iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

INTEGRATIVE SUSTAINABLE ARCHITECTURE/LANDSCAPE DESIGN FOR ENVIRONMENTAL ENHANCEMENT IN UNPLANNED URBAN SETTLEMENTS: THE CASE OF NAZZAL, AMMAN

Nourhan Bakr [1]*, Arin Ozgun [2]
Department of Architecture, Faculty of Art,
Design and Architecture, İstanbul Okan University, Turkey [1 & 2]

ABSTRACT
In developing countries, rapid urban growth leads to significant degradation in the natural environment especially within unplanned contexts that lack resources. This study focuses on the need of finding some strategies that are context-sensitive for enhancing the environmental sustainability within such areas. The study develops a framework with integrative design approaches that combine both sustainable architecture and sustainable landscaping design principles. Within its methodological framework, the study conducts a comprehensive review of relevant studies, as well as reviews cases from around the world, such as BedZED and Dockside Green, to inform the development of guidelines with criteria that effectively enhance the environment in unplanned urban contexts and applies it on the case of the unplanned neighborhood of Nazzal in Amman, Jordan, that is known to be facing crucial environmental challenges. For data collection, the study conducts site observations, questionnaire surveys with local community members as well as expert groups, and detailed mapping analysis of problematic areas within the study area. Specific design guidelines with recommendations that consider community engagement are generated by the study, which correspond to the environmental challenges of the context of the study area, including mitigating the urban heat island effect and enhancing green spaces, among others. The findings of the study contribute to providing insights to effective planning for urban planners, policymakers, local authorities, and community stakeholders that seek environmental sustainable enhancement to their unplanned challenging urban contexts, which further contribute to the broad field of sustainable urban development in similar contexts.

Keywords:
Environmental enhancement, Integrative sustainable architecture/landscape Design, Unplanned urban settlements, Nazzal Neighborhood.

1. INTRODUCTION

Global Urbanization drives economic growth but it challenges urban sustainability, especially in the rapidly expanding cities of the developing world (Kilbert. C. 2016). Demographic growth and concentration in cities put pressure on the urban infrastructure and natural environment, leading to environmental degradation (Pless. J. and Ferry. A. 2019). From this perspective, unplanned urban settlements, which are commonly characterized by rapid growth and limited services gets majorly affected by the negative impact of urbanization. The consequences of unplanned urban growth become stressful and result in many environmental challenges in poor urban areas that are densely populated and are lacking environmental resources, such as increased temperatures of air that contribute to UHIF - urban heat island effects and compromise human and ecological health and wellbeing. Also, inadequate infrastructure in those areas increases the chances of surface floods due to poor stormwater management in the presence of intensified precipitation, which challenges social and economic activities and compromises the existing infrastructures. Also, the high congestion and traffic in those areas result in emissions that accumulate from industrial practices and vehicles, which, when added to the inefficient waste disposal systems, can result in the generation of pollution which badly affects local communities' overall health and well-being (Carrilho, J., & Trindade, J., 2022). These environmental stressors that are interconnected with each other highlight the need to develop and plan for strategies and solutions that are context-specific for the purpose of enhancing sustainability of the environment and also build resiliency within unplanned urban areas.

At the scale of a neighbourhood such as Nazzal in Amman city, Jordan, with its unplanned expansion of overcrowded buildings and non-regulated sufficient spaces for greenery, intersecting architectural/landscape sustainable design approaches can be one way to tackle this matter and environmentally enhance such contexts.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

Accordingly, this study highlights the need to develop an innovative approach towards enhancing environmentally sustainable development within vulnerable areas that most likely are suffering from inadequate environmental health and deteriorated quality of life by developing adaptable and context-sensitive guidelines for the integration of sustainable architecture/ landscape design for achieving environmental enhancement for the unplanned neighbourhood of Nazzal by involving the local community as well as collaborating with professionals/policymakers. As such, the study investigates how unplanned neighbourhoods can be rehabilitated under environmentally sustainable enhancement regarding community engagement.

The study looks into environmental development at the scale of a neighbourhood and the local community. As such, the case study chosen for analysis for environmental enhancement is very challenging. The study further focuses on the intersection between landscape/architecture to promote environmental health and well-being that are lacking in such areas. Additionally, large-scale environmental planning is a challenging task; the study focuses on environmental enhancement by integrating suitable integrative landscape and architectural strategies in specific locations facing local problems. The study lastly develops a theoretical framework that has specific guidelines, strategies, and criteria that take into consideration context-sensitive data of the study area like land use, local regulations, and community perspectives on environmental development practices.

2. LITERATURE REVIEW; BACKGROUND FROM THEORY AND PRACTICE

2.1 Approaches of Sustainable Design

Sustainable architecture/landscape design are known disciplines in the field of sustainability, yet there is a more recent approach that integrates both and will be introduced in this section for their specific criteria. The study will also examine the relationship of this integrative approach to practices of environmental development as found in relevant previous theoretical studies.

2.1.1 Sustainable Architectural Design

Sustainable architectural design had been evolving to respond to the several emerging and rising challenges of climate change and rapid urban growth in a way that redefines buildings' role to be more than just a shelter. Sustainable architecture aims at establishing a nonharmful relationship between the built environment and the natural one while at the same time prioritizing the health and well being of the human and nature. The USGBC - U.S. Green Building Council (USGBC, 2021) identifies the concept of sustainable architectural design as an approach that is comprehensive to building with an emphasis on protecting the environment, efficient use of resources, and the enhancement of human health and well-being, which aligns in perspective with the growing number of scientific studies that focus on sustainable architecture.

In a study by Steiner, F in (2014), sustainable architectural design is defined as a comprehensive process which integrates the well-being of the environment and humans throughout the life cycle of the building in all stages from site selection to operation. This approach defined by Steiner aims at minimizing the negative environmental impact of buildings while at the same time enhance the quality of life for building occupants. Similarly, Cebezas, A. L. (2014) define sustainable architecture as a methodology that seeks to reduce the adverse environmental consequences of building construction and operation while prioritizing occupant well-being through energy-efficient and resource-conscious design.

These scholarly and practical definitions converge on many several key principles which define the concept of sustainable architectural design. Firstly, it focuses on reducing the negative impacts of buildings on the environment throughout all stages of building construction considering consumption of resources and energy. Sustainable architectural design also highlight the necessaty of using resources in a responsible and efficient way, this includes selection of building materials that are considered sustainable. Thirdly, it prioritizes the health and well-being of the humans by creating healthy living conditions and considers issues such as adequate lighting and good air quality. Moreover, sustainable architectural design requires many different disciplines to collaborate their efforts including architecture, construction, and environmental sciences. Furthermore, sustainable architectural design integrates several sustainable practices ranging from the selection of the site to the operation of the building. Also, sustainable architectural design uses technologies and designs that ensure energy efficiency in buildings. Lastly, sustainable architectural design emphasizes responsibility to the environment by designing with awareness to issues like local environmental conditions. As such, sustainable architectural design represents an approach that is holistic and integrated in seeking the creation of buildings that positively contribute to both the environment and human.

