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Article

Meta-analysis review of the literature on urban housing production from an Actor-network theory perspective

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ABSTRACT

Urban areas are dynamic and complex systems. In the built environment, reshaping and reconstructing urban spaces for a sustainable future raises not only physical and spatial challenges but also issues around stakeholder relations. Urban area production, consumption, use, and management processes involve complex interactions between heterogeneous assets. In recent years, understanding inter-stakeholder networks has been crucial for urban growth and transformation decision-making mechanisms. Urban transformation is a complex and multifaceted process that requires comprehensive and integrated methods involving stakeholders and addressing economic, social, and environmental aspects. Scientific approaches are necessary for dealing with cities' complex, dynamic growth due to social and physical factors.

This article evaluates actor-network theory (ANT), one of many approaches to resolving social relations, as a conceptual framework for its ability to unravel the entire network of relationships between actors, objects, and things involved in housing production processes in urban studies. The primary objective of the study is to construct a framework for decision-making models by analyzing housing production systems, both locally and globally, from the perspective of actor-network theory. This is achieved by analyzing stakeholder network relationships through meta-analyses of literature and ANT-based case studies, considering political, sociological, and historical differences. For developing decision-making models, articles reviewed in the meta-analysis framework are classified into four categories: (1) policies and strategies; (2) stakeholders and actors; (3) approaches and tools; and (4) potentials and risks. The study findings are expected to contribute to the development of decision-making models for urban transformation practices.

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INTRODUCTION

The concept of "urban transformation" has emerged as a critical component of the "new urban policy" introduced to address the problem of unplanned and unsafe housing, especially in cities undergoing deindustrialization and consumption-based urban development (Türkün,

2013). In response to the problems resulting from rapid urbanization, urban transformation has become increasingly important as a comprehensive action and vision that provides solutions to urban-related problems that arise under changing economic, physical, social, and environmental conditions in a transforming region (Thomas, 2003).

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Neglecting to involve local people residing in urban transformation areas in the participation process negatively affects the social sustainability of projects (Gür & Dostoglu, 2016). On the other hand, in various urban transformation practices, contractors often view the participation of local people and their dynamics as a means of profit-making rather than as a development opportunity (Kahraman, 2014). Leaving urban transformation decisions to free-market actors focused solely on short-term profit without including urban residents causes disparities in power and severely deprives city residents of management (Türkün, 2013). A rapid social and physical transformation in developing cities calls for innovative, science-based approaches that can adapt to global conditions (Cvetinovic et al., 2017).

Urban housing production for a more sustainable and equitable urban future is not only a spatial design challenge but also a relational problem among stakeholders. Housing production processes, planning, design, and management phases involve complex, diverse interactions. It is necessary to understand and decipher the networks of urban relations between actors in the analysis of the transformation process and decision-making analysis by using network theory. Research on sustainable urban transformation requires identifying the roles of stakeholders, thoroughly understanding their demands, and establishing a consensual environment (Palmer, 2014). The network theory identifies the roles of both human and non-human actors in urban areas and proposes the actor-network of the multifaceted process of housing production. Latour (2005) introduces the concept of a "sociology of associations" within actor-network theory as an unlimited and holistic approach that has emerged as an interdisciplinary research method.

The primary objective of this study is to construct a unique and powerful analytical framework for analyzing the housing production systems in urban transformation practices through the lens of actor-network theory (ANT).¹ This framework is based on the findings of case studies exploring causal relationships. The proposed framework includes the application form of case studies, its effects on networks of relationships, and variables such as dynamics, key actors, and actants. ANT, which serves as the theoretical framework for the study, focuses on the relationship between human and non-human entities and explains how these relationships lead to the creation of new formations. The concept of "network" can be seen as the shuttle of ANT, according to Latour (1993). Understanding a network requires understanding its actors, and understanding the actors requires understanding the networks they create.

ANT is a social theory and research method that considers material objects as contributory elements to the social realm, along with subjects, and is an innovative and analytical approach that facilitates multiple, plural, and heterogeneous readings of the network environment, allowing the network of urban relations to be uncovered. ANT was developed to help us understand the "how and why of the science and

technologies we have" (Cressman, 2009) and explore how housing systems are produced in the built environment and the relationships that lead to these systems.

The ANT approach has been introduced into housing studies research to contribute to and advance academic conceptualization of the theory. Based on these objectives, the article seeks answers to the following research questions:

- What policies and strategies are pursued concerning stakeholder relationships in urban housing production processes?
- Who/what are the stakeholders, actors, and dynamics involved in urban transformation practices?
- Which approaches and tools could be used in network applications to define levels of the relationship between stakeholders?
- What factors impact decision-making stakeholders? What is the process for identifying potential and risks?

Meta-analysis has been chosen as the method of research since answering the research questions primarily requires an in-depth examination of the scientific work conducted worldwide and the developing debate environment resulting from these case studies. We thoroughly review local and global scientific papers and explore the discussion environment that emerges from case studies. As the goal was to examine the network of relationships formed and the housing practices in our country, we will use the data obtained through the meta-analysis to identify stakeholder relationships during housing production processes. A scientific database search using the keywords "urban," "housing production," and "actor-network theory" found articles relating to the topic of this study, and the selected articles were meta-analyzed.

The study will first draw a conceptual framework, addressing the systematic literature review conducted to provide an interdisciplinary and integrated conceptualization of the ANT approach. The following section will explain the meta-analysis method, which allows an in-depth analysis of the selected articles and how the meta-analysis framework has been established as part of this research. This method involves reviewing, including, analyzing, synthesizing, controlling, and disclosing/making accessible the existing scientific articles and publications to create a reproducible process (Tranfield et al., 2003; Thorpe et al., 2005). Following the synthesis stage, meta-analysis is used to integrate research findings into data analysis, and articles reviewed within the framework were categorized. During the evaluation stage, several aspects of ANT in the literature will be discussed through case studies in the context of political, sociological, and historical differences (Figure 1).

