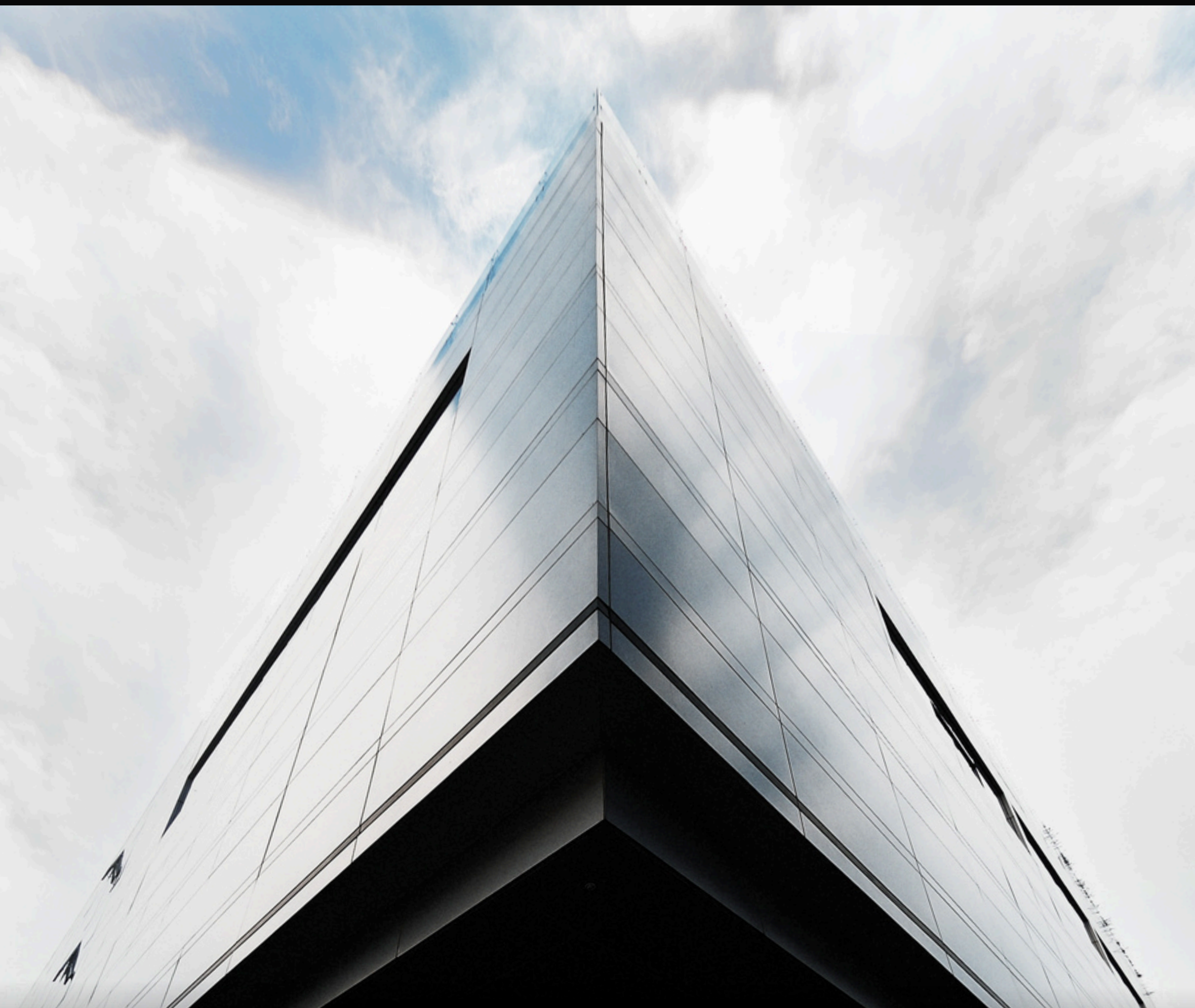

SMART LANDSCAPES

DIGITAL TOOLS, DESIGN AND CULTURAL CONTEXT

EDITOR
Zuhairu ADO

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PREFACE

This volume explores the evolving relationship between digital innovation and landscape practice. As technology reshapes how we design, build, and interpret our environments, these chapters offer timely insights into its transformative impact on both technical processes and cultural meaning.

