

ORIGINAL

## Utilizing Topic Modelling and AHP (Analytical Hierarchy Process) for Setting Policy Priorities to Strengthen Official Development Assistance at Local Government Level

### Utilización del modelo temático y del proceso de jerarquía analítica para establecer prioridades políticas con el fin de reforzar la ayuda oficial al desarrollo a nivel local

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#### ABSTRACT

In Korea, aid projects to developing countries at central government level are increasing in number significantly every year, yet at local government level their scale is extremely small. Recognizing this problem, this study aims to set policy priorities to strengthen official development assistance (ODA) at local government level in Korea. Accordingly, we analysed the important issues relating to ODA projects at local government level by performing topic modelling analysis method. On the basis of these analysis results, policy priorities were derived using the AHP method. The analysis suggests that in Korea, in order to revitalize ODA projects at local government level, a dedicated department that can professionally handle these projects must be established within each local authority. Furthermore, it is important to recruit and deploy professional administrators who can utilize these dedicated departments to discover new ODA projects.

**Keywords:** ODA at Local Government Level; Topic Modelling Analysis; AHP.

#### RESUMEN

En Corea, los proyectos de ayuda a los países en vías de desarrollo a nivel del gobierno central aumentan significativamente en número cada año, sin embargo, a nivel de los gobiernos locales su escala es extremadamente pequeña. Reconociendo este problema, este estudio pretende establecer prioridades políticas para fortalecer la ayuda oficial al desarrollo (AOD) a nivel de los gobiernos locales en Corea. Para ello, hemos analizado las cuestiones importantes relacionadas con los proyectos de AOD en el ámbito de los gobiernos locales mediante el método de análisis de modelos temáticos. Sobre la base de los resultados de este análisis, se establecieron prioridades políticas utilizando el método AHP. El análisis sugiere que en Corea, para revitalizar los proyectos de AOD a nivel de gobierno local, debe establecerse dentro de cada autoridad local un departamento dedicado que pueda gestionar profesionalmente estos proyectos. Además, es importante contratar y desplegar administradores profesionales que puedan utilizar estos departamentos especializados para descubrir nuevos proyectos de AOD.

**Palabras clave:** AOD a Nivel de Gobierno Local; Análisis de Modelos Temáticos; AHP.

## INTRODUCTION

Projects for international development cooperation are named Official Development Assistance (ODA) projects, but in many countries local authorities still have little interest in such projects. While this is true for almost all countries, in Korea especially this low awareness persists. While the amount of aid provided to developing countries at central government level has recently been rapidly increasing, local authorities have shown little interest in this area, meaning there is an acute need to increase local government interest in ODA.

Against this background, this study seeks, first, to analyse how ODA is viewed at local government level. This is a matter of understanding local authorities' policy issues in relation to ODA. Secondly, so as to increase interest in ODA at local government level, we aim to derive the policy priorities that are necessary if local government is to revitalize ODA projects.

In order to achieve the first research objective, this study seeks to perform topic modelling analysis on existing research papers relating to ODA and local government published in the social science field. Through topic modelling analysis of existing studies, ODA policy issues relating to local government can be derived. In order to fulfil the second objective, priorities are set regarding policy issues that local authorities must address in the future. To achieve this, the Analytical Hierarchy Process (AHP) method is applied.

## METHODS

### Analysis details

As mentioned above, our aim in this study is, first, to analyse the perspectives that local authorities have on ODA, and second, to set policy priorities for local government in revitalizing ODA projects in the future. In this regard, it is necessary for local authorities to implement high-priority policies first.

### Analysis method

This study utilizes two research methods. One of these is related to the first research topic, and this is the topic modelling analysis method. Topic analysis may be performed on existing research papers relating to local government and ODA using the Netminer 4.5 program, described below. For analysing the second research content, the AHP method is employed. This makes possible the setting of priorities for many policy issues using a pairwise method. In order to utilize the AHP method, this study will utilize the 'I MAKE IT' program and analyse the opinions of five experts with extensive academic and practical experience of ODA projects.

