Main Greening Issues from the Perspective of the Urban Environment

Young-Chool Choi, Professor, Department of Public Administration, Chungbuk National University, SOUTH KOREA

Contact: ycchoi@cbu.ac.kr

Summary

This study aimed to derive important policy issues to be considered when implementing greening policies in an urban environment, by performing text network analysis on urban-environment-related papers published in international journals over the past two years (2020–1). As a result, five important topics were derived: considerations of sustainability; interventions to safeguard the health of community residents; management systems by network; greening effects on water in an urban environment; and prevention of soil and air pollution in the city. The findings suggest that in order to pursue effective greening policies in the future, it is necessary to carefully consider these five topics in policy terms.

Keywords: urban environment, greening, text network analysis.

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1 Introduction

Today, many national and international organizations are recognizing cities as agents for solving global problems. Many researchers and international organizations (Aronson et al., 2017; Ouko et al., 2018; BMB, 2016; Kim et al., 2013) point out that among the problems facing the world today are the sacrificing of environmental and social values, and economic imbalances caused by rapid economic development. These problems, as many researchers (Korea Forest Service, 2019; Kang, 2014; Korea Forest Service, 2020; Abukari and Mwalyosi, 2020) have pointed out, are bound up with climate change. They include environmental problems such as the destruction of ecosystems, depletion of natural resources, extinction of species, the deterioration of environmental quality, and social and economic problems, such as disease and poverty, that relate to basic human survival. The major policies that the international community is trying to implement to solve these problems are extremely diverse. Some countries promote the establishment of a green financial system and the fostering of green companies and industries in order to create a transformative green economic ecosystem. The policies focus also on strengthening human competency.

At the same time, some countries and cities are expanding their green perspectives so as to build a foundation for greening in daily life, create an example to lead local greening efforts, and reinforce environmental education. Many of these efforts are being undertaken worldwide, and they take the form of various common policies such as carbon reduction and absorption, water resource management, ecosystem protection, waste management, prevention of/recovery from natural disasters, poverty eradication, and education and gender equality (Magura et al., 2010; Roy et al., 2012; Wolch et al., 2014). In particular, as a sense of crisis deepens owing to climate change increases, carbon reduction and the reduction of fossil energy use are being emphasized as the top priorities of greening policies. 'Greening' here refers to a policy that comprehensively takes account of environmental, social and economic sustainability, with a focus on carbon dioxide emission control and fossil fuel consumption reduction.

Major countries and international organizations around the world are aware of the need to green the urban environment in a holistic way as a solution to current problems; they combine this with reflection on the industrialized urbanization that has prevailed to date and actively discuss greening measures aimed at improving of the urban environment in the future. In particular, in recent years interest has grown in realizing carbon reduction via, for instance, carbon-neutral and zero-carbon cities, and efforts in these directions are increasing. 'Greening' is currently seen as a term representing a new paradigm in urban development, but the actual concept of greening is weak (Korea Forest Service, 2019). Greening, as many researchers define it, focuses on carbon reduction, and numerous related studies are being conducted without presenting a specific concept of a green city (Aronson et al., 2017).

At present, from a global perspective, cities are recognized as agents for solving global problems. When cities are targeted as a means for improving the urban environment and solving global problems, the question of how to green the city is hugely important. However, since the conceptual definitions of greening are different, it is better to examine what the common characteristics are of the greening measures currently being undertaken than to establish policy deductively on the basis of a definition of the concept.

From this perspective, and given the importance greening has attained as a global issue, this study reviews recent research and recent publications relating to greening and the urban environment, and examines how these studies view policy considerations that are important for promoting greening in cities. This approach has the advantage not only of suggesting directions for countries that are pursuing greening measures in cities, but also of providing researchers with information on areas that should be focused on more in future research. The study aims to derive important policy issues relating to greening in the urban environment by analysing recently-published research papers on these topics. To do this, we employ the text network analysis method, which has been widely used in the field of social sciences.

2   Theoretical Discussion

Recently, various studies (Bae et al., 2012; BMNT, 2019; Choi et al., 2017; Kang, 2014) have been conducted in relation to green cities, but these researches have been insufficient. These studies have put forward the concept of a green city and have emphasized the reduction of carbon dioxide emissions and, especially, reduction of carbon dioxide, all on the basis of international legal norms. However, they have failed to put forward a concrete concept of a green city, and as a result these researches have been too abstract.

