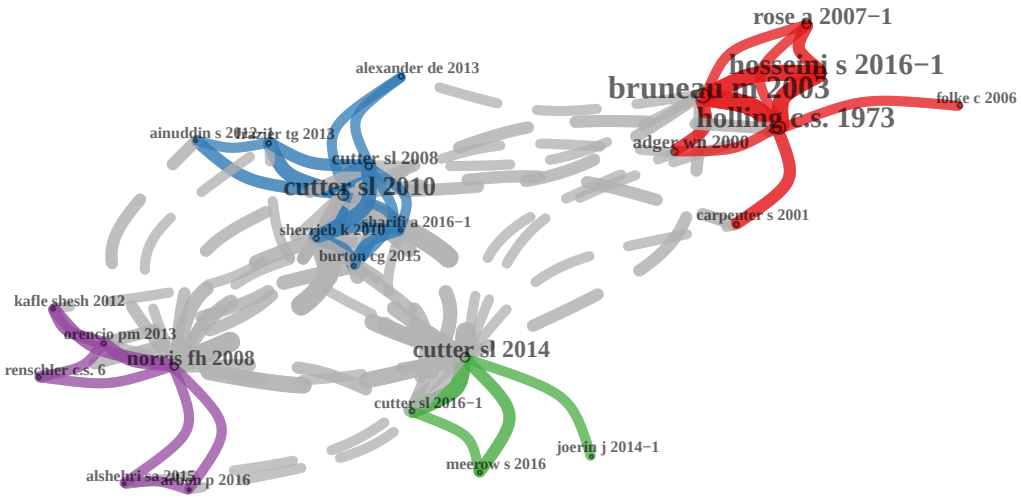
```
net$cluster_res
```

```
##                          vertex cluster btw_centrality clos_centrality pagerank_centrality
## 1            osei-kyei r, 2023       1   6.805657e+00      0.02000000          0.01826661
## 2              laurien f, 2022       1   9.948300e+00      0.02083333          0.03422040
## 6                tong ph, 2021       1   3.518905e+01      0.02272727          0.03190060
## 8         assarkhaniki z, 2020       1   4.218850e+00      0.02000000          0.03713273
## 9             sarker mni, 2020       1   4.792412e-02      0.01562500          0.01247474
## 11             nguyen hl, 2020       1   2.573417e+01      0.02272727          0.04572943
## 14           almutairi a, 2020       1   9.908996e-01      0.01785714          0.03381351
## 16           cariolet jm, 2019       1   1.204345e+01      0.02083333          0.04365244
## 18              saja ama, 2019       1   3.819307e-01      0.01724138          0.05714217
## 19              wilkin j, 2019       1   1.900392e+00      0.01785714          0.02841970
## 20                 cai h, 2018       1   7.882468e-03      0.01562500          0.02960671
## 21              saja ama, 2018       1   5.479310e+00      0.02083333          0.05327095
## 22           mochizuki j, 2018       1   1.260023e+01      0.02083333          0.04441923
## 23           asadzadeh a, 2017       1   1.134465e+01      0.02083333          0.04511708
## 25           sharifi a, 2016-1       1   1.231012e+00      0.01785714          0.04503408
## 26           sharifi a, 2016-2       1   9.815400e+00      0.02000000          0.02676718
## 28 ostadtaghizadeh abbas, 2015       1   2.608928e-01      0.01666667          0.02795806
## 3            osei-kyei r, 2022       2   1.328670e+00      0.01587302          0.01036352
## 4           rathnayaka b, 2022       2   4.378781e-01      0.01639344          0.01515358
## 5               poulin c, 2021       2   1.684061e+01      0.02127660          0.06687476
## 7               gasser p, 2021       2   1.048721e+02      0.02564103          0.04388268
## 10             mohebbi s, 2020       2   3.512567e+01      0.02439024          0.05211406
## 12             quitana g, 2020       2   1.328241e+01      0.02127660          0.02269349
## 13        goncalves lapj, 2020       2   7.545409e+00      0.02040816          0.05368759
## 15               zhou ym, 2019       2   3.140653e+00      0.01886792          0.04647882
## 17                rahi k, 2019       2   1.548293e+00      0.01754386          0.01005597
## 24         juan-garcia p, 2017       2   5.203251e+00      0.01818182          0.01672836
## 27            cantelmi r, 2021       2   6.003096e+00      0.02040816          0.02612079
## 29       mcclymont kerry, 2022       2   1.267192e+01      0.01960784          0.02092078
```

```
# As stated in the slides, it is very interesting to see that with Louvain clustering, there are two cl