### Analysis period

The analysis period of this study ran from January 2010 to June 2023, 2010 being the year Korea joined, and began activities as a member of, the OECD's DAC ([https://www.koica.go.kr/sites/koica\\_en/index.do](https://www.koica.go.kr/sites/koica_en/index.do)). Since 2010 was the year in which Korea officially began providing aid to developing countries in earnest, academic papers published between January 2010 and 30 June 2023 were deemed eligible for analysis.

### Analysis target

The academic papers subject to analysis in this study were limited to those published in social science journals managed by Springer, an internationally renowned publisher. The reason for this is that Netminer 4.5, the program used in this study, is already linked to the academic papers published by Springer, meaning that these papers can be analysed via this program. Also, because the academic journals managed by Springer have a high level of international reliability, it is believed that there are no serious academic issues in using the papers managed by this publisher.

## DISCUSSION

### The need for aid to developing countries at local government level

Why is there a need to carry out aid projects for developing countries at local government level? The following five reasons supply an answer (Al-Samarrai and Cerdan-Infantes, 2013; Gupta and Tiongson, 2002; Kaufman et al., (2007; Hofman and Kaiser, 2006):

1. *Local expertise can be utilized. Local authorities include industries or technologies specialized in terms of their region.* This expertise can be leveraged to provide tailored support to developing countries. For example, local authorities with developed agriculture can focus on transferring agricultural technology, and industrial cities can provide manufacturing-related technology or management know-how.
2. *It is possible to promote diversity and innovation.* Central-government-led ODA projects can sometimes adopt a consistent approach. On the other hand, through local government participation, diverse perspectives and innovative solutions can be derived. Through experience-sharing and cooperation between local authorities,

more effective development support methods can be found.

3. *It is possible to promote inter-regional co-operation and networking.* As local authorities participate in ODA projects, international inter-regional cooperation can be strengthened. This promotes economic and cultural exchanges between the two regions and helps build long-term partnerships.
4. *It can contribute to achieving sustainable development goals (SDGs).* Each local government can play an important role in supporting the various goals of the SDGs by leveraging its unique resources and capabilities.
5. *It can promote democracy and local participation.* Local government participation can promote democracy and local citizen participation in developing countries. In sharing their experiences, local authorities can strengthen their capacity and encourage the participation of local residents.

For all these reasons, local government participation in ODA projects can complement the efforts of central government and contribute to providing more effective and diverse support to developing countries (Hu and Mendoza, 2013; Busse and Groning, 2009; Chun et al., 2010; Collier and Dollar, 2001; Knack, 2001). Furthermore, if local authorities participate in aid projects in developing countries, this can also benefit them in more practical ways, since it can contribute strongly towards the following:

1. *Building international networks and partnerships.* Through aid projects, local authorities can establish international relationships and expand their networks. This can create an opportunity to build long-term partnerships in the form of trade, investment and cultural exchange.
2. *Development of local authorities providing aid and strengthening of their local economies.* Through cooperation with developing countries, companies in local government areas have the opportunity to enter new markets. This can promote the growth of the local economy and contribute to the creation of new jobs.
3. *Improving global awareness of the region.* Through aid projects, local authorities can increase their recognition on the global stage. This can have a positive impact in various ways, such as through increasing tourism, attracting foreign investment and hosting international events.
4. *Strengthening the capabilities of local authorities.* Through participation in international aid projects, local authorities' own management capabilities, technical capabilities and problem-solving abilities can be improved. This experience also helps local authorities to solve their own problems.
5. *Strengthening social responsibility and global awareness.* Aid projects for developing countries represent a way for local authorities to fulfil their global social responsibilities. This can deliver positive social value to local residents and contribute to strengthening the global awareness of the local community.
6. *Promoting cultural exchange and understanding.* Through coming into contact with diverse cultures through aid projects, local authorities and local residents can broaden their multicultural understanding and international perspectives. This plays an important role in promoting diversity and inclusion in the community.

For local authorities, then, promoting aid projects for developing countries is a project that is helpful not just from a humanitarian but also from a practical aspect (Lancaster, 2007; Meyer, 2010; McGillivray, 2003; Mishra and Newhouse, 2009). Thus there is a need for local government to implement aid projects for developing countries actively. Nevertheless, as stated above, in many countries, especially Korea, aid provision at central government level is increasing, but at local government level is very weak.