Other green city-related research (Kim et al., 2013) has focused mainly on planning characteristics and planning elements through case analysis of cities in various countries. Some scholars (Lawrence, 2018; Navarro and Pereira, 2015) take the view that a city that leads green growth and creates green jobs while minimizing environmental pollution and greenhouse gases by re-organizing the city as a low-carbon type is an important concept in greening. Others (Sekot, 2017; Toscani and Sekot, 2015) define a green city as one that primarily reduces dependence on fossil energy and, secondarily, uses a minimum of fossil energy, offsetting carbon through the use of natural elements and renewable energy. Some scholars (Korea Forest Service, 2019; Kim et al., 2013) also define a green city one that reduces carbon via carbon mitigation and absorbs generated carbon as much as possible in order to respond to global climate change caused by greenhouse gas emissions.

Other scholars (Abukari and Mwalyosi, 2020; Aronson et al., 2017) again define a green city as one where environment and economy coexist, promoting economic growth through job creation and new growth-engine creation while responding to environmental conservation and climate change by re-organizing all urban structures into a low-carbon system. Still others affirm that a carbon-neutral city that meets the carbon-neutral principle, and solves both climate change and energy problems at the same time, will reduce carbon emissions as much as possible and absorb generated carbon so as to ultimately zero the carbon concentration in the atmosphere.

On the other hand, many international and non-governmental organizations recognize the problems facing our society as encompassing the environment, society and economy (Threlfall et al al., 2017; Stee;e et al,. 2020; Porter et al., 2020; Phillips et al., 2020) . The problem, as they see it, is caused by an increase in environmental loads due to population

growth, and a change to a lifestyle centred on consumption of natural resources and energy. International organizations emphasize the need for the world to recognize this problem and to deal with it. As regards social and economic issues, matters relating to basic human livelihood security, such as basic education on hygiene, are mainly focused on underdeveloped countries that are marginalized in terms of economic development. NGOs are focusing on environmental aspects such as carbon reduction and changes in fossil energy consumption behaviours to respond to climate change, conservation of biodiversity such as in forests and oceans, and sustainability in terms of food safety and production technology. This reflects the character of international organizations that have traditionally tried to preserve the environment against development.

As is clear from the general interests of researchers and international organizations in greening, it is undeniable that greening is becoming the most important policy tool in terms of continuously improving the urban environment (Perkins, 2015; Ordonez and Duinker, 2013). In this context, the most important thing individual countries or cities can do is to find out what for them should be the most important policy considerations relating to greening; after identifying these policy considerations, they can then promote greening under long-term planning. What, then, should be the policy considerations as regards greening the urban environment? In order to answer this question, this study will perform text network analysis.

3   Survey Design

This study focuses on papers published in international journals over the past two years as the target of analysis. The analysis period runs from 1 January 2020 to 31 December 2021. We perform text network analysis on these papers by extracting those papers dealing with themes of 'urban environment' and 'greening' simultaneously.

Papers on the urban environment or greening are published every year in numerous academic journals. However, there are practical limitations in analysing all these papers. Therefore, in this study, 145 social science journals managed by Springer, an internationally-renowned publishing house, are analysed. The Netminer 4.4 software program is used as the analysis software. In the process of utilizing text network analysis, as a first step word-cloud analysis, connection centrality analysis and topic modelling analysis are performed on the extracted papers by entering 'urban environment' and 'greening' as simultaneous keywords (Scott, 2012). Following this analysis process, it is possible to uncover important policy issues relating to greening aimed at the improvement of the recent urban environment (Hansen and Smith, 2010).

4   Analysis Result

4.1   Word-cloud analysis

Figure 1 shows the results of word-cloud analysis of 11,202 words relating most closely to the urban environment and greening included in 1,003 papers published during the two-year analysis period. The Netminer 4.4 program employed in this study is the program most frequently used for text network analysis. When conducting word-cloud analysis with this program, 500 words are included as a maximum. Figure 1 presents the results of word-cloud analysis showing these 500 words in order of frequency of word occurrence.

Figure 1   Word-cloud analysis result

The word-cloud analysis results shown in Figure 1 provide basic statistics in terms of the network's size and scale. This analysis result provides basic information regarding the words included in papers dealing with the urban environment and greening. However, since this does not provide sufficient information about the relationship between words, it is necessary to examine the frequency of occurrence of words. Table 1 shows this. As one word, *city* occurs 867 times, thus having the highest frequency of occurrence. The word that appeared the next most frequently was *area* (619 occurrences). Next comes *development* (485 occurrences).