The first two chapters examine the integration of digital tools - ranging from general technologies to specialized systems like GIS, BIM, and VR - into landscape technology and design. They highlight how these tools enhance precision, visualization, and collaboration, redefining the possibilities of landscape planning and implementation.

The final chapter shifts focus to the cultural dimension, exploring how landscapes reflect and preserve local identity. It emphasizes the importance of grounding technological progress in cultural context, ensuring that innovation supports, rather than erodes, the unique character of place.

Editorial Team
January 17, 2026
Türkiye

CHAPTER 1
INTEGRATION OF DIGITAL TECHNOLOGY IN LANDSCAPE TECHNOLOGY

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INTRODUCTION

The rapid development of digital technologies has transformed various fields, including landscape technology. Integrating digital solutions such as Geographic Information Systems (GIS), drones, 3D modeling, Artificial Intelligence (AI), and smart sensors has revolutionized planning, design, and maintenance of landscapes. This paper examines the role of digital technology in modern landscape technology, highlighting the opportunities and challenges that accompany its adoption.

Data were collected through secondary sources, and the analysis emphasizes how the integration of digital tools enhances precision, sustainability, and efficiency in landscape management. Findings reveal that digital technology enables real-time data collection, improves environmental monitoring, reduces costs, and enhances aesthetic design. The paper concludes that effective integration of digital technology in landscape technology fosters innovation, sustainable development, and resilience in the built environment, particularly in developing countries (World Bank, 2023; UN, 2021).

Landscape technology traditionally relied on manual labor and conventional techniques for design, monitoring, and maintenance. However, globalization and the Fourth Industrial Revolution have introduced sophisticated digital solutions, reshaping the practice. Digital technology now plays a critical role in environmental conservation, urban planning, agriculture, and construction, allowing experts to achieve sustainable results with greater accuracy and efficiency (Smith, 2020; Zuo & Zhao, 2019). This paper explores how digital technology is integrated into landscape technology, its implications for environmental and urban development, and the challenges associated with its adoption.

1. LITERATURE REVIEW

Previous studies highlight the significance of integrating digital tools into natural and artificial landscape management. GIS, remote sensing, drones, and computer-aided design (CAD) software have proven essential for accurate mapping, monitoring vegetation, soil quality, and land use (Li & Zhao, 2020; Chen et al., 2021). Smart irrigation systems powered by IoT have been widely adopted to optimize water usage, promoting sustainability (Ahn & Lee, 2022).

AI and machine learning further provide predictive models for soil fertility, climate change impact, and urban green planning (Xu & Chen, 2021). Scholars such as Smith (2020) emphasize that technology not only enhances efficiency but also supports eco-friendly practices. In contrast, Johnson (2022) and Nyathi and Dlamini (2023) point out challenges such as high cost of implementation, lack of technical expertise, and inadequate policy frameworks in developing economies.

2. METHODOLOGY

The paper adopts a qualitative research approach, relying on secondary data from academic journals, reports, and case studies. Comparative analysis of countries that have successfully integrated digital technology in landscape management was also conducted (EEA, 2022).

3. DATA ANALYSIS AND FINDINGS

Table 1. Applications of Digital Technology in Landscape Technology

Digital Tool	Application Area	Benefits	Challenges
GIS & Remote Sensing	Mapping & Land Use Analysis	Accurate mapping, spatial analysis (Li & Zhao, 2020)	High setup cost
Drones	Aerial Survey & Monitoring	Real-time imagery, time efficiency (Chen et al., 2021)	Requires skilled operators
IoT Smart Sensors	Irrigation & Soil Monitoring	Water efficiency, climate adaptability (Ahn & Lee, 2022)	Maintenance cost
AI & Machine Learning	Predictive Analysis	Climate modeling, sustainability (Xu & Chen, 2021)	Data privacy concerns
3D Modeling & CAD	Landscape Design	Visual accuracy, reduced error (Smith, 2020)	Software cost

Findings show that integrating these tools contributes to sustainable landscape management. Developed countries benefit greatly, while developing nations face adoption challenges due to financial and infrastructural constraints (Nyathi & Dlamini, 2023).

