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Indonesia Urban Water Governance: The Interaction Between the Policy Domain of Urban Water Sector and Actors Network

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ABSTRACT

The urban water cycle comprises surface water, groundwater, drinking water, and wastewater, which are managed separately by many actors at different levels of government. They have their own respective laws and operational regulations which could result in fragmented governance. Fragmented urban water governance could threaten the future sustainability of urban development. This paper aims to determine to what extent urban water governance in Indonesia's metropolitan cities experiences features of fragmented governance. This paper also identifies key actors of urban water governance network that have a significant role and responsibility in policy domain. A mixed method research approach was used, comprising both qualitative content analysis and quantitative social network analysis. The Bandung Metropolitan Area was chosen as a case study to test the urban water governance network. The research results reveal that Indonesia urban water governance network has a low network density, a low degree-based centrality, a low betweenness centrality and a high reachability. These results indicate that Indonesia urban water governance network is disconnected between actor in each subsector and the policy domain of urban water sector. Urban water governance is fragmented. Our research contribution is a method for measuring the degree of interaction between urban water stakeholders within the policy domain.

1. INTRODUCTION

Indonesia is one of the emerging market economies of the world which has experienced rapid urbanization over recent decades [1]. The urban population has increased nearly three times from 50 million to 135.6 million from 1970–2015 [2]. The percentage of people living in urban areas reached 53% of total population. It is expected to reach 67% in 2035 with 3.4 million more people every year [3].

Urban areas play a critical role in environmental management and sustainable development from global to local scales. Urban areas consume more than 75% of natural resources and contribute approximately 75% of greenhouse gas emissions generated from transport and building sector activities [4]. Urban areas are an engine of economic growth and produce 70%–80% of the national gross domestic product [5]. As urbanized country, Indonesia's urban sector makes a significant contribution to national economic growth while at the same time contributing to increasing environmental problems.

Water is a key natural resource and a basic human need. It is also a foundation for public health and community welfare [6]. The quality of drinking water in urban areas is under pressures due to external changes such as rapid urbanization, population growth, climate change, economic development [7], environmental pollution, limited resource, and aging infrastructures [8]. These pressures threaten water security, increase water-related risk hazards, and decrease urban ecosystem functions such as provisioning services of water supply [9, 10]. Water scarcity is a threat for all countries, where clean water crisis has been observed in urban areas during the dry season.

Urban water problems arise not only from engineering activities or failures, but also from governance failures [11-14]. Urban water cycles - namely surface water, groundwater, drinking water, and wastewater, are separately managed by actors and institutions at different levels of government, where tasks and authorities often overlap. Water management in a metropolitan area involves many actors and sectors at different levels of government. The current approach to urban water management emphasizes physical infrastructures provision to reduce basic service gap. This traditional approach of water management will not address the challenges and dynamic changes in a metropolitan area.

This paper aims to determine to what extent urban water management in Indonesia's metropolitan cities experience fragmented governance. This paper also identifies key actors of urban water governance networks that are prominent and have a significant role in the policy domain. Furthermore, this paper provides valuable inputs for improving future urban water governance by looking at the interaction between the policy domain and actor network at multiple levels of government.

The materials and methods section provides a brief

description of urban water governance actors and institutions, the regulatory framework, a profile of the Bandung Metropolitan Area (BMA), and the methods used. Section 3 presents the results of the analysis. Section 4 presents a discussion of the results of the analysis. The final section concludes.

2. MATERIALS AND METHOD

2.1 Actors and institutions in urban water management

Indonesia's water management involves various actors and institutions at different levels of government starting from national to local. Actors are people and/or institutions at different levels of government whose tasks and responsibilities are relevant to, and directly involved in, the urban water sector. Several line ministries are involved in water provision with specific tasks and functions. They are the Coordinating Ministry of Economic Affairs (for interministerial coordination), the National Development Planning Board (for establishing national policies, planning, and implementation coordination), the Ministry of Public Works and Housing (for water resource utilization and project implementation), the Ministry of Environment and Forestry (for water pollution controlling), the Ministry of Health (for awareness building and water quality standard and monitoring), and the Ministry of Home Affairs (for capacity building and tariff regulation).