Table 1   Frequency of appearance of words

		1	2	3	4	5	6
		of Speech(P	Frequency	Word length	Name Type	uthor Keywor	Distance
1	city	nmon Noun"	867.0	4.0	"-"	"False"	1.0
2	area	nmon Noun"	619.0	4.0	"-"	"False"	1.0
3	development	nmon Noun"	485.0	11.0	"-"	"False"	1.0
4	health	nmon Noun"	461.0	6.0	"-"	"False"	1.0
5	environment	nmon Noun"	452.0	11.0	"-"	"False"	1.0
6	model	nmon Noun"	393.0	5.0	"-"	"False"	1.0
7	system	nmon Noun"	389.0	6.0	"-"	"False"	1.0
8	effect	nmon Noun"	377.0	6.0	"-"	"False"	1.0
9	level	nmon Noun"	343.0	5.0	"-"	"False"	1.0
10	change	nmon Noun"	327.0	6.0	"-"	"False"	1.0
11	impact	nmon Noun"	320.0	6.0	"-"	"False"	1.0
12	approach	nmon Noun"	296.0	8.0	"-"	"False"	1.0
13	population	nmon Noun"	291.0	10.0	"-"	"False"	1.0
14	community	nmon Noun"	289.0	9.0	"-"	"False"	1.0
15	policy	nmon Noun"	250.0	6.0	"-"	"False"	1.0
16	pollution	nmon Noun"	247.0	9.0	"-"	"False"	1.0
17	time	nmon Noun"	243.0	4.0	"-"	"False"	1.0
18	soil	nmon Noun"	241.0	4.0	"-"	"False"	1.0
19	management	nmon Noun"	236.0	10.0	"-"	"False"	1.0
20	technology	nmon Noun"	233.0	10.0	"-"	"False"	1.0

4.2 Topic modelling analysis

Topic modelling analysis is a method of classifying the subject categories of topics that can best express a set of language texts. A topic is called an 'issue category' because it is a concept that is composed of a plurality of words and represents that concept, and because it divides the entire set of language texts into a specific number of issue categories. Topic modelling analysis estimates all the topics from a document set on the basis of the words appearing in each document, and automatically extracts topics corresponding to individual documents and words constituting each topic on the basis of probability distribution.

Using this method, it is possible to identify, in the academic papers that deal with 'urban environment' and 'greening' as their core, important issues understanding of which is necessary for promoting greening in the urban environment. As described above, the results of this study can help individual countries or cities to select policy measures to be considered when promoting greening as a policy. Against this background, this study conducted topic analysis and found the following five main topics, shown in Figure 2.
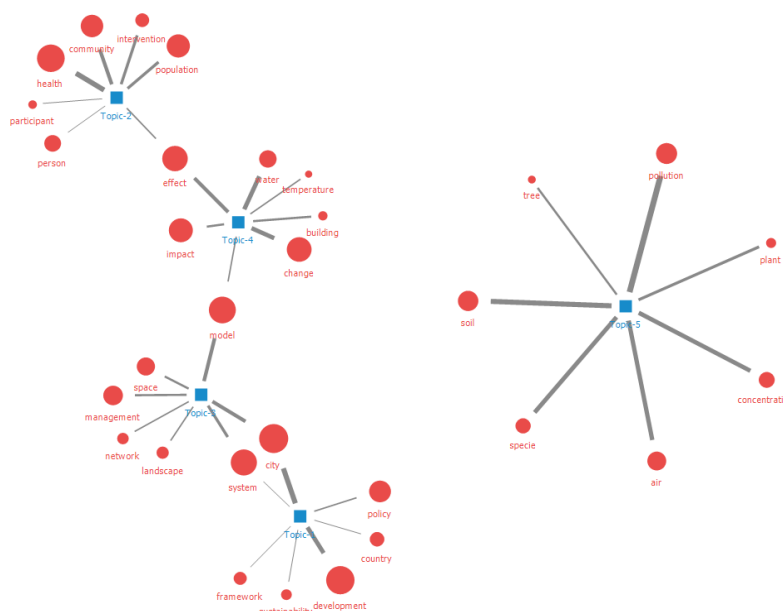