Discussion

The integration of digital technology into landscape technology enhances decision-making, improves efficiency, and fosters environmental sustainability. GIS and remote sensing provide accurate land-use planning data, while drones facilitate cost-effective monitoring of vast landscapes (Chen et al., 2021). IoT-driven irrigation ensures sustainable use of water resources, particularly in arid regions (Ahn & Lee, 2022). AI strengthens predictive capabilities, making landscapes resilient to climate change (Xu & Chen, 2021).

However, barriers such as high costs, insufficient expertise, and lack of policy support in developing nations hinder full-scale implementation (Johnson, 2022; Nyathi & Dlamini, 2023). Collaboration between governments, private sector, and academic institutions is necessary to overcome these challenges (World Bank, 2023).

CONCLUSION

The integration of digital technology in landscape technology is a transformative force in modern environmental and urban planning. It enhances sustainability, optimizes resource use, and supports climate resilience (UN, 2021; Smith, 2020). Despite challenges in developing countries, particularly in Africa, strategic investments, policy reforms, and capacity building can bridge the technological gap (Nyathi & Dlamini, 2023). Future advancements are expected to further revolutionize landscape technology, making it more inclusive, efficient, and environmentally friendly.

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CHAPTER 2
INTEGRATION OF DIGITAL TECHNOLOGIES (GIS, BIM, VR) IN LANDSCAPE DESIGN

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INTRODUCTION

Landscape design, as a discipline, has always been deeply connected to the interaction between people, nature, and the built environment. Traditionally, designers relied on manual drawings, physical models, and site surveys to communicate their ideas and evaluate landscape performance. While these methods provided creative freedom and tangible insights, they were often time-consuming, limited in accuracy, and less adaptable to the complexities of modern urban and ecological challenges. In recent decades, however, landscape architecture has undergone a paradigm shift, driven by the rapid evolution of digital technologies. Tools such as Geographic Information Systems (GIS), Building Information Modeling (BIM), and Virtual Reality (VR)—once confined to specialized fields like urban planning, construction engineering, or gaming—are now integral to landscape design workflows. These technologies empower designers, planners, and stakeholders to visualize, simulate, and manage landscapes with unprecedented efficiency and precision.

The adoption of digital technologies has transformed conventional design processes into dynamic, data-driven, and immersive experiences. GIS enables the analysis of spatial data across multiple layers—topography, hydrology, soil composition, vegetation cover, and climate—allowing designers to ground their proposals in environmental realities. BIM extends this functionality into construction and lifecycle management, providing detailed models of terrain, infrastructure, vegetation, and maintenance schedules. VR, on the other hand, offers immersive environments where stakeholders can virtually walk through future landscapes, exploring their scale, aesthetics, and functionality before a single tree is planted or stone is laid.

Beyond these core tools, complementary technologies such as Augmented Reality (AR), Artificial Intelligence (AI), and Digital Twins are further redefining landscape practice. AR overlays design models directly onto real-world sites, aiding on-site decision-making and stakeholder engagement. AI introduces predictive capabilities, from optimizing irrigation systems to simulating long-term ecological impacts under climate change scenarios. Digital Twins combine real-time data streams with virtual models, enabling continuous monitoring of landscape performance, from air quality to biodiversity health.

Collectively, these innovations enhance not only the precision of design but also its sustainability and inclusivity. Digital tools support collaborative workflows, enabling architects, ecologists, engineers, policymakers, and local communities to co-create landscapes. They foster evidence-based decision-making, ensuring that designs are not just aesthetically appealing but also resilient, cost-effective, and environmentally responsible.