#### **Korean local authorities' levels of aid to developing countries**

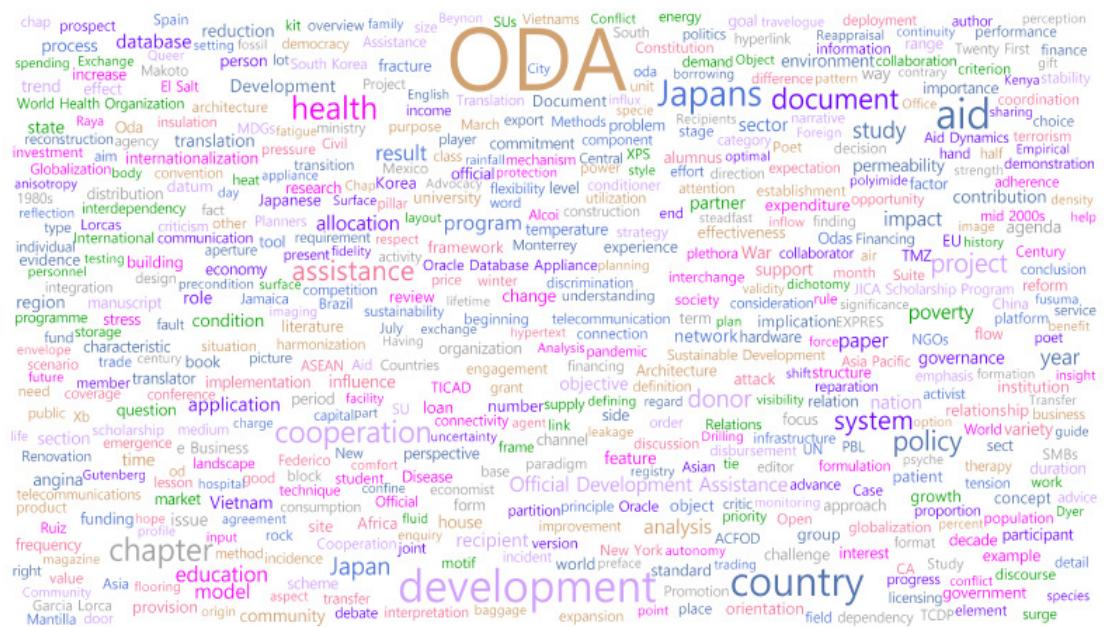
The amount of aid provided by Korea to developing countries at central government level reached \$2,7 billion as of 2022, and approximately \$3,5 billion in 2023. By contrast, as of 2022 the amount of aid provided by Korean local authorities to developing countries was only around \$6 million ([https://www.koica.go.kr/sites/koica\\_en/index.do](https://www.koica.go.kr/sites/koica_en/index.do)).

This enormous discrepancy suggests that local government in Korea should be far more proactive in providing aid to developing countries (Riddle, 2007; Shin, 2003; Stephen and Swiss, 2013; Moyo, 2009).

## **RESULTS**

### **Basic analysis**

First, we identified academic papers that included both 'local government' and 'ODA' in their titles, and performed word cloud analysis to conduct a basic analysis of the abstracts of these papers. Figure 1 shows the results of this analysis.



**Figure 1.** Word cloud analysis results for academic papers containing the terms ‘local government’ and ‘ODA’ in their titles

Meanwhile, figure 2 presents the words that appear most often in the abstracts of the academic papers, in order of frequency. The word 'oda' appears the most (132 times), followed by 'development' (57 times).