Figure 2   Five main topics

Each topic will be explained in turn. Topic 1 (Figure 3) consists of seven words: *sustainability*, *policy*, *framework*, *city*, *country*, *system* and *development*. Of these words, the word *city* has the highest connection score (0.079). Next is *development* with a connection score of 0.061. Considering the characteristics of Topic 1, the references to urban environment suggest that greening policies should be implemented in terms of sustainability. Therefore, Topic 1 can be named 'Considerations of sustainability'.
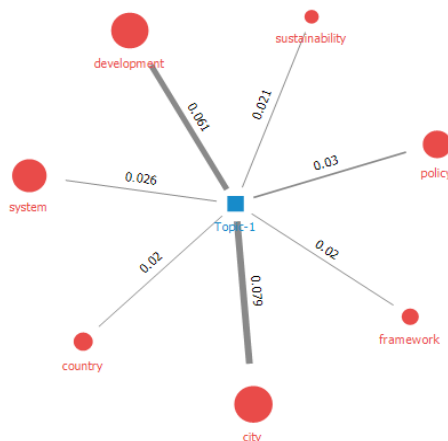
Figure 3   Topic 1: considerations of sustainability

Figure 4 shows Topic 2, which is made up of seven words: *community*, *health*, *person*, *participant*, *intervention*, *population* and *effect*. The word that can represent Topic 2 is *community* with a connection score of 0.043, which it can be seen is relatively higher than that of other words. Next is *population*, with a connection score is 0.041. When looking at the words constituting Topic 2 and the influence of each word on Topic 2, we see that greening in an urban environment should play a role as an intervention that can help the health of community residents.
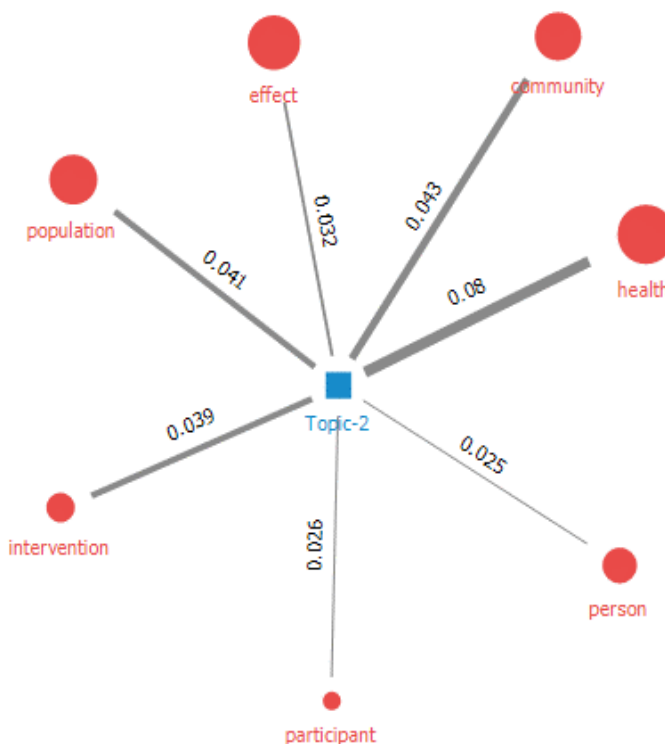
Figure 4   Topic 2: greening effects on water in urban environment

Figure 5 shows the words making up Topic 3 and the degree to which each word relates to its overall topic. Topic 3 consists of seven words: *network*, *city*, *landscape*, *system*, *space*, *management* and *model*. Among these words, *city*, at 0.051, indicated the highest degree of connection. It can be seen that this word *city* is duplicated in other topics. Considering the words constituting Topic 3 and the degree of connection of each word to Topic 3, the suggestion is that in greening policy for an urban environment, management via a network in the city is important. When it comes to greening in an urban environment, since many stakeholders are involved, networking among these stakeholders is important for success.
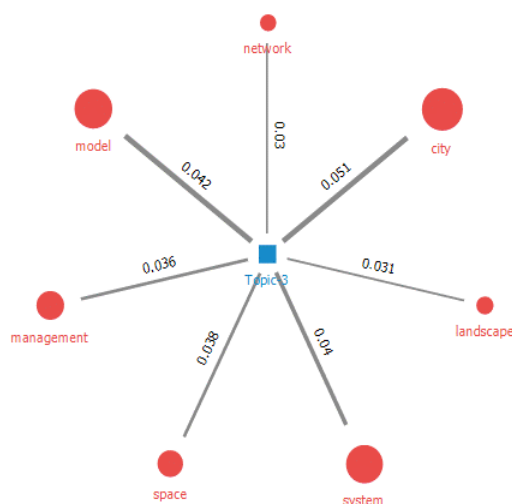

