

Management Barriers to Implementation of an Urban Common Utilities Tunnel in Tehran*

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ABSTRACT

Increasing population and expansion of cities requires the provision of more types of urban utilities and infrastructure for citizens. This increase and expansion has made capacity building and control of early depreciation of infrastructure facilities one of the biggest challenges of urban management. The construction of urban common utilities tunnel as a huge structure to integrate infrastructure is a prudent solution. Which brings a calm urban environment away from visual disturbance, environment and facilitates movement and transit for citizens and on the other hand, it facilitates the implementation, maintenance and renovation of urban utility, reducing the costs of protection and maintenance and repair of all installation lines, increasing urban space and preventing multiple excavations and reducing the cost of repairing roads and infrastructure for urban management. The purpose of this article is to identify the management barriers to the implementation of a common tunnel of urban utilities in the city of Tehran in the stages of policy and decision-making, planning and design, financing, implementation, operation and maintenance. The results of the research using the qualitative method of content analysis of the data obtained from 22 semi-structured interviews show that the most important obstacles are identified in the stages of policy-making, decision-making, planning and design, which in some way affect other stages. In the policy-making and decision-making stage, the lack of executive guarantee of the law, the emptiness of legal rules and necessary instructions, and the inefficient selection of actors are expressed. In the planning and design phase, we proposed the lack of a database and detailed maps of the current state of utilities networks, the lack of scheduling and financial considerations, the complexity of feasibility studies, the lack of needs assessment studies, general technical criteria and standards, and unclear details.

Keywords: Urban Infrastructure, Common Tunnel of Urban Utility, Project Management, Urban Management, Tehran.

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1. INTRODUCTION

The city, like a living thing, has two parts: the soul and the body. The epistemological perspective of jurisprudence (in charge of regulating the spirit of the city) and urbanization (in charge of regulating the body of the city) are also among the most complex areas of implementation in They are considered epistemology. Among these, the position of urban management as a mechanism of guidance, coordination and effectiveness of urbanization and law is very important (Kazemian et al., 2014, p. 474). One of the main and vital parts that requires attention and spend a lot of time and money for urban management in cities is the issue of implementation, maintenance and operation of urban utility. Today, the city and urban life are inconceivable without highways and rail networks, airports, water supply networks, sewerage networks, telephone, electricity and internet and mobile networks, and their basic presence seems normal for ordinary citizens. In the meantime, with the help of advances in science and technology, solutions can be devised for many problems in cities. Urban utilities have always seen unparalleled diversity and evolution over time and with the advancement of technology. Today, common tunnels of urban utilities as one of the most modern manifestations of these technologies have been used by cities to organize the issues of implementation, maintenance and repair of urban utilities. In developing countries, the lack of coordination between the various organizations involved in urban infrastructure has caused a number of problems, including overlapping and reworking activities and failure to complete the project on time.

In Iran, despite the drafting and approval of laws and regulations and rules for the construction of common tunnel of urban utilities, this project has not yet been significantly implemented in existing or even new cities in Iran. Responsibilities and Authorities The three main stages of providing urban utilities and infrastructure (planning, financing, and implementation) are divided horizontally and vertically between several organizations. This division of responsibilities and powers has disrupted the inter-sectoral relations and coordination between urban infrastructure managers (Yazdani, Dola, Azizi, & Yusof, 2015).

However, according to the law on the construction of common tunnel of urban utility, municipalities are obliged to act in accordance with the criteria set forth in this law and the observance of executive regulations to construct a common tunnel of urban utility. All these conditions have caused the failure to implement the common tunnel, despite the theoretical and practical necessities and the will of the legislator, to become one of the manifestations and examples of unsuccessful urban management in Iran, even in Tehran as the capital and pioneer of urban development projects.

Accordingly, the main question of the present research is: Which management barriers have caused the non-implementation of common tunnel of urban utilities in Tehran?

2. A REVIEW OF RESEARCH LITERATURE

The Common Utilities Tunnel, also called the Common Utilities Duct, is one of the city's infrastructure structures. Any structure above, below and above the ground that has more than two types of urban utilities lines is referred to by this name (Zandieh & Ardaneh, 2011).