Local government has also significant tasks and responsibilities in managing urban water provision both provincial government and city/district government. Several local government agencies are involved in water provision, namely local development planning board, public works agency, environmental agency, housing and settlement agency and health agency. Other stakeholders in urban water management among others are: nongovernmental organizations (NGOs), private sector, water company associations, water operators, academia, practitioners, and community-based organizations. These stakeholders significantly contribute to improving water services and maintaining water resources.

With its nature of multi-actors and multi-sectors, the coordination among actors and institutions become key requirement in order to improve the efficacy and efficiency of urban water governance. Types of actors in urban water governance can be categorized into three different groups namely: Nonexecutive Government Actors, Executive Government Actors, and Nongovernment Actors [15]. Table 1 shows the types of actors in urban water governance.

Table 1. Types of actors in urban water governance

Type of Actor	National	Province	District/City
Nonexecutive Government Actor	• House of Representative (DPR) • State Audit Agency (BPK)	Provincial House of Representative	Regency/Municipal House of Representative
Executive Government Actor	• Coordinating Ministry of Economic Affairs • Ministry of Public Works and Housing • Ministry of Environment and Forestry • Ministry of Energy and Mineral Resources • Ministry of Health • Ministry of Home Affairs • National Development Planning Agency/Bappenas • National Water Resources Council (DSDAN)	• Water Resources Agency • PSDA Unit for Citarum River • Energy and Mineral Resources Agency • Environmental Agency • Housing and Settlement Agency • Health Agency • Development Planning Agency • Water Resource Management Coordination Team (TKPSDA) Citarum	• Development Planning Agency • Environmental Agency • Health Agency • Housing, Settlement and Land Agency • Health Agency
Nongovernment Actor	• Nongovernment Organization, Practitioner, Professional Association, Water Operator (institutional and/or companies-based)	• Nongovernment Organization, Practitioner, Professional Association, Water Operator (institutional and/or companies-based)	• Nongovernment Organization, Practitioner, Professional Association, Water Operator (institutional and/or companies-based)

Source: Analysis, 2018

2.2 Regulatory framework

Regulatory framework is a critical element in shaping urban water governance. Indonesia's water regulatory framework is still being developed [16] and is continuously evolving. Water law refers to all law related to water including water resources, ground water, public regulation of waters (environmental, public health, pollution, etc) and other related water issues. Since its independence, Indonesia has stipulated two water laws namely Law No. 11/1974 on irrigation and Law No. 7/2004 on water resources. However, Law No. 7/2004 was annulled by the Constitutional Court in 2015, and to fill the legal vacuum the constitutional court reinstated the old Water Law No. 11/1974. It is the general regulatory framework that still requires further elaborate to general provision. Since it was stipulated more than forty years ago, there are discrepancies between Law No. 11/1974 and the existing regulations.

Water is highly complex problem with many different functions. Water issues are discussed in many sectoral laws [17] such forestry, environmental, energy, health and local governance. There is also strong linkage between water and land use and spatial plan as regulated in Law No. 26/2007 on spatial planning. Table 2 presents the laws and their relevance to urban water management.

Table 2. Laws and their relevance to urban water management

Law	Contents
Law No. 11/1974 on Irrigation	a) social function of water, b) right and authority of government, c) planning and technical planning of water regulation, d) irrigation water management, e) water concessions and water sources, f) exploitation and maintenance of irrigation structures, g) water protection, water sources, and irrigation buildings, h) financing, i) criminal provision
Law No. 32/2009 on Environmental Management and Protection	a) water quality standards, b) wastewater quality standards), c) water quality, d) control of water pollution, d) underground water collection tax, e) conservation of water resources, f) permit for wastewater disposal
Law No. 41/1999 on Forestry	a) the carrying capacity of the watershed, b) determination of forest area for microclimate, aesthetic, and water catchment arrangements
Law No. 36/2009 on Health	a) environmental health, b) drinking water quality standards, c) drinking water health requirements, d) liquid waste, e) polluted water
Law No. 23/2014 on Local Government	a) distribution of government affairs of water resources, b) distribution of government affairs of drinking water, c) distribution of government affairs of wastewater, d) distribution of government affairs of groundwater

Source: Collected from various sources, 2018

2.3 Bandung Metropolitan Area (BMA) as a case study

The BMA, also widely known as *Kawasan Perkotaan Cekungan Bandung*, is a national strategic area as stipulated in the National Spatial Plan. It comprises five administrative cities/districts namely: Bandung City, Cimahi City, Bandung District, West Bandung District, and Sumedang District. The total area of the BMA is approximately 348.261 ha [18]. The total population of the BMA in 2015 was 8.6 million, which accounted for 2.9% of the Indonesian population [19].