Figure 5   Topic 3: network management system

Figure 6 shows the components of Topic 4. Topic 4 consists of the words *change*, *impact*, *effect*, *model*, *water*, *temperature* and *building*. Of these words, it can be seen that *water* has the highest score (0.0073), and *change* and *effect* show the next-highest connection centrality score. Considering the characteristics of the words making up Topic 4, the topic can be called the effect of greening in the urban environment. In particular, it suggests that water problems can be greatly ameliorated through greening in urban environments.
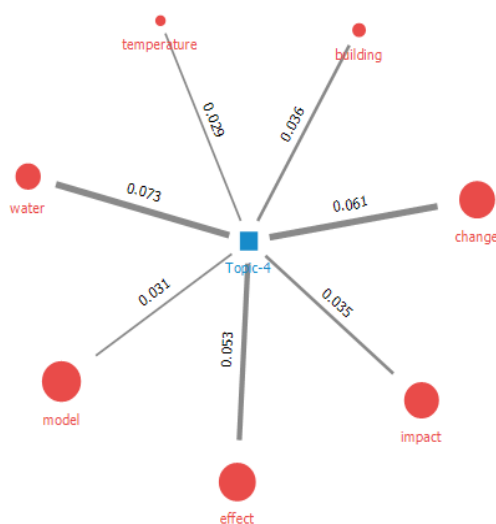

Figure 6   Topic 4: greening effect on water in urban environment

Figure 7 shows the main words composing Topic 5. Topic 5 consists of *pollution*, *specie*, *concentration*, *air*, *tree*, *soil* and *plant*. Of these, *pollution*, at 0.081, had the highest degree of connection with Topic 5. Next came *soil*, *air*, etc. Considering the characteristics and connections of the words constituting Topic 5, we can say that greening policy in an urban environment has a great contribution to make in preventing air or soil pollution in the city. Therefore, Topic 5 can be named 'Prevention of pollution of soil and air in the city'.
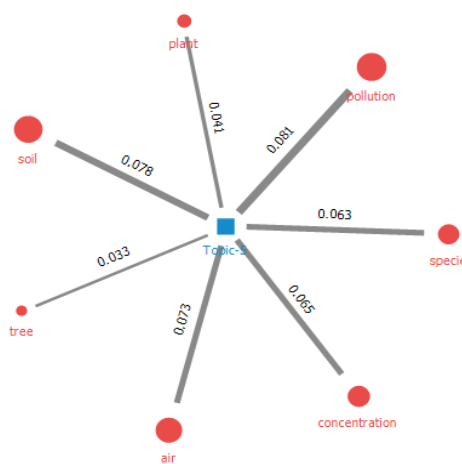

Figure 7   Topic 5: prevention of soil and air pollution in the city

4.3   Connection centrality analysis

As we have seen, the subject of greening policy in the urban environment was divided into five core subject categories. In the following, we examine the relationship between keywords in implementing greening policy in an urban environment. Here, analysis of the relationship between words can help us to select priorities in establishing and executing urban environment policies. To determine this, concentric circle analysis was performed, and the results are shown in Figure 8.
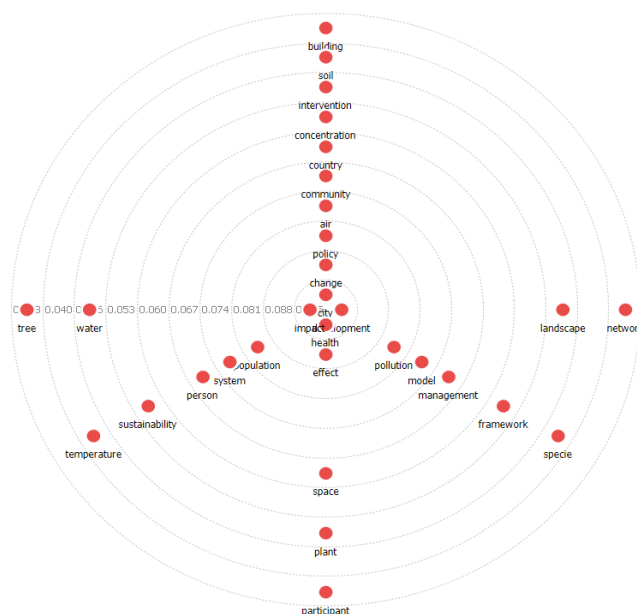

Figure 8   Concentric circle analysis result

It can be said that the nearer a word is to the centre of the concentric circle, the more important is the role it plays in the language network. From the above concentric circle analysis results, it can be seen that words such as *city*, *health* and *development* are located at the centre of the concentric circles.