		1	2	3	4	5
		Part of Speech(POS)	Frequency	Word length	Name Type	Author Keyword
1	ODA	"Proper Noun"	132.0	3.0	zation Name"	"False"
2	development	"Common Noun"	57.0	11.0	"_"	"False"
3	aid	"Common Noun"	51.0	3.0	"_"	"False"
4	country	"Common Noun"	49.0	7.0	"_"	"False"
5	Japans	"Proper Noun"	41.0	6.0	phical Name"	"False"
6	health	"Common Noun"	34.0	6.0	"_"	"False"
7	cooperation	"Common Noun"	30.0	11.0	"_"	"False"
8	document	"Common Noun"	28.0	8.0	"_"	"False"
9	assistance	"Common Noun"	27.0	10.0	"_"	"False"
10	policy	"Common Noun"	25.0	6.0	"_"	"False"
11	system	"Common Noun"	24.0	6.0	"_"	"False"
12	project	"Common Noun"	22.0	7.0	"_"	"False"
13	donor	"Common Noun"	20.0	5.0	"_"	"False"
14	Japan	"Proper Noun"	20.0	5.0	phical Name"	"False"
15	result	"Common Noun"	15.0	6.0	"_"	"False"
16	education	"Common Noun"	15.0	9.0	"_"	"False"
17	program	"Common Noun"	14.0	7.0	"_"	"False"
18	model	"Common Noun"	13.0	5.0	"_"	"False"
19	poverty	"Common Noun"	12.0	7.0	"_"	"False"
20	impact	"Common Noun"	12.0	6.0	"_"	"False"
21	allocation	"Common Noun"	12.0	10.0	"_"	"False"
22	Development As	"Proper Noun"	12.0	31.0	zation Name"	"False"
23	resource	"Common Noun"	11.0	8.0	"_"	"False"
24	recipient	"Common Noun"	11.0	9.0	"_"	"False"
25	database	"Common Noun"	11.0	8.0	"_"	"False"

**Figure 2.** Frequency of words appearing in abstracts

The word cloud analysis and general review of the words presented above do not provide in-depth analysis results. To resolve this, it is necessary to perform topic modelling analysis.

### Topic modelling analysis

Topic modelling is a statistical modelling method that discovers hidden topic patterns in large sets of documents (Choi et al., 2023). The goal of this method is to automatically identify and classify topics in documents. Simply put, topic modelling is the process of identifying what topics exist in a large amount of text data and ascertaining which topics each document is related to. Using this method, important issues relating to the aid currently provided by local government to developing countries can be explored.

For our topic modelling analysis, first, some unnecessary proper nouns were excluded, and then a coherence test was performed using the Netminер program to determine the appropriate number of topics. Using the 'Evaluation of topic models' function of the Netminер program provides information about the number of topics with good coherence. In topic modelling analysis, the 'coherence test' is an important method for evaluating the consistency of topics. This test usually produces two types of measurements: U Mass and CV. U Mass coherence is based on the correlation between words in a document. U Mass values are usually negative. The higher this value (i.e. the smaller the absolute value), the better the topic consistency.

Additionally, CV coherence value was used. CV coherence is based on the amount of mutual information between words, and compares the amount of mutual information between words in a topic and between words in the entire document. This value fluctuates between 0 and 1, with higher values indicating better topic consistency. CV shows good performance in data sets of more diverse sizes and provides more reliable results than U Mass, especially in small data sets. When determining the number of topics, it is a good idea to consider both these measures. It is better to consider the CV coherence value first, but also to refer to the U Mass value so as to make a more comprehensive decision. These measurements are used as indicators of how meaningful and contextually consistent the topics generated by the topic model are.

The coherence values derived using the Netminер program in this study are shown in figure 3. As is shown in red, the case where the CV value is high and the U Mass value low occurs when the number of topics is ten. In this case, the alpha value is 0,01 and the beta value 0,02. Topic modelling was performed using these conditions.