Urban utilities tunnel is an underground space in the city to integrate various lines of urban utility, such as electricity, communications, gas, water and drainage, which are planned and managed as a unit (Liu, Zhao, Li, & Dong, 2018). In the common urban tunnel, the five infrastructures of water, electricity, gas, telephone, telecommunication and sewage system are routed that will play an effective role in providing urban safety, saving infrastructure costs, increasing visual beauty along with reducing the amount of visual pollution and organizing the urban infrastructure management system (Divsalar, Haghiju, & Habibi, 2011). In general, common tunnel of urban utilities is the tunnel of access, concentration and aggregation of infrastructure lines that have replaced technical or aerial networks in the implementation of urban infrastructure (Dastmand, 2012, p. 41). Common tunnel is a system of underground structures that allows the installation, reconstruction, repair and maintenance of facilities without the need for drilling. For this work requires that individuals, or in some cases a type of vehicle, be able to pass through this structure (Rogers & Hunt, 2006). The main objectives of implementing common tunnel utilities in cities are: significant reduction in the amount of demolition and repair of urban roads; Reducing traffic problems caused by drilling in urban areas; Managing the subsurface space and preventing interference and disturbance by each urban utilities with another utility; Creating facilities for future development and use of new networks in the future such as fiber optics, hot water, sanitary water, improving conditions for repair, maintenance and operation of urban utility; (Rezaee, 2015, p. 36). Protection of the city's utilities lines in times of crisis, such as natural disasters or wartime, as well as ease of service in these conditions; Improving the urban landscape, urban safety and increasing the quality of the environment; Increasing the life of installation lines; Unit management and coordination between city utilities systems (Ge & Zu, 2019). The implementation of the common tunnel of urban utilities as an urban development project are the observance and during the project management stages on the one hand and the identification and analysis of actors involved in the project on the other hand.

2.1. Management Steps of Common Tunnel Project of Urban Utilities

The stages of project management in infrastructure projects include five stages of policy-making and decision-making, planning and design, financing, implementation, and operation and maintenance (Chase, 2014).

2.1.1. Policy Making and Decision Making

The initial phase of the Common Tunnel Utilities project is decision-making and policy-making, which emphasizes how to form an overall view of the project and set its goals. The main steps of this step are: identifying a common tunnel utilities project, estimating what the tunnel project should offer, defining the overall project objectives, setting the overall expectations of the actors, management and other key stakeholders, and defining the overall scope of the project and selection of initial members of the tunnel project team (Sabzehparvar, 2016, p. 55). From Mant's point of view, there are three major problems with infrastructure decision-making and planning that challenge the decision-making and planning process: 1. Common policies in governments alone cannot be applied to infrastructure as a general rule. 2. People do not intervene enough in determining the need for infrastructure. Many of the differences when it comes to infrastructure planning are whether the proposed infrastructure is really necessary - there is a gap in strategic planning and public participation between the national and local levels. There is not enough space for local level decision makers to participate

and collaborate in strategic discussions and raise needs with the national level (Mount, 2015, p. 2).

2.1.2. Planning and Design

The purpose of infrastructure planning is to determine the scope, scale, and design of the necessary infrastructure to provide the services needed in the short, medium, and long term (Robertson, 2002). In order to plan infrastructure, it is necessary to consider various aspects and factors. Factors that are essential for infrastructure planning are: The social and cultural values of communities in their current state (for infrastructure planning it is important to consider a strong sense of place, historical sense and emotional relationship of the community with the place where they live. These factors can be identified by social surveys), Geophysical considerations (including geographical hazards, geology and topographic features), Financial considerations (including costs of implementing decisions), Decision-making timing, social and economic sustainability (taking into account living needs and the ability to reproduce economically) (World Bank, 2008).

2.1.3. Financing

In general, there are three types of methods for financing the construction and operation of the common tunnel of urban utility, these three methods in terms of sponsorship are: Non-profits making organizations, profit making organizations and partnerships of non-profit making organizations with profit making organizations, the characteristics of these types are listed in Table 1.

Table 1. Three Types of Financing Methods of Common Utilities Tunnel

Financial Sponsor	Feature
Non-Profits Making Organizations	The cost of building a tunnel is usually higher and the return on investment is usually lower.
Profits Making Organizations	The for-profit department adopts efficient and rigorous management to control costs and earn revenue.
Partnerships of Non-Profit Making Organizations with Profit Making Organizations	Both sectors take full advantage of each other to invest in and realize a common tunnel.

(Sun, Liu, Ch, & Zhou, 2017)

Types of infrastructure financing options, including the Common Utilities Tunnel, include two categories of capital increase through Equity Financing and Debt Financing, which is provided from domestic sources (domestic investors, banks, special funds, domestic bond markets, investment institutions) or foreign sources (Foreign investors are provided with funds allocated for infrastructure (international commercial banks, international bond markets) (Ray, 2015, p. 11).

2.1.4. Execution and Implementation

At this stage, the common tunnel utilities project is implemented in accordance with the baseline design.