Table 2 shows the connection centrality scores of the words included in the concentric circle analysis presented above. Here, in-degree centrality means the number of links with which one node connects to another node. High in-degree centrality means that many other words are inwardly connected to a specific word. This means that certain words are 'popular' with others, so to say. On the other hand, out-degree centrality means that certain words move outward towards other words. This high out-degree centrality means that certain words expand the scope of their activities to the outside.

Table 2   Connection centrality of words

		1	2
		In-Degree Centrality	Out-Degree Centrality
1	city	0.101854	0.101854
2	health	0.096964	0.096964
3	development	0.095384	0.095384
4	impact	0.095257	0.095257
5	effect	0.092514	0.092514
6	change	0.090563	0.090563
7	pollution	0.084923	0.084923
8	population	0.083866	0.083866
9	policy	0.083054	0.083054
10	system	0.080185	0.080185
11	model	0.080119	0.080119
12	air	0.077879	0.077879
13	management	0.074014	0.074014
14	community	0.073293	0.073293
15	person	0.068174	0.068174
16	country	0.067034	0.067034
17	space	0.064674	0.064674
18	framework	0.057838	0.057838
19	sustainability	0.055321	0.055321
20	concentration	0.054260	0.054260

We will try to derive a reduced network using the PFnet function by employing the connection centrality analysis result analysed above. The PFnet function simplifies a complex network and shows only the outlines, and it is meaningful to show the relationship between the precedence and succession of each word. Figure 9 shows the reduced network by PFnet analysis.
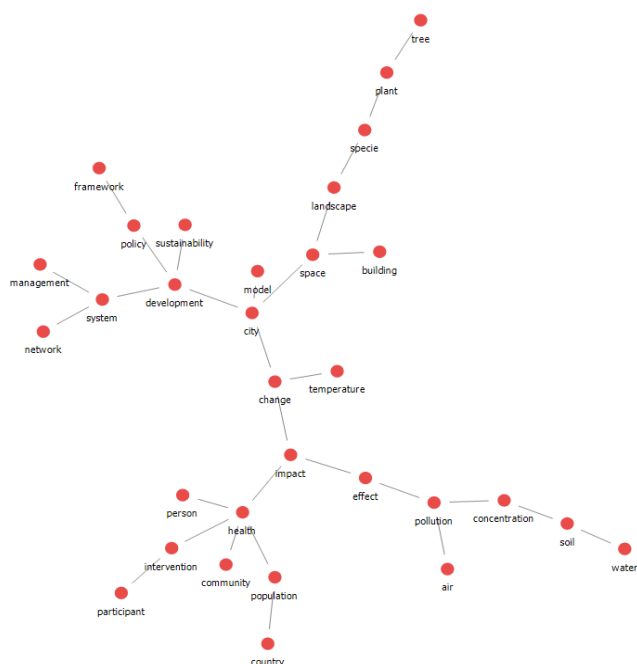
Figure 9   PFnet analysis result

Figure 10 shows the results of clustering achieved by dividing the reduced network by PFnet analysis into several sub-networks. It can be seen that the urban environment and greening language network made up of keywords are reconstructed into five reduced sub-networks. Figure 10 suggests that, when implementing greening policy in an urban environment, keywords divided into clusters can be divided into a single packaged policy, It is estimated that subdivided organizations can be formed to intensively manage these subdivided policies, and if central or local government allocates appropriate budgets to them, the chances of success for greening policies in urban environments are greater.
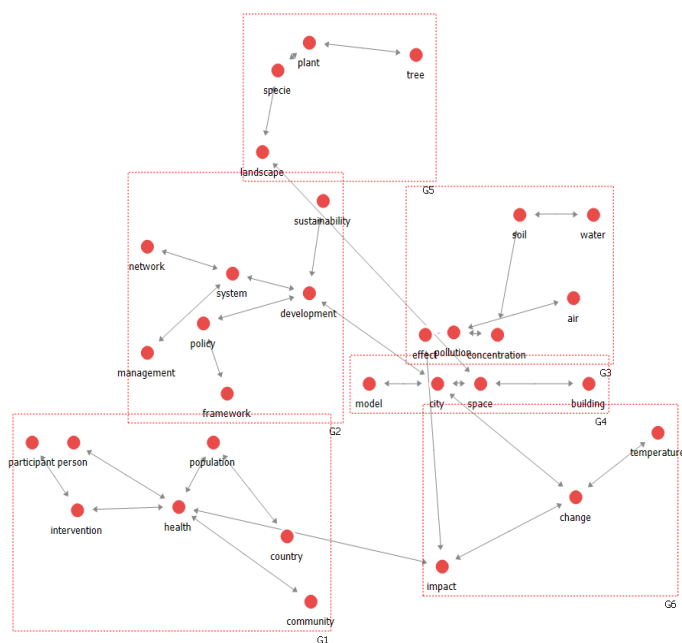