# Have to make the cluster table by hand instead...

####  Co-citation network ####
# Shows how the different cited references relate to each other
NetMatrix <- biblioNetwork(M, analysis = "co-citation", network = "references", sep = ";")
net=networkPlot(NetMatrix, Title = "Co-citation Network", type = "auto", size.cex=TRUE, size=3, remove.
```




```
net$cluster_res
```

```
##               vertex cluster btw_centrality clos_centrality pagerank_centrality
## 1     bruneau m 2003       1     44.8222280      0.011235955          0.05851356
## 4   holling c.s. 1973       1     39.7402720      0.011111111          0.07967746
## 6   hosseini s 2016-1       1      0.0000000      0.003278689          0.04354785
## 11   carpenter s 2001       1      0.0000000      0.010416667          0.01820406
## 13      adger wn 2000       1      0.0000000      0.010416667          0.02621088
## 14       folke c 2006       1      0.0000000      0.003125000          0.01466059
## 18      rose a 2007-1       1      0.0000000      0.003278689          0.03299030
## 2      cutter sl 2010       2     78.8206711      0.012048193          0.09169578
## 8      cutter sl 2008       2      1.3737669      0.010752688          0.06462451
## 9     sherrieb k 2010       2      0.9230769      0.010416667          0.04883882
## 10     burton cg 2015       2      0.8076923      0.010416667          0.04279540
## 15    frazier tg 2013       2      0.0000000      0.010309278          0.03494226
## 19 ainuddin s 2012-1       2      0.0000000      0.009009009          0.02346809
## 20 alexander de 2013       2      0.0000000      0.008928571          0.02102661
## 24   sharifi a 2016-1       2      0.0000000      0.010309278          0.03648655
## 3      cutter sl 2014       3    153.3429290      0.012987013          0.06211060
## 12   cutter sl 2016-1       3      4.2796528      0.010526316          0.03566218
## 16      meerow s 2016       3      0.0000000      0.003278689          0.02725530
## 21    joerin j 2014-1       3      0.0000000      0.003257329          0.01556413
## 5      norris fh 2008       4     37.8897110      0.011363636          0.07135302
## 7    alshehri sa 2015       4      0.0000000      0.010000000          0.02712497
## 17    orencio pm 2013       4      0.0000000      0.010416667          0.04110449
## 22   kafle shesh 2012       4      0.0000000      0.009433962          0.02932166
```

```
## 23  renschler c.s. 6       4      0.0000000      0.009433962          0.02569594
## 25       arbon p 2016       4      0.0000000      0.010000000          0.02712497
```