	Index	Topic (k)	alpha	beta	u_mass	c_v
1		1	5.0	0.01	0.01	-4.819946571118825
2		2	5.0	0.01	0.02	-5.281997032799441
3		3	5.0	0.02	0.01	-6.164258522977853
4		4	5.0	0.02	0.02	-5.5908418084745035
5		5	6.0	0.01	0.01	-7.5726884174410545
6		6	6.0	0.01	0.02	-7.004567767210324
7		7	6.0	0.02	0.01	-5.090412127391173
8		8	6.0	0.02	0.02	-6.031664422515518
9		9	7.0	0.01	0.01	-6.393011508082298
10		10	7.0	0.01	0.02	-5.7824593410944
11		11	7.0	0.02	0.01	-5.231045361626016
12		12	7.0	0.02	0.02	-4.212938569900062
13		13	8.0	0.01	0.01	-4.33260972334896
14		14	8.0	0.01	0.02	-7.913492347829972
15		15	8.0	0.02	0.01	-6.9670819520893374
16		16	8.0	0.02	0.02	-7.103219414692912
17		17	9.0	0.01	0.01	-7.318444750407197
18		18	9.0	0.01	0.02	-4.68660230279253
19		19	9.0	0.02	0.01	-6.193908423112411
20		20	9.0	0.02	0.02	-4.466484425228147
21		21	10.0	0.01	0.01	-6.530433787390535
22		22	10.0	0.01	0.02	-4.054059231497034
23		23	10.0	0.02	0.01	-7.184125774168176
24		24	10.0	0.02	0.02	-4.917735028128986

Figure 3. Coherence test results

Figures 4 and 5 present information concerning the U Mass value and CV value that can be determined through the graph.

Using the information obtained above, topic modelling analysis was performed with the number of topics set to ten, and ten topics were derived as shown in figure 6.

