



Addis Ababa University

School of Commerce

**Assessment of Infrastructure Integration Management of Condominium
Housing Projects with the other Infrastructure Supplying Institutions: the
Case of 20/80 Housing Provision**

**A project work submitted to school of commerce in Partial Fulfillment of
Requirements for the Degree of Master of Arts in Project Management**

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Addis Ababa University School of commerce

Addis Ababa, Ethiopia

June, 2024

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Statement of Declaration

I, Eyuel Kassu Eshetu, the undersigned, declare that this thesis, entitled "Assessment of Infrastructure Integration Management of Condominium Housing Projects: The Case of 20/80 Housing Provision," is my original work. I have undertaken the research work independently with the guidance and support of Wasihun Mohammed (Ph.D.). This final research is entirely my own and has not been submitted for any degree or master's program at this or any other university.

Eyuel kassu eshetu

Name of Student

Signature

Date

Statement of Certification

This is to certify that Eyuel Kassu Eshetu has carried out his final project work on the topic entitled "Assessment of Infrastructure Integration Management of Condominium Housing Projects with the Other Infrastructure Supplying Institutions: The Case of 20/80 Housing Provision" under my guidance and supervision. Accordingly, I hereby assure that his work is appropriate and standard enough to be submitted for the award of a Master of Arts Degree in Project Management.

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June, 2024

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Board of Examiners Approval Sheet

This is to certify that the final project entitled: Assessment of Infrastructure Integration Management of Condominium Housing Projects with the other Infrastructure Supplying Institutions: the Case of 20/80 Housing Provision is conducted by Eyuel kassu eshetu in partial fulfillment of the requirements for the award of the degree of Master of Arts in Project Management, with the regulation of the university and the accepted standards with respect to originality.

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Abstract

The effective implementation of project integration management greatly influences progress, performance oversight, and overall alignment with project goals and expectations. It plays a role in coordinating aspects of processes and individuals, managing resources, engaging stakeholders, and delivering outcomes in a streamlined and successful manner. Integrated urban utility infrastructure provision is essential for the development of urban areas. Ensuring the efficiency and effectiveness of infrastructure services, including roads, telecommunications, water, and power, requires coordination. One way to achieve this is by establishing an authority tasked with planning and organizing infrastructure development or by implementing methods for cooperation among organizations. The paper focuses on the assessment of infrastructure integration management in the context of condominium housing projects in Addis Ababa. The paper examines the existing methods of infrastructure integration, the factors that influence infrastructure integration, and the impact of infrastructure integration on the provision of housing. The paper also identifies the challenges to infrastructure integration and proposes recommendations for improving it. The paper is based on a qualitative and quantitative study of infrastructure integration in Addis Ababa. The paper collects data through questionnaire surveys, interviews, field observations, and document scanning. The paper analyzes the data to identify the key factors that influence infrastructure integration and the impact of infrastructure integration on the provision of housing. The findings of the paper will be significant for policymakers and practitioners in the field of urban development. They will provide insights into the challenges of infrastructure integration and the ways to improve it.

Key Words: *Project Integration Management, Infrastructure Integration Management, Condominium Housing Projects.*

List of Acronym and Abbreviations

AACHDC	Addis Ababa City Housing Development Corporation
AACRA	Addis Ababa City Road Authority
AAICA	Addis Ababa Infrastructure and Construction Authority
AAWSA	Addis Ababa Water and Sewerage Authority
EEPCO	Ethiopian Electric Power
GDP	Growth Domestic Product
GIS	Geographic Information Systems
MSE	Micro and Small scale Enterprise
RII	Relative Importance Index
STATA	Statistical data
SPSS	statistical package for the social sciences

CHAPTER ONE: INTRODUCTION

1.1 Background of Study

Project integration management practices play a significant role in driving execution, managing performance, and ensuring that projects meet their requirements and objectives in a comprehensive manner. These practices have the highest impact on the overall success and effectiveness of a project. They foster proper coordination of the various elements of processes and people, managing resources, stakeholders, and deliverables efficiently and effectively. Proactive management of the integration helps to achieve business outcomes while making trade-offs among competing objectives and alternatives to meet or exceed stakeholder needs and expectations. By identifying, defining, combining, unifying, and coordinating the many processes and activities within the project management process groups, the PMBOK (PMI, 2017) Project integration management is one of the 10 knowledge areas: project integration management, project scope management, project quality management, project human resource management, project communications management, project risk management, project cost management, project time management, project procurement management, and project stakeholder management.

Urban centers are always in progress since they are epicenters of development and they accommodate a large number of residents, mainly resulting from natural increases and rural-urban migration (Yilma, 2019). This has led to an increase in demand for infrastructure services and consequently forced many cities to engage in massive infrastructure projects to meet the ever-increasing demands of their residents. Infrastructure integration with 20/80 housing provision requires coordination and communication between the stakeholders participating in it. There are two types of infrastructure integration in these housing construction projects. The first type of integration is integration within the institution, which undertakes the construction of the residential buildings. This type of integration is the integration between the contractors, electrical, sanitary, and metalwork micro-small enterprises and different sub-contractors. This type of integration can also be classified as horizontal or vertical integration. The second type of integration, which is our main concern in this study, is the integration between the institution that undertakes the construction of the residential buildings (Addis Ababa City Housing

Development Corporation) and the different infrastructure-supplying institutions on the construction site, like the Addis Ababa City Road Authority (AACRA), the Addis Ababa Water and Sewerage Authority (AAWSA), the Ethiopian Electric Power Corporation (EEPCO), and Ethio-telecom.

According to some studies, it was realized that there are no clearly stated rules or regulations that suggest coordination among service providers at any stage so far. But there are legal conditions to hold stakeholders accountable for property and other damages that occurred during construction in the form of compensation. This suggested that the rules and regulations were mainly reactive undertakings in which institutions claimed and sued each other for compensation after the damages were done, rather than a proactive process that suggests those institutions work in coordination beginning from project conception and the early design stage (Mahlet, 2014). It was also realized that infrastructure-supplying institutions do not communicate each other's plans or designs unless one asks the other during implementations. The usual trend is that they each prepare their own designs individually without referring to the others' plans or designs, then they go to the city administration for permission to implement what they have planned. Hence, there is no communication or coordination between service providers during design, which is more likely to create disparities and conflicts in the next stages (Mahlet, 2014). The same study revealed that the underlying reasons for the absence of inter-sectoral integration were a lack of strong legal enforcement, a lack of capacity, a lack of interest and commitment from service providers, the absence of a responsible body to do the job, a lack of a long-term plan that is more practical on the ground than on paper, and a lack of standards or manuals that are common to all stakeholders, etc. (Mahlet, 2014).

There are economic impacts on infrastructure-supplying institutions that are characterized by property damages, high costs of compensation, the cost of carrying out repairs and relocations, and the cost of any temporary service arrangements necessary. Impacts on end users include frequent service interruptions, business may be stopped and data lost, and for industrial properties, production may be halted and machinery damaged, resulting in low productivity, a decrease in the number of customers, low profit, etc. There are also social impacts, which can be characterized as lost time, business opportunities, additional fuel consumption, spoilage of food because of refrigeration failure, injuries and traffic accidents, traffic congestion, safety hazards, and lack of transportation access. Environmental impacts include hygiene problems, sewage

backing up, flooding and storm water inundation, noise pollution, air pollution, and dust-induced lung diseases (Mahlet, 2014). Property damage and other related issues significantly impact the project budget and timeline. For instance, the absence of proper coordination results in damages that require costly repairs and compensation, thereby inflating the project budget. Furthermore, these damages and the resulting legal disputes cause delays in project completion, extending the project timeline beyond the planned schedule. Such disruptions not only lead to financial losses but also affect the overall efficiency and effectiveness of the project execution.

The impacts of poor coordination among the infrastructure-supplying institutions in Addis Ababa are severe to the point of leading businesses to bankruptcy, putting residents' lives in danger, and causing a long-term negative psychological attitude towards infrastructure development projects, which will have a long-term domino effect on the overall social development of the city and the nation at large (Yilma, 2019). Another study reveals that the lack of comprehensive city planning, an overlap of utilities, damage to public property, weak institutional coordination, inefficient use of public resources, high cost of compensation, procedural problems, and inconsistency of performance are summarized as the most important planning and institutional dimensions of the urban utility infrastructure provision problem (Zegeye, 2012). To enhance the effectiveness of infrastructure integration in condominium housing projects, comprehensive project design and proactive stakeholder communication are essential. Utilizing integrated project management systems and implementing effective coordination mechanisms can prevent overlaps and conflicts, reducing property damage and delays. Rigorous quality control and assurance processes ensure standards are met, minimizing rework and associated costs. Developing a comprehensive risk management plan helps identify and mitigate potential risks early. Finally, investing in training and capacity building for project managers and staff enhances their ability to handle complex projects and integration challenges effectively.

1.2. Statement of the Problem

Due to poor project integration management practices from project initiation to closing, Ethiopia was exposed to vicious challenges such as poor quality, low productivity, cost overruns, stakeholder dissatisfaction (such as donor fatigue), and ultimate project failure. This has been made worse by uneven institutional restructuring, arrangements, and change; fragmented, frequently shifting ambiguous roles and responsibilities; multiple actors engaged in the same

activity within sectors and subsectors; ineffective coordination; competing interests; and other similar weak integration practices that led the sectors to poor planning and subpar project and program implementation. In order to guarantee that processes operate effectively and reach predetermined goals, project integration management necessitates the coordination of all project components, including tasks, resources, stakeholders, and deliverables (Belete, 2022).

The inadequate standardization of urban utility infrastructure in cities can be attributed to the absence of an integrated policy and shared standards for urban utility infrastructure, a weak connection between land use development and utility infrastructure provision, insufficient institutional coordination, and the underutilization of digital mapping technologies (Zegeye, 2012).

One partially failed public initiative is the City Administration's integrated housing development program. Thousands of Addis Ababa people have gained home ownership as a result of these efforts. However, the type and severity of obstacles in the living styles of persons relocating to condominium units brought to moved households are not properly appraised.

Recently disclosed, spending billions of Birr and crafting development-oriented policies, but a lack of communication among multiple utility provider's results in project delays and capital inflation, as well as disorder in day-to-day operations. "Utility service providers and other construction organizations are frequently at odds, blaming each other for damage caused while demolishing each other's facilities while working on their separate projects.

The researcher noticed lack of coordination between different infrastructure-supplying institutions, lack of a single authority responsible for infrastructure planning and coordination, lack of political will to address the issue of infrastructure integration, and the weak legal framework for infrastructure development are all challenges to the development of condominium housing projects in Addis Ababa.

There is the client, which is the main responsible body for constructing the residential buildings and the site work activities like car parking lots, walkways, green areas, and play grounds; the Addis Ababa City Road Authority, which is responsible for the construction of main and pedestrian roads between those buildings; the Addis Ababa City Water and Sewerage Authority, which is responsible for the construction of the utility lines for the residents; the Ethiopian Electric Power Corporation, which is responsible for supplying electric power to the residents and the site; and Ethio telecom, which is responsible for telecom-related activities. The horizontal

integration between those institutions as a city administration is necessary so that we can satisfy the registered residents, protect our resources, and reduce the economic, social, and political damage that can be caused by a lack of integration between those institutions. Therefore, this study intends to assess the current practice of horizontal integration between those institutions, identify the main causes that affect the integration, assess the impact of poor integration among the institutions, and move forward.

1.3. Research Questions

This study seeks to answer the following questions to accomplish the research objectives of the study:

- What is the current practice of integration among different infrastructure-supplying institutions in Addis Ababa city for condominium housing project sites (20/80 housing program)?
- What are the primary influences on infrastructure integration across various infrastructure-supplying programs in Addis Ababa City for the 20/80 home-providing program?
- What are the effects of poor infrastructure integration among various infrastructure-supplying institutes in Addis Ababa City for the provision of 20–80 homes?

1.4 Objectives of the Study

1.4.1 General Objective

- The general objective of the research is to examine the infrastructure management integration of condominium housing projects with other infrastructure supply institutions: the case of 20/80 housing provision.

1.4.2. Specific Objective

The specific objective of the research to be carried out is

- To assess the present infrastructure integration practices across various infrastructure-supplying institutes in Addis Ababa City for the 20/80 home provision program.

- To determine the primary influences on infrastructure integration across various infrastructure-supplying programs in Addis Ababa city for the 20/80 home-providing program.
- To evaluate the effects of poor infrastructure integration among various infrastructure-supplying institutes in Addis Ababa city for the provision of 20/80 homes.

1.5. Significance of the study

Since a lack of integration between infrastructure supplying organizations is causing various types of damage to organizations, contractors, and registered residents, it is critical to assess the integration of condominium housing projects with other infrastructure supplying institutions, particularly road constructing institutions, on the site of housing projects in order to gain a better understanding of the gravity of the situation and provide an important solution. The study will benefit all practitioners by offering important information on how to increase integration among infrastructure supplying institutions in condominium housing projects. Similarly, municipalities, infrastructure-supply institutions, policymakers, and experts may all benefit from the findings.