The BMA has experienced rapid urban population growth in the core areas where land availability is very limited, and periurban areas, a place where the socioeconomic transformation process from rural to urban occurs [20]. Similar to other developing countries, periurban areas dynamically grow and develop. Rapid population growth and increased economic activity led to land use changes, mostly the conversion of agricultural land into built-up areas. The expansion of built-up area led to changes in hydrological functions [21].

Uncontrolled land-use conversion in catchment area of the BMA has resulted in declining water resources and scarcity of clean water in the dry season, low water quality, water pollution, and flood during rainy season [22]. The current urban water management in the BMA is conducted separately by actors and institutions at the national, provincial, and city/district levels. This fragmented urban water management could negatively affect the future urban sustainability.

2.4 Method

The research employed a mixed method combining both qualitative content analysis and quantitative social network analysis. Conventional approach of content analysis was used to determine policy domain which derived directly from the theme of laws and regulations in four subsectors: surface water, ground water, drinking water and wastewater [23]. Policy domain is the scope of policy substance that deals with actors in policy making process. We identify the policy domain in each subsector based on the theme of regulatory and who are the actors at different level of government involved in each policy domain.

The results of content analysis and actor's mapping are developed into the matrix which is used to conduct social network analysis. The first step is to develop two mode affiliation matrix in Excel file between actors (row variable) and policy domain (column variable). After that, we filled each cell in the matrix with 0 or 1. If the row variable (actor) is related to column variable (policy domain) then the number 1 is filled. If the row variable (actor) is not related to column variable (policy domain) then the number 0 is filled.

Social network analysis (SNA) was used to determine the degree of interaction between urban water actors within the policy domain [24]. SNA focuses on the relationship and it is an ideal method for assessing the collaboration [25]. The degree of interaction could be measured by three characteristics of a network namely: density, centrality and reachability [26, 27].

Density or network density explains the interaction or relationship between urban water actors within the policy domains. The relationship between actors and policy domain known as social ties. Density is the total number of connections exist between actors and policy domain in the network divided by the number of possible connections that could exist between actors and policy domain in the network. High density among actors reflects the potential for collective actions [28]. However, the high density decreases the diversity of information and ideas in the network. Much of the information circulating in the system is redundant in a dense structure [29]. Another network density characteristic is measured by the average degree of network which means that the average number of ties for an actor within policy domain.

Network centrality is intended to further identify actors that have a significant role within a network [30]. Measures of centrality include degree-based centrality and betweenness centrality. Degree-based centrality reflects an actor's level of network activity or involvement. It is calculated based on the number of actors involved in each policy domain divided by the total number of policy domains of urban water governance. An actor with a high degree of centrality within a network has more social ties than others. Betweenness centrality is used to determine the actors who have intermediary position and high capacity to broker or control the relationship among other actors. It is also widely used to measure the role of actors in transferring information from one part of the network to the other.

Connectivity of the network includes reachability that describes the overall network characteristics. Reachability is the number of connections by which one actor is connected to another actor in the network [30]. It is important because if there are actors within the network cannot be reached by other actors then the network could be experiencing division or subgroups.

We use Ucinet 6 Software Program to conduct a quantitative Social Network Analysis based on the affiliation matrix which composed of two modes [30]. The first mode is

the set of actors. The second mode is the set of event or policy domains. Network density and centrality are measured by using two-modes network, the two modes being the set of actors and the set of policy domains. The reachability and betweenness are measured by using one-mode network, which actors and policy domains can be represented separately. The illustration of network analysis shown in Sociogram, a graphic representation of social ties between urban water actors within the policy domain [30].

3. RESULTS

In this section, we provide the results of content analysis and social network analysis. The results of content analysis were used to conduct social network analysis. The three characteristics of network are measured and discussed in last section. Following the results, we illustrate the network in the form of a sociogram.

3.1 Policy domain of urban water governance

The policy domain is determined based on the analysis of the sectoral water laws and regulations and actor mapping in each policy domain. There are four types of water system: surface water, ground water, drinking water and wastewater. We identify the policy domain in each subsector and actors at different level of government involved in each policy domain (see Table 3).