The study constructs a holistic framework on how the ANT approach contributes to solving stakeholders' problems in the production of housing settlements (Palmer, 2016; Cvetinovic et al., 2017; Boolens and Coppens, 2015). The

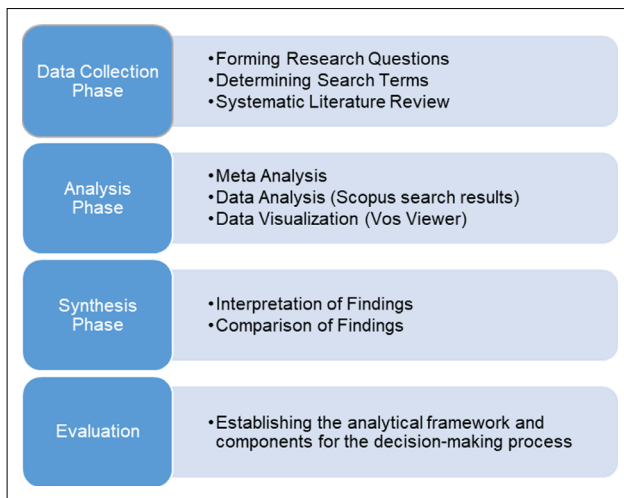


Figure 1. Study stages and methods.

objective is to use this framework to develop decision-making models that incorporate the ANT approach into the planning, design, and implementation stages of the urban transformation process. The aim is to develop innovative approaches to urban housing production, raise awareness about the use of the ANT method in urban transformation practices, and lay the groundwork for future research.

ACTOR-NETWORK THEORY (ANT) APPROACH AND CONCEPTS

The ANT focuses on reassembling "the social" through relationships between human and non-human actors. According to Latour (2021), social is not a special domain, a particular realm, or a particular sort of thing, but rather a very peculiar movement of reassembling; it seeks to redefine

notions of society by reverting to the original meaning of social and tracing back the interactions. Tarde (1969), who approached the phenomenon of "the social and its problems" from the perspective of "relationality," initiated the heterogeneous debates on the definition of "the social" with his key contentions that "everything is a society" and "every phenomenon is a social phenomenon." Tarde's ideas guided researchers who used the ANT to trace back to social ties.

Latour (2005) calls the ANT the "sociology of associations," which is based on the concept that natural and social phenomena are inseparable. Relationality, symmetry, and association are the principles underlying this approach (Farias & Bender, 2012).

"Actor-Network Theory" interprets the housing production process from the viewpoint of the relationships formed by all actors, forming the basis for Latour's conceptualization of the network approach. Per the foundational principle of this approach, "generalized symmetry," all entities—whether human or non-human—that can be conceptualized as actors or actants² have equal capacity in the process. The ANT approach challenges traditional perspectives on sociology that focus on social structures and power dynamics between actors and actants; it is a critical perspective that argues that interactions between human and non-human actors are equally important in shaping the world we live in (Latour, 2005).

The network approach provides an analytical framework for understanding the dynamics of transformation and renewal in urban areas and for analyzing networks' complex and variable structure. Among the unique terminology of this approach are terms like "network," "actor/actant," "mediators," "intermediaries," "translations," and "black box" (Latour, 2005) (Table 1).

Table 1. Actor-network theory terminology

Actor-network	A heterogeneous network of actors and relationships
Actor / Actant	<p>"Anything that does modify a state of affairs by making a difference is an actor—or, if it has no figuration yet, an actant" (Latour, 2005)</p> <p>A human or any being that accomplishes, is capable of, or undergoes an act (Czarniawska, 2017). Therefore, it is not limited to anthropomorphic creatures but may include anything from objects to concepts to animals (Greimas et al., 1982).</p>
Generalized symmetry	ANT considers that human and non-human elements play equal roles within a network. This notion is referred to as <i>generalized symmetry</i> . Generalized symmetry describes the democratic association of actors/actants (Latour, 2005).
Intermediaries Mediators	Intermediaries do not affect relationships, but they help link them. Conversely, mediators facilitate communication/interaction between entities, but unlike intermediaries, they can influence, transform, enhance, or reduce communication and interaction.
Focal Actor	The actor aligns his interests with those of different actors within the system (Callon, 1986).
Translation	Translation process through four steps: problematization, interessement, enrollment, and mobilization (Callon, 1986).
Black Box	When new actors are enrolled, or some of the existing actors are excluded, the network regains stability. Black box is a network that operates smoothly and consistently (Selman, 2000).

• Application of Actor-Network Theory to Urban Housing Production

The field of urban studies is not only an observer of the city but also a participant in its challenges and conflicts. One of the tasks of urban studies is to analyze how urban assemblages and knowledge mutually influence and shape each other. Urban assemblages make a valuable contribution by applying ANT to urban areas and addressing the possible challenges posed by the actor-network representation of cities. The theory's origin is rooted in the production of scientific knowledge as well as the technological innovations formulated by Bruno Latour, Michel Callon, and John Law during the 1980s (Callon, 1980). The study explored how ANT might analyze heterogeneous actors in housing production. The ANT viewpoint is used to study urban housing production actors' interactions. The relationally oriented approach of ANT has given architecture a new critical foundation.

Yaneva (2022) emphasizes the structure as a fluid, process-based, or dynamic collaboration with Latour. This view sees the structure as a dynamic network and controversial space (Yaneva & Heaphy, 2012), with spatial pluralities determined by entity cohabitation and folded over time. Yaneva (2016) developed the "Controversies Mapping Method" project to analyze the design and implementation phases for architecture. The method deciphers the interconnections among several elements and actors/actants involved in the structure's production.

ANT's approach, concepts, methodological applications, and study areas are reviewed in the literature. In addition to its influence across a variety of disciplines, it is interesting that the ANT (Latour, 2005) has been applied in fields such as architecture and urban studies (Yaneva & Heaphy, 2012; Farias & Bender, 2012), network governance (Koppenjan & Klijn, 2004), planning theory (Porter & De Roo, 2012), and housing production (Palmer, 2014). Figure 2 provides a comprehensive overview of the ANT approaches used to

evaluate urban fields, concepts, and countries in the meta-analysis.

Several socio-technical network theory studies provide a framework to understand housing production's complicated relationships and concepts (Bevan & Lu, 2012; Mullins & Rhodes, 2007). Despite the growing popularity of network perspectives in housing research in the last decade, only a limited amount of research on housing production has employed actor networks. Palmer (2016) explored the interrelationships between social and technical actors involved in housing production and development in Australia. Her study employs actor-network mapping and social network analysis to unravel black boxes and formulate an output-based methodology. In the relevant literature, network perspectives have been employed to analyze variables and components of the urban housing production system (Cvetinovic et al., 2017).