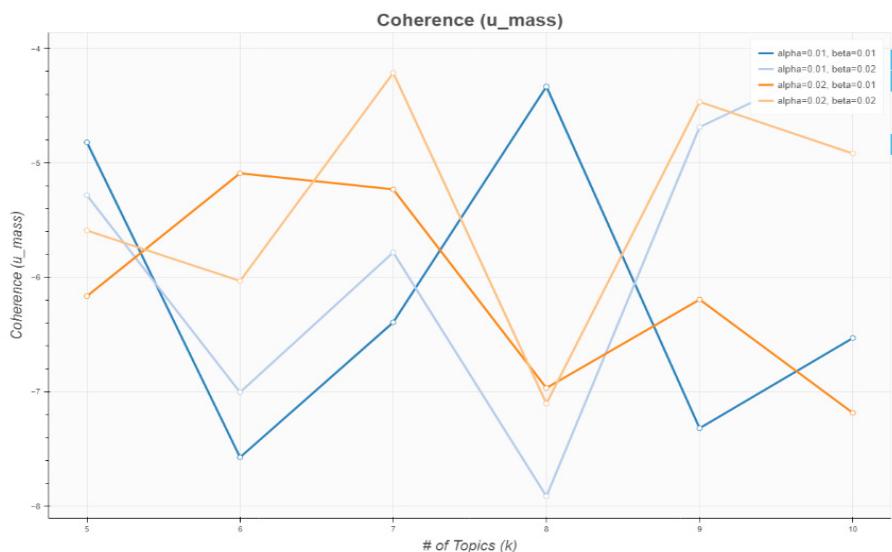


Figure 4. Relationship between U Mass value and number of topics

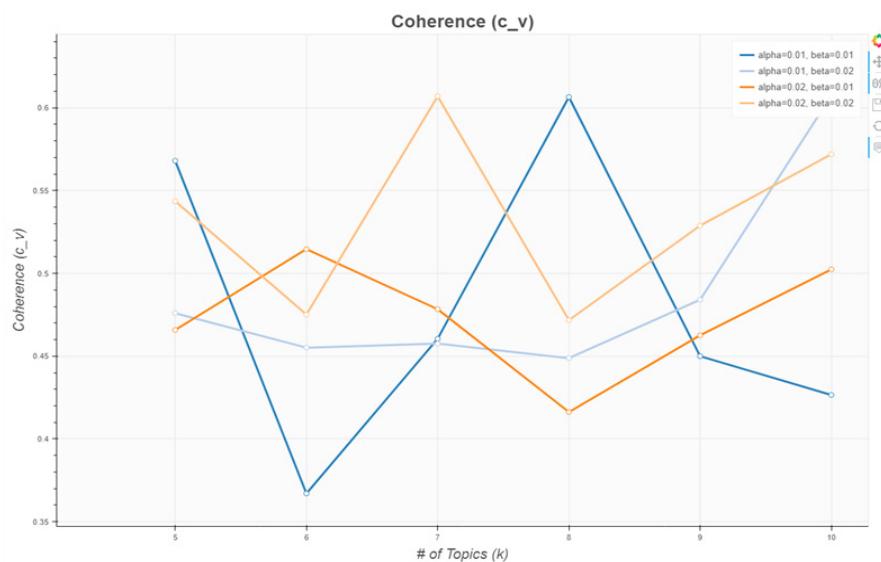


Figure 5. Relationship between CV value and number of topics

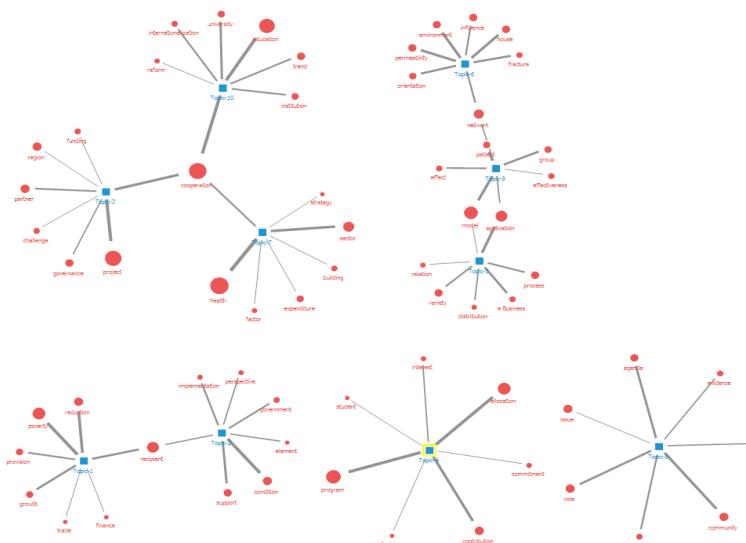


Figure 6. The ten topic groups derived

As shown above, PFnet analysis was performed on the ten topics derived. ‘PFnet’ is an abbreviation of ‘Pathfinder Network Scaling’, and this analysis is used to simplify complex network data and clearly understand the structure. At the heart of PFnet analysis is revealing the core structure of the network by highlighting important connections within the network and removing unnecessary connections.



**Figure 7.** PFnet analysis results

On the basis of the information presented in figure 7, this study extracted the important elements at work when local authorities carry out ODA projects for developing countries. These elements are then supplied to the Analytical Hierarchy Process (AHP) that is performed to set priorities between elements, as described below.

## AHP analysis

### *Basic model*

The AHP method was developed by Thomas L. Saaty in the 1980s. It organizes various standards and alternatives hierarchically, and quantifies the relative importance between them to help with decision-making. This method is used primarily in relation to problems where comparison is difficult or subjective judgement is required. The AHP analysis model stratified using the information derived from the above-mentioned topic modelling analysis is shown in figure 8.

A brief explanation of the above model is as follows. The final decision-making goal is local government ODA, indicated as 'Local ODA'. In other words, through AHP analysis, 'Local ODA' is presented as a goal in revitalizing ODA at local government level. In the AHP model, the first layer is 'local government' and 'ODA-related organizations'. The first question here is, is the role of local government important in activating ODA at local government level? Or alternatively, is a process required to select whether various institutions other than local government are important? The important tasks within local government are itemized in detail: namely, the establishment of a dedicated department to handle ODA professionally, the deployment of dedicated professionals, the enactment of ordinances at local government level, and securing the budget needed to carry out ODA projects are included in the detailed variables.

Next, the importance of various institutions that relate to local government but are outwith local government must be established. In the case of Korea, organizations other than local authorities connected with ODA include: development corporations belonging to local government; Saemaul Undong chapters established in each province (Local Government Saemaul chapter); and various public institutions existing under local authorities. There are LG public bodies, local universities, local enterprises, and local NGOs, in relation to ODA. We must ask: in the *first* tier, are local authorities important for activating ODA at local government level, or is the role of various institutions within the jurisdiction of local authorities more important? The *second* layer focuses on determining which factors are more and which less important for local authorities: for example, a dedicated ODA department, ODA personnel, securing an ODA-related budget, or enacting ODA-related ordinances.