Figure 10   Segmented network divided by clustering

5   Conclusion

Today, as regards both developed and underdeveloped countries, issues relating to the implementation of green technology, green industry and green economic systems are increasing in importance. The scope of environmental policy is expanding, to include matters relating to green living, green land, low-carbon transportation systems, taxation, finance, manpower training, education, and international co-operation relating to green growth. Many countries have been implementing policies for the environment and for the greening of cities, viewing cities as spatial targets. For the success of greening policy in the urban environment, it is important above all to understand the major issues surrounding such policy, and it is important for individual countries or cities to establish and implement their own environmental policies in consideration of these issues. In recognition of this problem, this study attempted to derive the important issues relating to greening policy in cities from papers published in international journals over two periods in 2020 and 2021.

As a result, five major policy issue topics were derived. These topics were: sustainability considerations, health interventions for community residents, network management systems, greening effects on water in urban environments, and prevention of soil and air pollution in cities. Our findings indicate that, in order to pursue greening policy in an urban environment, it is necessary to carefully consider the five topics derived above in policy terms. Of course, this study acknowledges certain limitations in research performance: for example, the analysis period was limited to the last two years (2020–1), and only 145 international journals managed by the Springer publishing house were dealt with. If our study is supplemented by the work of future researchers, these studies taken together will be able to contribute further to the successful future implementation of greening policies in urban environments.

References

[1].   Abukari, H. and Mwalyosi, R.B. 2020. Local communities' perceptions about the impact of protected areas on livelihoods and community development. Global Ecology and Conservation. doi:10.1016/j.gecco.2020.e00909

[2].   Aronson, M.F., Lepczyk, C.A., Evans, K.L., Goddard, M.A., Lerman, S.B., MacIvor, J.S., Nilon, C.H., Vargo, T. 2017. Biodiversity in the city: key 121 AJCB Vol. 10 No. 1, pp. 115–123

[3].   Bae, J.S., Joo, R.W. and Kim, Y.S. (2012). Forest transition in South Korea: reality, path and drivers. Land Use Policy 29(1): 198-207.

[4].   Biodiversity Management Bureau (BMB) Department of Environment and Natural Resources (DENR). 2016. Philippine Biodiversity Strategy and Action Plan (2015-2028): Bringing Resilience to Filipino Communities. BMB-DENR, United Nations Development Programme – Global Environment Facility, Foundation for the Environment. C. Cabrido (Ed.). Diliman, Quezon City, Philippines.

[5].   BMNT (Ed.), 2019. Austrian Green Report 2019, 60th ed. Federal Ministry for Sustainability and Tourism, Vienna, Austria.

[6].   Choi, J. Y·, Lee, S. and Hwang, B. (2017). Evaluation of an Official Development Assistance (ODA) project: Focus on a forest recreation and eco-tourism site in Indonesia. Korean Journal of Agricultural Science. 4 (2) : 221–227.

[7].   Forest Cooperation between Korea and Indonesia. Research report to Korea Forest

[8].   Hansen, D., Shneiderman, B. and M. A. Smith. 2010. Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann.

[9].   https://www.forest.go.kr/kfsweb/kfs/idx/Index.do (searching date, 12 November 2021)

[10].   https://www.infrastructurevictoria.com.au/wpcontent/uploads/2019/03/IV_30_Year_Strategy_WEB_V2.

pdf.