This chapter, therefore, explores the applications, benefits, and challenges of integrating digital technologies in landscape design. It highlights how GIS, BIM, and VR contribute to better-informed planning, immersive visualization, and streamlined project execution. Furthermore, it discusses emerging trends—including AI-driven generative design, real-time monitoring through Digital Twins, and the role of AR in participatory planning—illustrating how the discipline is evolving toward next-generation landscape architecture that is adaptive, intelligent, and future-ready.

1. ROLE OF GIS IN LANDSCAPE DESIGN

1.1 Overview of GIS in Landscape Architecture

Geographic Information Systems (GIS) represent one of the most transformative digital technologies in landscape design, providing a structured framework for capturing, storing, analyzing, and visualizing spatially referenced data. Unlike traditional two-dimensional drawings or static maps, GIS operates as a multi-layered database environment, allowing designers to integrate diverse datasets—ranging from topography and soil conditions to climate projections and land-use patterns—into a single decision-support platform.

For landscape architects, GIS serves as both an analytical engine and a communication tool. It enables evidence-based site analysis, supports predictive modeling of ecological and urban processes, and facilitates stakeholder engagement through interactive and visually rich mapping interfaces. By transforming raw geospatial data into meaningful insights, GIS ensures that landscape design is informed by accurate, real-world conditions rather than assumptions or generalized data.

1.2 Data Acquisition and Integration in GIS

The utility of GIS in landscape design largely depends on the quality and comprehensiveness of its data inputs. Modern GIS platforms integrate information from a wide variety of sources:

Remote Sensing Data: High-resolution satellite imagery, LiDAR (Light Detection and Ranging), and drone-based photogrammetry enable precise terrain mapping, canopy cover assessment, and hydrological modeling.

Survey and Ground Data: On-site surveys, soil samples, and vegetation inventories can be digitized and linked to GIS layers for micro-level design precision.

Environmental and Climatic Datasets: Climate models, rainfall patterns, temperature records, and pollution data provide insights into long-term environmental suitability.

Socio-economic and Demographic Data: Population density, cultural heritage sites, land ownership, and zoning regulations are integrated to ensure socially sensitive and legally compliant design.

By layering these datasets, GIS allows designers to identify constraints, opportunities, and synergies across natural and human systems.

1.3 Technical Applications of GIS in Landscape Design

Site Suitability Analysis

GIS enables multi-criteria decision analysis (MCDA) by combining factors such as slope, soil type, water availability, accessibility, and vegetation. Using weighted overlays, designers can determine the most suitable zones for recreational parks, urban green corridors, or ecological restoration projects.

Hydrological and Environmental Modeling

GIS supports advanced hydrological modeling by simulating water flow patterns, watershed boundaries, and storm water runoff. This is essential for designing rain gardens, wetlands, and green storm water infrastructure that mitigate flooding risks and enhance water quality.

Landscape Ecology and Habitat Connectivity

Through spatial analysis, GIS helps identify habitat fragmentation and ecological corridors. Designers can plan green infrastructure networks that support biodiversity, such as wildlife crossings, riparian buffers, and continuous greenways.

Climate Resilience and Risk Assessment

Using predictive climate data, GIS allows the mapping of heat islands, flood-prone areas, and erosion risks. This informs adaptive landscape strategies such as drought-tolerant planting schemes, urban forestry for cooling, and erosion-control measures.

Urban Landscape Planning

In urban contexts, GIS supports 3D city modeling, land-use planning, and transportation integration. By linking landscape features with built infrastructure, designers can create cohesive, sustainable, and user-friendly urban environments.

GIS as a Collaborative and Decision-Making Tool

Beyond technical analysis, GIS provides an **interactive platform** for collaboration:

Public Participation GIS (PPGIS): Citizens can contribute local knowledge; preferences and feedback through web-based GIS portals, ensuring designs reflect community needs.