The study will be beneficial for a variety of stakeholders, including Residents of condominium housing projects in Addis Ababa, Municipalities, Infrastructure-supplying institutions, Policymakers & Interested experts.

1.6. Scope of the study

The study mainly examined infrastructure integration among several infrastructure-supplying entities in Addis Ababa for the 20/80 home provision program. The vertical and horizontal integration of the 20/80 housing projects with all of the other infrastructure-supplying institutions was difficult to analyze, lowering the quality of the research outcome. As a result, the study focused on the horizontal integration of 20/80 housing provision with infrastructure-supplying institutions such as Addis Ababa City Road Authority (AACRA) and Addis Ababa Water and Sewerage Authority (AAWSA), as well as consultants and contractors associated with those institutions, leaving the vertical integration of infrastructure-supplying institutions for other interested researchers. The study was conducted in Addis Ababa, Ethiopia, where the 20/80 housing projects were carried out; specifically, the project under the project site chosen for the study were Yeka Tafo sites under the branch 2 project office located in Addis Ababa city.

The study selected this project site based on the current status of site work operations.



Figure 1. Location of the study area, housing projects under branch two offices (Yeka Tafo)

1.7. Limitation of the Study

While the study on infrastructure integration management for condominium housing projects in Addis Ababa provided valuable insights, it was constrained by several limitations. These included a narrow scope focusing on horizontal integration, challenges in data collection, inadequate legal frameworks, geographical limitations, institutional fragmentation, and technological constraints. Addressing these limitations in future research and practice is essential for developing more effective and integrated infrastructure solutions that can meet the growing demands of urban development.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

The purpose of this chapter is to present the research theory, concepts, and ideology that exist with regard to the theoretical and practical issue of urban utility infrastructure provision. The key objective is to inform the review of current and up-to-date knowledge about the general concept of urban infrastructure, integrated and coordinated infrastructure planning and development, and concepts of utility infrastructure provision in international and local contexts. Web-based searches have been conducted using the latest literature search to ensure that the process has in its background documents state of the art think tank pieces to consult on.

2.2. Theoretical Review of Literature

2.2.1 Project Management

According to the Project Management Knowledge Guide (PMBOK® 6th ed., 2017), the implementation of effective project management offers numerous benefits to individuals, groups, and both public and private organizations. These benefits include the ability to achieve business objectives, meet stakeholder expectations, enhance predictability, increase the likelihood of success, and deliver products at the appropriate time. Additionally, efficient and effective project management enables the resolution of problems and issues, timely response to risks, optimal utilization of organizational resources, identification, recovery, or termination of failing projects, management of various constraints (such as scope, quality, schedule, costs, and resources), and the ability to balance the impact of these constraints on the project (for instance, increased scope may result in increased costs or schedule). Furthermore, effective project management facilitates better change management practices. In contrast, inadequate project management or the absence thereof can lead to various negative outcomes such as missed deadlines, exceeding budget limits, compromised quality, rework, uncontrolled project expansion, damage to the organization's reputation, dissatisfied stakeholders, and failure to achieve project objectives. The 6th edition of the PMBOK® Guide effectively emphasizes that projects play a pivotal role in generating value and benefits within organizations. In today's business landscape, organizational leaders must possess the capability to navigate tighter budgets, shorter timelines, limited resources, and rapidly evolving technology. The business environment is characterized by dynamism, with a

rapid pace of change. In order to maintain competitiveness in the global economy, companies are embracing project management as a means to consistently deliver business value.

2.2.2 PMBOK Knowledge Areas

PMI has organized project management knowledge and practice in terms of its component processes into ten knowledge areas. They are: project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communications management, project risk management, project procurement management, and project stakeholder management. PMBOK® Guide, 6th edition (PMI, 2017).

2.2.3 Project Integration Management

Project integration management is a way of making various processes work together to complete a project on time and within budget, as it takes the numerous processes that are being used in a project and makes sure that they're evidently identified, defined, combined, unified, and well-coordinated, possibly by making trade-offs while managing those interdependencies (Westland, 2018). Integration is the combination and coordination of separate and diverse elements or units into a more complete or harmonious whole. On the other hand, integration is the unified control of a number of successors of similar economic processes formerly carried on independently. Achieving success necessitates a combination of cooperation and coordination. Additionally, it requires the establishment of a unified and formalized decision-making system, along with the necessary procedures to support its existence. Integration possibly permits for more successful and proficient utilization of assets in order to attain a given set of goals (Mahlet, 2014). There are two types of integration, and they are both essential success factors, particularly in a multi-project program environment. They are vertical and horizontal integrations. Vertical integration (intra-sectorial integration) looks inside and up and down into the business, program, project, and product service components. This kind of integration targets the program, project, and product and builds a product or service with integrity. It looks downstream in the project process to product performance and customer satisfaction (GebreMeskel, 2020). Horizontal integration (inter-sectorial integration) looks outside and around to the external, the environmental, and the organizational assets that support the project. It focuses on outside forces that create risk and opportunity, market forces that will shape the product or service (Seife, 2019).

2.2.4 Infrastructure Integration Management

Infrastructure is commonly characterized as the underlying basic buildings, institutions, and facilities, as well as other critical aspects required to support and enable community growth and development. As a result, infrastructure encompasses a wide range of services, institutions, and facilities ranging from transportation and public utilities to banking, rules and law enforcement, education, and research. The previous concepts demonstrate that infrastructure plays vital functions in our society (Okwir 2019).

Integration is the combination and coordination of separate and diverse elements or units into a more complete or harmonious whole. It is the unified control of a number of successors of similar economic processes formerly carried on independently. For it to function, there must be collaboration and coordination, as well as a single, structured decision-making system and the processes that make it possible for such a system to exist (Munaye, 2021). Integration may make it possible to employ resources more effectively and efficiently in order to accomplish a certain set of goals (Zegeye, 2012).

All development involves change, but the rate at which changes occur can vary significantly; different phenomena operate on different timelines. For example, energy and environmental processes tend to evolve slowly or through transitional phases, such as those seen in construction and infrastructure investments. These are more closely linked to technological breakthroughs and long economic waves than to the swift economic, social, and institutional responses often observed in other areas (Munaye, 2021). Adequate infrastructure in terms of quantity, quality, and reliability is a fundamental prerequisite for rapid economic growth. The state of a nation's infrastructure is directly correlated with its internal production capabilities, international competitiveness, attractiveness for direct foreign investment, and export dynamism. For a nation to achieve sustainable economic development and growth, it must develop an efficient infrastructure system. This efficiency is crucial for the proper and effective functioning of urban economic and social activities (Mahlet, 2014).

Cities can be described as centers where individuals, resources, information, and various activities converge. The proximity of intelligent and talented individuals within these urban areas leads to numerous advantages, stemming from the diverse interactions of people and ideas, as well as the potential for economies of scale and scope resulting from agglomeration effects.

When interactions within a city are dynamic, concentrated, and encompass a diverse range of perspectives, there exists a fertile environment for innovation and creativity to thrive.

The importance of infrastructure in a country's economic and social system has been recognized. It is a critical component in the generation of economic growth and development as well as the primary driver of urban activity. The effectiveness of economic and social systems is dependent on the efficiency of infrastructure. For a country to have long-term economic development and progress, it must have a well-developed infrastructure system. This is necessary for the efficient and appropriate operation of urban economic and social activities.

.2.2.5. Mechanism of Integration

Infrastructure management systems can be integrated in various ways, often involving the combination of separate management systems into a unified platform rather than a single, all-encompassing system. This integration is typically achieved through the use of a common platform. One effective mechanism for integration is data sharing, particularly through the use of geographical information systems (GIS), which offer robust and existing integration mechanisms. According to Seife (2019), primitive manual data sharing was once the simplest and most flexible method, utilizing diskettes or tape drives for data exchange. In contrast, automatic data sharing, which primarily relies on network connections for data transfer, is more efficient for frequent exchanges. Further integration can be achieved by standardizing data items, definitions, collection procedures, quality, and updating schedules within a central database (Zhang & Hudson, 1998). Standardization of analysis procedures is also crucial, as some analyses require specific inputs derived from previous analyses. Moreover, integrating policy and decision-making processes helps administrators develop coordinated policies and make comprehensive decisions, ensuring optimal use of available resources (Mahlet, 2014; Steinman's & Engineering, 2017).

2.2.6. Cross-Sectional Approach for Infrastructure Integration

Effective management of township public spaces necessitates a change in management approach. In order to accommodate this change, urban management must transcend the traditional definition of participatory urban planning. It entails working together with those who ultimately utilize public spaces and services. Above all, it involves them in their efficient participation in the establishment, running, and upkeep of public institutions (Munaye, 2021). Improving the

standard of living in emerging country communities and stimulating economic growth depend heavily on the development of municipal services and infrastructure. However, wise investment choices and efficient use of limited municipal resources are necessary for the growth and enhancement of infrastructure and services. In order to effectively direct and encourage urban growth and considerably raise the gross national product of emerging nations, integrated infrastructure development planning is essential (Munaye, 2021). As a result, the sectoral planning technique is widely used throughout the city's urban sectors. They haven't invited one another during the phases of implementation, assessment, or monitoring—only at the planning stage. As a result, their performance falls below expectations as compared to the original plan (Mathewos, 2006). This was mostly due to the fact that their service-providing institutions, which are dispersed across various degrees of development, lack integration, are incredibly bureaucratic, and severely lack access to and utilization of cutting-edge technology and a skilled staff. Cross-sectoral approaches enable the sectors to plan, implement, assess, and monitor together since it has been stated that they are more important for ensuring effective and efficient urban management than sectoral planning approaches. As a result, it will require less money, energy, and time to maintain urban infrastructure. (Kitila, 2015).

2.2.7. The need for coordination and cooperation

The need for coordination is accelerating as more utilities are installed in limited right-of-way. It is true that, despite the high level of problems in the city centers, urban areas are always in progress since they are the epicenter of development and they accommodate a large number of populations, mainly resulting from natural increases and rural urban migration. Rapid population growth as well as dense and plan-less structuring have also led to an increase in demand for utility services, and consequently, in the resources used for the construction and maintenance of utilities, most Third World cities could not be saved from such problems. Moreover, in cities with dense populations, damages to roads and sidewalks during the construction and maintenance of utilities cause problems in daily life, create financial burdens, and necessitate effective solutions. (Mahlet, 2014)

2.2.8. Collaboration among Integrated Infrastructure Practice

The current practice of inter-sectoral level integrated infrastructure projects management system constitutes intuitional current capacity, which incorporates the organizational structure, project

planning, communication and information technology in supporting decision-making on budget and plan, a central data base and information exchange, and the city's infrastructure integration, construction, permit, and control authority with respect to its capacity to enforce the law and coordinate all project stakeholders during the new project development and maintenance stage (Munaye, 2021). The current institutional capacity gap impinges on organizational structure; almost all institutions do not have a primarily concerned department for utilities infrastructure project implementation, maintenance, and rehabilitation management. In addition, they have no clear project participant roles and responsibilities. These factors create inconsistency in utility project administration and become a challenge for effective and integrated project management within and across the sector (Seife, 2019). The current level of integration among service providers is considered low. The technological capacity of existing institutions is inadequate for managing the complex and interdependent nature of city infrastructure projects. Therefore, it is essential to ensure that technological advancements are compatible, cost-effective, and adaptable to the specific context. This will enable the creation of an effective and efficient integrated infrastructure project management system. (Mahlet, 2014).

2.3. Empirical Review

2.3.1. Factors that affect Collaboration among Infrastructure Integration

According to Mahlet (2014), the current level of integration between service providers and the current status of integration among service providers are said to be low. However, efforts were made to introduce an integrated approach but were not successful due to various reasons, such as a lack of clearly stated rules or regulations or any legal conditions that suggest coordination among service providers, which were also found to be causes for the lack of strong integration between stakeholders. There is still loose communication during implementation due to a lack of accurate information about the location, size, and type of utility lines and the negligence and carelessness of service providers in communicating. In general, lack of strong legal enforcement, lack of capacity, lack of interest and commitment of service providers, absence of a responsible body to do the job, and lack of a long-term plan were identified as the root causes of the absence of inter-sectoral integration.