At this stage, the goal is to implement the common tunnel in accordance with the programs, principles and quality determined in the planning and design stage and using financial resources. Some important activities of this phase are: Guidance and implementation of tunnel project- recruitment, development and management of the project executive team and holding a coordination meeting with them; resolving disputes and conflicts during project implementation - provide the necessary resources (money, manpower, equipment) for the proper construction of the tunnel and finally stakeholder participation management (Sabzehparvar, 2016, p. 372).

2.1.5. Repair and Maintenance

In general, there are three main factors in the operation and maintenance of quality infrastructure, including common tunnel facilities: adequate funding for ongoing maintenance and maintenance programs; creating sufficient capacity for successful implementation of operation and maintenance programs; organizing governance in order to strengthen the desired exploitation and maintenance programs (Wong, 2014, p. 18). Since there is no need to dig the passages in order to repair and maintain the facilities located in the tunnel, the green space and urban furniture are not damaged, so the process of repairing and maintaining the common tunnel of urban utilities are cheaper and faster. Also, during the maintenance process of these tunnels, the comfort of residents and economic activities located around the tunnel are not taken away (due to noise generation, environmental pollution and traffic) (Hunt, Nash, & Rogers, 2014). The basic responsibility of the government is to get the maximum value from the money spent to operate and maintain the existing facilities. Governments can adopt various strategies to optimize the social and economic returns from infrastructure assets.

2.2. Actors and Organizations Involved in the Implementation of the Project of Common Tunnel Urban Utilities

Determining the actors and organizations involved in implementing a common tunnel of urban utilities around the world is usually done based on the following two factors: 1. Different regulations or national standards in different countries regarding the classification of lines located in the common tunnel Utilities and related facilities (ITU, 2015); 2. Differences between infrastructure preparation and supply systems and utilities in developing and developed countries (Yazdani et al., 2015).

In developing countries such as Iran, the issues of procurement and supply of urban facilities and infrastructure are not designed and built as connected and integrated systems, but independently. As a result, different stakeholders and actors from different organizations are involved in this issue and the need for horizontal and vertical coordination between them becomes a serious challenge. Each of these actors, with a different organizational structure and under the supervision of different upstream institutions, work with their own specific organizational missions and goals and are responsible for implementing a specific stage of preparation and provision of urban facilities and infrastructure. This leads to limited inter-sectoral relations between trustees, parallelism and overlap in activities, creating incoherence, waste of human and material resources, irresponsibility, lack of accountability for the problems of the urban system and infrastructure, and ultimately the failure of the project.

3. RESEARCH BACKGROUND

In this section, the background of domestic and foreign research is reviewed.

3.1. Background of Internal Researches

In a research entitled Recognizing the effects of constructing a common urban tunnel utilities in order to achieve better management of urban services, Bagheri states that with the growth of population and the expansion of cities, it can be acknowledged that if the system of shared tunnels of facilities is on the agenda of municipalities, in addition to eliminating a number of problems today to provide utilities services, it can also eliminate the cost of repairing or damaging this equipment and give a general organization to the urban appearance with a special order. Basirat, in a study entitled "Investigating the advantages and disadvantages of constructing a common tunnel of urban utility", states that the main obstacle to the implementation of tunnels is the lack of financial resources and lack of common utilities tunnel discussion in the minds of urban managers (Basirat, 2015). Majdi and Shokouhi, in a research entitled "Assessment of managerial barriers to the construction of common tunnel utilities in Iranian cities" showed that despite the development and approval of the law, executive regulations, weak management structure to control, support and monitor has been preventing the implementation and spread of this Technology (Majdi, Shokouhi, & Khosravi, 2012). Zandieh and Ardaneh, in a study entitled The Two-Way Relationship between Equipment and City View, state that common tunnel of utilities is one of the most important and effective urban elements in the spatial physical system of urban development and its success depends on the cooperation and comprehensive coordination of various organizations such as water and sewerage, telecommunications, gas and municipalities (Zandieh & Ardaneh, 2012).

3.2. Background of Foreign Researches

In a research entitled Common Tunnel of Urban Utility, Jay and Zu discuss the importance of implementing a common tunnel of urban utilities and point out that these tunnels, in addition to their benefits for urban management and cause the organization of utilities lines in cities, can also be used in times of crisis and emergencies and facilitate the provision of services in these conditions (Ge & Zu, 2019). Sun et al., Using the experiences of different countries in the field of construction of common tunnel of urban utility, study and compare different methods of financing these tunnels and among the existing methods, the most common and best method is the participation and cooperation of the public sector with the private sector (Sun et al., 2017). Mao and Zhang in a research with entitled "Identifying the challenges of the implementation process of the common tunnel of urban

utilities by examining the subject literature and survey studies" divide the sixty challenges of implementing urban tunnels in three levels: macro, medium and micro to guide project planners and managers to be a common tunnel of urban utilities (Mao & Zhang, 2017).