2.1.2 Sustainable Landscape Design

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

Sustainable landscape design that is also known as environmentally friendly landscaping or green landscape architecture focuses on the design of outdoor spaces that are not only focused on aesthetics but also prioritize ecological function and community well-being. This approach emphasizes protection of the environment, conservation of resource, and the development of outdoor environments that exist in harmony with each other and also bring benefits to human and nature. The U.S. EPA -Environmental Protection Agency (EPA, 2000) guidebook on low-impact development acknowledges sustainable landscape design as an approach that promotes several environmental issues: the conservation of water, preservation of biodiversity , and human/environmental health and well-being. The concepts of EPA encourage strategies that are ecologically responsible, such as the selection of native plants and permeable paving as approaches that create landscapes that are both aesthetically pleasing and environmentally compatible.

Perspectives found within Scholarly works further identify the concept, such as the study of Dunnett and Kingsbury (2004) that defines sustainable landscape design as a method for planning and designing outdoor environments into spaces like gardens and parks with an emphasis on protecting the environment, preserving the natural resource, and also considering the well being of human. Dunnett and Kingsbury (2004) highlight the importance of integrating several practices like gardening with water efficiency, selection of native plants, conservation of habitat, and management of stormwater, all in favor of bringing a balance between the built and natural environments within urban areas. From a similar perspective, a study by Booeri, S., et al. (2019) describes the concept of sustainable landscape design as an approach that is ecologically conscious and that prioritizes land use, resource protection, and environmental health. This approach considers plant selection, materials, and design features to minimize environmental impact, conserve water, maintain biodiversity, and enhance human and wildlife well-being.

These interpretations converge on several key principles: environmental health and protection through resource and water conservation; biodiversity preservation through habitat creation and native plant selection; the creation of aesthetically pleasing and functional outdoor spaces that enhance human well-being; the use of ecologically responsible strategies throughout the design process; the promotion of resiliency in ecosystems and the balancing between the needs of human with natural environments. As such sustainable landscape design is a concept that aims to creating exterior spaces that take into consideration the visual appeal as well as the ecological benefit to people and the nature.

2.1.3 Integrative Sustainable Architecture / Landscape Design

Integrative sustainable architecture/landscape design is an approach that includes multiple disciplines that go beyond the traditional boundaries of design by including disciplines like architecture, landscape architecture, ecology, and environmental sciences together. This integration of disciplines works with the aim of creating contexts that are responsible to the environment and resource-efficient in a way that contributes to enhancing both stability to the environment as well as human well-being as it integrates many of the aspects of sustainable architecture and landscape design strategies. In a study by Grant and Barton (2006), Integrative sustainable architecture/landscape design is defined as a comprehensive methodology that emphasizes a balanced combination of architecture and landscape while at the same time fosters the collaboration between them in order to reduce harmful negative impacts on the environment, and also work on the promotion of a good relationship between both the human and the natural world. Integrative sustainable architecture/landscape design is described in similarity by a study for Reed, W (2009) where the study acknowledges it as a multidisciplinary strategy that possitivly influences the planning and designing of the built environment with an aim of creating sustainable environments that value human well being as well as ecosystem well being equally. Also, a study for Downton (2015) brings an emphasis on integrative sustainable architecture/landscape design's focus on several sustainable issues from community, ecology, resiliency, and human well-being in a design approach that is collaborative. Another study by Colding and Barthel (2019) describes the concept of integrative sustainable architecture/landscape design with characteristics that balances human-made contexts with the natural environment, with a strong emphasis on long-term sustainability and community well-being.

These interpretations converge on several key principles: multidisciplinary collaboration, harmonious integration of architectural and landscape elements, environmental responsibility, human well-being, regenerative design, green infrastructure integration, responsiveness to climate, sustainability for communities, and also the balancing of built and natural environments. The integration of sustainable architecture design and sustainable landscape design is an approach that is recognized for enhancing the environment, this recognition takes in consideration the interconnected relationships between the built and the natural environments as a whole. In this perspective, The report published by the UN- United Nations, known as "Our Common Future" report in 1987,

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

identifies this integration between the built and the natural environments as an important pillar of sustainable development that encourages practices like using resources efficiently and building urban contexts that are responsive to the environment. The role of integrative design has been emphasized in studies as it helps in achieving goals of sustainability by promoting building practices which are ecologically aligned, like in The UNEP's -United Nations Environment Programme (UNEP, 2016) study that within its scope recognizes the integrative architecture/landscape design for its contributions to health and well-being of the urban communities, both ecological and human. Also in 2019, the UN highlighted the integrative architecture/landscape design contributions for environmentally sustainable development as it helps in creating environments that are resilient and resource-efficient (UN, 2019). However, it is important to acknowledge the differences between the two concepts of environmentally sustainable development and integrative architecture/landscape design; environmental sustainable development as a concept contains the broad general policies and actions that are found across various sectors, while the integrative architecture/landscape design approach focuses on the physical integration of specific architectural and landscape elements within the built environments.

In the summary in Table 1, it is clear how environmental sustainable development works at multiple levels and scales to address relevant global concerns, while integrative design primarily impacts local environments and contributes to specific design solutions. Despite these differences, integrative sustainable architectural and landscape design remains a critical component of achieving broader sustainability goals, offering a localized and context-specific approach to environmental enhancement.

Table 1: Comparison between Environmental Sustainable Development and Integrative Sustainable Architecture/Landscape Design. As retrieved from the literature.

Feature	Environmental Sustainable Development	Integrative Sustainable Architecture/Landscape Design
Scope of the Influence	Broader, across various sectors like energy, transport, agriculture, ….	Focus on the physical environment and integrating architectural/landscape aspects
Hierarchy of the Influence	A general framework for sustainability objectives	Precise scale with emphasis on design/planning within the built environment
Scale of the Application	Global policy to regional planning and local projects	Single buildings, communities, and outdoor areas; limited to global/regional impact
Specificity of the Design	High-level policies like climate accords, renewable energy, ….	Focus on architecture/landscape; materials, GI-green infrastructure, community well-being,….
Local Impact vs. Global Impact	Global viewpoint that addresses global concerns	Local impact to improve urban settings and enhance urban communities
Time Horizon	Long term global goals like zero net emissions	Immediate impact on the life quality in specific built environments

2.2 Analysis of Global Case Studies

Global examples of the integrative sustainable architecture/landscape design offer some valuable insights that are used to create resilient urban contexts and environments that are ecologically responsible. Some of the well-known projects like BedZED in the UK, Dockside Green in Canada, The Grow Community in USA, Vauban in Germany, and Eco-kampung in Indonesia, demonstrate several approaches on how to integrate principles of sustainable design at the scale of a neighbourhood, which aligns with the scale from this study as it focuses on local community-level interventions.