The current status of integration could be said to be low or poor among service-provider institutions. The major reasons for the poor level of integration at the inter-sectoral level are: lack of adequate professionals, lack of integrity and working together, shortage of budget, absence of a responsible body, absence of policy, plan year and change of plan, infrastructural policy, legal ground of sectors, and presence of a formal committee and regular meeting (Mulugeta, 2011). According to research, the main causes of the urban sectors' lower performance levels are: weak institutional arrangements; a lack of funding and oversight from relevant parties; poor coordination between the sectors during all stages of urban management; a lack of funding for various trainings, workshops, and regular meetings to inform working officials; a lack of clear-cut policy frameworks regarding which approach is to be adopted and exercised; a lack of political will and a bias towards the traditional approach; a lack of commitment and responsibility towards the new approach; a lack of political will and a preference for the traditional approach; a lack of coordination within and between sectors; reluctance on the part of certain individuals; and uncoordinated or lacking in integrity within and between the urban service sectors (Kitila, 2015)

.2.3.2. Impacts of Weak Integration among Integrated Infrastructure

Property damage, hefty compensation costs, the expense of making repairs and relocations, the cost of any necessary interim service arrangements, the potential loss of "product," and a decline in income during service disruptions are the economic repercussions on service provision. Utility users may experience frequent service outages, company closures, data loss, and other consequences. Industrial properties may have machinery damage, production halts, lower customer volume, low profit margins, and other issues. The societal impact includes things like wasted time, missed chances for business, increased fuel usage, food rotting due to improper refrigeration, accidents and injuries, traffic jams, safety risks, and limited access to transportation. The report identifies several environmental factors that might lead to hygiene issues, including polluted water supplies, sewage backups, floods and storm water inundation, noise pollution, air pollution, and dust-induced lung ailments (Mahlet, 2014). The major negative effects of poor or absent infrastructure integration could be economic (repetition of work and wastage of scarce resources), social traffic accidents, and congestion. Moreover, people have negative mentalities as well as environmental and health issues. The socioeconomic impact of the absence or low level of integration was repetition of work, traffic accidents, the deaths of a

significant number of people, and the loss of a huge amount of resources. Since excavation is usually done during peak hours and with traditional methods, it will have a considerable effect on both economic and social aspects (Mulugeta, 2011).

The three main impacts—economic, social, and administrative will be determined. In terms of economics, this is evident in the enormous costs associated with maintaining the damaged line, including personnel, material purchases, time, and energy expenditures. Socially, a broken utility line will result in a service disconnect and a long-lasting loss of services for the community. Since there is a greater time lag between the utility line's destruction and maintenance, it takes longer for the bureaucracy to determine who is to blame for the line breakdown. Ultimately, the issues pertaining to administrative components include the possibility of an increase in disputes, arguments, and pointless discussions among officials from different sectors. (Kitila, 2015).

2.3.3. Local Practices of Integrated Urban Infrastructure

The majority of infrastructure and service providers, including power, telecommunications, water, transportation, and drainage, have always made an effort to incorporate their plans with the current and planned road networks. However, the activities may not have achieved the anticipated level of success because of the absence of regular follow-up (Mathewos, 2006).

Redesigning flawed designs and replacing utility lines have resulted in a substantial waste of money due to disorganized planning and design as well as inadequate institutional frameworks. The effectiveness of the urban transportation system and the quality of the environment have been negatively impacted by the frequent cutting of municipal roadways by different utility providers. Utility companies (ETC, now called Ethiopian Telecom, AAWSA, and EEPKO) in Addis Ababa used to apply to the Addis Ababa City Road Authority (AACRA) for permission to break paved roadways when they wanted to lay new lines or upgrade the ones that were already there. Permits were frequently not issued right away. Furthermore, the permissions granted lacked sufficient data and a database. The utility company that obtained the permission was primarily concerned with installing its own utility lines. Because of this, these developments frequently came at the expense of the preexisting utility lines. Actually, as a result of this, additional infrastructure links that were previously in fine shape have been cut and destroyed. Additionally, it has caused project execution to be delayed, which has a negative impact on the general infrastructure and service delivery of the city (Mahlet, 2014).

Only around 16 years ago, following a protracted period of neglect, the Addis Ababa City Government formally constituted a committee made up of officials from several infrastructure-supplying organizations that was tasked with integrating infrastructure development plans. The committee's inefficiency was mostly attributed to the absence of a robust coordinating organization and a legal enforcement mechanism. Furthermore, the committee was made up of occupied authorities. Therefore, it was common for members of different institutions to skip committee sessions when the committee wasn't discussing matters that directly affected them. The committee's sole accomplishment was organizing a few of the city administration's initiatives (Mahlet, 2014).

In 2000, the office responsible for modifying the Addis Ababa master plan aimed to develop an integrated infrastructure database. This involved creating a comprehensive map that combines various infrastructure networks such as roads, power, water, drainage, and telecommunication. Additionally, the updated master plan proposed the establishment of an infrastructure authority to enhance coordination and integration among the infrastructure organizations operating within the city. As a result, the Addis Ababa Infrastructure and Construction Authority (AAICA) was established in 2003 following the reorganization of the City Administration. The AAICA was entrusted with the responsibility of overseeing and coordinating the initiatives of infrastructure institutions operating in Addis Ababa (Mahlet, 2014).

All infrastructure institutions are encouraged to submit their three-year plans to AAICA in order to ensure effective integration. A coordinated infrastructure plan spanning three years is then created by AAICA. Within AAICA, the Coordination Team and the Infrastructure Coordination Department are in charge of carrying out the daily tasks. They assess the ideas, ensure that the data complies with the master plan, and include daily applications for infrastructure building (Mahlet, 2014).

2.4. Summary of the Literature Review and Research Gap

Key to the research to be carried out is the improvement of integration among infrastructure-supplying institutions in Addis Ababa City. The supply of infrastructure services is a critical factor for economic growth and contribution to GDP. For example, the capital stock that supplies

public goods and services is known as infrastructure, the provision of which acts as a formal conduit for leveraging economic and market drivers (Munaye, 2021).

The primary factors affecting collaboration among integrated infrastructure systems include a lack of cooperation and coordination across sectors, poor integration of infrastructure between sectors, and limited institutional capability in terms of systems, technology, and strategies. Additionally, the absence of effective decision support tools for strategic analysis and planning, a shortage of professionals, and a lack of integrity and cooperation between sectors further impede collaboration. Budget constraints, the absence of a responsible body to oversee integration efforts, and the current inadequate status of integration among infrastructure-providing institutions are also significant challenges. Communication issues are prevalent throughout the process, with a lack of communication during design preparation and loose communication during implementation due to poor utility databases. Furthermore, there is a lack of central database systems for data and information exchange, planning, and decision-making. This is exacerbated by weak legal enforcement, a lack of common standards and guidelines for all service providers, and the absence of clearly stated rules and regulations for integrated infrastructure. The policy and legal framework for infrastructure integration is insufficient, marked by a lack of comprehensive policies, manuals, procedures, standards, and regulations. Additionally, there is a notable lack of interest and commitment from service providers towards integration efforts, and a low level of commitment to coordination between sectors (Munaye, 2021).

Several impacts exist as a result of poor collaboration among integrated infrastructures on sustainability. The major social impacts are lost time, missed business opportunities, increased fuel usage, food rotting due to improper refrigeration, injuries and traffic accidents, traffic jams, safety risks, limited access to transportation, service interruptions, and handicaps. Many challenges were identified. Economic impacts are property damages, high costs of compensation, costs for any temporary service arrangements necessary, costs of carrying out repairs and relocations, possible loss of product and revenue reduction during service interruptions, wastage of scarce resources, repetition of works or overlaps, and reduction of the asphalt service year. The major environmental impacts are that hygiene problems may arise because water supplies

are contaminated; sewage backing up, flooding, storm water flooding, air pollution, noise pollution, and lung illnesses brought on by dust were identified (Munaye, 2021).

Even though the common factors that affect integration among infrastructure-supplying institutions are evidenced by the findings, there is no specific framework for improving integration among infrastructure-supplying institutions in the case of Addis Ababa City. The sustainability of integration among infrastructure-supplying institutions can be measured by the impact that could be seen on the economic, social, and environmental developments of a country. The 20/80 housing provision in Addis Ababa city is suffering from a lack of infrastructure integration between infrastructure-supplying institutions. As the researcher noticed above, different literatures are now highlighting the significance of a new collaborative approach to effectively manage and share the risks and rewards. In addition, the research will try to assess specifically the integration of the 20/80 housing provision in Addis Ababa with the other infrastructure-supplying institutions, as it has not been discussed, and put forward a working plan for the improvement of the integration among the institutions in previous literature.

2.5. Conceptual Framework

A Conceptual framework is a fundamental tool used in various disciplines to provide a structured and systematic approach to analyzing, understanding, and addressing complex problems or phenomena. It helps researchers to identify research objectives or hypotheses, select appropriate research methods, and make sense of the data collected. A well-developed conceptual framework is based on a comprehensive review of the existing literature and provides a coherent and systematic approach to the research problem (Creswell, 2014).

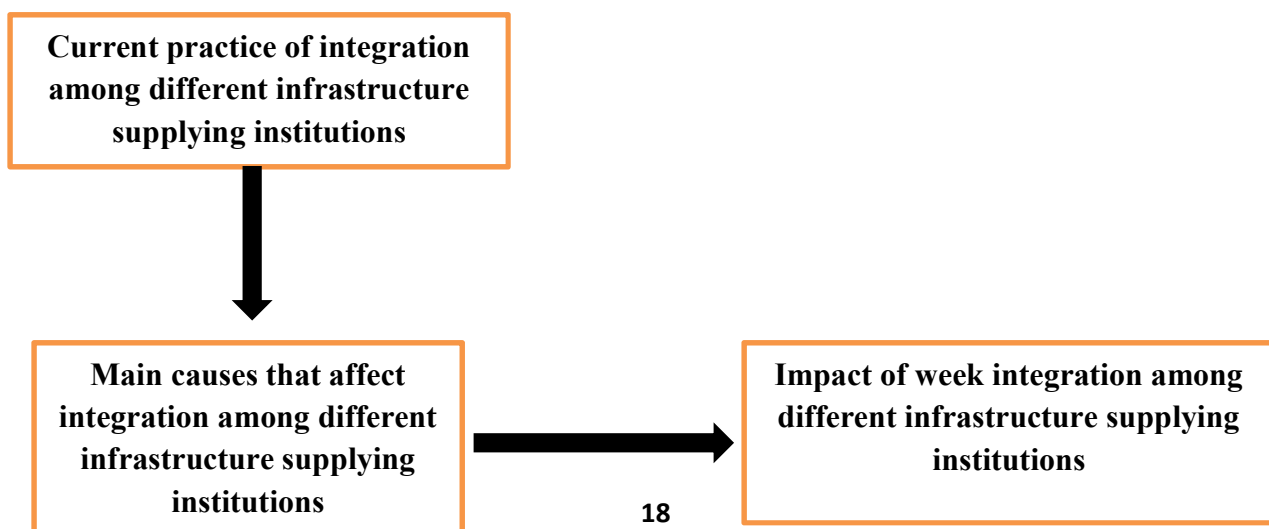


Figure 2: Conceptual Frame Work

Source: conceptual model developed by a researcher based on study objectives and existing literature review

The conceptual framework depicted in the figure outlines the relationships among three key elements related to the integration of infrastructure supplying institutions. Here's a detailed description of each component and their interconnections:

➤ **Current Practice of Integration**

This element represents the existing state or level of collaboration and coordination among various institutions responsible for supplying infrastructure. It sets the baseline for understanding how these institutions currently interact and work together.

➤ **Main Causes That Affect Integration**

This component identifies the primary factors or reasons that influence the level of integration among the institutions. These causes could be organizational, technical, regulatory, or cultural factors that either facilitate or hinder effective integration.

➤ **Impact of Weak Integration**

This part of the framework focuses on the consequences or outcomes resulting from poor integration among infrastructure supplying institutions. It aims to highlight the effects on service delivery, efficiency, project implementation, and overall infrastructure development.

The framework suggests a cause-and-effect relationship starting from the current practices of integration among infrastructure supplying institutions, identifying the main causes that affect these practices, and leading to the impacts observed due to weak integration. By understanding and analyzing these elements, researchers or policymakers can develop strategies to enhance integration and mitigate negative impacts.

CHAPTER THREE: RESEARCH METHODOLOGY

3. Research approach and Methodology

3.1 Discussion and rationale for choice of approach

The study aimed to explore the intersecting issues of municipalities and urban utility (drainage, water supply, power, and telecommunication) authorities. The research follows a mixed research approach, as it needs both qualitative and quantitative analysis to gain a comprehensive understanding of the issues and to develop effective solutions. Qualitative research can be used to understand the lived experiences of the stakeholders involved, such as the challenges they face and the solutions they have proposed. Quantitative research can be used to measure the prevalence of the issues and the effectiveness of potential solutions. The complementary nature of qualitative and quantitative research makes it the ideal approach for this study. Qualitative research could be used to conduct interviews with municipal officials and urban utility workers to understand their perspectives on the intersecting issues. Quantitative research could be used to survey a representative sample of residents to assess the prevalence of the issues and the effectiveness of existing solutions. The findings from the qualitative and quantitative research can be used to develop effective solutions to the intersecting issues of municipalities and urban utility authorities. The mixed research approach is the ideal way to gain a comprehensive understanding of the issues and to develop effective solutions.