Interdisciplinary Collaboration: Architects, engineers, ecologists, and policymakers can work on a shared GIS database, reducing data silos and miscommunication.

Scenario Simulation: Designers can test multiple landscape scenarios under varying assumptions (e.g., population growth, climate shifts, zoning changes) to inform strategic planning.

Benefits of GIS in Landscape Design

Data-Driven Precision: Designs based on empirical spatial data rather than subjective assumptions.

Sustainability Enhancement: Supports ecological sensitivity and resource-efficient planning.

Scalability: Applicable across scales, from micro-site designs to regional landscape systems.

Visualization and Communication: Interactive maps and 3D GIS improve communication with stakeholders.

Long-Term Monitoring: GIS databases can be continuously updated for maintenance and post-occupancy evaluation.

Technical Challenges in GIS Application

While GIS offers immense potential, its integration into landscape architecture is not without limitations:

Data Accuracy and Resolution: Low-resolution or outdated datasets can lead to flawed designs.

Interoperability Issues: Difficulty in integrating GIS data with BIM and VR platforms.

High Technical Expertise Requirement: Effective use requires training in geospatial analysis and software tools such as ArcGIS, QGIS, or GRASS GIS.

Cost and Licensing: Commercial GIS software and high-resolution data acquisition can be expensive.

2. BIM FOR LANDSCAPE ARCHITECTURE

2.1 Introduction to BIM in the Landscape Domain

Building Information Modeling (BIM) is traditionally associated with the design and management of buildings and civil infrastructure. However, its scope has expanded to include landscape architecture, giving rise to the concept of Landscape Information Modeling (LIM) or Landscape BIM (LBIM). At its core, BIM is a data-rich 3D modeling process that enables the creation, management, and exchange of digital representations of physical and functional characteristics throughout a project’s life cycle. For landscape architects, BIM provides a centralized, parametric, and information-driven platform that supports design, documentation, construction, and maintenance of outdoor environments.

Unlike conventional CAD-based approaches that focus solely on geometry, BIM integrates metadata (materials, performance criteria, maintenance schedules, costs) into each modeled component—whether it is a tree, irrigation pipe, retaining wall, or pedestrian pathway.

2.2 Core Principles of BIM Applied to Landscapes

The adaptation of BIM in landscape design is underpinned by several core principles:

Parametric Modeling: Landscape elements (e.g., terrain surfaces, vegetation, pavements) can be defined parametrically, meaning they update automatically when input parameters change (e.g., slope adjustments update grading and drainage).

Information-Rich Objects: Every component is linked with attributes such as species type, soil requirements, irrigation demand, or carbon sequestration potential.

Lifecycle Integration: BIM supports all phases of landscape projects: conceptual design, design development, construction documentation, facility management, and long-term operations.

Collaboration and Interoperability: BIM provides a shared digital environment that connects architects, engineers, contractors, ecologists, and facility managers through common standards (e.g., IFC – Industry Foundation Classes).

2.3 Technical Applications of BIM in Landscape Architecture

Terrain and Topography Modeling

BIM platforms allow for digital terrain modeling (DTM) where contour data, LiDAR scans, or GIS-derived elevation models are imported to create accurate topographic surfaces. These can be further refined to design grading plans, retaining walls, slopes, and drainage systems.

Vegetation and Planting Design

Each plant species can be represented as a smart object with embedded metadata such as botanical name, canopy spread, growth rate, water needs, and maintenance schedules. Parametric plant libraries facilitate precise planting schedules, quantity take-offs, and sustainability assessments.

Irrigation and Stormwater Systems

BIM enables detailed modeling of subsurface irrigation networks, stormwater drains, bioswales, and retention basins. Hydraulic analysis tools can be linked to BIM to simulate water flow, ensuring efficient irrigation and flood resilience.