BedZED (London, UK), a pioneering project that shows a comprehensive approach that integrates all residential, commercial, and communal spaces within it in a way that minimizes negative ecological footprints. The project emphasis on efficiency of used resources through its utilization of natural ventilation, solar energy, and materials that are local and sustainable. The project also uses green roofs and community gardens in an extensive way which highlight the potential of them as architectural design elements that enhances biodiversity and provide interaction through the community (Bioregional.com). Another project known as Dockside Green (Victoria, Canada) also uses the integrative approach as it prioritizes community development along with environmental sustainability as it incorporates strategies such as waste water treatment, district energy systems, and connected green spaces that creates walkable and naturally vibrant urban environment (Docksidegreen.com).

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

The Grow Community (Bainbridge Island, USA) is an example of a neighbourhood that uses sustainable architecture design and landscape design in an integration to create harmony in the living environment. In this project, several approaches are used to demonstrate feasibility of integrative design sustainable practices within residential urban developments such as energy efficient homes, community gardens, and pedestrian-friendly spaces that promote engagement between community members as well as reduce their reliance on private vehicles (growbainbridge.com). Vauban project (Freiburg, Germany) is a neighborhood that is designed to be free of car movement, which illustrates how urban planning is able to transform urban contexts though the promotion of sustainable lifestyles. The Vauban project also focuses on other sustainable strategies such as buildings that are energy-efficient, green roofs, and communal green spaces in a way that highlight the role of integrated design in creating resilient and ecologically balanced urban environments (Fraker, 2013). Eco-kampung prokect located in Semarang, Indonesia, offers a unique perspective of integrative design approaches as it showcases sustainable practices that are driven by community members of the urban villages. The project uses several integrative design strategies trhough initiatives that are focused on waste management, conservation of water, and urban agriculture and farming that together demonstrate the potential of local communities in addressing the environmental challenges they are facing and enhancing their living conditions (who.int, 2021).

The approaches seen within these case studies highlight several key principles of the integrative architecture/landscape sustainable design that are relevant to this study's focus on the enhancement of environmental health and well-being in challenging urban contexts and are as follows: Firstly, the integration into a Specific context, as seen from **e**ach project that it uses specific design strategies that correspond to the context of its location regarding ecological aspects, social aspects and cultural aspects which demonstrates that the integrative design principles can be adaptable. Secondly, community centered Approaches are used within the projects that emphasizes aspects of community engagement and participation, and also recognizing the importance of social factors in trying to achieve sustainable results. Thirdly, multi layered approach towards Sustainability are used in the projects as they integrate a wide range of sustainable practices that include but not limited to; energy efficiency, conservation of water, management of waste, and enhancement of biodiversity, which overall demonstrate the multi approach towards environmental sustainability. Fourthly, the projects show scalability and replicability as they offer reasonable models for a neighborhood scale sustainable urban development that can be generalized through similar contexts. Finaly, the projects emphasis on UGI, Urban Green Infrastructure as it can play a critical role in enhancing ecological resilience and community well-being through a variety of strategies like green roofs, community gardens, and permeable surfaces, amongst others. As such, this study identifies from examining these global case studies how it is critical to integrate sustainable architecture / landscape strategies within challenging urban settings in providing a foundation for developing context-sensitive guidelines for environmental enhancement.

To this end, this study's approach to environmental enhancement is grounded in the synthesis of sustainable architectural and landscape design principles in a framework that is based by the concept of Integrated Design that emphasizes the synergy within the relationship between architecture and landscape elements and recognizes them as one system.

3. MATERIALS AND METHODS

3.1 Study Area: The Nazzal Neighborhood

The Nazzal Neighborhood that is located in the capital city of Jordan, the city of Amman (figure 1) serves as a example of an unplanned urban context for several reasons like its complex socio-economic structure, rapid urban growth, and its rising environmental challenges. Its historical development, marked by successive waves of refugee influx and internal migration, has resulted in high density population, inadequate poor infrastructure, and lack of green spaces. These factors make Nazzal a critical site for exploring the application of integrative sustainable architectural and landscape design in challenging urban contexts. (Potter, et al. 2009)

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

Figure 1: (A) Map of Jordan within Adjacent countries, locating Amman City, Retrieved online from Newworldencyclopedia.org. (B) Map of Amman Highlighting Nazzal; "Bader" boundaries in Red, Retrieved online from Nationstates.com.

Nazzal, one of Amman's oldest and poorest districts, is characterized by its unplanned urban sprawl (figure 2A), dense residential areas (primarily high density areas known as type C and type D), and mixed use of land that extends the residential area to include both commercial and industrial zones. The Nazzal neighborhood faces significant challenges to the environment like air and noise pollution, increased surface temperatures and UHIF - urban heat island effect, and increasing risks of flash and sudden floods due to the untreated steep slopes and inadequate water management systems. From another perspective, Nazzal Socially is home to a large and often economically urban poor and disadvantaged population, lacking adequate public services and green spaces. The area exhibits a stark contrast between older, congested areas shown in figure 2B; (Al-Akhdar Mountain and Al-Dra'a) and newer, more organized sub-neighborhoods (Dahiyat Al-Yasmeen, Al-Humraniyya, and Al Hilal).