The network governance approach is being recognized as a "new form of governance" in housing studies and urban areas (Mullins & Rhodes, 2007). New forms of governance frameworks are being used to explain, examine, and inform urban regeneration processes. The concept of network governance refers to intricate social challenges across various levels, including fundamental, strategic, and institutional uncertainties (Koppenjan & Klijn, 2004). The context of ANT built on network governance is a strong practice in guiding networks toward specific goals through collaboration and consensus (De Bruijn, 2002).

ANT attempts to clarify the dynamics of interactions between multiple stakeholders, including both human and non-human entities, through the process of "translation." Callon's four-stage translation process (1986) has been adopted in studies that examine the relationships between theory and practice in urban area research and its reflection on the possibilities and forms of generalization and the emergence of neighborhoods in an analytical context (Wissink, 2013; Webb, 2012; Liu et al, 2021; Sharif, 2020).

Various network approach tools (social network analysis, mapping, etc.) have been used to visualize the actors, the tools that form the network, and the stages of actor-network formation in studies (Seçilmişler, 2010; Palmer, 2016) focusing on Callon's translation process. The ANT approach offers insights and perspectives on how urban norms and structures are formed, how components of cities emerge, and how translation processes take place (Cvetinovic et al., 2017; Martin & Bezemer, 2020). Actor-network diagrams and network mapping were used to examine urban development processes discussed in the case studies.

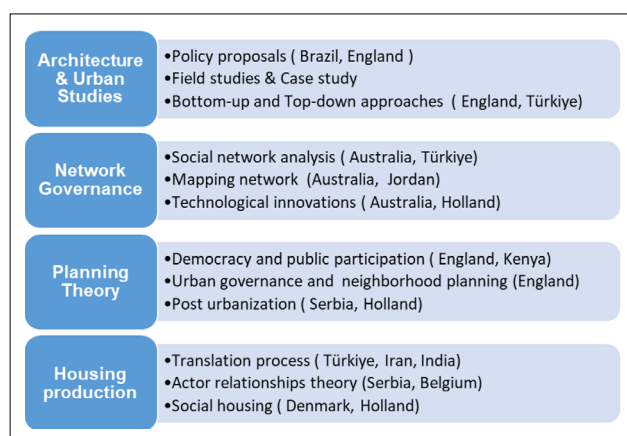


Figure 2. ANT approaches urban fields, concepts, and countries.

METHODOLOGY OF RESEARCH

Kemeny (2001) argues that understanding diversity in housing systems and typologies requires theoretical exploration of the relationship between housing and its context. Similarly, Elsinga & Wassenberg (2014) promotes the use of qualitative comparative analysis and claims that comparative housing research offers "a reliable evidence base for highlighting national differences." Therefore, a meta-analysis of housing production processes in urban areas was conducted through scientific studies at local and global levels.

Glass & Smith (1978) introduced meta-analysis into the literature as a statistical method. Glass defines meta-analysis as "the analysis of analyses." Glass further defined meta-analysis as "a statistical analysis aimed at drawing a meaningful conclusion from many individual studies" (Glass & Smith, 1978).

According to Çarkungöz & Ediz (2009), the term meta-analysis refers to "the quantitative review and synthesis of the results of related but independent research studies." As meta-analysis provides meaningful and holistic results on a topic based on the systematic evaluation of various research findings (Timulak, 2009), this method facilitates the rapid gathering of qualified data for the study. In contrast to literature reviews, meta-analyses combine studies on the same topic and re-analyze their findings (Sönmez & Alacapınar, 2019). Although meta-analysis is more commonly used in quantitative research, there have recently been ideas that this strategy can be applied to qualitative research (Timulak, 2009; Merriam & Tisdell, 2016).

Meta-analysis begins with establishing the research questions and the meta-analysis framework. Afterwards, the inclusion and exclusion criteria must be established (Timulak, 2009). The validity and reliability of the meta-analysis depend on these procedures. An analysis of the results is presented as graphs and tables.

For conducting the meta-analysis, a significant amount of literature was reviewed. Thus, a literature review on urban areas and housing studies included Scopus, SCI-SSCI, DergiPark, Ulakbim, ProQuest, and National Thesis Center scientific articles, theses, declarations, and conference papers. The study analyzed case studies of housing production processes based on scientific studies published worldwide.

The last step in the meta-analysis process was to review the studies using the PRISMA flowchart. It is a commonly used reporting guideline for systematic reviews and meta-analyses (Figure 3). A four-step protocol called **Preferred Reporting Items for Systematic Reviews (PRISMA)**³ was used. The PRISMA statement is a research protocol with a 27-item checklist translated into Turkish by Aşık & Özen (2019). This protocol is intended to help researchers improve their reporting of systematic reviews and meta-analyses.

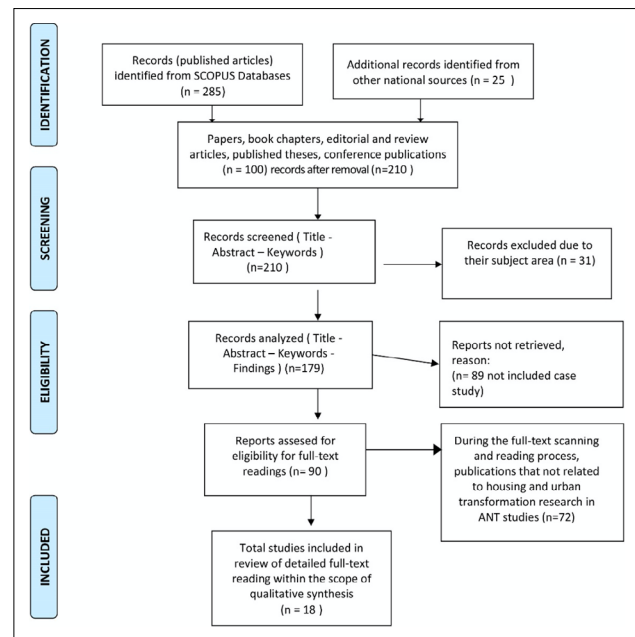


Figure 3. Prisma flow chart.