An explanatory and descriptive type of research method is used for this study, as it aims to explain the causes that effect infrastructure integration across different infrastructure-supplying institutions with the 20/80 housing provision in Addis Ababa city and to describe the current practice of integrated infrastructure among infrastructure-supplying institutions with the 20/80 housing provision in the city, respectively. As a result, the research strategy was mixed (explanatory and descriptive study design).

3.2 Population and Sampling Method

3.2.1. Population of the Study

The target populations of this study were the professional employees under the three target institutions located in Addis Ababa city, namely: Addis Ababa City Housing Development

Corporation, Addis Ababa City Road Authority (AACRA), Addis Ababa Water and Sewerage Authority (AAWSA), professional employees in the consultants under the target institutions, if any, and professional employees in the contractors under the target institutions, if any, with more emphasis on the horizontal infrastructure integration between those institutions. The infrastructure-supplying institutions (mostly the target institutions indicated above) involved in the project sites of the Addis Ababa City Housing Development Corporation Yeka Tafo project offices will serve as the sampling unit for the study. They are professional personnel of Addis Ababa City Housing Development Corporation, Addis Ababa City Road Authority (AACRA), and Addis Ababa Water and Sewerage Authority (AAWSA) who work at the 20/80 branch offices. In this research, the target population will consist of a total of 78 professional workers, experts, managers, and directors, i.e., 34 for the Addis Ababa City Housing Development Corporation, 29 for the Addis Ababa City Road Authority (AACRA), and 15 for the Addis Ababa Water and Sewerage Authority (AAWSA).

3.2.2. Sampling Method

Sampling is a method that allows researchers to infer information about a population based on results from a subset of the population without having to investigate every individual (Munaye, 2021). This research will use stratified random sampling techniques due to the nature of the target population, which is divided into subgroups in the different infrastructure-supplying institutions, and this technique is generally more accurate in representing the population. Purposive sampling is a useful sampling method that allows a study to get information from a sample of the target population that knows most about the subject matter (Lelisa, 2021). Within stratified random sampling techniques, the study will use non-probability sampling techniques (purposive sampling techniques) due to the nature of the target institutions. From those target institutions, professionals under the contract departments, operation departments, design departments, and legal departments who have direct and indirect relations with the issue under study will be purposefully selected. Other professionals in departments who have no direct or indirect relation to the issue under study won't be selected at all so as to control the quality of the information. The study used a random sample to select from each selected department so that the study wouldn't lose sight of the significance of following a random sampling technique, which means that each element of the target population has an equal and independent chance of being

included in the sample. Generally, the study can be concluded using a combination of stratified sampling techniques, purposive sampling techniques, and random sampling techniques.

A simplified Slovin formula to calculate sample sizes for a finite population was used to determine the sample size for this particular study. A 95% confidence level is assumed for this formula to determine the sample size at $e = 0.05$, and the sample size is determined by the following formula: Where n is the required sample size, N is the population size, and E is the level of precision applying the above formula, = 78 rounding to the nearest integer. Hence, the sample size for this research will be 78 employees. Therefore, samples of 78 employees will be prepared for questionnaires.

Assumptions: A 95% confidence level, and $e = \pm 5\%$

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{97}{1 + 97(0.05)^2}$$

$$n = 78$$

Table 1. List of branches, their populations and Sample sizes are taken proportionally from each branches

No	List of Institution	Number of Population	Sample Size
1	AAWSA	19	15
2	AACRA	36	29
3	AACDC	42	34
	Total	97	78

3.3. Data Type and Source

The study employed both primary and secondary data types. The primary data types are questionnaires, field observation, and pictorial data collection. On the other hand, secondary data types were published and unpublished documents, maps, plans, standard documents, statistical information, and other related material collected from different sources.

3.4. Data Collection Techniques

The researcher adopted several kinds of methods to collect data for the study. The following data collection procedures have been used to collect the required data for the purpose of the study:

3.4.1. Questionnaire Survey

A questionnaire survey is a method for acquiring and recording data on a certain issue that contains clear instructions, options, and answer space (Munaye, 2021). In quantitative research, closed-ended questionnaires are used to create statistics, whereas open-ended questionnaires are used in qualitative research (Lelisa, 2021). Because the study used a mixed research approach, the questionnaire survey comprised two types of questions: open-ended questions for qualitative data and closed-ended questions for quantitative data analysis. The questions were made up of questions that related to the research objectives. The responders were officers, directors, managers, and other professionals from the target institutions. This method of data collection provided the researcher with primary data.

3.4.2. Field Observation

Direct observation and participant observation are the two basic types of field observation. Direct observation includes observing a particular subject in a specific situation and frequently involves the use of technology such as video cameras. In participant observation, however, the researcher becomes much more absorbed in the lives of the individuals being observed (Lelisa, 2021). In this study, both direct and participant observation were employed to see what the target institutions actually did and what they were doing at the project sites with regard to the various aspects of infrastructure integration. Furthermore, the information gathered through this technology demonstrated what was going on in the project areas. This form of data gathering technique provided the researcher with primary data, which was then qualitatively analyzed.

3.4.3. Document Scanning

Written documents like contract documents, approved payment certificates, notes, diaries, memos, letters, and site books, if any, in the target institutions were used for the collection of secondary data.

3.5. Data Analysis Techniques

The different data analysis techniques used for the analysis of the primary and secondary data collected based on the above data collection techniques were Cronbach's alpha (α) coefficient,

Relative Importance Index (RII), Spearman rank correlation coefficient and narrative analysis as discussed in the following sections.

3.5.1. Cronbach’s alpha (α) coefficient

Cronbach's alpha is a scale that spans from 0 to 1.0 and is used to examine the reliability or internal consistency of data on a questionnaire. It shows how similar the respondents' responses are to the same question. When utilizing Cronbach's alpha coefficient, the lowest acceptable degree of reliability is 0.7, and any result below 0.7 shows that the variables are inconsistent and unreliable. (Takele, 2020). The reliability of the collected data was analyzed by determining the Cronbach's alpha coefficient for the data collected through the questionnaire survey. Below is a commonly accepted rule of thumb for interpreting Cronbach’s alpha (Fellows, R. and Liu, A., 2008).

Table 2: Cronbach’s alpha range

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Very high consistency
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$\alpha < 0.7$	Poor internal consistency and unacceptable

STATA: Analyze > Scale > Reliability Analysis

To ensure the validity of the results, multiple data collection techniques were employed to evaluate the same phenomenon. This approach provided an advantage in which any shortcomings associated with one data collection technique were offset by the use of another technique. By employing a combination of data collection methods, the study was able to mitigate the weaknesses of one technique by leveraging the strengths of another.

3.5.2. Relative Importance Index (RII)

The data collected through the questionnaire survey was analyzed using Relative Importance Index (RII) to determine the ranks of the common variables recognized for each specific objectives by using a five point Likert scale as the researcher believed that a 5 point scale fairly represents the respondents’ perception reliably.

Relative Importance Index (RII) is determined by the following empirical formula (Akadiri, 2011).

$$RII = \frac{\sum W_i f_{xi}}{AN} \dots\dots\dots \text{Eq. 3.5.2-1}$$

Where W = is the weighting given to each statement by the respondents, (ranging from 1 to 5 in 5-point Likert scale)

A = is the highest weight integer (5 in 5-point Likert scale)

N = is the total number of respondents.

The value of the relative importance index lay between 0 and 1 ($0 \leq RII \leq 1$). The level of relative importance is described as follows (Akadiri, 2011):

Table 3: Range of RII

RII values	Importance level
$0.8 \leq RII \leq 1$	High
$0.6 \leq RII \leq 0.8$	High-Medium
$0.4 \leq RII \leq 0.6$	Medium
$0.2 \leq RII \leq 0.4$	Medium-Low

Source: (Akadiri, 2011)

3.5.3. Spearman Rank Correlation Coefficient

Spearman rank correlation coefficient is a statistical measure of the strength of a monotonic relationship between paired data. It was used to determine the strength of rankings between two parties in this case between the factors those affect infrastructure integration and the impacts for the lack of infrastructure integration regarding the 40/60 housing provision. (Takele, 2020).

The spearman rank correlation coefficient, r_s is between -1 and 1 ($-1 \leq r_s \leq 1$). There are five strength of relationships ranging from 0 to 1 with 0.2 interval namely very weak, weak, moderate, strong and very strong respectively. When r_s is closer to ± 1 , it is an indication of strong relationship between the factors those affect infrastructure integration and the impacts due

to the lack of infrastructure integration. However if the spearman rank correlation coefficient is exactly zero, no correlation at all between the factors those affect infrastructure integration and the impacts due to the lack of infrastructure integration (Takele, 2020).

3.6. Ethical Consideration

Given the involvement of influential infrastructure supplying institutions within the city, the study faced potential legal and ethical considerations. Prior to distributing the survey questionnaire, all research participants were provided with clear information regarding the research objectives. Their consent and willingness to participate were obtained. The study ensured the privacy of participants by not disclosing any individual's name in the research. Moreover, an ethical aspect considered was to prevent any potential harm to the respondents by safeguarding the findings from causing damage.

Chapter Four: Data Presentation, Analysis and Interpretation

4.1. Introduction

This chapter presents what was learned from field observations on the selected project sites, a questionnaire survey distributed and collected from professionals in the target institutions, interviews with experts from the target institutions, data analysis, and interpretation of survey results. The questionnaire response rate is also provided, and the questionnaire survey's reliability was assessed using Cronbach's alpha coefficient.

The information gathered through field observation, questionnaire surveys, and documents was analyzed within the context of the study objectives. The relative importance index (RII) approach was used to conduct the analysis. The major findings of the analysis indicated the current level of integration among infrastructure supplying institutions, the causes that affect integration among those institutions, and the impact of absence or low level of integration among those institutions in terms of 20/80 housing provision. As a result, interpretations and comments were offered alongside the findings.

The questionnaire survey was prepared and distributed to the professional employees under the three target institutions located in Addis Ababa city namely: Addis Ababa City Housing Development Corporation, Addis Ababa City Road Authority (AACRA), Addis Ababa Water and Sewerage Authority (AAWSA), professional employees in the consultants under the target institutions, professional employees in the contractors under the target institutions. The questionnaire distribution and collection took six days since most of the respondents were willing to cooperate with answering the questions raised in the questionnaire survey.

A total of 78 questionnaire surveys were distributed and all questionnaires were returned successfully which means the questionnaire survey had a 100% of response rate.

4.2 Demographic analysis

4.2.1 Age of the Respondents

Table 4: age of the respondents

	Frequency	Percent
20 – 25	0	0
26 – 35	30	38.46
36 – 45	38	48.72
46 – 55	10	12.82
Above 55	0	0
Total	78	100.0

Source: Own questionnaire survey analysis, 2024

The data reveals that the majority of respondents fall within the 36-45 age range, accounting for 48.72% of the total. This is followed by the 26-35 age group, representing 38.46%. The 46-55 age group constitutes 12.82% of the respondents. There are no respondents in the 20-25 and above 55 age categories. This distribution indicates a higher participation from middle-aged individuals, which might reflect the demographic engaged in infrastructure management and planning in Addis Ababa.

4.2.2 Sex of the Respondents

The data indicates that the majority of respondents are male, comprising 70.5% of the total sample. Female respondents make up the remaining 29.5%.

Table 5: sex of the respondents

	Frequency	Percent
male	55	70.5
female	23	29.5
Total	78	100.0

Source: Own questionnaire survey analysis, 2024

4.2.3. Educational Background of the Respondents

Education is one of man's primary requirements, and it is the most significant aspect in achieving all-round development, which, of course, includes infrastructural integration (Munaye, 2021).

Table 6: Educational background of the respondents

	Frequency	Percent
PhD	0	0
MSc/MA	9	11.5
BSc/BA	69	88.5
Diploma	0	0
Total	78	100.0

Source: Own questionnaire survey analysis, 2024

The respondents' educational levels range from first to second degrees. In terms of educational background, the majority of respondents (88.5%) held a first degree, while the next group of respondents (11.5%) held a second degree. None of the respondents held a third degree or a diploma. This revealed that the vast majority of responders were well-educated and knowledgeable in their subjects. This gave the researcher with the knowledge he needed to conduct a valid and trustworthy evaluation of the data.

4.2.4. Work Experience of the Respondents

Table 7: Work experience of the respondents

Work experience	Frequency	Percent
Less than 5 years	6	7.69
5-9 years	35	44.87
10-14 years	31	39.74
above 14 years	6	7.69
Total	78	100.0

Source: Own questionnaire survey analysis, 2024

About 7.7% of the respondents had a work experience of less than 5 years. The respondents which had 5 up to 9 years of related work experience were 44.87% which was the most from the

given classification indicated in the questionnaire survey. The respondents which had 10 up to 14 years of related work experience were 39.74%. And finally the percentage of the respondents which had above 14 years of work experience were 7.69 %. Since most of the respondents (92.3%) were having a work experience between 5 and 14 years, this made their response very valuable, reliable and useful.