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

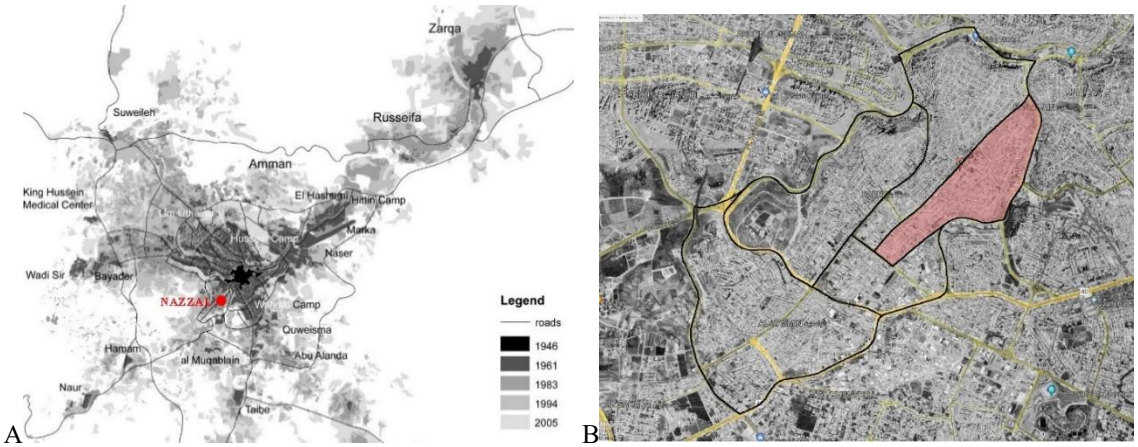

Figure 2: (A) Amman city, highlighting Nazzal; showing sprawling expansion and growth between (1946-2005). Courtesy of the IFPO Atlas of Jordan with the Royal Jordanian Geographic Center (Ababsa, 2010)). (B) Map highlighting the chosen Dra'a /Al-Thra'a sub-neighborhood within Nazzal's other regions as retrieved from Google Pro. Adapted by the researcher.

To address the specific challenges of Nazzal, particularly in the most congested and problematic sub-neighborhood of Al-Dra'a (figure 3), this study applies the integrative sustainable architecture/landscape design criteria that is developed from the previously discussed global cases and theoretical studies. The application of the criterea is focused on four key areas that exibit problematic zones through Al-Dra'a area in Nazzal as each represents a distinct challenge to its land use, as follows: Commercial and Industrial, this area is characterized by steep and untreated slopes as well as high levels of pollution. Commercial, Institutional/Governmental, and Residential Type C (high density), this areas are marked by a confliction to its land uses and potential restrictions on public spaces. Commercial and Residential Type D, areas that are dominated by high-density housing and severe congestion. And, Residential Type C and D, area that represents the most densely populated area with minimal green space.

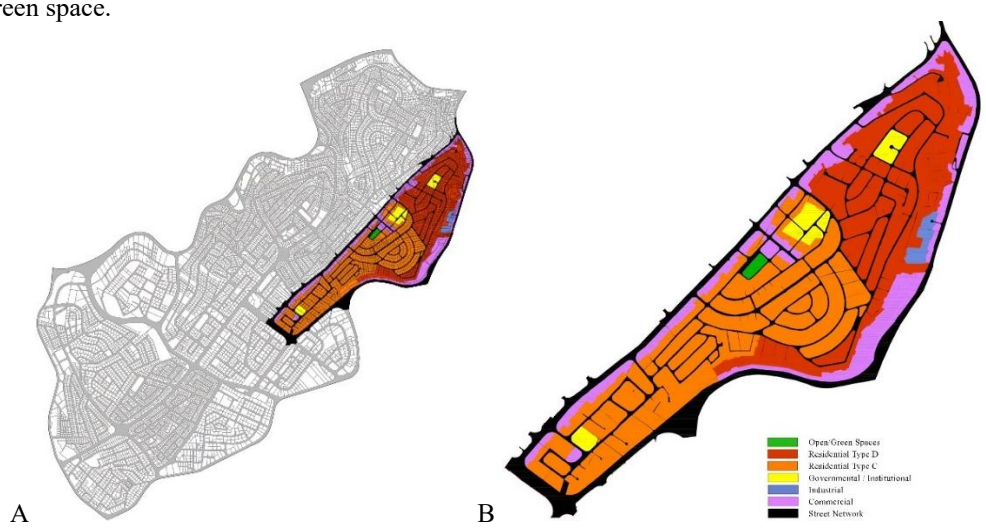

Figure 3: (A) Al-Dra'a within Nazzal area. (B) Land Use for Al-Dra'a. Retrieved from GAM 2023. Adapted by the researcher.

The criteria developed for Nazzal focus on community engagement and environmental enhancement, considering the currently found and existing challenges of the area as well as for the limitations of implementing the specific strategies which are typically used in new developments rather than in existing areas. Accordingly, the main aspects of the suggested criteria include:

- Addressing both air and noise Pollution in the study area through the integration of urban GI- green infrastructure to mitigate pollution from relevant sources like traffic.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

- Mitigating UHIF - Urban Heat Island Effect by implementing elements to buildings like green roofs, vertical walls as well is an overall increased urban greening.
- Managing sudden flood risks through designing permeable surfaces and using permeable pavements where possible, also through GI - green infrastructure specific strategies that help in managing runoff of stormwater, especially in areas with steep and untreated slopes.
- Enhancing public spaces and outdoor areas by creating green spaces that are accessible and areas that are pedestrian-friendly which can improve community and individuals well-being.
- Promoting community participation and engagement through involving residents in Nazzal within all processes and stages of the design and maintenance of green and open spaces, which also promote their sense of ownership and responsibility.
- Improving Waste Management: Implementing community-based recycling and composting initiatives.
- Integrating Sustainable Building Practices: Encouraging the use of local, sustainable materials and energy-efficient building designs.

These criteria are applied to each problematic area shown in figure 4, tailoring specific integrative architectural and landscape design strategies to address the unique challenges and opportunities presented by each site, summarized in table 2.

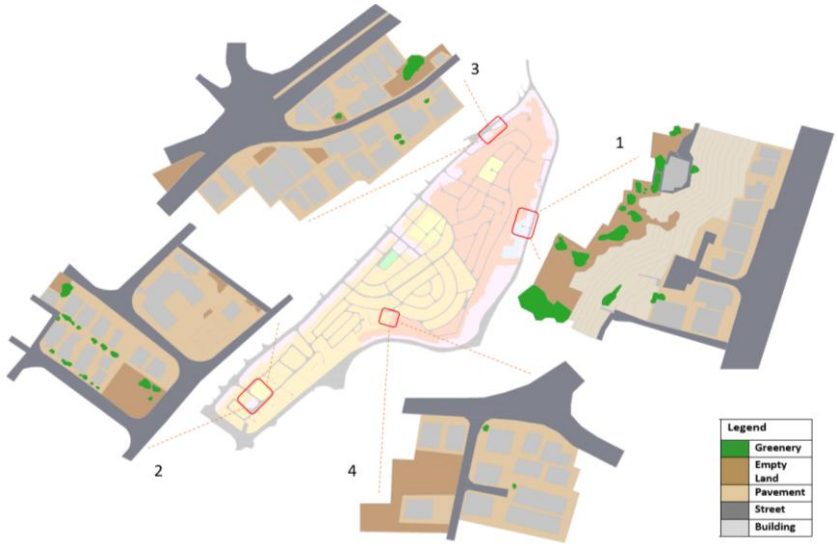

Figure 4: Schematic Plans for Problematic Areas 1 - 4. Developed by the researcher. *Note: The boundaries chosen are a rough estimate of the chosen area defined by adjacent streets and land use.