4. RESEARCH METHOD

The present research is applied in terms of purpose and has been prepared with a qualitative approach and content analysis method. The reason for using the qualitative approach was that there was no specific hypothesis in response to the main research question. Content analysis is one of the most common methods in qualitative research that identifies, analyzes and reports patterns (themes) in data. In this method, the collected

data is formulated and described in valuable detail and different aspects of the research topic are interpreted and a good understanding of seemingly irrelevant information is obtained (Braun & Clarke, 2006, p. 6). The steps of performing the content analysis method are shown in Figure 1. In this research, considering the objectives and research questions of the method analytical network of content and MAXQDA software has been used to analyze the data. MAXQDA software is advanced software for analyzing quality data such as text, photos, film and audio that is used in the fields of social sciences and humanities. This software helps the researcher to categorize and manage their data and easily analyze the data. By using this software, qualitative research can be done with less time, accuracy and ease.

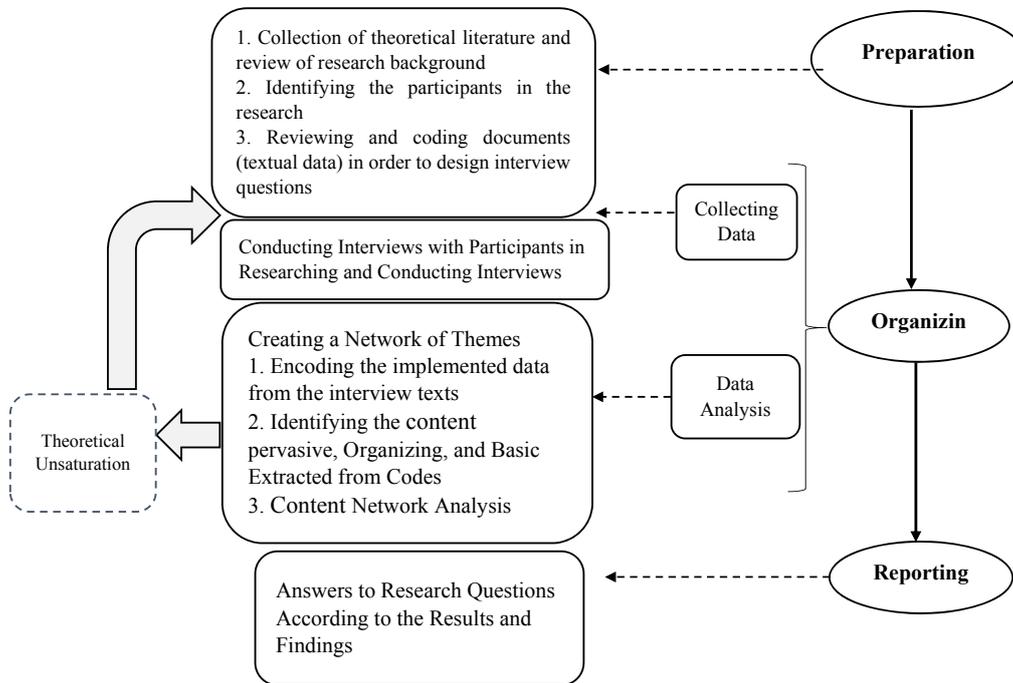


Fig. 1. Steps to Perform Content Analysis Method

In this research, semi-structured interviews were used to collect data. Qualitative data related to these interviews have been collected in the first six months of 2018. The main axes of the questions in the interviews were: obstacles in the policy-making and decision-making stages, planning and design, financing, implementation and maintenance, and maintenance. The duration of these interviews is between 60 to 120 minutes and the audio file of the interviews has been implemented. The characteristics of the participants in the research are stated in Table 2. The sampling method is theoretical in that the conceptual classification and determination of categories is done simultaneously

with the research stages such as data collection and analysis. In this research, in interview 19, due to the repetition of many data and the decrease of new data was achieved the theoretical adequacy. However, in order to ensure this, the interviews continued and finally were conducted 22 interviews. The management level of relevant specialists in the municipality (first row of the above table) was as follows: five of them were senior management level and the rest were operational management level and about the relevant specialists in four operating devices were top level and the rest were operational level.