4.2.5. Current Job Position of the Respondents under their Corresponding Institution

Most of the respondents (55.1%) were site supervisors. Since they are the first to control and monitor any site related activities related to infrastructure integration in the project sites, this had made the response of the questionnaire survey more reliable and valid. The next most percentage of the respondents (19.2%) were found to be office engineers. The respondents who were site coordinators were only 2.6%, and resident engineers were found to be 9%. There were also other job positions like directors, survey engineers and material engineers. The job position of the respondents is summarized in the table below.

Table 8: Job position of the respondents under the target institutions

Current position	Name of infrastructure supplying institutions					Total	Total (in %)
	AACHDC	AACRA	AAWSA	Consultant	Contractor		
Project Manager	1	0	0	0	2	3	3.85
Coordinator	0	0	0	1	1	2	2.56
Resident Engineer	0	0	2	4	1	7	8.97
Site supervisor	11	17	6	7	2	43	55.13
Office Engineer	2	8	4	1	0	15	19.23
Other	1	4	3	0	0	8	10.26
Total	15	29	15	13	6	78	100

Source: Own questionnaire survey analysis, 2024

4.2.6. Primary Area of Work of the Respondents under their Corresponding Institution

Most of the respondent's (60.25%) primary work area found was in the construction department. The next most area of work of the respondents (19.23%) found was in the design department. There were also other departments of the respondent's area of work which was found like operation, maintenance, controlling and monitoring. The primary work area of the respondents under their subsequent institutions is summarized in the table below.

Table 9: Primary area of work of the respondents

Primary area of work	Frequency	Percent
Design	15	19.23
Construction	47	60.25
Operation & Maintenance	9	11.53
Other Specify	7	8.98
Total	78	100.0

Source: Own questionnaire survey analysis, 2024

4.3. Reliability Analysis

Reliability refers to the consistency or repeatability of the respondents to the same question (Creswell & Creswell, 2018). Cronbach analysis was carried out to determine the reliability of the questions in the five-point Likert scale questionnaire survey. Cronbach's alpha is a scale that spans from 0 to 1.0 and is used to examine the reliability or internal consistency of data from a questionnaire survey. The minimum accepted level of Cronbach's alpha coefficient is 0.7 and any value below this is considered unacceptable (Takele, 2020).

The reliability of the questionnaire survey was evaluated using Cronbach's alpha to ensure internal consistency across various objectives. For the first specific objective, which involved assessing the current practice of integration among infrastructure supplying institutions in Addis Ababa for the 20/80 housing provision program, the Cronbach's alpha was 0.77, indicating acceptable reliability. The second objective, focused on identifying the main causes affecting integration, yielded a Cronbach's alpha of 0.87, demonstrating good internal consistency. The

third objective, which assessed the impact of integration, showed a very high reliability with a Cronbach's alpha of 0.94. Overall, when considering all questions in the survey, the Cronbach's alpha was 0.93, confirming the questionnaire's excellent reliability and suitability for further data analysis.

Here is the consolidated table including all the Cronbach's alpha results for the different objectives:

Objective	Cronbach's Alpha	Number of Items	Source
Assessing the current practice of integration among infrastructure supplying institutions	0.77	6	Own questionnaire survey analysis 2024
Identifying the main causes that affect integration among infrastructure supplying institutions	0.87	10	Own questionnaire survey analysis 2024
Assessing the impact of integration among infrastructure supplying institutions	0.94	17	Own questionnaire survey analysis 2024
Overall Reliability Statistics	0.93	33	Own questionnaire survey analysis 2024

Table 10: provides a summary of the reliability analysis conducted using Cronbach's alpha

4.4. Current Practice of Infrastructure Integration among Institutions

The respondents were asked to rank the current practice level of infrastructure integration between their institution and the other infrastructure supplying institutions in Addis Ababa city in terms of 20/80 housing provision, using a relative importance index strategy. The effect of common infrastructure integration practices on 20/80 housing provision has been examined and ranked using the RII five-point Likert scale ((1-Strongly Disagree; 2-Disagree; 3-Moderately Agree; 4-Agree; and 5-Strongly Agree) as evaluated by respondents. According to their response, RII received a ranking from highest to lowest in terms of six common current practice levels of integration between their institution and the other infrastructure supplying institutions. Six factors were considered as existing integration practices among infrastructure supplying institutions in Addis Ababa city in terms of 20/80 housing provision. Appendix III shows the RII analysis for the six selected common infrastructure integration practices for 20/80 housing provision.

4.4.1. Efforts Made for Institutional Infrastructure Integration

Efforts are being made to create an integrated method for infrastructure integration across infrastructure supplying institutions, which was ranked first with a RII value of 0.61 and a mean score of 3.07 this demonstrated that attempts were being made to integrate infrastructures in relation to the 20/80 housing provision

Table 11 : RII analysis for some selected variables of practice of infrastructure integration

Common practices of infrastructure integration among infrastructure supplying institutions	N	Minimum	Maximum	Mean	RII	Rank
There are efforts made to introduce integrated approach for infrastructure integration between the institutions.	78	1	5	3.07	0.61	1

Source: Own RII analysis, 2024

4.4.2. Procedures/Standards Institutions Follow for the Integration of Infrastructures

The interviews reported that each infrastructure supplying institution had its own manuals to which they referred when designing procedures and standards. Manuals and guidelines are essential in any institution, but these materials are not shared by all of the target institutions. In addition to the independent standards and recommendations, a standard procedure or guide book to regarding the implementation of the 20/80 housing provision, greater integration and cooperation among those organizations is required.

Table 12: RII analysis for some selected variables of practice of infrastructure integration

Common practices of infrastructure integration among infrastructure supplying institutions	N	Minimum	Maximum	Mean	RII	Rank
Procedures/standards are common for all infrastructure service providers.	78	1	5	1.59	0.31	5

Source: Own RII analysis, 2024

4.4.3. The legal Aspect with Regards to Infrastructure Integration in 20/80 Housing Provision

Some specific legal issues that could arise from lack of infrastructure integration in 20/80 housing provision. **Property damage:** If there is a problem with the infrastructure, such as a water main break or a power outage, and someone's property is damaged, the stakeholders involved in the project could be held liable. **Personal injury:** If someone is injured due to a problem with the infrastructure, such as a fall caused by a pothole or an electrical shock, the stakeholders involved in the project could be held liable. **Contractual disputes:** If there are problems with contracts or agreements related to the infrastructure, such as disputes over payment or delays in construction, the stakeholders involved in the project could be involved in legal disputes. **Regulatory violations:** If the project does not comply with applicable regulations, such as environmental regulations or building codes, the stakeholders involved in the project could be subject to fines or other penalties. There are legal conditions to hold stakeholders accountable for property and other damages due to lack of integration was the second ranked variable with a RII value of 0.54 and a mean score of 2.72 Experts from the target institutions' legal departments were interviewed, and related papers were evaluated. Among the key functions of legal departments include resolving issues before they go to court, negotiating compensation for relocations and property losses.

The experts who were working in the target institutions were asked different questions about infrastructure integration in their institutions with regards to the 20/80 housing provision. During the interview, the experts revealed that there was no clearly specified laws or regulations, or any legal condition that suggest infrastructure integration between infrastructure supplying institutions. However, there was legal conditions in place to hold stakeholders accountable for property and other damages sustained due to lack of infrastructure integration between infrastructure supplying institutions. They also revealed that the rules and regulations were primarily reactive endeavors in which infrastructure supplying institutions claim and sue one other for compensation after losses or damages had occurred, rather than being a proactive procedure that encourages infrastructure supplying institutions to integrate infrastructures from the beginning of a project.

Table 13: RII analysis for some selected variables of practice of infrastructure integration

Common practices of infrastructure integration among infrastructure supplying institutions	N	Minimum	Maximum	Mean	RII	Rank
There are legal conditions to hold stakeholders accountable for property and other damages due to lack of integration	78	1	5	2.72	0.54	2

Source: Own RII analysis, 2024

4.4.4. The Design Aspect with Regards to Infrastructure Integration in 20/80Housing Provision.

To avoid any complications during the implementation stage, all infrastructure supplying institutions who may be directly or indirectly engaged in the process should communicate during the design stage. Experts from the target institutions were quizzed on various aspects of infrastructure design in relation to infrastructure integration. Experts of the target institutions acknowledged that their designs are prepared by their own engineers and professionals in the appropriate fields. Mostly, there are two ways to prepare designs. One option is for the institution's own force to prepare the designs, while the other is to contract out to external bodies. The experts also revealed that infrastructure integration in the target institutions was a reactive process, occurring only near the end of a design project and the start of construction, rather than a proactive one that begins at the project conception and early design stage. Infrastructure integration starts even in the middle of construction at some infrastructure supplying institutions regarding the 20/80 housing provision.

The experts also revealed that infrastructure supplying institutions do not share plans or designs unless one of them specifically requests it during execution. The customary practice is for them to develop their own designs without consulting the plans or designs of others, and then apply to the city administration for authorization to carry out their plans. After that, if relocations are required, they will write letters to the other infrastructure supplying institution. Even after writing a letter, they won't wait for the response of the other infrastructure supplying institution rather they were just proceeding to finish their own work.

Table 14: RII analysis for some selected variables of practice of infrastructure integration

Common practices of infrastructure integration among infrastructure supplying institutions	N	Minimum	Maximum	Mean	RII	Rank
There are strategic relationships between infrastructure supplying institutions.	78	1	5	2.307	0.461	3
Plans/designs are in line with the plans/designs of the other infrastructure supplying institutions.	78	1	4	1.641	0.328	4
There is efficient infrastructure integration between the institutions during planning, designing, implementing and data exchanging.	78	1	5	1.448	0.289	6

Source: Own RII analysis, 2024

4.5. The main factors those affect infrastructure integration among Institutions

The overview evaluation for identifying the main factors those affect infrastructure integration was done by asking the respondents to rank the common factors those affect infrastructure integration between infrastructure supplying institutions in Addis Ababa City with regards to 20/80 housing provision, which was done using a relative importance index strategy. The contribution of common factors those affect infrastructure integration regarding the 20/80 housing provision was investigated and ranked using the RII five-point Likert scale ((1-Strongly Disagree; 2-Disagree; 3-Moderately Agree; 4-Agree and 5-Strongly Agree) as evaluated by the respondents. RII was ranked from the highest to the lowest, which was the rankings of 10 common factors those affect infrastructure integration between their institution and the other infrastructure supplying institutions as per their response rate. Ten variables were taken into account as common factors those affect the infrastructure integration among infrastructure supplying institutions in Addis Ababa city with regards to 20/80 housing provision. The RII analysis for 10 selected common factors those affect infrastructure integration regarding the 20/80 housing provision is shown in appendix IV.

4.5.1. Legal Enforcement Regarding Integration of Infrastructures in 20/80 Housing Provision

Lack of strong legal enforcement regarding integration of infrastructures in the 20/80 housing provision was ranked first with a RII value of 0.885 and a mean score of 4.423. According to table 15, the above result showed that the first ranked variable had a high level of importance index. This clearly indicated that there was a lack of strong legal enforcement regarding infrastructure integration in 20/80 housing provision even though the experts revealed that there were legal conditions to hold stakeholders accountable for property and other damages due to lack of infrastructure integration between infrastructure supplying institutions. To add to that, Lack of clearly stated rules and regulations, manuals, standards and procedures about infrastructure integration between infrastructure supplying institutions was ranked fourth with a RII value of 0.85 and a mean score of 4.27. As a result of this, the researcher concluded that the lack of clearly specified laws and regulations in relation to infrastructure integration had resulted in a lack of strong legal enforcement for infrastructure integration.

The interviewees from the target institutions confirmed that despite the fact there were legal conditions to hold the target institutions accountable, the rules and regulations were primarily reactive endeavors in which institutions claim and sue each other for compensation after damages have been caused, rather than a proactive process that encourages institutions to collaborate from the start of a project.

Low levels of integrated infrastructure service were one of the key factors for lack of growth of urban centers which indeed includes the housing sector, according to the housing development strategy released by the Ministry of Urban Development and Construction in 2012 E.C (Housing Development Strategy, 2020).

Table 15: RII analysis for some selected factors those affect infrastructure integration

The main factors those affect infrastructure integration between infrastructure supplying institutions	N	Minimum	Maximum	Mean	RII	Rank
Lack of strong legal enforcement regarding integration of infrastructures	78	1	5	4.423	0.885	1

Lack of clearly stated rules and regulations, manuals, standards and procedures about infrastructure integration between infrastructure supplying institutions	78	1	5	4.269	0.854	3
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Source: Own RII analysis, 2024

4.5.2. Cooperation and Coordination among Infrastructure Supplying Institutions

Lack of cooperation & coordination between infrastructure supplying institutions was the second ranked factor that affect infrastructure integration regarding the 20/80 housing provision with a RII value of 0.885 and a mean score of 4.423. The RII value of this variable was also between 0.8 and 1.0. This indicated the variable had a very high importance index based on the responses of the respondents. During the interview process, it became clear that there was a distinct lack of cooperation and coordination between AACRA and AAWSA, AACRA and AACHDC, and AAWSA and AACHDC with regards to the 20/80 housing provision.