```
# This network shows nodes that has at least 5 edges. This filter was chosen in order to reveal the mos
# In a way, this network is the flip side of bibliographic coupling network.

#### Author Keywords Analysis  ####
NetMatrix <- biblioNetwork(M, analysis = "co-occurrences", network = "author_keywords", sep = ";")
net=networkPlot(NetMatrix, Title = "Author Keywords Co-occurence Network", type = "auto", size.cex=TRUE
```


```
net$cluster_res
```

```
##                                  vertex cluster btw_centrality clos_centrality pagerank_centrali
## 1                            resilience       1   3199.6250000    0.0017857143         0.047391
## 2                  critical infrastructure       1    395.2083333    0.0015479876         0.024199
## 15                             disasters       1     24.5000000    0.0014880952         0.011758
## 38                 criticality assessment       1      0.0000000    0.0014164306         0.008363
## 39                       damage reduction       1      0.0000000    0.0014164306         0.008363
## 44                         drinking water       1      0.0000000    0.0006887052         0.007114
## 49                  flood risk management       1      0.0000000    0.0006802721         0.004820
## 59                      literature review       1      0.0000000    0.0006887052         0.007114
## 60                             management       1      0.0000000    0.0006896552         0.007646
## 62                                metrics       1      0.0000000    0.0006887052         0.007114
## 65                        natural hazard       1      0.0000000    0.0006887052         0.007114
## 69                  performance measures       1      0.0000000    0.0006887052         0.007114
## 82                       sendai framework       1      0.0000000    0.0014164306         0.008363
## 83                          sewer systems       1      0.0000000    0.0006896552         0.007646
```

## 87	standards	1	0.0000000	0.0014224751	0.004231
## 93	system analysis	1	0.0000000	0.0006887052	0.007114
## 96	systems approach	1	0.0000000	0.0006802721	0.004820
## 98	transportation system	1	0.0000000	0.0006849315	0.006396
## 100	urban community	1	0.4666667	0.0014265335	0.004430
## 103	urban networks	1	0.0000000	0.0006849315	0.006396
## 104	urban transportation modes	1	0.0000000	0.0006849315	0.006396
## 106	wastewater	1	0.0000000	0.0006896552	0.007646
## 107	wrrf	1	0.0000000	0.0006896552	0.007646
## 3	community resilience	2	553.3000000	0.0015455951	0.017788
## 6	disaster management	2	657.4333333	0.0016260163	0.015445
## 7	disaster resilience	2	278.8000000	0.0013755158	0.015452
## 16	resilience assessment	2	2.0000000	0.0006882312	0.013831
## 26	big data	2	0.0000000	0.0015337423	0.006533
## 33	composite indicators building (cib)	2	0.0000000	0.0006146281	0.006529
## 51	governance	2	0.0000000	0.0015337423	0.006533
## 53	information visualisation	2	0.0000000	0.0006548788	0.008164
## 58	knowledge representation	2	0.0000000	0.0006548788	0.008164
## 67	operationalizing	2	0.0000000	0.0006146281	0.006529
## 74	resilience indicator	2	0.0000000	0.0006697924	0.006839
## 78	resilience modelling	2	0.0000000	0.0006548788	0.008164
## 80	risk management	2	0.0000000	0.0015337423	0.006533
## 94	systematic overview	2	0.0000000	0.0006548788	0.008164
## 95	systematic survey	2	0.0000000	0.0006146281	0.006529
## 4	criteria	3	482.8690476	0.0016366612	0.016406
## 8	indicators	3	138.5071429	0.0016103060	0.014994
## 11	assessment	3	321.0000000	0.0015576324	0.009588
## 21	adaptive capacity	3	0.0000000	0.0015337423	0.007990
## 23	assessment tool	3	0.0000000	0.0014619883	0.006209
## 25	awareness	3	0.0000000	0.0015337423	0.007990
## 29	climate change mitigation and adaptation	3	0.0000000	0.0015337423	0.008913
## 46	empirical studies	3	0.0000000	0.0015337423	0.007990
## 68	organizational resilience	3	0.0000000	0.0015337423	0.007990
## 70	principles	3	0.0000000	0.0015337423	0.008913
## 88	sustainability	3	0.0000000	0.0015337423	0.008913
## 99	uncertainties	3	0.0000000	0.0014619883	0.006209
## 102	urban energy	3	0.0000000	0.0015337423	0.008913
## 5	measurement	4	195.9071429	