Table 2. Characteristics of Research Participants

Statistical Society	Selection Criteria	Interview Code	Number
Urban Infrastructure and Utilities Specialists in the Municipality	Scientific and Work Experience of More Than 10 Years in the Field of Utility, Development and Urban Planning	M1	10

Statistical Society	Selection Criteria	Interview Code	Number
Specialists in Infrastructure and Urban Utilities in Operating Devices (Water and Sewage, Electricity, Gas and Telecommunications)	Scientific and Work Experience of More Than 10 Years in the Field of Utility, Development and Urban Planning	O ²	7
Professors of Urban Planning and Specialists of Consulting Engineering Companies in the Field of Utilities and Common Urban Utilities Tunnels	Scientific and Work Experience of More Than 10 Years in the Field of Infrastructure and Urban Utility	A ³	5

5. DISCUSSION AND FINDINGS

In order to answer the main question of the research, after conducting the interview through the content analysis, we coded and identified the contents based on the codes extracted from the texts. The network of themes categorizes the basic themes (key points of the text), the organizing themes (themes derived from the

combination of basic themes) and the comprehensive themes (macro concepts extracted from the main text) according to a specific process and shows the relationship between these three levels of themes. Accordingly, the mentioned topics are identified and the results of the interviews are presented in detail according to Table 3.

Table 3. Creating Themes by Groups Participating in the Research

Comprehensive Contents	Contents Organizer	Basic Contents	Interview Codes			
			M	O	A	
Policy Making and Decision Making	Lack of executive guarantee of the law of construction of Common tunnel of urban utility	Failure to notify the construction of common tunnel law to a specific trustee	*	*	*	
		Lack of legal instructions to notify a specific trustee			*	
		Lack of legal mechanisms to hold responsible managers accountable for non-compliance with the law	*		*	
		Lack of proper and sufficient performance of monitoring devices	*	*	*	
	Lawlessness and non-compliance of managers with approved laws	Non-compliance of the law with the interests of some individuals and groups			*	
		Lack of mastery of managers and brokers over the content of the law			*	
		Incompatibility of the construction of a common tunnel law with the set of upstream laws (municipal laws, utilities companies laws)			*	
	Void of legal rules and binding instructions	Secondary nature of the law of construction of a common utilities tunnel	Lack of position of law on construction of common tunnels in one-year, five-year plans and comprehensive strategic-structural plan of the municipality			*
			Lack of rules and regulations for access, safety and security of the tunnel	*	*	
			Unclear legal and administrative responsibilities of related organizations and institutions in conducting studies and executive operations	*	*	
		Void of legal rules and binding instructions	Lack of coordination instructions between responsible institutions	*	*	*
			Void of operation criteria due to non-preparation of instructions by the Organization of Municipalities and Rural Affairs of the Ministry of Interior in accordance with Article 4 of the Law on Construction of utilities common tunnel	*	*	*
			Multiple decision-making and policy-making in urban affairs due to the lack of integrated urban management	*	*	*

Comprehensive Contents	Contents Organizer	Basic Contents	Interview Codes			
			M	O	A	
		Organizations do not believe in carrying out the utilities common tunnel due to the prevalence of daily management and neglect of long-term plans.	*	*	*	
		Ambiguity of tasks, powers and expectations of actors in different stages of project implementation	*	*	*	
		Failure to consider the goals and organizational plans of the actors when selecting them (no need for telecommunications to use the underground space, both terrestrial and canal, technically due to the use of fiber optics instead of thick copper cables and wireless lines)		*		
Planning and Design	Lack of database and detailed utilities maps in the passages to assess the current situation	Failure to record records due to the obsolescence of urban utilities networks in Tehran	*	*	*	
		Changes in passages and squares in geometric widening and correction plans and inconsistency of old plans with the new situation	*		*	
		Lack of integrated maps and their distribution in installation areas	*	*	*	
		Lack of computer maps of some urban utilities networks in Tehran and non-compliance of maps and information with GIS	*	*	*	
		Legal restrictions on accessing and providing the available set of information and drawings to consulting and design engineering companies			*	
		Diversity and complexity of feasibility studies	Weakness in correct estimation of the time of completion of work with regard to unpredictable technical, executive and non-technical delays	*	*	
			Weakness in financial estimation of project implementation in different phases and determining the share of all organizations	*		*
			The need for social considerations such as the occurrence of anomalies and irregularities in the daily life system of people due to the slow nature of construction operations	*		
			Necessity of feasibility study (such as worn-out areas and urban development, traffic issues and conflicting utilities such as oil and diesel pipelines, gasoline pipelines)	*		
			The need to anticipate environmental considerations at different stages of construction, operation and after the life of the project (demolition and collection stage)	*		
	Lack of needs assessment studies	The need for feasibility studies for passive defense and crisis management	*			
		Lack of needs assessment studies of tunnels in different urban spaces (existing spaces, under construction, renovated)	*		*	
		Lack of accurate needs assessment of any of the organizations exploiting the development of Tehran (such as densities, uses, geometric condition of roads) in order to estimate the utilities needs		*		