Table 3. Policy domains in urban water subsectors

Surface Water	Ground Water	Drinking Water	Wastewater
A pattern and plan for surface water management	A groundwater management plan	Policy and strategy for a drinking water provision system and a masterplan for a drinking water provision system	Domestic wastewater treatment system planning
A permit for water resources for business use	A permit for groundwater extraction	Piped water development and management	In-situ domestic wastewater
water allocation		Financing for a drinking water provision system	Centralized domestic wastewater
A business for surface water and groundwater		Drinking water tariff	
River basin management		Water health and water source protection	
Water quality management and water pollution protection			
Supervision for water resource businesses			

Source: Analysis, 2018

3.2 Social network analysis

3.2.1 Network density

Table 4 shows the results of network density analysis. The density of urban water network in Indonesia is only 25% of all possible relationships are present within a network. This indicates that the network is not well connected. The total number of possible network connections is about 180, which is used to determine the density and the average degree of the network.

The average degree of each actor's ties is 4.5 compare to 18 policy domains. It means the average number of ties for each actor in the network is about 4 to 5. Most actors are only dealing with policy domain in their respective subsectors. The sparse network could hinder potential collective actions among actors in urban water sector.

Table 4. Network density

Item	Value
Density	0.250
Network ties	180
Standard deviation	0.433
Average degree	4.5

Source: Analysis, 2018

3.2.2 Degree centrality

Table A.1 shows degree-based centrality of each actor's in Indonesia urban water network. Degree centrality shows how many connections an actor has within the network. As shown in the table, the degree of centrality is relatively low. All actors within network has the degree centrality below 41%. Only three actors have reached 40.9% centrality and 27 actors have below 25% centrality. Those three actors are prominent actors within urban sector network which have connections to at least seven policy domains. They could have a central role in urban water network in Indonesia.

3.2.3 Betweenness centrality

Table A.2 shows betweenness centrality of urban water governance network in Indonesia using one mode affiliation matrix. As shown in the table, most actors have linked to more than one policy domain, therefore they could act as broker or intermediary within network. Only four actors do not act as intermediaries since they are linked with only one policy domain. They could not act as intermediaries in transferring flow of information among actors within the network.

3.2.4 Reachability

Reachability refers to the number of ties required to connect the internal actors. The average social tie in the network is 2.5. It indicates that all actors in the network can be reached by other actors.

3.3 Sociogram

Figure 1 represents a sociogram of Indonesia urban water governance network. This illustrated the location of key actors within the network whether they are centrally connected to the majority of policy domain or located in the periphery of the network. There are few agencies are prominent actors in urban water governance network, such as: DPKP PROV (the Housing and Settlement Agency of West Java Province), DPKP KAKPO (the Housing and Settlement Agency of the district and city levels), and PDAM_UPT (the Local Water Company (PDAM)/Technical Operation Unit (UPT)/Local-Owned Company).

There are also few agencies such as: KV_DPR (Commission V of Indonesian House of Representative), DESDM_PROV (Energy and MIneral Resource Agency of West Java Province) and PATGL_KES (Center for Ground

Water and Environmental Geology - Ministry of Energy and Mineral Resources) which are located in the periphery of the network. Most of actors are only responsible for their own specific sector policy and few agencies have connection across to cross-sectoral policies such as: water resource and water supply and/or water supply and wastewater. There is no key actor that could involve in whole water cycles including: surface raw water, ground water, water supply and wastewater.