Table 2: Summary of Problematic areas site selection, Highlighting in red the chosen Area for the study.

Problematic Area	Land Use	Proper greening?	Sustainable practices?	Prevalent Challenges
Area 1	Commercial and Industrial	No	No	○ Congestion &Traffic ○ Air/noise pollution ○ Pollutants emission ○ Steep untreated slopes ○ Subjected to surface floods
Area 2	Commercial, Institutional/Governmental, & Residential Type C	No	No	○ Restriction of publicly accessible areas / green spaces and pedestrian movement ○ Increased air temperatures ○ High density middle income Housing
Area 3	Commercial, Residential Type D	No	No	○ Congestion &Traffic ○ Increased air temperatures ○ Air/noise pollution ○ Subjected to flash floods

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

				○ Unprivileged local communities that lack attention ○ High density low income Housing
Area 4	Residential Type C, Residential Type D	No	No	○ Congestion &Traffic ○ Increased air temperatures ○ Air/noise pollution ○ Subjected to flash floods ○ Restriction of publicly accessible areas / green spaces and pedestrian movement. ○ Unprivileged local communities that lack attention ○ High density low income Housing

The goal is to develop context-sensitive solutions that help in enhancing the environmental sustainability in the area, as well as improve the quality of life for the Nazzal neighbourhood residents, table 3, figure 5.

Table 3: Criteria for Nazzal; Corresponding Integrative sustainable design approaches to Nazzal's challenges with a focus on local communities' participation and environmental enhancement. Prepared by the researcher – according to site observation and referenced to conclusions from theoretical studies, literature review, and examples from previous chapters.

Main Categories		**Indicators for Environmental Enhancement**	
Integrative Sustainable Groups		**Sub Groups**	**Suggested Applications for Community Engagement**
Physical Perspective	**Sustainable Architecture**	**Community-Centered Design**	**Participatory planning and design**
			Inclusive and accessible spaces
			Integration of community-specific needs and preferences
		Sustainable Materials and Construction	**Use of locally sourced and recycled materials**
			Energy-efficient construction techniques and materials
			Low-carbon building practices
		Energy Efficiency	**Solar panels for heating and hot water**
			Renewable energy generation
		Water Conservation and Management	**Integrate Rainwater harvesting**
			Utilize Water-efficient fixtures
	Sustainable Landscape	**Community Gardens and Green Spaces**	**Creation of shared public green spaces**
			Urban agriculture initiatives
			Educational programs on sustainable gardening
		Urban Greening (Community Scale)	**Utilize Green roofs/Vertical walls**
			Install Street Trees – Energy efficient Landscaping fixtures
			Develop Private Gardens – In between buildings Green Spaces
		Biodiversity Conservation	**Encourage Planting native species**
Social Perspective	**Community Engagement**	**Participatory Planning and Design**	**Community workshops and meetings**
			Collaborative decision-making
		Educational Programs	**Workshops on sustainable landscaping and architecture**
			Awareness exchange through social media platforms
			Citizen advisory boards, and focus groups

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

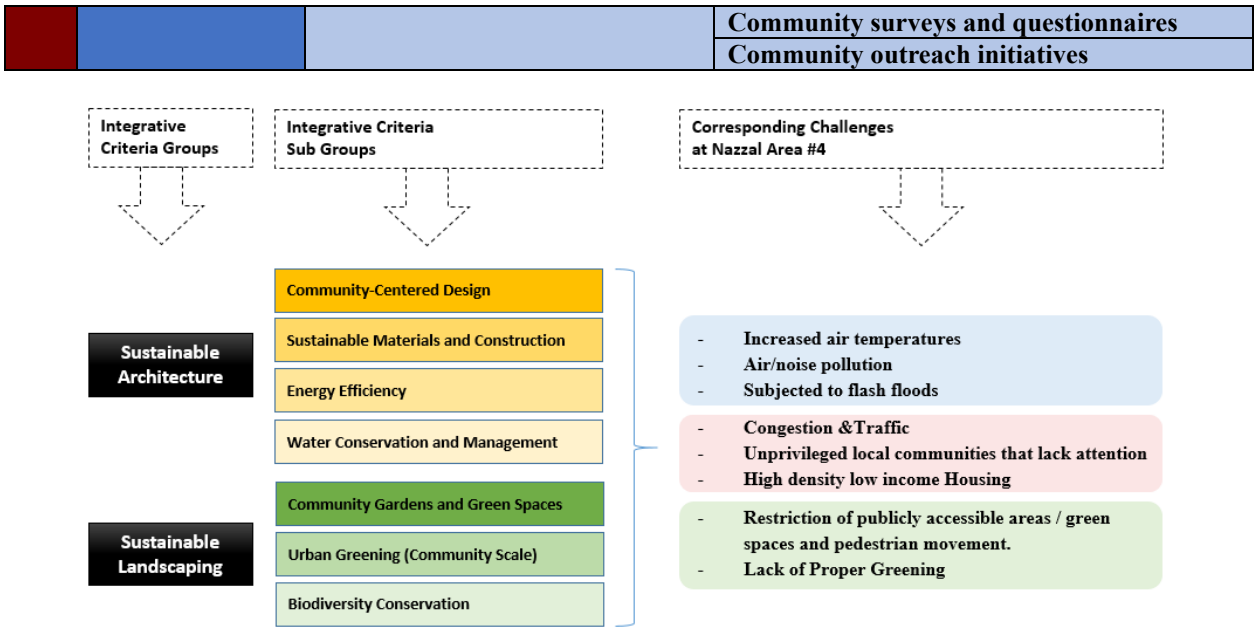

Figure 5: Summary of the challenges of Nazzal's at the Problematic Area #4 to criteria groups.