Comprehensive Contents	Contents Organizer	Basic Contents	Interview Codes		
			M	O	A
		Lack of preparation of urban utilities tunnel routing principles according to various technical, executive and operation criteria commonly	*	*	
	General rules and technical standards and uncertainty of details	Incomplete technical standards for determining the privacy and interference of utilities located in the tunnel	*	*	
		Imposition of high costs for operating organizations in order to transfer utilities into the tunnel		*	
Financing	Lack of financial resources for tunnel construction and transfer of existing utility	Budget deficits and financial problems of organizations for running costs	*	*	
		The initial cost is high for the construction of tunnels	*	*	*
		The need to allocate a significant portion of the city's development budget in the short and medium term on the one hand and the return on investment in a time much longer than the implementation period	*		
		Reluctance and motivation of the private sector to participate in the construction of tunnels due to lack of financial return in the short term and direct profit	*		*
	Barriers to financing methods	Existence of investment risk for the private sector in participating in the construction of tunnels as a result of changing management approaches with the establishment of new management			*
		Lack of forecasting the necessary financial credit for the construction of tunnels in the operating companies	*	*	
		Lack of a mechanism for how the private sector participates in common utilities tunnel projects	*		*
		Lack of credit line in the annual budget of the municipality for the construction of the tunnel	*		
		Lack of credit line forecast in the annual budget of the country	*		*
		Difficulty in obtaining tunnel costs from utilities companies due to the difference between the municipal treasury and these organs	*		
		Lack of forecasting the mechanism of obtaining credit from the World Bank for the construction of tunnels such as the Tehran Sewerage Project	*		
		Lack of anticipation of a mechanism for introducing supervisors from operating organizations to the municipality in order to monitor the implementation of work	*		
Execution and implementation	Barriers to forming an executive team	Lack of coordination between organizations in forming the executive team due to the multiplicity of managements	*		*
		Difficulty of holding municipal coordination meetings with operating organizations due to lack of integrated urban management	*		*

Comprehensive Contents	Contents Organizer	Basic Contents	Interview Codes			
			M	O	A	
Execution and Implementation	Execution process problems	Occurrence of traffic problems, especially in busy squares and intersections due to high drilling surface	*			
		To be long the construction process	*			
		Lack of agreement of operating organizations to establish utilities in the tunnel	*	*		
		Density and frequency of utilities in urban passages of Tehran and the possibility of multiple common tunnel collisions with the utility	*	*		
		Possibility of cumulative effects in the event of accidents or natural disasters	*			
		Possibility of damage and destruction of other utilities and buildings or utilities in the construction phase	*	*		
		Possibility of creating suitable habitat for some harmful animals such as insects and rodents	*			
		High operating and maintenance costs	*	*	*	
		Lack of estimating the total cost and determining the appreciation of the organizations involved in the operation and maintenance	*	*		
		Repair and Maintenance	Insufficient budget	Lack of preparation of comprehensive instructions and programs for operation, maintenance of installed utilities and internal collection	*	*
Lack of sufficient knowledge and information about operating and maintenance conditions	*				*	
Lack of skilled manpower familiar with the tunnel complex	*				*	
Low capacities of technical, human and legal	Lack of reputable and independent repair, maintenance and service companies				*	
	Consideration of the life cycle of the tunnel project in the design and construction stages				*	
	Improper governance		Lack of coordination of operating organs in order to update the utilities inside the tunnel and repair the structure of the tunnel and its surrounding utility	*	*	

Based on the data and content of Table 3, the most important barriers to the implementation of the common tunnel in different stages of this type of project are:
Policy and decision-making stage: The first important barrier at this stage is not using the legal approvals of the Islamic Consultative Assembly as a legislator to ensure the implementation of the law on the construction of a common tunnel of urban utility. On the other hand, the lack of precise definition of the general objectives of the project and the failure to determine the general expectations of the actors by the legislator has led to lawlessness and managers' interpretation of the content of this law. For example, one of the participants in the study said: "Managers act in a tasteful manner instead of enforcing the law, and this leads to the imposition of many costs and irregularities on the city." In a

good system, there must be a public prosecutor and a specific trustee must be held accountable. (A1)⁴ Lack of space for effective participation and cooperation of decision makers and managers at national and regional levels with city managers in decision-making and determination of needs has led to inconsistency of the law of construction of a joint tunnel with the goals and organizational programs of relevant actors. According to one participant: "Because there are so many ministries involved that have to decide and fund, there is a lot of decision-making. (M3)" On the other hand, the presence of various actors (municipalities, operating organizations) in Tehran due to the lack of an integrated urban management system has caused many inconsistencies. Another participant stated: "These organizations are not coordinated due to their different

nature. The municipality, as a public non-governmental organization, on the one hand, and the establishment organizations under the government ministries, on the other, create many problems, even for holding meetings (M4).