A systematic review of electronic databases using the keywords "urban" OR "housing production" AND "actor-network theory" was conducted to compile the research sample for the meta-analysis. Keywords were limited to those included in the "title, abstract, and keywords" to keep the topic relevant. The literature review focused on the years 2000–2022, turning points when urbanization became a global phenomenon. Urban centers have changed due to the spatial effects of period developments and the shift in economic policy since the 2000s.

- **310 publications** were identified through systematic literature searches in the Scopus database (n=285) and other national sources (n=25). After removing statements, book chapters, theses, conference publications, editorials, and review essays, a total of 210 articles were selected (n=210).
- The **Title-Abstract-Keywords** of the selected articles were reviewed, and articles whose subject areas were not appropriate for this study were excluded. **31 publications** were excluded from the scope at this point, and full-text publications were evaluated for their eligibility (n=179).
- The full text of the "Findings-Methodology" sections of the remaining articles was reviewed, and articles with case studies were selected, excluding those that did not contain practice-based studies.
- **90 articles** with case studies were reviewed in full text to select publications for the meta-analysis.
- As part of the full-text review, ANT studies that did not address urban areas or housing research were excluded (n=72), and **18 articles** were selected for qualitative synthesis to conduct an in-depth full-text review.

The selected studies have been found to share the following commonalities according to the ANT approach:

- The case studies were discussed in terms of their unique dynamics.
- Groups and partnerships were evaluated considering the ANT approach.
- The case studies selected focused on actors/stakeholders/dynamics and their roles.
- The case studies explored how ANT was applied.

DATA ANALYSIS

In recent studies, the complexity and dynamics of network urban systems have been reinterpreted from Latour's ANT perspective, and the principle of generalized symmetry has been applied to all human, social, and technical elements.

Based on the analysis of ANT-based studies, despite the wide range of studies published in international literature focusing on the relationships between actors, there are limited national publications in this field. A detailed list of the articles analyzed between 2000 and 2022 with the theme "ANT approach in urban areas" can be found in Appendix 1. It is possible to compare the research topics, methodologies, ANT-applied policies, stakeholder relations, and data analysis techniques used in the publications reviewed.

A meta-analysis is intended to provide insights into the progress, transformation, and status of housing research studies that apply ANT and to identify new concepts, themes, or topics through bibliometric techniques. This will thereby provide concrete suggestions for future studies.

Analyzing the Meta-Analysis Data

After reading the full text of all the articles reviewed in the meta-analysis studies, analysis results were obtained using the Scopus database. Based on the number of ANT-based studies by year, most publications were published between 2017 and 2021. ANT-based urban studies started addressing the theoretical framework in 2001, and more studies began including case studies after 2008 (Figure 4).

The articles reviewed show that the ANT-based approach has been applied to practices in the United Kingdom (Figure 5). Following this are Australia and the Netherlands. As seen from the publication years, the number of articles published in the context of the ANT approach has increased since 2019. It is mostly applied to practices in northern European countries (Denmark, Belgium) and the UK. A growing interest in ANT-based academic studies can be seen in Türkiye, Iran, and Jordan from 2020 onwards.

The articles published in scientific publications on planning and urban studies cover a wide range of topics. A closer

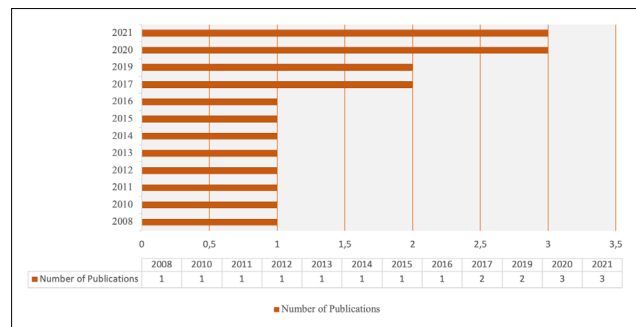


Figure 4. Distribution of research on ANT by years.

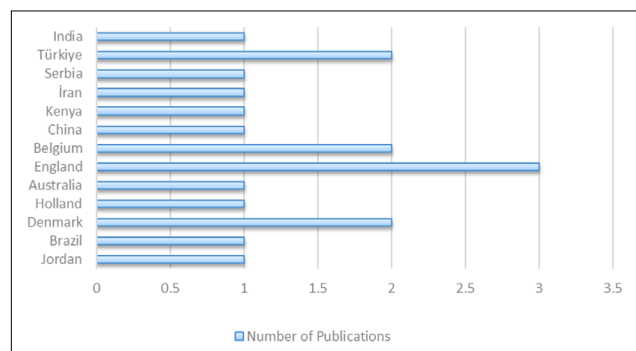


Figure 5. Countries analyzed in ANT research.

examination of the articles shows that they are focused on "social theory," "sociality," "innovative housing," "network mapping," and "social innovation," with a primary focus on "actor-network theory." Several methods and techniques, such as "case analysis" and "social network analysis," were the most common methods used; however, "surveys," "focus groups," "interviews," and "secondary data analyses" have also been frequently used in the process of collecting data (Figure 6).

Data Visualization

Data visualization with VOSviewer 1.6 (Visualizing Scientific Landscapes)⁴ software was used in the meta-analysis for visualizing bibliometric networks and analyzing textual relationships between terms and phrases. A bibliometric study aims to map existing research and analyze the metadata collected from the articles reviewed. Several questions related to bibliometric data were identified:

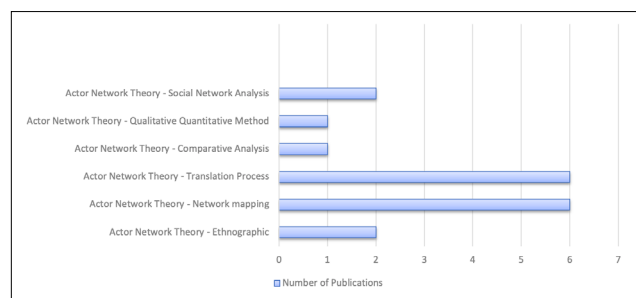


Figure 6. ANT research data analysis methods.

- What are some of the past publications and studies published in this field?
- In this field, which researchers have published the most studies?
- Which key concepts stand out?
- What are the most frequently used and clustered keywords?