3.2 Methodology

3.2.1 Methods of Data Collection

The study uses a mixed methodology approach in collecting the needed data comprehensively on the environmental challenges of the study area, as well as to the potential for integrative sustainable architecture/landscape design in the Nazzal neighborhood, with a focus on the Al-Dra'a sub neighborhood and its specific problematic #area 4. The methods for the data collection included the following:

a- Observations to the site; direct observations were conducted in the selected area of Al-Dra'a in Nazzal for the purpose of documenting its existing urban conditions, which included data about building degradation, patterns of land use, quality of existing infrastructure, and green spaces availability. These observations conducted by the researcher provided some of the qualitative data needed regarding the physical conditions, characteristics and environmental challenges of the study area which helped in informing the development of the questionnaire survey and mapping analysis.

b- Questionnaire Surveys; Firstly, the study conducted a structured survey with the Local Community that was developed for the purpose of gathering quantitative and qualitative data from a representative sample of 193 residents in problematic area 4. The questionnaire included sections on socio-demographic information, perceptions of building conditions, land-use organization, and community engagement in sustainable practices in the form of closed-ended questions that were used to quantify residents' perceptions. Secondly, Expert Group Interviews in the for of in-depth interviews as the researcher in the questionnaire used both closed ended and open ended questions. The expert group was limited to 10 experts upon availability to participate and were chosen to represent several perspectives, including policymakers, stakeholders, architects, and planners from the Greater Amman Municipality. These interviews aimed to gather expert opinions on regulatory frameworks, current urban conditions, and the feasibility of implementing sustainable design strategies. The expert group interviews was helpful as they provided critical views and insights about the practical aspects as well as some policy related aspects regarding the environmental enhancement for the Nazzal area.

c-Mapping Analysis**;** the researcher analyzed and visualized the available spatial data of the study area from aspects related to land use, street networks, topography, and environmental hazards to help in identifying the specific areas with problems and also understand the spatial distribution of the environmental challenges present in the study area for the purpose of informing integrative sustainable architecture/landscape design criteria and its application in the study area. The researcher retrieved mapping data from several sources, namely; the GAM- greater amman municipality, Google maps, and Google earth pro.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

3.2.2 Data Analysis and Analytical Framework of the Study

Quantitative data from the community survey was analyzed, this analysis used descriptive statistics for the purpose of identifying relevant patterns and existing trends in residents' perceptions. Also, Qualitative data from both community surveys and the interviews with experts was analyzed using content analysis which helped in identifying the main themes and understand expert insights. Moreover, the results of the mapping analysis was used to create visual representations of the areas with problems within Nazzal which helped in directing and aiding the analysis of the questionnaire data. The study, with those methods, provided a general broad understanding of the environmental challenges and opportunities for integrative sustainable design in Nazzal, enabling the development of context-sensitive guidelines for environmental enhancement."

The following in Figure 6 is the methodological approach for this study, summarized in an analytical framework for integrative sustainable design.

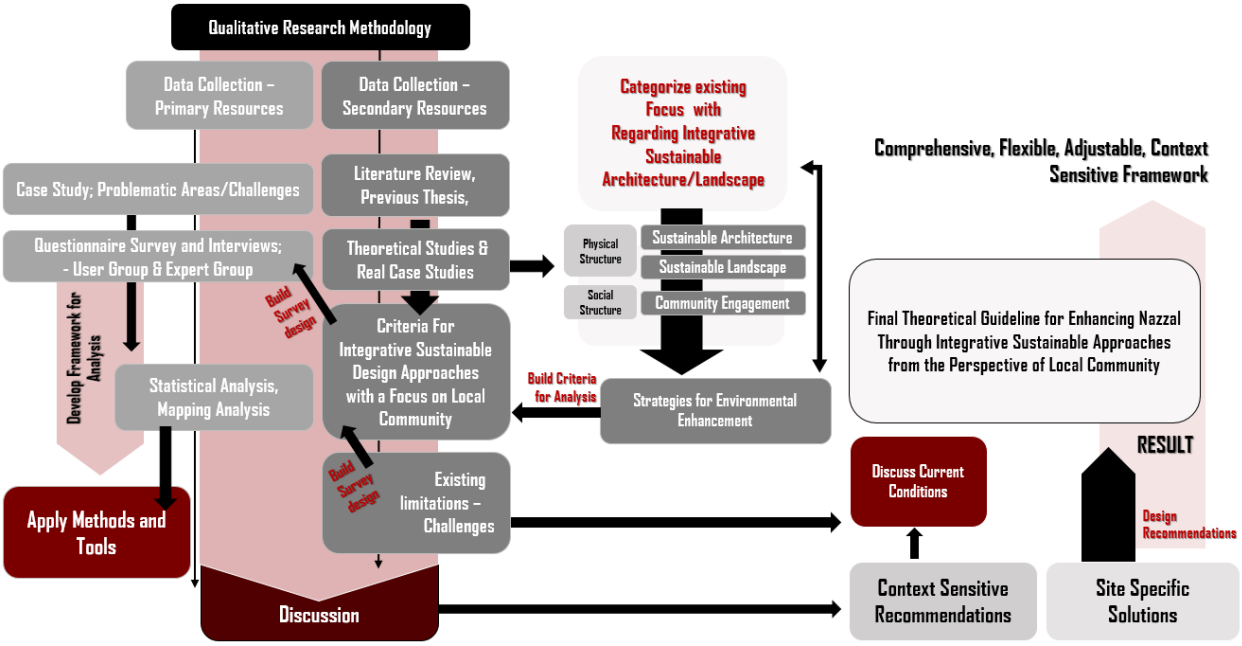

Figure 6: Analytical framework for integrative sustainable design of the study.

4 RESULTS

4.1 Analysis of Survey: Local Community and Expert Group

The community survey revealed that the residents of Nazzal represent a population that is facing many social and economic challenges that include challenges of poverty as it was noted to be present in high levels, also disadvantages in education, as well as housing insecurity. The residents of Nazzal are well aware to the problems within their built environment as they perceive it as a degraded setting that is characterized by building deterioration, land use that is unorganized, infrastructure that is inadequate, and a context that lacks open and green spaces. Data also revealed that even though there is some interest in sustainable practices at an individual level in areas like energy efficiency, yet the data revealed that there is some limitation to the general community engagement in the broader planning and decision-making processes. The study suggests that this limitation is most likely influenced by some factors present in the community member of the study area, which include issues like lack of the awareness, also trust issues, and the competing priorities that are related to the basic needs of them. As such, the findings of the survey shows that there is a pressing need for interventions in that matter, like interventions to address the physical aspect of Nazzal as well as the social aspects of its local community for the purpose of empowering the residents to engage and actively participate in the improvement of their living conditions.

As for the expert group survey, it helped in understanding the perceptions of the local community's in a way that highlights specific challenges like the inadequacy of the current existing regulations, also building

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

deterioration prevalence, and the challenges that are present due to the unorganized land use and insufficient in adequate infrastructure of Nazzal. From the survey, the study reveals how the experts emphasizes the importance of practices of sustainable design particularly those regarding matters like energy efficiency and water conservation. It also acknowledges from the experts how there might be difficulties facing their implementation for reasons like constraints in available resources and complexities in the context of the setting of the study area. The experts acknowledged how significant community-centered design is, also acknowledged the importance of participatory planning which recognizes the actual need and value of involving the local residents in the decision-making processes in planning for and implementing enhancement projects. However, the experts also pointed out that the challenges of achieving community engagement in an effective way includes the need to firstly build trust and also overcome any socio-economic barriers within the local communities. Additionally, the expert group opinions focused on the need to develop and reform the current existing regulations in a way that addresses the social and environmental wellbeing of Nazzal in a better appropriately.