Planning and design stage: According to many participants in this study, the lack of a database and accurate maps of facilities in the passages to assess the current situation in Tehran is one of the main obstacles in the planning and design of these tunnels. A problem that even affects the next steps in terms of determining the route of the tunnel, the type of construction method and estimating the financial and time costs of the project. In this regard, one of the participants said: "In our projects, the feasibility study is not done or if it is done, it is very superficial. The feasibility study should have several attachments such as social, cultural, passive defense and crisis management. "Unfortunately, in our projects, evaluations are done after the project is done (M2)". According to most participants, the most discussed issues in the coordination meetings are: the lack of preparation of the basics of tunnel routing of urban facilities due to various technical, executive and operational criteria and the incompleteness of technical standards provided by the Program and Budget Organization. In this regard, one of the participants stated: "The incompleteness of legal rules and regulations, in which all aspects are not fully considered, causes a lot of time to be spent in coordination meetings with utilities companies to discuss the gaps in the rules and regulations (M6)".

Financing stage: At this stage, an important obstacle that exists not only in Tehran but also according to existing documents and articles and review of theoretical literature in most cities of other countries is the issue of high initial cost of construction of joint tunnels of urban facilities. According to one of the participants: "Another reason why these tunnels have not been implemented financially is that these tunnels have not been attractive to organizations involved in terms of cost-effectiveness in the short term. Because most managements are looking for short-term returns. "But common tunnels cost a lot in the first few years (M1)". In the city of Tehran, for the construction of a common tunnel of utility, a special line of credit is not foreseen in the municipal budget and it is not possible to finance it. In this regard, one of the participants said: "As long as there is no urban unit management and all institutional organizations are not under the management of the urban unit and there is no systematic administrative relationship between organizations. "Organizations do not believe in carrying out these projects, and for this reason, despite the budget allocation notice, has not been made credit forecast (O2)". The transfer of utilities lines into the tunnel also imposes high costs on operating organizations (water, electricity and telecommunications) that are beyond their financial capacity. In this regard, one of the participants stated

the reason for this as follows: "The cost of transporting these facilities into the tunnels is also high because many of these lines are worn out (O1)". Lack of prediction of a mechanism for private sector partnerships and non-profit organizations to build a common tunnel is the most important shortcoming in financing this project.

Execution and implementation stage: According to the law, the municipality, along with the organizations in charge of municipal facilities such as water and sewage, electricity, gas and telecommunications, and selected contractors are the main actors in this phase. They face several obstacles in forming, developing and managing the project implementation team and coordinating the implementation of civil operations due to the lack of integrated urban management. Meanwhile, the problems and obstacles during the construction and implementation of the joint facility tunnel in Tehran will be very complex due to the fact that the city is full of residents and buildings with different uses and various types of infrastructure and dense installation lines. In this regard, we can refer to the comments of one of the participants in the research as follows: "Comprehensive and complete construction of these tunnels in large cities with old and dense texture is facing many problems that are difficult due to the presence of dense buildings, irregular networks and intertwined facilities (M8)".

Maintenance stage: The main obstacles at this stage, despite the existing legal requirements, are lack of estimation of total costs and determining the contribution of organizations involved in the repair and maintenance of tunnels by the Organization of Municipalities and Villages and failure to provide detailed instructions on how to repair, maintain and ensure security. The lines and tunnels are run by the Commission under the responsibility of the Ministry of Interior and the Ministries of Roads and Urban Development, Oil, Energy, Communications and Information Technology. In this regard, we can refer to the comments of two participants as follows:

"Another gap is the way of exploitation. We do not know how much and how the municipality will receive the costs and how to control the traffic to these tunnels. These tunnels need a control room that can be controlled with a continuous camera, but no arrangements have been made yet. M2)». "The law does not specify the role of these organizations in the maintenance and operation of these tunnels. We do not have reputable repair, maintenance and service companies. "The manpower entering these tunnels must have information about the set of utilities (A2)".