The **VOSviewer** program offers three distinct levels of data visualization:

1. **Network Visualization:** Keywords with similar clusters are assigned to a cluster of the same color. The frequency and relational status of the keywords used in the studies can be monitored. As part of the co-occurrence analysis/author and index keywords feature in the **VOSviewer** program, the keywords used by the authors and included in the index have been analyzed (Figure 7).

Table 2 lists the top sixteen keywords ranked by their total link strength (TLS). The table also shows the number of links, occurrences, and average publication years. "Actor-network theory" keywords are generally associated with concepts like "local participation," "neighborhood," "urban housing," "housing market," and "housing policy."

2. **Overlay Visualization:** Shows the appearance of words in publications according to the publication year. Low-scoring words are in blue, and high-scoring words are in yellow. According to the overlay map, the keyword "actor-network theory" is particularly associated with the concepts of "local participation," "neighborhood," and "urban housing" (Figure 8). It is seen that from 2020 onwards, the concepts of "comparative research," "relational patterns," "activity

networks," and "urban planning" were featured in studies more frequently.

3. **Density Visualization:** Displays the frequency and density of the use of concepts in studies. On a blue background, yellow and green colors indicate how frequently words appear in publications; those with a larger font size are shown in a darker yellow color to indicate greater frequency (Figure 9).

RESEARCH FINDINGS

The research findings initially concentrated on applying the ANT approach for its intended purpose and later analyzed its implementation in urban housing areas in the context of political, sociological, and historical differences. The research findings also include an analysis of the mechanisms and components of decision-making processes from the perspective of ANT.

Analysis of Case Studies in the Context of Political, Sociological, and Historical Differences

Nowadays, scientific research on any subject has grown more accessible. However, drawing significant conclusions from studies conducted independently on the same topic in several geographical locations and disciplines is challenging. The aim of the study is to provide an analytical framework for the synthesis and re-analysis of the findings of case studies conducted in different contexts and scales using meta-analysis and an ANT perspective.

In the literature, research is available to examine the approach of actor-network theory in urban areas through studies conducted in different contexts. These studies

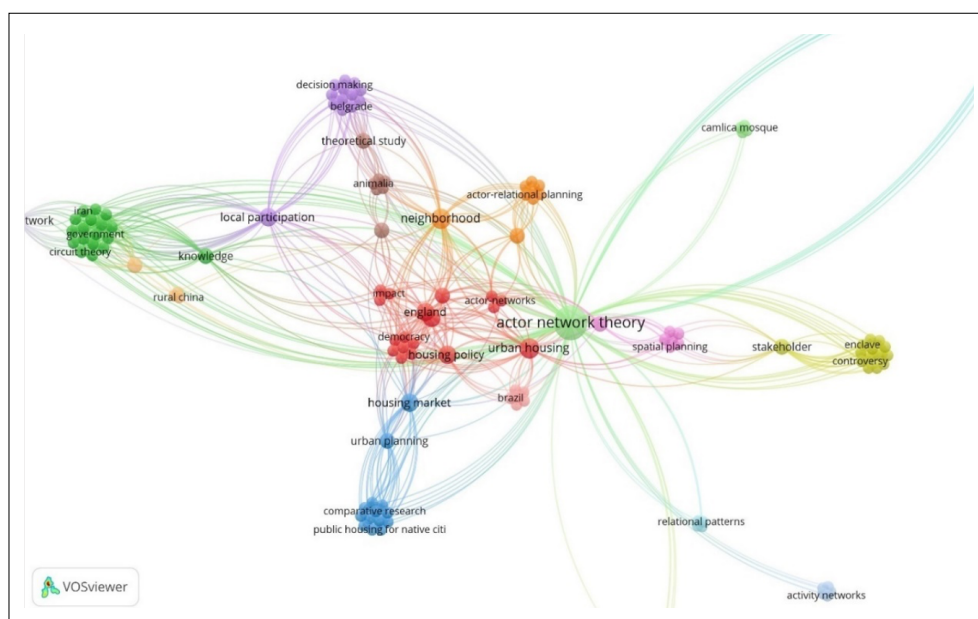


Figure 7. Network visualization keywords cluster.

Table 2. Frequently occurring keywords in the analyzed articles

Sr. No.	Keywords	Links	Total link strength (TLS)	Occurrences	Avg. pub. year
1	actor network theory	133	151	16	2016
2	local participation	47	49	3	2019
3	neighborhood	41	48	4	2015
4	urban housing	34	41	4	2015
5	housing market	30	35	3	2014
6	England	26	34	3	2014
7	United Kingdom	26	34	3	2014
8	housing policy	27	31	3	2016
9	knowledge	30	31	2	2017
10	urban planning	27	27	2	2020
11	actor-network	25	25	2	2018
12	public participation	24	25	2	2021
13	stakeholder	22	23	2	2014
14	theoretical study	21	22	2	2012
15	circuit theory	21	21	1	2022
16	conservation	21	21	1	2022

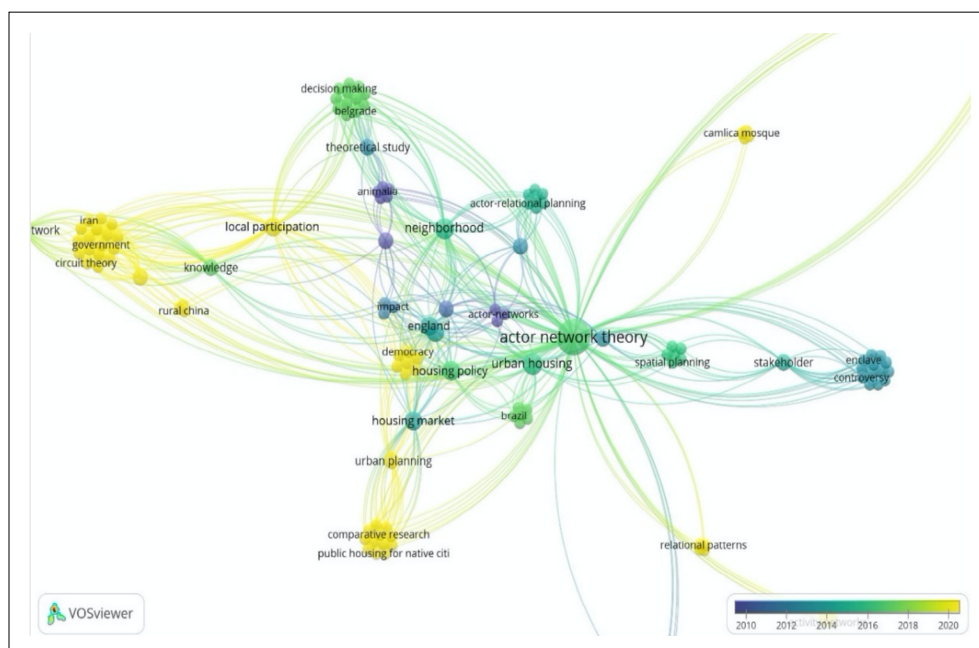


Figure 8. Overlay visualization keywords cluster.