4.2 Design Guidelines and Recommendations

Both the community and expert perspectives identified the needs and challenges of the study area, and based on them, this study proposes a set of design guidelines and recommendations for environmentally developing Nazzal, taking into regard community engagement. The proposed set of guidelines and recommendations focus on and aim at addressing the specific issues facing Nazzal which include ; degradation of buildings, the unorganized mixed land use, the deficiencies in the existing infrastructure systems, and the lack of open and green spaces. They also focus on achieving local community engagement as well as promote the use and application of sustainable practices and development. The guidelines in general focus on the improvement of the building conditions where strategies for retrofitting the existing buildings and promoting sustainable building and construction practices. The guidelines also focus on enhancing the architectural design elements in the setting of the study area in a way that can properly respond to climate conditions as well as address some aesthetic concerns that are relevant. Also, the guidelines focus on optimizing land use and the study concludes into some recommendations for integrated planning for issues such as the use of land, management of traffic, and creating accessible open green spaces. Moreover, the guidelines of the study focus on the enhancement of Infrastructure like improving conditions of the road network as well as in the water and sanitation systems, and taking measures to improve the energy efficiency. Additionally, the guidelines call for promoting community engagement as it suggests strategies for participatory planning, building trust in authorities and decision-makers, and addressing issues that help in leveraging the social media platforms for communication and advocacy. Furthermore, the guidelines of the study recommend the integration of sustainable architecture/landscape design practices by implementing urban GI- green infrastructure and encouraging the use of sustainable resources and materials. Finally, the regulatory framework within its guidelines recommend that the regulations are updated to include aspects covering both social and environmental well being.

To this end, these guidelines and recommendations will be tailored to the specific context and setting of the study area at Al-Dra'a in Nazzal taking into consideration many factors like needs of the community members, the constrains to its resources, and characteristics of their culture. Also, they emphasize how important it is to build approaches that are built on collaborations and that involve all residents, local authorities, and experts in the design and implementation process of environmentally enhancing Nazzal.

5 DISCUSSION OF FINDINGS

This research with, in its methodology, examined the possibility of the application of the integrative sustainable architecture / landscape design approaches in the challenging context of Al-Dra'a, Nazzal, Amman. The study's most significant contribution lies in its development of a context-sensitive framework (Table 3), which provides a tangible pathway for environmental enhancement in resource-constrained, unplanned urban settings. This framework, directly informed by both community and expert perspectives, emphasizes the critical need for updated regulations, robust sustainable design practices, and, crucially, community-centered approaches.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

Table 3: Guidelines Framework with Criteria and Strategies for Environmentally enhancing existing contexts through integrative sustainable architecture/landscape design. Prepared by the researcher –as adapted according to experts' perspectives on the study area.

Category		Criteria	Applicability	Strategies: Suggested Applications and Indicators for environmental enhancement
Key Integrative Architecture/Landscape Sustainable Aspects	CURRENT CONDITIONS	**Multidisciplinary Collaboration**	✓	Architects, urban planners, landscapers, and policymakers at local municipalities collaborate to enhance current regulations regarding social and environmental factors, promote sustainability and address community needs
		Balance Between Built Environment and Nature	✓	Raise green areas regulations, increase urban Greening, Increase green Areas. Address violations of physical structures within regulations on behalf of context and enhance building codes accordingly.
		Physical structure and infrastructure quality/stability	✓	Prevent the informal construction and building violations, enhance stability in the deteriorated structures, and provide adequate infrastructure systems like sanitation – water – electricity – streets - basic amenities.
		Architectural style - Design	✓	Develop relevant codes and regulations that help raise aesthetics and unify materials and heights.
		Indoor Air – light quality; Climate Responsiveness	✓	Develop codes and regulations to address local climate, install elements to enhance passive cooling and lighting, focus on building orientation and form, utilize locally available materials,
		UHI Mitigation	✓	Increase urban landscaping and enhance land use regulations to prevent congestion.
	SUSTAINABLE DESIGN PRACTICE	**Energy efficiency**	✓	Reduce energy consumption measures; Solar panels for heating, photovoltaic cells for electric power generation; lower energy costs for residents and mitigate climate change to Improve living conditions and reduce environmental impact. Regulations and codes that focus on insulation. Raise awareness on using energy-efficient appliances.
		Integration of renewable energy	✓	Renewable energy utilization for heating/cooling buildings; raise awareness on energy efficient solution implementation in the community
		Sustainable materials /resources		Integrate local materials into the physical structure and create codes to restrict the use of non-local materials. Encourage the use of local building materials and native greenery
		Water conservation and management	✓	Install stormwater harvesting systems on buildings for second-hand use, such as flushing, and increase urban greening with efficient irrigation systems. Raise awareness of water scarcity and water conservation strategies; greywater reuse.
		Include Green Infrastructure	✓	Inner city GI – green infrastructure, like street trees, green roofs/walls, preamble pavements, green space, vegetated surfaces, amongst others.
		Integration of nature into urban areas	✓	Increase urban landscaping and green Infrastructure elements. Plan for livable spaces through regulations for implementing urban green spaces, neighborhood parks, and community gardens.
		Environmental Responsibility	✓	Raise awareness in the local community and teach sustainable practices.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

		Regenerative Design	✓	Approach integrative sustainable context-sensitive strategies, raise resources and awareness to implementing sustainable design practices.
		Community-centered Design	✓	Take sustainable decisions at the scale of the community and also the individual to enhance the human health and well-being and also help in responding to community needs and preferences
		Biodiversity Conservation	✓	Green infrastructure - GI, sustainable land use planning, and community education. Create green open spaces, protect the existing vegetation / green spaces, and promote environmental awareness.
		Ecosystem Restoration and Enhancement	✓	Raise green area regulations and increase urban greening.
		Promote Resiliency	✓	Decrease existing vulnerabilities in urban communities and both natural and built environments.
	COMMUNITY ENGAGEMENT	**Planning and Development**	✓	Engage in developing private green spaces like private green spaces, community gardens, &public Areas. Also, raise awareness and encourage community participation. Acknowledge existing limitations, challenges, and Barriers. Emphasize ownership and empower local communities, highlighting collaboration and trust.
		Decision Making	✓	Workshops, public meetings and focus groups. Also, explore alternative approaches like social media. Highlight the importance of follow-up. Focus on Accessibility and Inclusivity.
		Social media	✓	Utilize relevant social media platforms for information dissemination, also, facilitate communication, and support community in their development projects.