Loose communication between infrastructure supplying institutions during design preparation and implementation was ranked fourth with a RII value of 0.846 and a mean score of 4.23. This also showed high level of importance. As discussed in the above sections, the common practice of the target institutions was developing their own designs/plans without consulting the plans/designs of others, and then apply to the city administration for authorization to carry out their plans. They were writing letters to the other stakeholders if and only if relocations were required

Table 16: RII analysis for some selected factors those affect infrastructure integration

The main factors those affect infrastructure integration between infrastructure supplying institutions	N	Minimum	Maximum	Mean	RII	Rank
Lack of cooperation & coordination between infrastructure supplying institutions	78	1	5	4.423	0.885	1

Loose communication between infrastructure supplying institutions during design preparation and implementation	78	1	5	4.231	0.846	4
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Source: Own RII analysis, 2024

4.5.3. Responsible Body to Integrate Infrastructure Supplying Institutions

Absence of responsible body to integrate infrastructure supplying institutions was ranked fifth with a RII value of 0.841 and a mean score of 4.205. This indicated absence of responsible body to integrate infrastructure supplying institutions has a significant negative influence on infrastructure integration for the 20/80 housing provision.

According to the AAWSA interviewees, the municipal administration had constituted a responsible organization called Addis Ababa City Administration Infrastructure Integration, Construction Permit and Control Authority with the express purpose of supervising and monitoring infrastructure integration between infrastructure supplying institutions. This indicated that the city administration was beginning to see the various negative consequences of the city's lack of or low level of infrastructure integration. According to certain experts, the aforementioned institution should play a critical role in the integration of infrastructures for the 20/80 housing provision. The target institutions were writing letters to this authority in order to feel like they were carrying out their duties. However, they didn't follow up the responses of the letters they wrote. Regardless of the plans/designs of the other institutions, they were beginning construction of their own work on the project site. As a result, infrastructure integration for the 20/80 housing provision has suffered a setback.

Other key factors affecting infrastructure integration among the target institutions including the ones which were not identified as common factors in the questionnaire survey but were mentioned on the open space provided on the questionnaire survey by respondents were;

- Lack of proper attention by infrastructure supplying institutions,
- Lack of government policy regarding infrastructure integration,
- Lack of sense of ownership of infrastructure supplying institutions and
- Lack of capability and loyalty of infrastructure supplying institutions

Table 17: RII analysis for some selected factors those affect infrastructure integration

The main causes that affect infrastructure integration between infrastructure supplying institutions	N	Minimum	Maximum	Mean	RII	Rank
Absence of responsible body to integrate infrastructure supplying institutions	78	1	5	4.205	0.841	5
Lack of central database system for data and information exchange, planning, designing and decision making	78	1	5	3.679	0.736	6

Source: Own RII analysis, 2024

4.6. The Impact of Infrastructure Integration among Institutions

The overview evaluation for identifying the impacts of infrastructure integration was conducted by asking respondents to rank the common impacts that have taken place as a result of the lack or absence of infrastructure integration among infrastructure supplying institutions in Addis Ababa City with regard to 20/80 housing provision, and it was conducted out using the relative importance index strategy. The impact of the common impacts noticed as a result of the lack or low level of infrastructure integration on the 20/80 housing provision was evaluated and ranked using the RII five-point Likert scale (1-Very low; 2-Low; 3-Medium; 4-High; and 5-Very high). The found common repercussions were separated into three major categories: social impacts, economic impacts, and environmental impacts. The table below demonstrates the RII value of the most common social, economic, and environmental impacts of a lack or low level of infrastructure integration across infrastructure supplying institutions in terms of 20/80 housing provision. Appendix V shows the RII study for 17 selected common consequences due to insufficient infrastructure integration among institutions about the 20/80 housing provision.

The most common impact of low-level infrastructure integration is property damage. This is followed by avoidable costs, waste of resources, and various types of service interruptions. The least common impacts are air pollution and spoiling of food. These impacts are caused by the lack of coordination between different infrastructure systems. When infrastructure systems are

not integrated, it can lead to accidents, damage to property, as well as avoidable costs and waste of resources. It can also lead to disruptions to essential services such as transportation, water, and power. It is important to take steps to improve infrastructure integration in order to reduce these impacts. This can be done by improving coordination between different infrastructure agencies, developing common standards and procedures for infrastructure planning and design, investing in information sharing and communication systems, and creating a culture of collaboration and cooperation between different infrastructure institutions .



Figure 3: Damage by infrastructure supplying institutions at project site.

The above figure illustrates the damages done to a store in yeka tafo project site due to the lack of integration between AACRA and AACHDC. As the professionals revealed during the interview process, the store was constructed regardless of the design of the road width. This created a problem which could have been solved by integrating the designs of the road width with the cross section area of the store.

Another expert revealed to the researcher that AACHDC didn't request infrastructure supplying institutions for any design/plan of the site work activities related to the project site when starting the site work project. This had a huge economic impact on the infrastructure supplying institutions.



Figure 4 : car parking lot

The image to the above shows that the top elevation of the car parking lot never coincides with the floor finish level of the nearby residential structures, and that the elevation of the road and the parking lot diverge significantly. At the time of asking, the total payment certified to the contractor doing the site work activity was 12,328,872.90 birr. Because this was a significant amount of money, it required careful consideration of the designs and plans of the other infrastructure-supplying institutions. However, one expert observed the researcher that during the project conception of this site task activity, AACHDC was asking AACRA that to have the design of any site work related activities. Since there was no response from the responsible body at the time, they started the construction process of these parking lots as well as walkways. Another expert from AACHDC's infrastructure department stated that the corporation was required to begin site work operations regardless of the designs/plans for the road, water supply, and sewage utility lines that were to be built at the project site.

4.6.1. Social Impacts of Absence or Low Level of Infrastructure Integration

The influence of the common social impacts identified due to the absence or low level of infrastructure integration with regards to the 20/80 housing provision were investigated and ranked using the RII five-point Likert scale (1-Very low; 2-Low; 3-Medium; 4-High and 5-Very high). The dominant social impact was different types of service interruption like transport, water and electricity with a RII value of 0.862 and a mean score of 4.308. The second dominant social impact was creating challenges for handicap people & Lower service quality with a RII

value of 0.826 and a mean score of 4.128. Physical injuries to workers during period of construction was also one of the social impacts of low level of infrastructure integration regarding the 20/80 housing provision with a mean score of 4.090. Physical injuries to workers and residents were the next social impacts occurred due to absence or low level of integration with a mean score of 3.949 and 3.538 respectively.

It is overall known that any building project needs to prioritize worker and resident safety. Although only construction professionals should be permitted to enter the working corridor, individuals who may be unconcerned of the dangers posed by the construction activity, such as young children, blind persons, and residents, should be given special attention.

This must be prioritized since, in the case of the 20/80 housing provision, the lucky may like to see their own homes as witnessed during field observation. Furthermore, field validation showed that the contractors had placed no signs or other protections to keep the fortunate inhabitants away from the construction corridor on the project site. The table below summarizes the findings of a relative importance index examination of the societal consequences of a lack or low level of infrastructure integration.

Table 18: RII analysis for the social impacts of low level of infrastructure integration.

Most common social impacts	N	Minimum	Maximum	Mean	RII	Rank
Different types of service interruption like transport, water and electricity	78	1	5	4.308	0.862	1
Challenges for handicap people	78	2	5	4.128	0.826	2
Lower service quality	78	1	5	4.128	0.826	2
Physical injuries to workers during period of construction	78	2	5	4.090	0.818	4
Physical injuries to residents	78	2	5	3.949	0.790	5

Spoiling of food because of absence of water and electricity	78	1	5	3.538	0.708	6
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Source: Own RII analysis, 2024



Figure 5: The existing water supply line in the project site/field observation.

As observed in the graphic above, the water supply pipe was above ground during the road construction at one of the project sites. The road construction company's employees were questioned regarding the existing water supply connection. They revealed that they were ordered by higher-ups to work entirely on their own projects and to notify their institution if anything went wrong during the excavation phase. The researcher communicated with those officials about any steps taken by their institutions. The officials said that they had submitted a letter to AAWSA urging that the water supply line project begin and be completed as soon as possible at the project site. The usual approach of the infrastructure supplying institutions was to simply write a letter informing them of the problems that were developing at the project site for the sake of writing a letter and contacting them. According to one of those being interviewed, the infrastructure supplying institutions' lack of ownership had a major effect on infrastructure integration throughout the institutions.

This backed up the findings from the questionnaire survey, which showed that the rules and regulations were primarily reactive in nature, with infrastructure supplying institutions suing and claiming compensation after losses or damages, rather than being a proactive procedure that encourages infrastructure supplying institutions to integrate infrastructures from the start of a project.

4.6.2. Economic Impacts of Absence or Low Level of Infrastructure Integration

The significance of common economic impacts were evaluated, and respondents' assessments of the common impacts were graded using the RII five-point Likert scale (1-Very low; 2-Low; 3-Medium; 4-High and 5-Very high). In comparison to the social and environmental impacts, economic impacts were most felt. The dominant economic impact was property damage with a RII value of 0.903 and a mean score of 4.513. The second dominant economic impact was avoidable cost for any temporary service arrangements with a RII value of 0.882 and a mean score of 4.410. Wastage of scarce resources was the third ranked economic impacts of low level of infrastructure integration regarding the 20/80 housing provision with a mean score of 4.397. There were also other economic impacts like the possible loss of product and revenue reduction during service interruptions and high cost of compensation. The table below shows the results of relative importance index analysis for the economic impacts of absence or low level of infrastructure integration.

Table 19: RII analysis for the economic impacts of low level of infrastructure integration

Most common economic impacts	N	Minimum	Maximum	Mean	RII	Rank
Property damage	78	2	5	4.513	0.903	1
Avoidable cost for any temporary service arrangements	78	2	5	4.410	0.882	2
Wastage of scarce resources	78	3	5	4.397	0.88	3
Avoidable cost of carrying out repairs and relocations	78	2	5	4.359	0.872	4
The possible loss of product and revenue	78	2	5	4.244	0.849	5

reduction during service interruptions						
High cost of compensation	78	1	5	4.231	0.846	6

Source: Own RII analysis, 2024



Figure 6: A figure showing the elevation difference of the two car parking's/field observation.

As illustrated in the Figure 6 above, there was a significant height difference between the road and the two car parks built on one of the project sites. According to one expert, this will have a detrimental impact later on when the parking service begins operations because of the elevation difference caused by the lack of infrastructure integration during the planning phase. According to the same expert, the two parking lots were the first to be built on the project site.

One of the experts from the institution in responsibilities for the road project said that the mistake was made because AACHDC began the project without knowing the floor finish level of the buildings and the designs of car parking lots had a significant elevation variation. According to the same expert, AACRA was constructing the road based on the design acquired from AACRA, which showed the floor finish level of the residential buildings. This demonstrated to the researcher that AACHDC should have alerted AACRA of the date on which they were to begin site work construction on the project site before beginning any site work related construction.



Figure 7: A figure showing a partially demolished project office/field observation.

As it was revealed by one of the interviewees, this was the office of yeka tafo project site. AACRA was ordered to dismantle it when the site work road construction was starting to take shape as it was in the region of the road. The researcher believed this could have been easily avoided by informing the responsible body the plan/design of the road being constructed before the start of the construction of the project office. The financial damage due to the lack of integration between the two infrastructure supplying institutions was yet to be determined. This indicated that infrastructure supplying institutions are usually late to notice and request any type of compensation.



Figure 8: A figure showing the passing line of tele and electric utility under the road, According to an expert from the AACHDC's infrastructure department, this was the electrical and telecom utility line that would be excavated following the building of the main road at the project sites of the 20/80 housing provision. Infrastructure providing institutions might have easily avoided this by planning together at the start of any construction activity, or by examining the plans/designs of other infrastructure providing institutions if they were developing separately.



Figure 9: A figure showing the demolished sides of a car parking. As an expert from the target institutions revealed, the car parking in the above figure was constructed before the beginning of the main road between the blocks in the project site. This had caused to demolish part of the already constructed car parking (the two sides of the car parking) to accommodate the design of the road width. As another expert from the same

institution revealed, the payment of the car parking was already certified and paid to the contractor. This had a huge economic impact to the institution due to the lack of integration of the designs of the car parking and the road width. As the figure below showed, another car parking was partially demolished by the contractor constructing the road in the project site on one side.