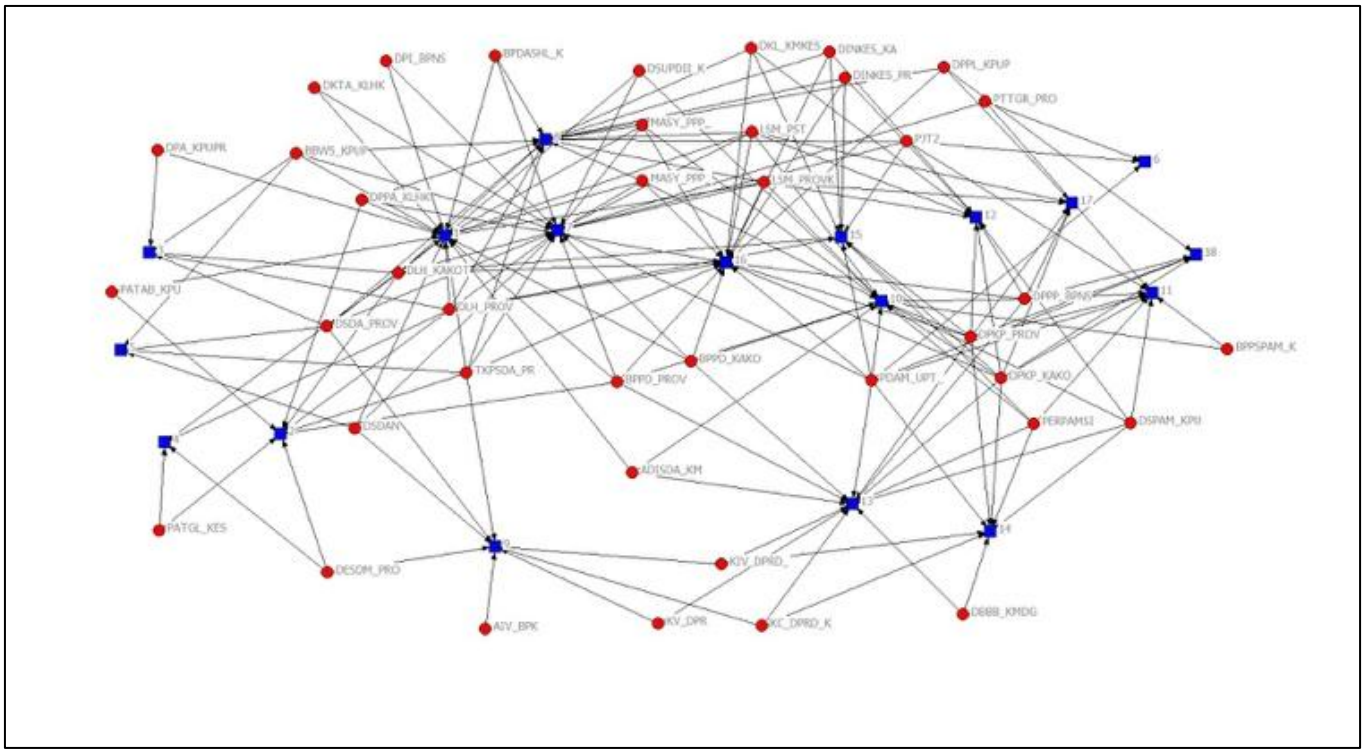

Figure 1. Sociogram (Source: Analysis, 2018)

Note: (1) Pattern and Plan of Surface Water Resources, (2) Management Plan of Ground Water, (3) Permit for Water Resources Exploitation, (4) Permit for Ground Water Exploitation, (5) Water Allocation, (6) Exploitation of Surface and Ground Water, (7) River Basin Management, (8) Management of Water Quality and Controlling Water Pollution, (9) Monitoring for Water Resources Exploitation, (10) Policy and Strategy of Drinking Water Provision System and Master Plan of Drinking Water Provision System, (11) Development and Management Piped-System of Drinking Water Provision System, (12) Development and Management Non-Piped System of Drinking Water Provision System, (13) Financing of Drinking Water Provision System, (14) Tariff of Drinking Water, (15) Water Health and Security, (16) Planning for Domestic Waste Water Treatment Plant, (17) In-situ Waste Water Treatment Plant System, (18) Centralized Waste Water Treatment Plant System.

In figure, the actor with the highest betweenness score is Regional Development Planning Agency of West Java Province (BPPD_Prov). This actor is the most involved in multiple policy domains such as Pattern and Plan of Surface Water Resources, Management Plan of Ground Water, River Basin Management, Policy and Strategy of Drinking Water Provision System and Master Plan of Drinking Water Provision System, Financing of Drinking Water Provision System and Planning for Domestic Waste Water Treatment Plant. High level of betweenness indicates the actor could act as broker in transferring information among actors within the policy domain.

4. DISCUSSION

The results of social network analysis for three network characteristics reveal that Indonesia urban water governance network has a low network density (Table 4), a low degree-based centrality (Table A.1), a high betweenness centrality (Table A.2) and a high reachability. These results indicate that the level of interaction between actors and the policy domain in the urban water governance network is not well connected and is fragmented. The potential collective actions among actors within policy network could hinder due to low network density. Most actors can act as intermediaries in transferring information among urban water actors.