0.0016260163	0.015813
## 20	adaptive and transformative capacity	4	0.0000000	0.0015337423	0.006475
## 37	coping	4	0.0000000	0.0015337423	0.006475
## 41	databases	4	0.0000000	0.0015337423	0.009643
## 45	earthquakes	4	0.0000000	0.0015337423	0.009643
## 48	enhancement	4	0.0000000	0.0015337423	0.009643
## 52	hurricanes	4	0.0000000	0.0015337423	0.009643
## 79	risk drivers	4	0.0000000	0.0015337423	0.006475
## 81	roads	4	0.0000000	0.0015337423	0.009643
## 97	transportation	4	0.0000000	0.0015337423	0.009643
## 9	resilience indicators	5	603.0333333	0.0015384615	0.015415
## 13	disaster risk management	5	98.2000000	0.0007272727	0.014750
## 18	urban resilience	5	56.0000000	0.0013698630	0.012382
## 22	assessment framework	5	0.0000000	0.0006720430	0.008588
## 24	assessment tools	5	0.0000000	0.0006993007	0.007275
## 30	climate-related disasters	5	0.0000000	0.0013623978	0.006075
## 31	coastal communities	5	0.0000000	0.0006720430	0.008588

```
## 32                          coastal hazards       5      0.0000000    0.0006720430         0.008588
## 35                    conceptual diversity       5      0.0000000    0.0006993007         0.007275
## 50                                     gis       5      0.0000000    0.0006451613         0.007306
## 61                                     map       5      0.0000000    0.0006451613         0.007306
## 63            models indices and domains       5      0.0000000    0.0006993007         0.007275
## 101                     urban ecosystems       5      0.0000000    0.0013623978         0.006075
## 10                                review       6    287.5333333    0.0015723270         0.020913
## 17              resilience measurement       6    242.4000000    0.0015243902         0.009887
## 27       biophysical resilience functions       6      0.0000000    0.0015337423         0.006921
## 28                              climate       6      0.0000000    0.0006747638         0.009276
## 34         comprehensive risk management       6      0.0000000    0.0006747638         0.009276
## 42                    decision support       6      0.0000000    0.0006747638         0.009276
## 47                      energy systems       6      0.0000000    0.0015337423         0.006921
## 55            infrastructure resilience       6      0.0000000    0.0013550136         0.006910
## 64                    multiple hazard       6      0.0000000    0.0006747638         0.009276
## 73              resilience engineering       6      0.0000000    0.0013550136         0.006910
## 76               resilience management       6      0.0000000    0.0013550136         0.006910
## 91              swoosh resilience curve       6      0.0000000    0.0015337423         0.006921
## 12         community disaster resilience       7    329.1666667    0.0007473842         0.010261
## 14              disaster risk reduction       7   1035.0500000    0.0016286645         0.010333
## 36                         connectivity       7      0.0000000    0.0007002801         0.009510
## 40                                 data       7      0.0000000    0.0007002801         0.009510
## 56                           innovation       7      0.0000000    0.0007002801         0.009510
## 84              social network analysis       7      0.0000000    0.0007002801         0.009510
## 85               social network mapping       7      0.0000000    0.0007002801         0.009510
## 86                       social networks       7      0.0000000    0.0007002801         0.009510
## 19                adaptation strategies       8      0.0000000    0.0250000000         0.009345
## 43      disaster resilience measurement       8      0.0000000    0.0250000000         0.009345
## 75                   resilience indices       8      0.0000000    0.0250000000         0.009345
## 92                   synthesis analysis       8      0.0000000    0.0250000000         0.009345
## 105                        validation       8      0.0000000    0.0250000000         0.009345
## 54        infrastructure interdependency       9      0.0000000    0.0333333333         0.009345
## 57                         integration       