The key findings of this study revealed a big disconnection between how residents are aware of the environmental degradation in their living area and their engagement and willingness to engage in active participation within planning and implementation processes of development which highlight how urgent it is needed to address the existing barriers they are facing like a limitation in information accessibility as well as lack of their trust in local authorities and decision-makers. Also, the study sheds light on how the role of the multidisciplinary collaboration is important in filling the gap between the theory of sustainable design and its practices in a context-specific way.

To this end, this study bring contributions to the filed of environmental sustainable development from several areas as it provides a practical and adaptable framework that integrates sustainable architecture/landscape design principles in unplanned urban settings as a model that can be generalized and applicable globally in similar urban contexts. Also, the study demonstrates a gap that is seen to exist between community awareness and effective participation which offers important insights that can help in developing inclusive urban development strategies. Moreover, the study generates some actionable design guidelines that are based upon the interviewed expert knowledge as well as tailored based on the surveyed community needs, which makes them directly applicable to urban planning and policy studies and practices. Furthermore, the study emphasis on efforts for the reinforcement of all necessity disciplines to collaborate in addressing complex urban environmental challenges. Finally, the study expands the knowledge on environmental sustainability especially within challenging complex urban contexts like unplanned poor urban areas, while at the same time focuses on the specific needs of marginalized communities within them.

6 CONCLUSION:

The presence of the opinions of both local community members and experts from the field stresses on the urgent need to address the existing challenges within the environment and the social structure at the study area at Al-Dra'a, Nazzal. The results from the survey revealed how the local community is well aware of its current

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

challenges in many aspects like to their degraded living conditions, an issue that a group of experts suggested facing by using some sustainable practices and solutions. However, the study revealed that for achieving a successful implementation to those suggested solutions depends on realizing and overcoming the existing challenges and barriers which include resources limitations, lack of trust towards local authorities and decision makers by local community members, and the presence of significantly competing priorities for them. The study within its findings as well highlight the need for a developing a comprehensive approach that integrates some physical interventions along with social and economic empowerment in a way that must prioritize issues regarding the engagement of the local community to ensure that all residents of the study area are benefit from the development plans and also act as active participants in the process of transforming their challenging neighborhood.

The study suggests that the future research and development efforts must take into consideration developing actual pilot projects to demonstrate if the suggested framework for environmental enhancement tailored by this study is feasible and effective with all its proposed design guidelines and recommendations in an approach that can foster a culture of collaboration and sustainability in areas similar to Al-Dra'a, Nazzal. As such, the future research that can come from this study can include exploring the scalability of its proposed framework with its guidelines to other and broader urban contexts, it can also imploy participatory research methods within its methodology to gain more exact perceptions from the local community.

Also, future research can focus on investigating strategies to overcome issue the emerged due to lack of data, integrate other disciplines within its perspective like social sciences that can make the framework more comprehensive, conduct longitudinal studies that help in assessing the effectives of the proposed integrative approach in the long term perspective as a way to further advance the field of environmental development that regards local communities and sustainable live in urban contexts.

REFERENCES:

1. Kibert, C. J. (2016). "Sustainable Construction: Green Building Design and Delivery." Wiley.
2. Pless, J. D., & Ferry, A. F. (2019). "Sustainable Building Design: A Systems Engineering Approach." Wiley.
3. Carrilho, J., & Trindade, J. (2022). Sustainability in peri-urban informal settlements: a review. Sustainability, 14(13), 7591.
4. U.S. Green Building Council (USGBC). (2021). "LEED v4 Building Design and Construction (BD+C): Sustainable Design and Construction." USGBC.
5. Steiner, F. (2014). "The Living Landscape: An Ecological Approach to Landscape Planning." Island Press.
6. Cabezas, A. L. (2014). "Sustainable Architectural Design: An Overview." Sustainable Development.
7. U.S. Environmental Protection Agency (EPA). (2000). "The Low Impact Development Design Strategies: An Integrated Design Approach." EPA 841-B-00-003.
8. Dunnett, N., & Kingsbury, N. (2004). "Planting Green Roofs and Living Walls." Timber Press.
9. Boeri, S., et al. (2019). "Architectural Integration of Renewable Energy Sources and Technologies: A Review." Sustainability, 11(11), 3001
10. Grant, G., & Barton, H. (2006). "Sustainable Urban Development: An Overview and Analysis of Contemporary Urban Planning Initiatives." The Geographical Journal, 172(3), 195-212.
11. Reed, W. (2009). "Towards Sustainable Cities: How the Integration of Landscape and Ecology Can Contribute to Sustainability." In Sustainable Development: Principles, Frameworks, and Case Studies (pp. 241-253). CRC Press.
12. Downton, P. (2015). "Sustainable Architecture in Australia." Routledge.
13. Colding, J., & Barthel, S. (2019). "Exploring the Social-Ecological-Technological Effects of Green Roof Adoption in the Context of Urban Sustainability." Sustainability, 11(8), 2359.
14. United Nations. (1987). "Our Common Future: Report of the World Commission on Environment and Development (Brundtland Report)." Oxford University Press.
15. United Nations Environment Programme (UNEP). (2016). "Eco-innovation in Industry: Enabling Green Growth." UNEP Division of Technology, Industry, and Economics.
16. "The Sustainable Development Goals Report." United Nations. (2019).

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

17. www.bioregional.com/projects-and-services/case-studies/bedzed-the-UK's-first-large-scale-eco-village, Accessed in Oct 2023
18. www.docksidegreen.com, Accessed in Oct 2023
19. growbainbridge.com, Accessed in Oct 2023
20. Fraker, H. (2013). Vauban, Freiburg, Germany. The Hidden Potential of Sustainable Neighborhoods, 97–119. doi:10.5822/978-1-61091-409-3_5
21. Thematic Kampung programme. (2021). How the Healthy Cities initiative is paving the way for health and well-being in Indonesia. https://www.who.int/ . Accessed in December 2023.
22. Potter, R. B., Darmame, K., Barham, N., & Nortcliff, S. (2009). Ever-growing Amman, Jordan: Urban expansion, social polarisation and contemporary urban planning issues. Habitat international, 33(1), 81-92.
23. Map of Jordan within Adjacent countries, locating Amman City, Retrieved online from Newworldencyclopedia.org.
24. Map of Amman Highlighting Nazzal; "Bader" boundaries in Red, Retrieved online from Nationstates.com.
25. Greater Amman Municipality GAM, 2023
26. Ababsa, M. (2010, July). The evolution of upgrading policies in Amman. In Sustainable Architecture and Urban Development.