Figure 10: A figure showing partially demolished car parking due to lack of integration,

4.6.3. Environmental Impacts of Absence or Low Level of Infrastructure Integration

The contribution of common environmental impacts were also assessed, and the respondents' evaluations of the attributes were scored using the RII five-point Likert scale (1-Very low; 2–Low; 3–Medium; 4–High and 5-Very high). The dominant environmental impact was sanitation problems for the residents and the environment due to shortage of water supply with a RII value of 0.854 and a mean score of 4.269. The second dominant environmental impact sewage backing up in the residential area with a RII value of 0.813 and a mean score of 4.064. Dust induced lung diseases to the residents was the third ranked environmental impact of low level of infrastructure integration regarding the 20/80 housing provision with a mean score of 4.00. The table below shows the results of relative importance index analysis for the environmental impacts of low level of infrastructure integration.

Table 20: RII analysis for the environmental impacts of low level of infrastructure integration

Most common environmental impacts	N	Minimum	Maximum	Mean	RII	Rank

Sanitation problems for the residents and the environment due to shortage of water supply	78	2	5	4.269	0.854	1
Sewage backing up in the residential area	78	2	5	4.064	0.813	2
Dust induced lung diseases to the residents	78	2	5	4.00	0.800	3
Flooding in the residential area	78	1	5	3.923	0.785	4
Air pollution in the residential area	78	2	5	3.769	0.754	5

Source: Own RII analysis, 2024

The potential for increasing conflict was not cited as a common environmental impact of lack of infrastructure integration in the questionnaire survey, but it was mentioned by respondents.

4.7. Correlation Analysis between the Factors and the Consequent Impacts

In order to understand the degree of relationship between the independent variables and the dependent variable, a Spearman's correlation test was conducted. Based on the questionnaires completed by all the project teams and project managers participated in the data center project, the results of the correlation analysis between the variables are shown in below table.

The results of the correlation between the factors those affect infrastructure integration among infrastructure supplying institutions and the impacts due to a lack of infrastructure integration among the institutions regarding the 20/80 housing provision were 0.74 when examined using SPSS. The result showed that there is strong correlation between the factors those affect infrastructure integration among the institutions and the impacts due to the lack of infrastructure integration regarding the 20/80 housing provision.

Spearman's Correlation Coefficient					
			Practice	Factors	Impacts
Spearman's rho	Practice	Correlation Coefficient	1.000	-.76	-.635
		Sig. (2-tailed)	.000	.015	.039
		N	78	78	78
	Factors	Correlation Coefficient	-.76	1.000	-.598
		Sig. (2-tailed)	.015	.000	.000
		N	78	78	78
	Impacts	Correlation Coefficient	-.635	.74	1.000
		Sig. (2-tailed)	.039	.000	
		N	78	78	78
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 21: Spearman's Correlation Analysis

4.8. Regression Analysis and result

4.8.1. Tests of Normality

Testing of data; to measure the deviation of the data from the mean/ central tendency of the data normality test is done via SPSS-20 numerically. The result is depicted in table 21 Tests of Normality.

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
residual	.101	78	.0540	.975	78	.123

a. Lilliefors Significance Correction

Table 22: Tests of Normality

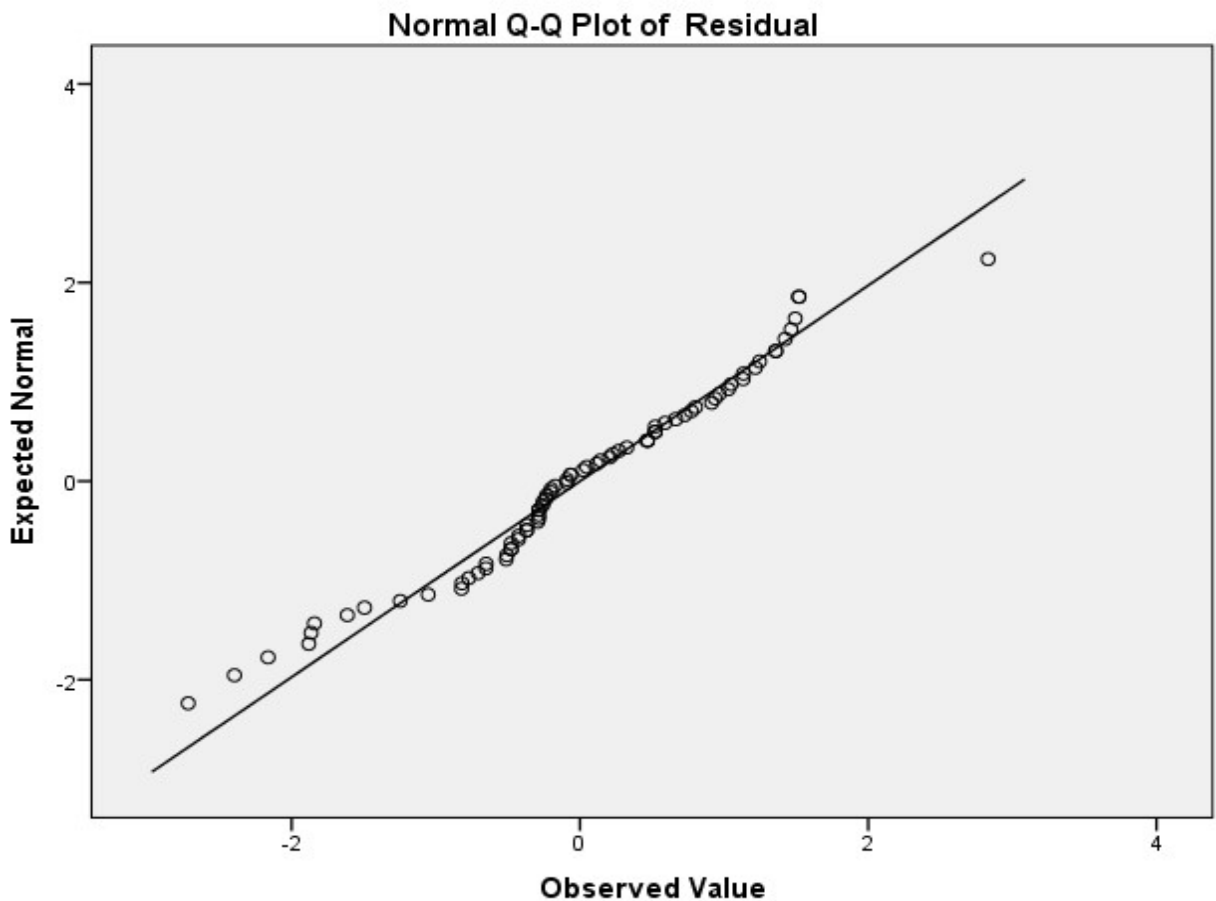
1. **Kolmogorov-Smirnov Test:**

- **Statistic (0.101):** This value measures the largest difference between the empirical distribution of the data and the normal distribution.
- **Significance (0.054):** Since this value is greater than the conventional alpha level of 0.05, that the data is normally distributed. This suggests that the residuals do follow a normal distribution.

2. **Shapiro-Wilk Test:**

- **Statistic (0.975):** This value is close to 1, which indicates that the sample distribution is close to a normal distribution.
- **Significance (0.123):** Since this value is greater than 0.05, this suggests that the residuals are normally distributed.

Figure 11: Normal Probability Plot of Standardized Residual



Source: Own Survey, computed by SPSS Version 20.0

In a Q-Q plot, the straight diagonal line represents the expected quantiles and the data were perfectly normally distributed. In the Normal Probability Plot points will lie in a reasonably straight diagonal line from bottom left to top right. This would suggest no major deviations from normality. The study applied Normal Q-Q Plot of regression Standardized Residuals can be seen in the above figure to test linearity. Since the points were symmetrically distributed around a diagonal line, linearity pattern was observed. Hence, the straight line relationship between the residuals and the predicted dependent variable scores depicted that linearity was achieved.

Generally the residuals of the regression model follow a normal distribution, this suggests that the model is appropriately specified, capturing the underlying relationship between the independent and dependent variables effectively, and that the findings are likely to be robust and generalizable.

4.8.2. The ANOVA table

The analysis of variance (ANOVA) it's a statistical method used to analyze the differences among group means in a sample, particularly useful when more than two groups to compare, as it allows you to determine whether there are statistically significant differences among the means of the groups. The following table shows the result output via SPSS-20.

Table 23: The ANOVA table of the regression analysis

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.285	2	3.643	12.781	.000 ^b
	Residual	21.376	75	.285		
	Total	28.661	77			

a. Dependent Variable: dependent-impact

b. Predictors: (Constant), independent-current practice, independent- cause

The ANOVA results indicate that the regression model, which includes the independent variables "independent-current practice" and "independent-cause," significantly predicts the dependent variable "dependent-impact" ($F(2, 75) = 12.781, p < .001$). This means that the independent variables collectively have a statistically significant effect on the dependent variable. This is the p-value corresponding to the F-statistic. A p-value less than 0.05 typically

indicates that the model is statistically significant. Here, the p-value is .000, which is highly significant.

4.9. Comparison of Findings with Previous Literatures

In terms of the integration of infrastructure-supplying institutions, certain findings in the study were similar to past literatures. According to (Mahlet, 2014), the current level of integration between infrastructure supplying institutions in Addis Ababa city was said to be low as in the case of this study which had an overall mean score of 3.58 according to . However, there were efforts made to introduce an integrated approach but were not successful due to various reasons. This study also found that efforts were made to introduce an integrated method, but that they were unsuccessful this time as well. The low level of infrastructure integration in the city was also confirmed according to (Mulugeta, 2011)

According to (Mahlet, 2014), the main reasons for the lack of strong integration between infrastructure supplying institutions were a lack of clearly stated rules or regulations, a lack of accurate information about the location, size, and type of utility lines, and negligence, carelessness of service providers in communicating, a lack of capacity, a lack of interest and commitment of infrastructure service providers, the absence of a responsible body to do the job, and a lack of long-term plan. Lack of adequate professionals, lack of integrity and working together, shortage of budget, absence of responsible body, absence of policy, plan year and change of plan, infrastructural policy, legal ground of sectors, and presence of formal committee and regular meetings were revealed as the major reasons for the low level of integration at inter sectoral level in another study (Mulugeta, 2011). Absence of clear policy frameworks on which approach is to be chosen and practiced; lack of funds to organize various trainings, workshops, and frequent meetings to inform the officials working; lack of clear policy frameworks on which approach is to be adopted and exercised; a lack of commitment and accountability to the new strategy; Lack of political will and a preference for the old approach were also identified as major factors in the lack of infrastructure integration among infrastructure-supplying entities (Kitila, 2015)..

Regarding the impacts of absence or low level of infrastructure integration between infrastructure supplying institutions, this study discovered several conclusions that were similar

to those found in prior studies. These were property damage, relocation costs, interim service arrangements costs, and frequent service outages, dust-induced lung diseases, air pollution, and flooding, among other things. (Mahlet, 2014).

The study discovered significant findings that had not been revealed in previous studies. One of the factors those affect infrastructure integration with relation to the 20/80 housing provision was recognized as a lack of sense of ownership among infrastructure supplying institutions, as well as a lack of competency and loyalty. One of the respondents mentioned the potential for increased political conflict as a political impact of the absence of infrastructure integration.

Chapter Five: Conclusion and Recommendation

5.1. Conclusions

The general objective of this study was assessing the infrastructure integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision program. The specific objectives of this study were assessing the current practice of infrastructure integration; identifying the main factors those affect infrastructure integration and assessing the impact of infrastructure integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision program. As a result of the data analyzed in the previous chapter, the researcher came to the following conclusions.

In relation to the first objective, the researcher had concluded:

- The top three current practice of infrastructure integration among infrastructure supplying institutions are institutions have efficient infrastructure integration between the institutions during planning, designing, implementing and data exchanging even though they are not common for all infrastructure supplying institutions regarding the 20/80 housing provision.
- Infrastructure integration for the 20/80 housing provision has been a reactive process, occurring frequently only near the end of the design phase rather than a proactive one that begins at the conception of project idea and early design stage.
- Unless one of the infrastructure supplying institutions requests it, infrastructure supplying institutions do not discuss or exchange information about their plans/designs with the other infrastructure supplying institutions throughout implementation. As a result, there is no infrastructure integration communication or coordination between infrastructure supplying institutions.
- There are no clearly defined laws, regulations, or legal requirements that propose infrastructure integration across infrastructure supplying organizations.

Therefore, the current level of infrastructure integration among infrastructure supplying institutions regarding the 20/80 housing provision is very low. It requires immediate improvement in order to mitigate the harmful consequences of the lack of infrastructure integration.