9      0.0000000    0.0333333333         0.009345
## 77                 resilience metrics       9      0.0000000    0.0333333333         0.009345
## 89          sustainable design strategies       9      0.0000000    0.0333333333         0.009345
## 66                 objective indicator      10      0.0000000    0.0333333333         0.009345
## 71              quantitative measurement      10      0.0000000    0.0333333333         0.009345
## 72                 resilience dimension      10      0.0000000    0.0333333333         0.009345
## 90  sustainable development goals (sdgs)      10      0.0000000    0.0333333333         0.009345
```

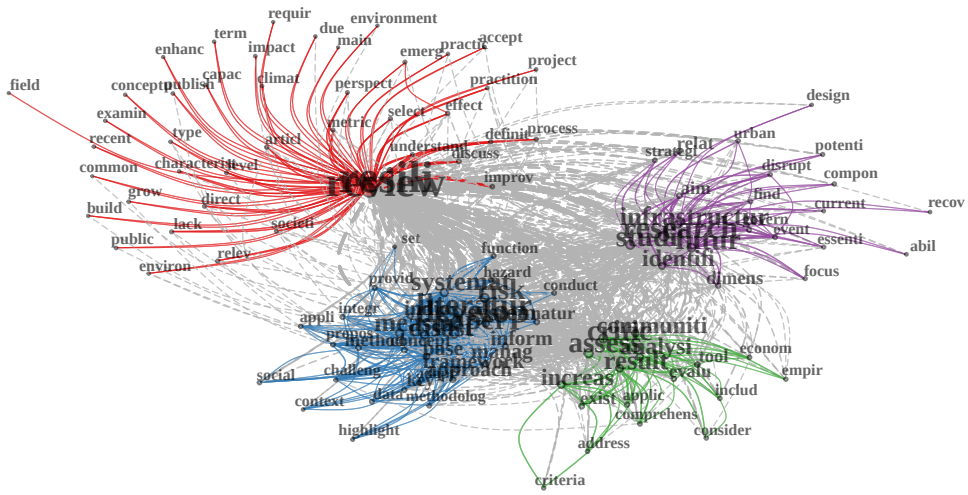
```
# Using Louvain clustering, 11 clusters were identified. It's interesting to see that that there are th

####  Abstract Co-occurence Network, 1-gram ####
abstract_terms = termExtraction(M, Field="AB", ngrams=1, verbose=F, stemming = TRUE)
NetMatrix <- biblioNetwork(abstract_terms, analysis = "co-occurrences", network = "abstracts")
summary(networkStat(NetMatrix))
```

```
##
##
## Main statistics about the network
##
##  Size                            828
##  Density                         0.189
##  Transitivity                    0.479
##  Diameter                        2
```

```
##  Degree Centralization                 0.811
##  Average path length                   1.811
##
```

```
net=networkPlot(NetMatrix, Title = "Abstract Co-occurence Network (1-gram)", type = "auto", size.cex=TRU
```




```
net$cluster_res
```

```
##            vertex cluster btw_centrality clos_centrality pagerank_centrality
## 1          resili       1   1.886113e+03    0.0043859649         0.072272185
## 4          review       1   1.576507e+03    0.0043103448         0.069147247
## 40         articl       1   7.542617e-02    0.0028490028         0.003764447
## 46         climat       1   0.000000e+00    0.0025380711         0.003206164
## 49         improv       1   1.793535e+00    0.0030674847         0.004985659
## 53          capac       1   0.000000e+00    0.0007374631         0.003155818
## 55        definit       1   3.695465e-01    0.0029585799         0.004460501
## 58         metric       1   2.705140e-02    0.0029411765         0.004161237
## 61   characterist       1   0.000000e+00    0.0026809651         0.003596616
## 63       conceptu       1   0.000000e+00    0.0007374631         0.003155818
## 64         direct       1   0.000000e+00    0.0027700831         0.003655978
## 69          level       1   0.000000e+00    0.0024096386         0.003594001
## 70        process       1   1.705548e-01    0.0030487805         0.003905200
## 72         select       1   9.449310e-02    0.0029154519         0.003758533
## 75        discuss       1   4.008754e-01    0.0029940120         0.004664688
## 76         effect       1   3.064362e-01    0.0028901734         0.004984538
## 79           lack       1   0.000000e+00    0.0026525199         0.003638360
## 80       perspect       1   0.000000e+00    0.0027700831         0.003652690
```

```
## 82           type       1   4.740834e-02    0.0026455026         0.003255827
## 83          build       1   0.000000e+00    0.0025974026         0.003206024
## 87          emerg       1   0.000000e+00    0.0027548209         0.004349036
## 88         enhanc       1   0.000000e+00    0.0007374631         0.003155818
## 89        environ       1   0.000000e+00    0.0028490028         0.003268921
## 90         examin       1   0.000000e+00    0.0007374631         0.003155818
## 93     practition       1   2.658396e-02    0.0028409091         0.003744023
## 94          relev       1   8.863616e-02    0.0028248588         0.003540993
## 95     understand       1   1.547085e-01    0.0028985507         0.004248204
## 97         common       1   0.000000e+00    0.0024752475         0.003204501
## 98            due       1   0.000000e+00    0.0025906736         0.003219344
## 100          grow       1   0.000000e+00    0.0024875622         0.003221032
## 101       practic       1   0.000000e+00    0.0028490028         0.003289218
## 102       societi       1   7.870220e-02    