6. CONCLUSION

In the present research, the managerial obstacles to the implementation of joint tunnels of urban utilities were classified into five categories: policy and decision-making, planning and design, financing, implementation and maintenance, and maintenance. The results and

findings of data collection through interviews and creating a network of thematic management obstacles to the implementation of joint tunnels of urban facilities in Tehran showed that the main barriers identified in the policy-making and decision-making phase are the lack of executive guarantees of the law, the illegality of managers and the inefficient selection of actors. The research of Majdi, Shoukuhi, & Khosravi 2015 also confirms the weakness of the management structure in this regard. In the planning and design stage, the main obstacle is the lack of information and new maps of the current state of utilities networks, as well as the lack of scheduling and financial considerations. The barriers identified at this stage have not been found in previous studies and show the differentiation of this research. Also, the issue of high initial implementation costs and financial problems of relevant organizations that have been raised in the financing phase, has been raised in Basirat, 2015 as an important barrier.

In the implementation phase, the researchers have raised some problems such as lack of coordination for the formation of the executive team and problems of the implementation process, such as dealing with buildings and facilities in Tehran. In this regard, the study of Zandieh & Ardaneh, 2011 also stated that the successful implementation of these tunnels depends on the cooperation and coordination of various organizations.

In the last stage, ie operation and maintenance, insufficient budget, weak capacities and inadequate governance have been identified as the main obstacles to the implementation of the common tunnel in Tehran that barriers raised at this stage have not been addressed in other research.

Practical suggestions in this section, according to the barriers identified in the present research, in five stages of policy-making and decision-making, planning and design, financing, implementation and implementation, operation and maintenance are presented as follows.

6.1. Policy Making and Decision Making

Regarding the inefficiency of determining the actors involved in the common tunnel of urban utilities project, the approval and implementation of an integrated urban management system is proposed. Integrated urban management means designing a new organizational and management category consisting of all relevant institutions of urban management. The most important factor in the lack of policy integration in Tehran is the system of power relations, the different amount and source of power between different institutions and since the power of formal institutions is largely due to government appointment, therefore, it is suggested that with the strengthening of the urban management system, including the municipality and the city council, the transfer of power from the government and all its organizations and institutions to urban management take place; in this regard, it seems

necessary to follow the organization of municipalities and villages to complete and approve the integrated urban management. Finally, in order to guarantee the implementation of the law on the construction of common tunnel of urban utility, it is suggested that the city council have political interventions to oblige the implementation of tunnels in new contexts and the scope of development and renovation plans in existing cities.

6.2. Planning and Design

Accurate estimation of budget and financial costs of project implementation in different phases and determining the share of all actors and organizations involved are other important measures that should be considered in the planning and design phase. In the global experience, not paying attention to the issue of overall budget estimation has led to a 50% increase in budget. It seems that after determining the general costs of tunnel construction by the Program and Budget Organization and the supervision of the proposed commission in the policy-making and decision-making stage, the appreciation of the relevant actors can be determined and communicated to them.

6.3. Financing

Regarding the obstacles to common tunnel financing methods of urban utility, it is suggested to adopt political mechanisms to facilitate the financing of the common tunnel of facilities. In this regard, the policies that can be used are: Liberalize restrictions on foreign direct investment in infrastructure, facilitate the political environment for bank financing to purchase shares from financial investors in profitable operating projects, create a transparent documentation environment regarding project allocation and contractual partnerships, Private by urban management using the theory of transfer of development rights.

6.4. Execution and Implementation

Suggestions for the successful implementation of the common tunnel of utilities project in the execution and implementation stage in terms of management are: Holding regular meetings with executive team members, providing the required resources (money, trained manpower, equipment), identify possible changes in the project implementation process and launch the project improvement cycle, measuring the achievement of goals set according to financial considerations and scheduling by monitoring the implementation and reporting disputes with the program, make corrective decisions to bring the implementation in line with the plan and, if necessary, receive evaluation and decision changes on the proposed project from all actors involved (municipality, water, electricity, gas and telecommunications organizations) or members of the project implementation team, re-

planning the project if necessary, adapt resource levels as needed, return to the program to match the results and goals and get the necessary approvals.

6.5. Exploitation and Maintenance

Policymakers need to consider three strategies in order to implement maintenance programs sustainably: Adequate and sustainable budgeting (by allocating taxes to users through repair budgets, requesting users' usage costs, adopting subsidiary business

opportunities)

- Creating institutional and individual capabilities (through the introduction and planning of asset management, application of data, criteria and tools, educational guidance and talent development)
- Governance reform (through the organization and professionalization of government representatives, strengthening inter-organizational cooperation, considering the participation and competition of the private sector.

END NOTE

1. Code M is abbreviated from the word Municipality for the codes of interviews with research participants in the municipality.
2. Code O is abbreviated from the word Organization for codes of interviews with research participants in operating devices.
3. Code A is abbreviated from the word Academic for the codes of interviews with research participants, including professors and project consultants.
4. ID A1 according to Table 2, ie interview with the first person from the group of professors and project consultants.

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