evaluated the effectiveness of the ANT approach as a public policy tool in the transformation of Rio slum areas in Brazil (Becerril, 2017), its contribution to the creation of social housing and shared housing models in the Netherlands, Denmark, and other European countries (Boonstra, 2016; Jessen & Tietjen, 2020), and the social dynamics and interaction of ANT approaches in the post-war urban residential reconstruction process in Belgium and Kenya (Boelens & Coppens, 2015; Martin & Bezemer, 2020).

Today's cities, due to increasing social and physical transformations, raise a profound need for appropriate scientific approaches tailored to the conditions of global complexity and dynamic development patterns. The post-war renovation of public housing has been a major concern for many European cities in recent years. In the example of Belgium (Boelens & Coppens, 2015), the experience gained with actor-related approaches in the post-war renovation of collective housing was discussed.

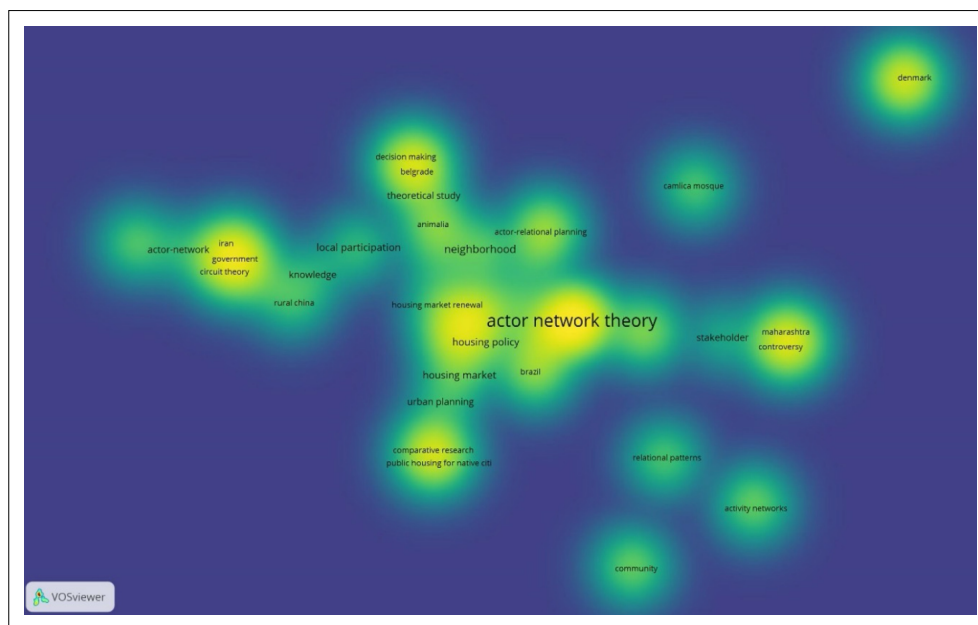


Figure 9. Item density visualization keywords cluster.

In the case of Serbia (Cvetinovic et al., 2017), the methodological approach of ANT has been applied to analyze the urban development process in a post-socialist neighborhood in the city of Belgrade, and the relational and operational elements that shape the conditions for urban development have been discovered. Participatory democracy dominates in England, so the problematization, agreement, participation, and action stages of the network approach were used to identify factors influencing local people's neighborhood planning and housing policy decisions (Bradley, 2020).

Similarly, urban controversies question traditional social views of architecture. Digital controversy mapping methods are explored using the London Olympic Stadium as a case study (Yaneva & Heaphy, 2012). This method could improve decision-making, and the mapping of the London Olympic Stadium challenge for the 2012 Games demonstrates a novel approach to visualizing controversies using architectural techniques.

Framework of Decision-Making Processes and Their Components

Urban transformation practices involve the economic and social restructuring of urban areas, including physical and social transformation and stakeholder relationships. Deciding on the roots of stakeholder relationships, which reflect urban elements' relationality, affects complex structures and interactions. Decision-making processes show various complex urban management processes involving many stakeholders, different viewpoints, and interests (Grabowski, 2012).

To discover the decision-making mechanisms, it is essential to identify all stakeholders and dynamics of housing production stages, understand their policies and strategies, approaches and tools used, the roles and responsibilities of stakeholders, and analyze the impact of potentials and risks on outcomes. The ANT is a potentially useful tool for analyzing decision-making processes involving human and non-human actors across socio-technical networks. Decision-making methods can help identify dynamic and interactive networks of participants.

The article presents a theoretical framework developed to facilitate the decision-making process in urban areas in the context of ANT (Figure 10)⁵. This framework divides its components into four categories, each of which influences decisions about the production of urban housing:

1. A set of policies and strategies, focusing on strategic solutions and policy proposals, which are designed to guide the central and local governments in conducting urban activities.
2. All stakeholders and actors, such as central government, local government, project developers, and local people, who influence the outcomes of decision-making processes.
3. Approaches and tools used to support decision-making and to coordinate the participation of all stakeholders.
4. Potentials and risks in the decision-making process that may arise for all actors in the network of relationships.