0.0029069767         0.003659103
## 103          term       1   0.000000e+00    0.0007374631         0.003155818
## 104        accept       1   0.000000e+00    0.0027472527         0.003275143
## 105   environment       1   0.000000e+00    0.0025974026         0.003206024
## 106         field       1   0.000000e+00    0.0007363770         0.002233999
## 107        impact       1   0.000000e+00    0.0025380711         0.003206164
## 108          main       1   0.000000e+00    0.0007374631         0.003155818
## 109       project       1   0.000000e+00    0.0027100271         0.003289124
## 110        public       1   0.000000e+00    0.0026455026         0.003218714
## 111       publish       1   0.000000e+00    0.0024813896         0.003205287
## 112        recent       1   0.000000e+00    0.0007374631         0.003155818
## 114         requir       1   0.000000e+00    0.0007374631         0.003155818
## 2           measur       2   4.976473e+01    0.0033112583         0.023936567
## 5           disast       2   1.851251e+01    0.0033444816         0.022351416
## 6        framework       2   4.911686e+00    0.0032786885         0.011134834
## 7            indic       2   1.555279e+00    0.0032467532         0.013435741
## 10          system       2   2.658428e+01    0.0033444816         0.015565075
## 12         develop       2   5.959670e+02    0.0036764706         0.031411601
## 13          social       2   2.446795e-02    0.0030303030         0.003963786
## 15            risk       2   4.185092e+02    0.0035587189         0.020754278
## 16           paper       2   2.214970e+02    0.0034482759         0.023489080
## 17        approach       2   6.927247e-01    0.0032258065         0.008626303
## 19       literatur       2   1.584770e+02    0.0034364261         0.022428832
## 22         concept       2   1.480119e+00    0.0032467532         0.011970947
## 25        systemat       2   8.803968e+01    0.0034013605         0.017823401
## 27          method       2   7.884331e+00    0.0032362460         0.013165973
## 29           adapt       2   3.096725e-02    0.0030769231         0.010187206
## 30             key       2   6.129000e-01    0.0032362460         0.007487444
## 31          manag       2   6.368753e+00    0.0032573290         0.012865413
## 34            data       2   1.873327e-02    0.0030303030         0.005951352
## 37            base       2   1.295138e+01    0.0033222591         0.017006061
## 39     methodolog       2   1.254333e-01    0.0031055901         0.006745474
## 41        context       2   1.376322e-02    0.0029498525         0.004552277
## 44          propos       2   4.707550e-02    0.0030395137         0.008550923
## 50          inform       2   9.740155e-01    0.0032051282         0.009656746
## 52           appli       2   2.446795e-02    0.0030303030         0.006043911
## 54         conduct       2   4.330643e-01    0.0031645570         0.004664405
## 56          hazard       2   1.504177e-01    0.0031645570         0.006411652
## 57          integr       2   8.684236e-02    0.0031446541         0.006619108
## 59           natur       2   1.065418e+00    0.0032467532         0.006775526
## 60       challeng       2   2.446795e-02    0.0029585799         0.007894663
```

```
## 67       function       2   2.307589e-01    0.0031446541         0.005262398
## 71         provid       2   1.066446e-01    0.0031746032         0.007154765
## 92      highlight       2   1.376322e-02    0.0029498525         0.004033498
## 115           set       2   9.557793e-03    0.0029498525         0.002970970
## 3          assess       3   4.574140e+02    0.0036630037         0.020313587
## 9       communiti       3   3.557327e+01    0.0034722222         0.010707603
## 20         critic       3   4.410049e+02    0.0037735849         0.019934546
## 21        analysi       3   2.870307e+01    0.0034246575         0.014484035
## 28           tool       3   1.148345e+00    0.0032362460         0.006499533
## 32         result       3   2.867380e+01    0.0034602076         0.015415723
## 33       criteria       3   1.376322e-02    0.0030487805         0.003131665
## 