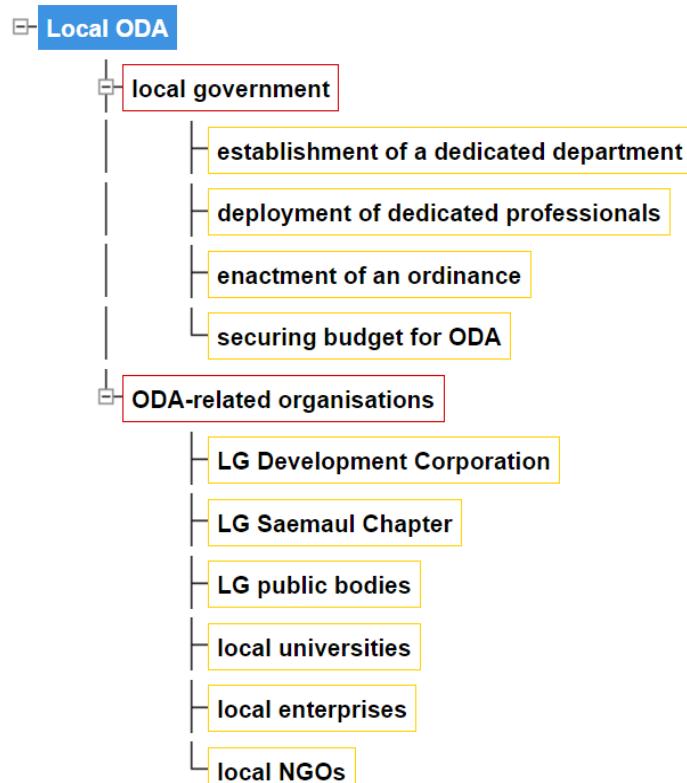


Figure 8. AHP model applied in this study

Thus, in the evaluation of organizations other than local authorities, priority and weight values are determined regarding which of the six related organizations are more and which less important in revitalizing ODA at local government level. The analysis results presented in figure 9 show the priority and weight values for the ten detailed elements included in the second layer of the model.

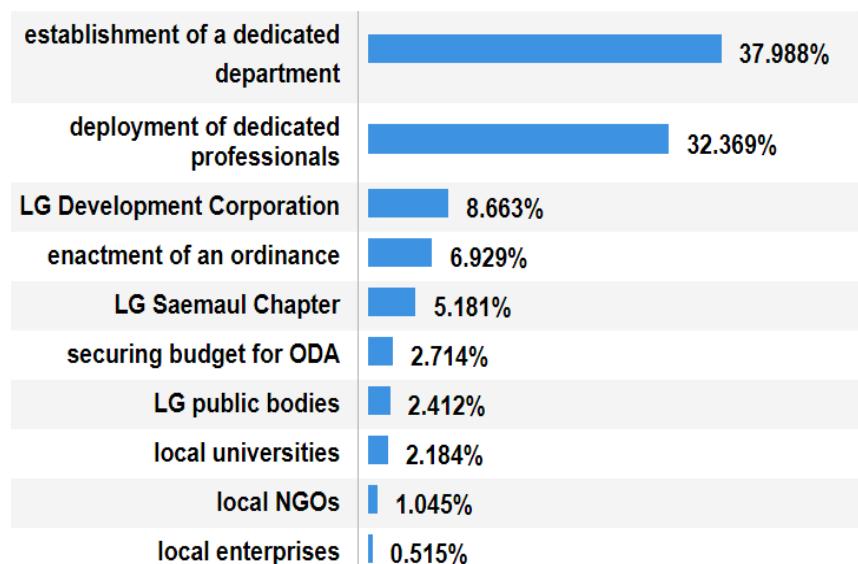


Figure 9. Weight values for all the detailed items

As figure 9 shows, in terms of revitalizing ODA projects at local government level, the establishment of a dedicated department within local government for professionally performing ODA work scores the highest, at 37,988. In other words, in order to revitalize ODA projects at local government level, it is more important than anything to establish a department that will professionally manage only this ODA work. The next most important thing is that employees with the know-how to handle ODA work professionally must be recruited and

deployed. Because ODA work is a specialized task, it is emphasized that professional administrators should be assigned to it, rather than general administrators. After this, the next most important thing is the development corporation established within local government. The development corporation, which is in charge of various development tasks, is also considered important in revitalizing local ODA.