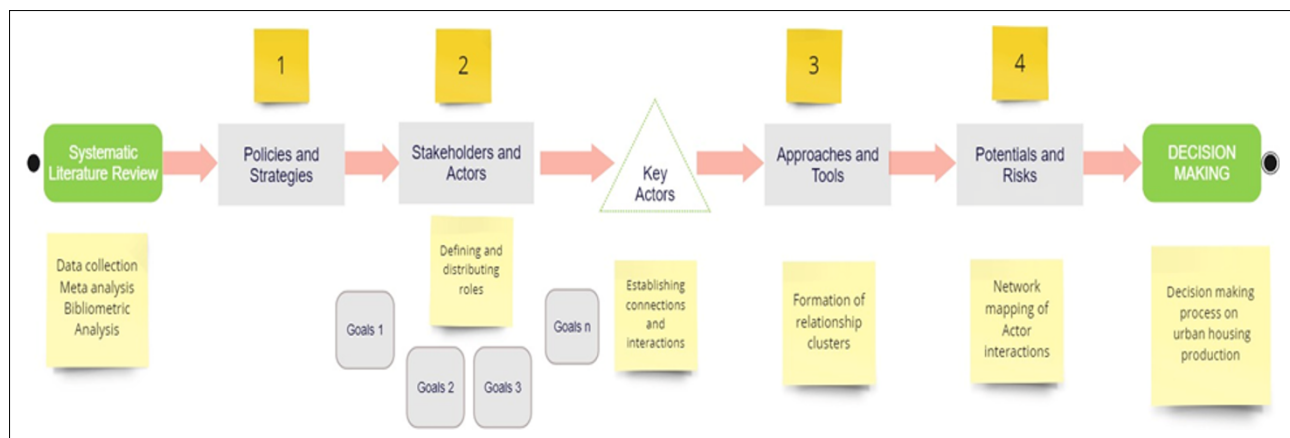


Figure 10. Framework of decision-making process.⁵

Four Sub-Headings Giving Meta-Analysis Findings about Framework Components (Figure 11, 12)

1. Policies and Strategies

Under the heading of policies and strategies are the housing production policies that balance 'top-down' and 'bottom-up' approaches in urban areas (Webb, 2012), policies for housing production and organization in urban transformation practices (Boonstra, 2016), and policies to protect the historic environment and cultural heritage (Seçilmişler, 2010). Promoting democracy and public participation in cities can be a way to solve the social problems that arise when creating policies to reduce social inequality (Bradley, 2020).

2. Approaches and Tools

The actor-relational planning approach (Boelens & Coppens, 2015), social network analysis, and actor diagram (Martin & Bezemer, 2020) approaches are used in stakeholder relations studies to determine the roles among critical stakeholders.

To promote local people's participation in complex network structures that emerge in urban areas, emphasis should be placed on decision support systems and applications. The development of decision-support approaches should make use of flexible, adaptable, and applicable decision-support tools and models, and interdisciplinary advanced research methods and techniques.

3. Stakeholders and Actors

Stakeholders play an essential role in decision-making processes in sustainable urban transformation practices, so relationships with stakeholders need to be coordinated by balancing economic, social, and environmental interests. Research on sustainable urban transformations requires identifying the roles of stakeholders, thoroughly understanding their demands, and establishing a consensual environment (Palmer, 2014).

In making forward-looking decisions, stakeholders often have diverse interests, which create conflict and result

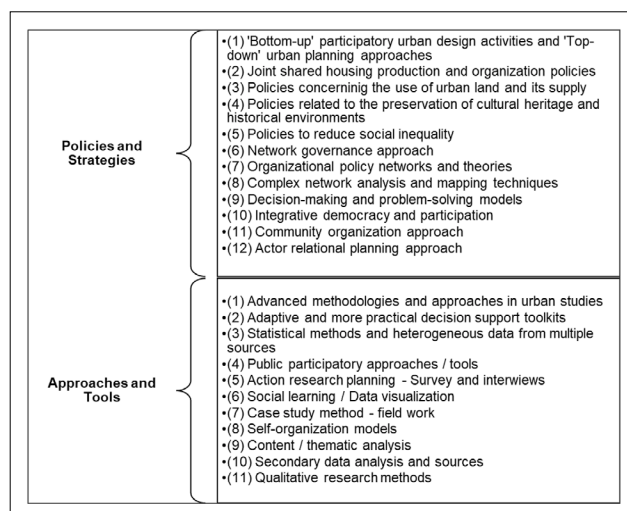


Figure 11. Policies and Strategies – Approaches and Tools sub-concepts.

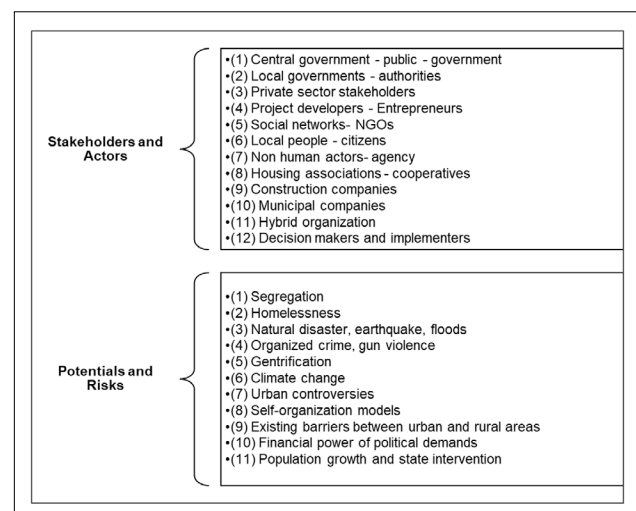


Figure 12. Stakeholders and Actors – Potentials and Risks sub-concepts.

in significant delays in implementing those decisions (Wissink, 2013). Participation of stakeholders is crucial for implementing housing production policies in urban areas, preserving the urban texture, and providing activity networks in these areas (Sharif, 2020).

Although there are studies in the existing literature that analyze stakeholder relationships and use different approaches and tools in different policy contexts (Palmer, 2014; Sharif, 2020; Cvetinovic et al., 2017), it is necessary to create collaborative decision-making mechanisms in urban areas and models that ensure active public participation.

In studying co-housing formation dynamics through two case studies, Boonstra (2016) found, for example, that stakeholders actively involved in public, private, and civil actor networks have limited opportunities to participate in decision-making processes and must adapt constantly to changing conditions.

4. Potentials and Risks

Webb (2010) suggests that promoting participatory housing production policies and technical solutions within the context of reconciliation tools could speed up and make the process of urban transformation for economic development more effective.

A study by Wissink (2013) highlights the detrimental effects of preconceived ideas about urban actors and their interests and concludes that supporting stakeholders' involvement in the urban design and planning process by providing them with the opportunity to tell their own stories about new urban settlement areas makes a positive contribution to the decision-making process. Stakeholder participation is also vital for preserving urban architectural heritage (Seçilmişler, 2010).