35        increas       3   1.583030e+02    0.0034602076         0.012582537
## 36        address       3   2.302738e-01    0.0031746032         0.003830389
## 43          evalu       3   1.155294e+02    0.0033112583         0.007395979
## 47     comprehens       3   1.516501e+00    0.0031746032         0.005977661
## 48          exist       3   2.568085e+00    0.0032258065         0.006822721
## 68         includ       3   1.152854e+00    0.0031055901         0.006133604
## 73         applic       3   2.038524e+00    0.0032786885         0.006573973
## 77          empir       3   7.869119e-02    0.0031948882         0.003801027
## 84       consider       3   1.873327e-02    0.0031446541         0.003941907
## 86         econom       3   2.792986e-01    0.0031948882         0.005067337
## 8        research       4   6.619296e+02    0.0038461538         0.028433757
## 11          studi       4   2.281553e+02    0.0036764706         0.018605965
## 14          urban       4   2.623887e-01    0.0031347962         0.003953533
## 18  infrastructur       4   9.890378e+01    0.0035587189         0.020084957
## 23          futur       4   1.827714e+02    0.0036630037         0.023675894
## 24       identifi       4   1.155874e+01    0.0034013605         0.009538233
## 26         dimens       4   1.288670e+00    0.0032573290         0.006073285
## 38            aim       4   2.997426e+00    0.0033222591         0.010029865
## 42        disrupt       4   1.605709e-02    0.0031055901         0.005753812
## 45       strategi       4   6.442291e-01    0.0031847134         0.004076650
## 51          relat       4   9.016614e-01    0.0031545741         0.004074700
## 62         compon       4   1.376322e-02    0.0030487805         0.003670750
## 65          event       4   5.229286e-01    0.0032573290         0.007423593
## 66           find       4   5.617038e-01    0.0031746032         0.005893936
## 74        current       4   1.376322e-02    0.0029850746         0.003789500
## 78         govern       4   5.396681e-01    0.0031746032         0.004767396
## 81        potenti       4   1.605709e-02    0.0029498525         0.003639136
## 85         design       4   9.557793e-03    0.0029498525         0.002885715
## 91          focus       4   6.594763e-02    0.0030959752         0.003944894
## 96           abil       4   9.557793e-03    0.0029498525         0.002892331
## 99       essenti       4   1.298246e-01    0.0031347962         0.003951226
## 113        recov       4   0.000000e+00    0.0029325513         0.002800149
```

```
# I'm debating if this should be included... I don't think so, because the previous network already doe

#### Unused Codes ####

# # Abstract Co-occurence Network, 2-grams
# abstract_terms = termExtraction(M, Field="AB", ngrams=2, verbose=F, stemming = TRUE) # need to first
# NetMatrix <- biblioNetwork(abstract_terms, analysis = "co-occurrences", network = "abstracts")
# net=networkPlot(NetMatrix, Title = "Abstract Co-occurence Network", type = "auto", size.cex=TRUE, siz
#
# # Co-word Analysis through Scopus Keyword co-occurences
```

```
# NetMatrix <- biblioNetwork(M, analysis = "co-occurrences", network = "keywords", sep = ";")
# net=networkPlot(NetMatrix, normalize="association", n = 50, Title = "Scopus Keywords Co-occurrences",
#
# # Historiograph. Better not to use this, because it is rather broken
# histResults = histNetwork(M, sep=";", min.citations = 1)
# net = histPlot(histResults,size=5,labelsize=4) # a lot of papers are not shown because there aren't a
# histResults$histData # shows direct citation results
# # bibliometrix:::histPlot #shows the source code for histPlot
#
# # Multiple Correspondence Analysis through abstracts
# suppressWarnings(
#   CS <- conceptualStructure(M, method="MCA", field="AB", minDegree=11, clust="auto", stemming=T, labe
# ) #minDegree of 10 works the best
#
# # Metric Multidensional Scaling through abstracts
# suppressWarnings(
#   CS <- conceptualStructure(M, method="MDS", field="AB", minDegree=18, clust="auto", stemming=T, labe
# ) #minDegree of 10 works the best
#
# # Shiny Interface
# biblioshiny() #to use the Shiny interface.
```