Each actor within the network is working in sectoral ego based on their tasks and responsibilities. Actors involved in urban water management are still separated by sector from surface water, groundwater, drinking water and waste water. Although the four subsectors have been integrated in the coordination of water resources management at all levels of government, the relationship between the four subsectors is relatively weak.

The interaction among urban water actors within the policy domain is relatively low. The actors are only involved in subsector policy domain. Few actors involve in cross-sectoral policy domain and have a prominent position in the network. This is relevant with the fact that urban water sector is a complex problem and involved actors at different levels of government. Key actors at national level which have important contribution in urban water sector are: (i) Ministry of National Development Planning, (ii) Ministry of Public Works and Housing, (iii) Ministry of Environment and Forestry and (iv) Ministry of Health. The actors at the provincial and city/district level which have a central role in urban water management are: (i) The Provincial Housing and Settlement Agency, (ii) The Provincial Environment Agency, (iii) The City/District Housing and Settlement Agency, (iv) The

Environmental Agency, and (v) Local water company (PDAM) and Technical Implementation Unit (UPT).

Surface water management involves many actors and institutions at different levels of government, among others are: (i) The Directorate of Water and River Basin Management as regulator, (ii) Perum Jasa Tirta as operator, (iii) TKPSDA as coordinator and (iv) PDAM, industrial businessman and agricultural managers as users. The clarity of tasks and functions of the institutions in surface water management are required.

The interface between surface water management and drinking water provision system occurs when the allocation of raw water and granting business permit for urban and household needs. The River Basin Management Agency (BBWS) has a key role in the allocation of raw water and provide technical recommendation for the licensing of water concessions. The main problem is related to the consistency between planning and implementation of water allocation.

Groundwater management is managed by the Ministry of Energy and Mineral Resources at policy level, while the Provincial Government has responsibility at operational level. Groundwater is separately managed from surface water management. However, the river basin concept actually considers the integrated management of surface water and groundwater.

The drinking water provision system is managed by the Ministry of Public Works and Housing. The piped water supply provision is currently under the management of local water company (PDAM) and Technical Operational Unit (UPT). While the provision of non-piped water supply system could be done by all actors including private sector and community groups.

5. CONCLUSION

Shifting from traditional approaches to be more sustainable urban water management is needed in order to cope with serious challenges and future uncertainties. Urban water management are facing challenges related to rapid urban population growth, increased water demand, water shortages, and improved access to water. These challenges are also exacerbated by the governance failure in managing urban water sector.

Indonesia's urban water governance network is not well connected between actors and the policy domain. It is also highly fragmented which indicated by low network density and low degree centrality. Most actors in urban water sector are only connected within their subsector policy domain. It also indicates the sectoral ego among urban water actors involved in policy domain. The collaborative works among actors in urban water network should be promoted in order to achieve sustainable urban water management.

This research is aimed to measure to what extent the level of interaction between urban water actors within the policy domain. The research results provide key findings on the characteristics of urban water governance network and key actors who have prominent role in urban water sector. These results could be used by policymakers at different levels of government as the basis to support collaborative works among actors and across sector in urban water management.

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APPENDIX

Table A.1. Network centrality

Formal Actors	Level of Centrality
Commission V of Indonesian House of Representative (DPR RI)	0.091
Member IV of Indonesian State Audit Agency (BPK RI)	0.045
Assistant Deputy of Natural Resources Infrastructure - Coordinating Ministry of Economic Affairs	0.136
Directorate of Water Resource Utilization - Ministry of Public Works and Housing	0.091
Ground Water and Raw Water Center - Ministry of Public Works and Housing	0.091
Center for Citarum River Region - Ministry of Public Works and Housing	0.227
Directorate of Water Supply System Development - Ministry of Public Works and Housing	0.227
Directorate of Environment Sanitation Development - Ministry of Public Works and Housing	0.182
National Supporting Agency for Water Supply System Development - Ministry of Public Works and Housing	0.091
Directorate of Soil and Water Conservation of Environment and Forestry Ministry	0.091
Watershed Management and Protection Forest Center (BPDASHL) for Citarum Ciliwung - Ministry of Environment and Forestry	0.136
Director of Water Pollution Control - Ministry of Environment and Forestry	0.182
Center for Ground Water and Environmental Geology - Ministry of Energy and Mineral Resources	0.091
Directorate of Housing, Settlements and Urban - Bappenas	0.318
Directorate for Water and Irrigation Development - Bappenas	0.091
Directorate of Synchronization of Regional Government Affairs II (SUPD II) - Ministry of Internal Affairs	0.136
Directorate of BUMD, BLUD and BMD - Ministry of Internal Affairs	0.091
Directorate of Environmental Health - Ministry of Health	0.182
National Water Resources Council	0.182
Jasa Tirta 2 Public Company	0.227
PERPAMSI	0.227
Central Experts Community/Practitioners	0.227
Nongovernmental Organization	0.318
Commission IV of West Java Provincial House of Representative	0.136
West Java Provincial Development Planning Agency	0.273
West Java Provincial Department of Housing and Settlement Area	0.409
West Java Provincial Environmental Agency	0.364
Water Resources Office of West Java Province	0.273