[11].   Kang, Y. S. 2014. A study on Environmental Politics in Indonesia: Focusing on Tropical Rainforests. The Journal of Philippine & Southeast Asian Studies. 17(1) :25-278

[12].   Kim, S. B., Sung, Y.J., Park, K.S., Oh, D.G., Kim, D,S. and Go, Y,Y. (2013). International forestry cooperation and forestry ODA of Korea. Journal of the Korean Institute of Forest Recreation, 591-594.

[13].   Kim, S. B., Sung, Y.J., Park, K.S., Oh, D.G., Kim, D,S. and Go, Y,Y. 2013. International forestry cooperation and forestry ODA of Korea. Journal of the Korean Institute of Forest Recreation, 591-594.

[14].   Korea Forest Service. 2019. A study on expanding forest cooperation through self-evaluation of technology support projects for forest management and use in Indonesia. Research report to Korea Forest Service. (in Korean).

[15].   Korea Forest Service. 2020. A study on Development Plan of Mid-and Long-term

[16].   Lawrence, A., 2018. Do interventions to mobilize wood lead to wood mobilization? A

[17].   Magura, T., Horváth, R., Tóthmérész, B. 2010. Effects of urbanization on ground-dwelling spiders in forest patches in Hungary. Landscape Ecology 25(4):621-629.

[18].   Navarro, L.M., Pereira, H.M., 2015. Rewilding abandoned landscapes in Europe, in: Pereira, H.M., Navarro, L.M. (Eds.), Rewilding European Landscapes. Springer International Publishing, New York..

[19].   Ordonez, Camilo, and Peter N Duinker. 2013. "An Analysis of Urban Forest Management Plans in Canada: Implications for Urban Forest Management." Landscape and Urban Planning 116: 36–47. doi:10.1016/j.landurbplan.2013.04.007.

[20].   Ouko, C.A., Mulwa, R., Kibugi, R., Owuor, M.A., Zaehringer, J.G., Oguge, N.O. 2018. Community perceptions of ecosystem services and the management of Mt. Marsabit Forest in Norther Kenya. Environments 5(11):121.

[21].   Perkins, Harold. 2015. "Urban Forests are Social Natures: Markets, Race, Class, and Gender in Relation to (Un)just Urban Environments." In Urban Forests, Trees and Greenspace: A Political Ecology Perspective, edited by L. Anders Sandberg, Adrina Bardekjian, and Sadia Butt. Abingdon, OX: Routledge.

[22].   Phillips, Catherine, and Jennifer Atchison. 2020. "Seeing the Trees for the (Urban) Forest: MoreThan-Human Geographies and Urban Greening." Australian Geographer 51 (2): 155–168. doi:10.1080/00049182.2018.1505285.

[23].   Porter, Libby, Julia Hurst, and Tina Grandinetti. 2020. "The Politics of Greening Unceded Lands in the Settler City." Australian Geographer 51 (2): 221–228. doi:10.1080/00049182.2020.1740388.

[24].   Roy, S., Byrne, J., Pickering, C. 2012. A systematic quantitative review of urban tree benefits, costs, and assessment methods across cities in different climatic zones. Urban Forestry and Urban Greening 11(4), 351-363.

[25].   Scott, J. 2012. Social Network Analysis.: A Handbook. Thousands Oaks, California: SAGE.

[26].   Sekot, W., 2017. Forest Accountancy Data Networks as a Means for Investigating

[27].   Service. (in Korean).

[28].   Small-Scale Forestry: A European Perspective. Small-scale Forestry 16, 435–449.

[29].   Steele, Wendy, Aidan Davison, and Aviva Reed. 2020. "Imagining the Dirty Green City." Australian Geographer 51 (2): 239–256. doi:10.1080/00049182.2020.1727127.

[30].   Stirling, Andy. 2010. "Keep It Complex." Nature 468: 1029–1031. http://www.nature.com/nature/journal/v468/n7327/abs/4681029a.html.

[31].   Threlfall, Caragh G, and Dave Kendal. 2017. "The Distinct Ecological and Social Roles That Wild Spaces Play in Urban Ecosystems." Urban Forestry & Urban Greening 29: 348–356. doi:10.1016/j.ufug.2017.05.012.

[32].   Toscani, P., Sekot, W., 2017. Assessing the Economic Situation of Small-Scale Farm Forestry in Mountain

Regions: A Case Study in Austria. Mountain Research and Development 37, 271–280. https://doi.org/10.1659/MRD-JOURNAL-D-16-00106.1

[33]. Wolch, J.R., Byrne, J., Newell, J.P. 2014. Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'. Landscape and urban planning,125:234-244.