DISCUSSION

The actor-network theory has been examined in literature through diverse aspects and case studies. Literature has explored ANT across many disciplines, discussing its application in urban planning, architecture and urban research, the housing market, economics, finance, urban sociology, history, and geography. In an analysis of critical urban theory, Brenner (2012) described three categories within the ANT approach: empirical, methodological, and ontological. This paper discusses the ANT approach within a methodological framework and conducts a review of publications featuring case studies.

Comparing the housing supply policies of different countries, it is apparent that participatory urban design activities are 'bottom-up' and urban planning policy and approaches are 'top-down', which are fundamentally linked to one another. A good interpretation of these policies can provide solutions to the problems faced by urban renewal/transformation practices with stakeholders.

Studies in architecture, housing production, and urban planning focus on buildings, artifacts, objects, processes, and elements of the built environment. **Field studies of the ANT approach**, which is effective in policies developed in urban areas, are followed in different ways: 1) in the field of housing production, Finding the missing, hidden, or invisible human and non-human entities in market and policy practices (Becerril, 2017; Webb, 2012), 2) as a tool for interpreting urban development processes and mechanisms to distinguish between passive and active mediators and intermediaries (Valibeigi & Shaneh, 2022), 3) in the field of architecture, as a theory of action used to interpret the complex relationships and interactions of people and objects (Sağır & Sağır, 2021; Wissink, 2013; Boonstra, 2016), 4) in the field of urban governance and planning, by opening up the black box in the 'planning, application, and design' phases to expose the complexity of stabilizing/destabilizing object animation mechanisms (Boolens and Coppens, 2015; Liu et al., 2021), 5) in the field of production of post-war social housings, as actor-relationship theory combined with strategic, collaborative, communicative and participatory approaches (Martin & Bezemer, 2020; Jessen & Tietjen, 2020; Cvetinovic et al., 2017; Gabriel & Jacobs, 2008), 6) for the evaluation of the relational aspect of regulations, as a method for demonstrating the impact of the use of innovative tools in sustainable urban planning and transformation/renovation. (Sharif, 2020; Palmer, 2014)

Urban operations at various scales widely apply the paradigm of the ANT network approach. Based on Callon's (1986) actor-network theory, four stages of translation and various network mapping techniques were used to study complex relationships that emerged during China and Jordan's post-urbanization period (Sharif, 2020; Liu et al., 2021). However, Sağır & Sağır (2021), applies ANT as a research strategy and uses Callon's network process analysis to examine the impact of social relations on the construction process.

It is believed that discussing the actor-network theory approach will contribute to the solution of stakeholder relations problems that arise in urban transformation projects and that the housing production process will be more sustainable and transparent.

CONCLUSION

It is imperative to develop innovative approaches to stakeholder relations that offer sustainable solutions to the social and environmental pressures faced by urban areas and engage all stakeholders in the transformation process. ANT concepts need to be introduced to urban transformation studies, and the applicability of this approach needs to be empirically evaluated in housing production case studies.

The review of publications selected within Latour's ANT conceptual framework provided essential insights into housing production processes. The study's methodological background involves identifying and conceptualizing various actors involved in urban transformation practices through the network approach. Urban transformation requires a broader perspective, and reshaping the housing production network requires following all stakeholders. When designing decision-making models, the focus should be on defining the roles, distribution, potential efforts, and participatory power of stakeholders.

In global and local studies, the transformation of the built environment is increasingly becoming a critical issue, where increasing participation from different segments of society is crucial. In urban transformation processes, stakeholder relationships will form the foundation for identifying possible and beneficial partnerships and collaborations for creating data visualization. Innovative studies on urban housing production policies need strategic models that are easy to implement, consider local characteristics, incorporate all components of urban sustainability, and are equipped with an integrated measurement and evaluation system. Visualizing network systems to understand how urban relational networks affect housing production may make it easier to construct a strategic housing production model that shows how new strategies interact with urban housing production.

A review of publications on the ANT approach has demonstrated the importance of stakeholder relations in housing production in urban areas and highlighted their importance and breadth. This article discusses the current situation regarding the subject, the fields ANT is employed in, what the evaluation criteria are, what the shortcomings are, and how future studies should proceed. An analytical framework has been developed in the context of ANT to identify the factors that influence decision-making processes. As a result of a comprehensive review of the existing literature on the evolution of decision-making processes for urban housing production, four main research areas have been identified: policies and strategies, stakeholders and actors, approaches and tools, and potentials and risks.

This study can serve as a roadmap for researchers focusing on the issues of formulating policies for housing production processes that are functional within the context of the local dynamics of urban areas, as well as the development of decision-making tools for identified purposes. Policymakers, urban planners, and community organizers can gain insight into housing production using ANT. Instead of focusing primarily on social objectives or economic drives, this perspective can lead to more effective and sustainable housing solutions that bring together all stakeholders and situations.

The study is expected to contribute significantly to the development of social consensus regarding the decisions made during the planning, design, and implementation processes of urban transformation projects with participation from the public sector, private sector, non-governmental organizations, rights holders, and all other stakeholders. This project seeks to strengthen participation strategies for stakeholder relations in urban settings, which could contribute to a substantial impact on addressing challenges in building governance systems for cities. The objective of the research is to highlight ANT-related studies carried out worldwide and share the findings of the meta-analysis conducted so that they can be used as guidance for future housing research.

NOTES

¹It is a complex and layered theory method proposed by researchers Bruno Latour, Micheal Callon, and John Law. ANT takes entities and facts and seeks to analyze the effects of their interactions and the relationships between stakeholders.

²Actants are conceptualized in a more abstract manner than actors.

³Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta- Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097 for detailed information see www.prisma-statement.org.

⁴Data visualization tool VOS viewer displays clusters and connections, enabling bibliometric analysis. For detailed information see <https://www.vosviewer.com/>

⁵Miro application was used to design the diagrams. For detailed information, see: https://miro.com/app/board/uXjVKfoWKIc=

Appendix: [https://jag.journalagent.com/megaron/abs_files/MEGARON-54670/MEGARON-54670 \(4\) Appendix 1.pdf](https://jag.journalagent.com/megaron/abs_files/MEGARON-54670/MEGARON-54670 (4) Appendix 1.pdf)

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