In relation to the second objective, the researcher had concluded:

- The most significant factors those affect infrastructure integration among infrastructure supplying institutions with regards to the 20/80 housing provision are lack of strong legal enforcement regarding integration of infrastructures, lack of cooperation & coordination between infrastructure supplying institutions, Lack of clearly stated rules and regulations, manuals, standards and procedures about infrastructure integration between infrastructure supplying institutions.

In relation to the third objective, the researcher had concluded:

- The most severe social impacts of absence or low level of infrastructure integration between infrastructure supplying institutions with regards to the 20/80 housing provision are different types of service interruption like transport, water and electricity, creating challenges for handicap people, lower service quality, physical injuries to workers and lucky residents.
- The most severe economic impacts of absence or low level of infrastructure integration between infrastructure supplying institutions with regards to the 20/80 housing provision are property damages, avoidable cost for any temporary service arrangements, wastage of scarce resources, possible loss of product and revenue reduction during service interruptions and high cost of compensation.
- The most severe environmental impacts of absence or low level of infrastructure integration between infrastructure supplying institutions with regards to the 20/80 housing provision are sanitation problems for the residents and the environment due to shortage of water supply, sewage backing up in the residential area and dust induced lung diseases to the residents.
- The lack or low level of infrastructure integration across infrastructure supplying organizations has a political impact on the 20/80 housing provision, as disclosed by the respondents, which could lead to conflicts.

5.2. Recommendations

As it was seen in the study, the level of integration of infrastructures among infrastructure supplying institutions has been very low. As a result, in order to limit further damage caused by a lack of infrastructure integration, a practical and immediate solution is required. After identifying the above conclusions based on the three specific objectives of the study, the researcher forwarded the following recommendations to the infrastructure supplying institutions, the municipalities, the policy makers, the lucky residents of the 20/80 housing provision and the professional workers at the project site.

Infrastructure supplying institutions are recommended to:

- Have a clear and enforced communication with the other infrastructure supplying institutions before project conception and at early design stage for improvement of integration of infrastructures with regards to the 20/80 housing provision.
- Have efforts to make introduce integrated approach for infrastructure integration between supplying institutions with regards to the 20/80 housing provision.
- Develop a common procedure/standard for all infrastructure supplying institutions to follow while planning, designing, and executing with regards to the 20/80 housing provision.
- Have a regular meeting about infrastructure integration between infrastructure supplying institutions.
- Have a central database system for data and information exchange, planning, designing and decision making.
- Train and upgrade people in their professional capabilities by introducing new technologies used in various regions of the world in terms of infrastructure integration.
- Respond immediately and on time to the other infrastructure-supplying institutions' request for design clarifications as if it were their own letter.
- Wait a reasonable amount of time for a response from the other infrastructure supplying institutions, when explanations about one's infrastructure supplying institution's plans/designs are requested.

The municipalities are recommended to:

- Prepare a strong, appropriate, dependable, and accountable institution to oversee and govern infrastructure integration across infrastructure supplying institutions.
- Improve the infrastructure supplying institutions' ability to integrate infrastructures in project sites in terms of system, technology, and strategies.

The policy makers are recommended to:

- Create a robust and applicable policy that requires institutions to have clearly specified rules and regulations, manuals, standards, and procedures in place for infrastructure integration amongst infrastructure-supplying institutions.

The lucky residents of the 20/80 housing provision are recommended to:

- Stay with the expert personnel, when visiting the project site to check on the progress of their homes.

The professional workers at the project site are recommended to:

- Follow the safety guide lines during the period of construction, controlling and managing in the project site with regards to the construction of infrastructures.

Further study is recommended for interested researchers' to assess the vertical integration within infrastructure supplying institutions themselves with regards to integration of infrastructures. Impacts related to housing affordability due to the lack of infrastructure integration regarding the 20/80 housing provision and assessment of infrastructure integration between the sanitary, the electrical and the metal MSEs within the residential buildings in the 20/80 housing provision is also left for further study.

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Appendix-I: Questionnaire Survey



POST GRADUATE PROGRAM

MA in Project Management

Assessment of Infrastructure Integration Management of Condominium Housing Projects with the other Infrastructure Supplying Institutions: the Case of 20/80 Housing Provision

A project work Submitted to Addis Ababa university school of commerce, for Partial Fulfillment of the Requirements for the Award of a Master's degree in Project Management

Objective of the questionnaire survey

Dear/Sir;

The purpose of this questionnaire is to collect data for the research study entitled “Assessment of Infrastructure Management Integration of Condominium Housing Projects with the other Infrastructure Supplying Institutions the Case of 20/80 Housing Provision” as a fulfillment of the Requirements for the Award of a Master's degree in Project Management from Addis Ababa university school of commerce. Thus, your genuine, professional opinion and timely responses are vital to determine the success of this study. Please note that the information you provide will only be used for academic purpose and all the information relieved will be kept confidential.

Thank you in advance for your cooperation!

For further explanation, you can contact me through the address indicated below:

Eyuel kassu

Mobile Number: +2519-22579228

Email: eyubeatz@gmail.com

General Instruction:

- No need of writing your name/address.
- To those questions with alternatives mark your response on the space provided by Putting “ ✓ ”
- For any additional opinion or explanation you are kindly requested to write briefly on the space provided.

Part One: General information about the respondents

1. Age

- 20 – 25 46 – 55
 26 – 35 Above 55
 36 – 45

2. Name of your institution

- male female

3. Name of your institution

- AACHDC Consultant
 AACRA Contractor
 AAWSA Other (Please specify) _____

4. Educational background (qualification)

- PhD MSc/MA BSc/BA
 Diploma Other (Please Specify) _____

5. Work experience

- Less than 5 years 5-9 years
 10-14 years above 14 years

6. Current position/responsibility in your institution

- Project Manager Coordinator Resident Engineer
 Site supervisor Office Engineer Other (Please specify) _____

7. Your primary area of work

- Design
 Construction
 Operations and Maintenance
 Other (Please specify) _____

Part Two: The current practice of integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision.

To what extent do you agree with the current practice of integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision? Please indicate the current practice level by making on the appropriate box using a Likert Five-Scale (1-5): Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1).

Current Practice Level	scale				
	S.A (5)	A (4)	N (3)	D (2)	S.DA (1)
There are strategic relationships between infrastructure supplying institutions.					
Plans/designs are in line with the plans/designs of the other infrastructure supplying institutions.					
The procedures/standards are common for all infrastructure service providers.					
There are legal conditions to hold stakeholders accountable for property and other damages due to lack of integration					
There are efforts made to introduce integrated approach for infrastructure integration between the institutions					
There is efficient infrastructure integration between the institutions during planning, designing, implementing and data exchanging.					

Part Three: The main causes that affect integration among different infrastructure supplying Institutions in Addis Ababa city for 20/80 housing provision.

To what extent do the following factors affect integration among different infrastructure supplying Institutions in Addis Ababa city? Please indicate the influence factors by making on

the appropriate box using a Likert Five-Scale (1-5): Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1).

causes that affect integration	scale				
	S.A	A	N	D	S.DA
	(5)	(4)	(3)	(2)	(1)
Lack of cooperation & coordination between infrastructure supplying institutions					
Lack of strong legal enforcement regarding integration of infrastructures					
Lack of adequate professionals in infrastructure supplying institutions.					
Limitation capability to integrate infrastructures in the project sites in terms of system, technology & strategies					
Budget constraints in infrastructure supplying institutions					
Lack of willingness and commitment between infrastructure supplying institutions					
Absence of responsible body to integrate infrastructure supplying institutions					
Loose communication between infrastructure supplying institutions during design preparation and implementation					
Lack of central database system for data and information exchange, planning, designing and decision making					
Lack of clearly stated rules and regulations, manuals, standards and procedures about infrastructure integration between infrastructure supplying institutions					

If there are any other causes that affect integration among different infrastructure supplying Institutions in Addis Ababa city for 20/80 housing provision which is not mentioned above, please list them with their level of effect on the space provided below

Part Four: The impact of week integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision program.

To what extent do you rate the following impacts as a result of week integration among infrastructure supplying institutions for 20/80 housing provision program? Please indicate the degree of impacts by making on the appropriate box using a Likert Five-Scale (1-5): Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1).

Impact of week integration	Scale				
	S.A	A	N	D	S.DA
A. Social impacts	(5)	(4)	(3)	(2)	(1)
Spoiling of food because of absence of water and electricity					
Physical injuries to workers during period of construction					
Physical injuries to residents					
Lower service quality					
Different types of service interruption like transport, water and electricity					
Challenges for handicap people					
B. Economic impacts					
Property damage					
High cost of compensation					
Avoidable cost for any temporary service arrangements					
Avoidable cost of carrying out repairs and relocations					
The possible loss of product and revenue reduction during service interruptions					
Wastage of scarce resources					
C. Environmental impacts					

Sanitation problems for the residents and the environment due to shortage of water supply					
Sewage backing up in the residential area					
Flooding in the residential area					
Air pollution in the residential area					
Dust induced lung diseases to the residents					

If there are any other impacts due to week integration among different infrastructure supplying Institutions in Addis Ababa city for 20/80 housing provision which is not mentioned above, please list them with their level of impact on the space provided below

Part Five: - Please answer the following open ended questions on the space provided.

1. Do you have communications/meetings on infrastructure service integration with different stakeholders? If your answer is yes, how?

2. What changes do you think might improve the current process of integration among infrastructure supplying institutions in 20/80 housing provision?

3. Do you have any implementation techniques which greatly reduce the impact of week integration among infrastructure supplying institutions in 20/80 housing provision?

Appendix-II: RII analysis for the common practices of infrastructure integration

Current practice of integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision.	No	Minimum	Maximum	Mean	RII	Rank
There are strategic relationships between infrastructure supplying institutions.	78	1	5	2.31	0.46	3
Plans/designs are in line with the plans/designs of the other infrastructure supplying institutions.	78	1	4	1.64	0.33	4
The procedures/standards are common for all infrastructure service providers.	78	1	5	1.59	0.32	5
There are legal conditions to hold stakeholders accountable for property and other damages due to lack of integration	78	1	5	2.72	0.54	2
There are efforts made to introduce integrated approach for infrastructure integration between the institutions	78	1	5	3.08	0.62	1
There is efficient infrastructure integration between the institutions during planning, designing, implementing and data exchanging.	78	1	5	1.45	0.29	6

Appendix-III: RII analysis for the common factors those affect infrastructure integration

The main causes that affect integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision.	No	Minimum	Maximum	Mean	RII	Rank
Lack of cooperation & coordination between infrastructure supplying institutions	78	1	5	4.42	0.88	1
Lack of strong legal enforcement regarding integration of infrastructures	78	1	5	4.42	0.88	1
Lack of adequate professionals in infrastructure supplying institutions.	78	1	5	2.95	0.59	10
Limitation capability to integrate infrastructures in the project sites in terms of system, technology & strategies	78	1	5	3.04	0.61	9
Budget constraints in infrastructure supplying institutions	78	1	5	3.12	0.62	8
Lack of willingness and commitment between infrastructure supplying institutions	78	1	5	3.54	0.71	7

Absence of responsible body to integrate infrastructure supplying institutions	78	1	5	4.21	0.84	5
Loose communication between infrastructure supplying institutions during design preparation and implementation	78	1	5	4.23	0.85	4
Lack of central database system for data and information exchange, planning, designing and decision making	78	1	5	3.68	0.74	6
Lack of clearly stated rules and regulations, manuals, standards and procedures about infrastructure integration between infrastructure supplying institutions	78	1	5	4.27	0.85	3

Appendix-III: RII analysis for the common impacts of low level of infrastructure integration

The impact of week integration among different infrastructure supplying institutions in Addis Ababa city for 20/80 housing provision program	No	Minimum	Maximum	Mean	RII	Rank
Spoiling of food because of absence of water and electricity	78	1	5	3.54	0.71	17
Physical injuries to workers during period of construction	78	2	5	4.09	0.82	11
Physical injuries to residents	78	2	5	3.95	0.79	14
Lower service quality	78	1	5	4.13	0.83	9
Different types of service interruption like transport, water and electricity	78	1	5	4.31	0.86	5
Challenges for handicap people	78	2	5	4.13	0.83	9
Property damage	78	2	5	4.51	0.90	1
High cost of compensation	78	1	5	4.23	0.85	8
Avoidable cost for any temporary service arrangements	78	2	5	4.41	0.88	2
Avoidable cost of carrying out repairs and relocations	78	2	5	4.36	0.87	4
The possible loss of product and revenue reduction during service interruptions	78	2	5	4.24	0.85	7
Wastage of scarce resources	78	3	5	4.40	0.88	3

Sanitation problems for the residents and the environment due to shortage of water supply	78	2	5	4.27	0.85	6
Sewage backing up in the residential area	78	2	5	4.06	0.81	12
Flooding in the residential area	78	1	5	3.92	0.78	15
Air pollution in the residential area	78	2	5	3.77	0.75	16
Dust induced lung diseases to the residents	78	2	5	4.00	0.80	13