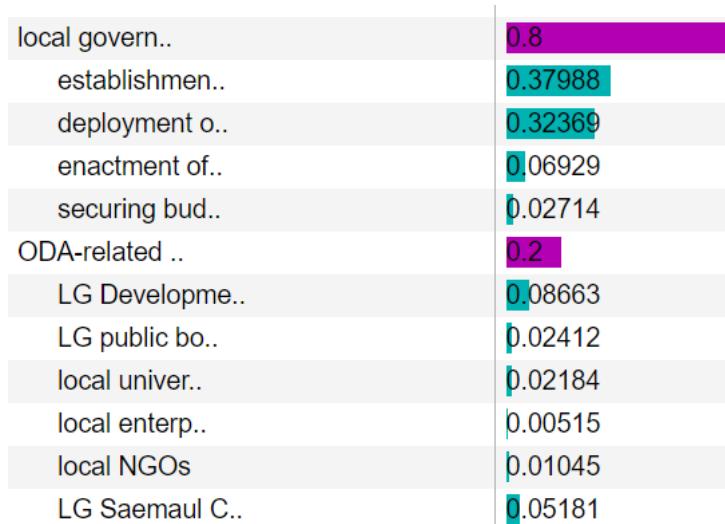


Figure 10. Weights of detailed variables by class

Looking at the relative weight of local authorities and local-government-related organizations as shown in figure 10, we see that local government scores 0,8, which is much higher than the weight value of 0,2 for other local organizations relating to ODA. This suggests that local authorities play a very important role in revitalizing ODA projects at local level. It can be said that local authorities, which have budgets and executive authority, play a more important role in ODA than the various public institutions located in local areas. Meanwhile, as regards the question of importance within local authorities, the following order was given: establishment of a specialized department that can handle ODA work (0,3798), and deployment of professional administrators with professional knowledge of ODA (0,3236). Also, as regards local organizations connected with ODA, important organizations are placed in order, with the role of the development corporation under local government scoring highest (0,086) and the role of the Saemaul Undong branch established in the local area scoring lowest (0,051).

## CONCLUSION

This study has attempted to analyse which factors should be prioritized in order to revitalize ODA at local level in Korea, granted the premise that local government should actively participate in ODA projects. For this purpose, important impact variables relating to ODA at local level were derived via topic modelling analysis of existing academic papers. On this basis, AHP analysis was performed in an attempt to derive policy priorities for revitalizing ODA at local government level in the future.

The analysis shows that, in order to revitalize ODA projects at local government level in Korea, it is imperative that local authorities should establish a dedicated department to handle such projects professionally. If a dedicated department is established, this will serve to secure the human and material resources required to discover ODA projects, and thereby a variety of ODA projects can be promoted. The next most important policy priority is the deployment of professional administrators who can specialize in ODA projects. Because ODA projects represent a field that requires great expertise, administrators with practical experience and professional knowledge are needed. Unlike with other projects, in order to promote ODA projects various kinds of professional knowledge are required, such as knowledge about international development, statistical knowledge, and knowledge of analysis and evaluation. Administrators with specialized knowledge should be recruited to take charge of these issues, and institutional improvements should be supported so that these experts can carry out ODA work effectively.

Furthermore, in Korea, in terms of organizations outwith local authorities, there are Saemaul Undong chapters established in each local authority area. These organizations have concluded various agreements with local authorities in foreign countries and are currently carrying out various aid activities, although these are small in scale. Efforts to support these Saemaul Undong chapters in their work to promote support activities for developing countries at the private level should be further strengthened.

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**CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest.

**AUTHORSHIP CONTRIBUTION**

*Conceptualization*: Young-Chool Choi

*Research*: Young-Chool Choi

*Analysis*: Young-Chool Choi

*Drafting*: Young-Chool Choi

*Writing*: Young-Chool Choi

*Data Collection*: Yunseo Jeon, Gamin Kim, Cavallini Yona.