Department of Energy and Mineral Resources of West Java Province	0.136
West Java Provincial Health Office	0.182
Water Resources Management Coordination Team of West Java Province	0.318
Tirta Gemah Rimah Inc. of West Java Province	0.136
Experts Community/Practitioners of Provincial/District/City	0.227
Nongovernmental Organization Province/Regency/City	0.318
Commission C of Regency/City House of Representative	0.136
Development Planning Agency; Research and Regional Development	0.227
Department of Housing, Settlement Area, and Land Affairs Regency/City	0.409
Regency/City Environmental Agency	0.364
Regency Health Agency	0.182
PDAM/UPT/Regional Company	0.409

Source: Analysis Result, 2018

Table A.2. Betweenness centrality

Actors	Betweenness
Regional Development Planning Agency of West Java Province	31.267
Water Resources Management Coordination Team of West Java Province	27.876
West Java Provincial Water Resources Office	19.350
Development Planning Agency; Research and Regional Development	18.033
PDAM/UPT/Regional Company	14.268
National Water Resources Council	13.354
West Java Provincial Environment Office	12.536
Regency/City Environmental Office	12.536
Assistant Deputy of Natural Resources Infrastructure - Coordinating Ministry of Economic Affairs	12.535
Director of Water Pollution Control - Ministry of Environment and Forestry	10.429
Directorate of Housing, Settlements and Urban - Bappenas	8.024
Department of Housing and Settlement Area of West Java Province	8.024
Department of Housing, Settlement Area, and Land Affairs Regency/City	8.024
Central Experts Community/Practitioners	7.263
Central Nongovernmental Organization	7.263
Regional Experts Community/Practitioners (Province/Regency/City)	7.263
Regional Nongovernmental Organization (Province/Regency/City)	7.263
PERPAMSI	6.143
Directorate of Water Supply System Development - Ministry of Public Works and Housing	5.149
Commission V of Indonesian House of Representative (DPR RI)	4.887
Commission IV of West Java Provincial House of Representative	4.887
Commission C of Regency/City House of Representative	4.887
Jasa Tirta 2 Public Company	4.792
Directorate of Synchronization of Regional Government Affairs II (SUPD II) - Ministry of Internal Affairs	4.753
Department of Energy and Mineral Resources of West Java Province	4.145
Ground Water and Raw Water Center - Ministry of Public Works and Housing	3.718
Tirta Gemah Rimah Inc. of West Java Province	2.871
Center for Citarum River Region - Ministry of Public Works and Housing	2.541
Watershed Management and Protection Forest Center (BPDASHL) for Citarum Ciliwung - Ministry of Environment and Forestry	2.541
Directorate of Environmental Health - Ministry of Health	1.290
West Java Provincial Health Office	1.290
Regency Health Office	1.290
Directorate of Soil and Water Conservation of Environment and Forestry Ministry	0.487
Directorate for Water and Irrigation Development - Bappenas	0.487
Directorate of Environment Sanitation Development - Ministry of Public Works and Housing	0.452
National Supporting Agency for Water Supply System Development - Ministry of Public Works and Housing	0.085
Member IV of Indonesian State Audit Agency (BPK RI)	0.000
Directorate of Water Utilization - Ministry of Public Works and Housing	0.000
Center for Ground Water and Environmental Geology - Ministry of Energy and Mineral Resources	0.000
Directorate of BUMD, BLUD and BMD - Ministry of Internal Affairs	0.000

Source: Analysis Result, 2018