Hardscape and Site Infrastructure

Landscape BIM supports modeling of pavements, pathways, outdoor lighting, fencing, seating, playground equipment, and street furniture. Each object can be assigned material properties (permeability, durability, maintenance cost), enabling material performance analysis and life cycle costing (LCC).

Integration with Buildings and Urban Systems

Since landscapes interface with buildings, transportation systems, and utilities, BIM ensures alignment by integrating with architectural and engineering BIM models. This enables seamless coordination in urban parks, campuses, transit-oriented developments, and smart city projects.

Construction Sequencing and Simulation (4D BIM)

BIM extends to time-based simulation (4D), where landscape construction processes are visualized. This allows planners to optimize sequencing of grading, planting, and infrastructure installation while minimizing site disturbance.

Cost Estimation and Resource Planning (5D BIM)

With embedded material and labor cost data, BIM automatically generates bill of quantities (BoQ) for soils, plants, paving materials, and irrigation systems, supporting accurate budgeting and resource allocation.

Facility Management and Maintenance (6D & 7D BIM)

In the post-construction phase, BIM transitions into asset management, where landscape components are monitored for performance. For example:

- Irrigation systems linked to IoT sensors for real-time water usage.
- Vegetation growth models updated for pruning schedules.
- Pavement condition logs for predictive maintenance.

2.4 Technical Benefits of BIM in Landscape Architecture

Data Integration: Combines geometric, ecological, material, and cost data in one model.

Accuracy in Documentation: Reduces errors in grading, planting, and construction drawings.

Performance Simulation: Enables analysis of stormwater behavior, shading, and carbon footprint.

Collaboration: Facilitates multi-disciplinary coordination, reducing design conflicts.

Lifecycle Sustainability: Tracks material use, water consumption, and maintenance costs over decades.

2.5 Challenges in Implementing BIM for Landscapes

Despite its benefits, BIM adoption in landscape architecture faces several hurdles:

Software Limitations: Most BIM tools (e.g., Revit, ArchiCAD) are designed for buildings, not outdoor environments. Specialized tools like Vectorworks Landmark and plugins for Revit are bridging this gap, but functionality is still maturing.

Data Complexity: Modeling natural systems (e.g., plant growth, hydrology) requires dynamic, non-linear data that traditional BIM platforms handle poorly.

Interoperability Issues: Integrating BIM with GIS, VR, and ecological modeling software requires standardized workflows.

Learning Curve and Cost: Requires specialized training and higher software licensing costs compared to CAD.

Cultural Resistance: Many landscape practitioners still rely on CAD or GIS, slowing the transition to BIM.

2.6 Future Directions for Landscape BIM

The evolution of BIM for landscapes is heading toward integration with advanced digital ecosystems:

BIM + GIS Integration: Real-time linking of spatial GIS data with BIM models for enhanced environmental analysis.

BIM + VR/AR: Immersive visualization of BIM landscapes for stakeholder participation and construction support.

AI-Driven Generative BIM: Use of artificial intelligence to generate optimized planting layouts, grading schemes, and resource-efficient designs.

Digital Twins: Dynamic, data-linked BIM models that update continuously using IoT sensors for adaptive landscape management.

3. VIRTUAL REALITY (VR) AND AUGMENTED REALITY (AR) IN LANDSCAPE DESIGN

In the realm of digital technologies applied to landscape architecture, Virtual Reality (VR) and Augmented Reality (AR) have emerged as powerful visualization and decision-support tools. Both technologies leverage immersive, real-time 3D environments to bridge the gap between abstract design concepts and tangible spatial experiences.

- VR creates a fully simulated environment that allows users to explore and interact with a proposed landscape before it is built.
- AR overlays digital landscape models onto real-world environments using mobile devices, tablets, or AR headsets, enabling real-time contextualization of designs within existing sites.

Together, VR and AR transform landscape design into an interactive, experiential, and participatory process, enhancing communication between designers, clients, policymakers, and communities.

3.1 Core Concepts

Virtual Reality (VR)

VR involves the use of head-mounted displays (HMDs), 3D models, and real-time rendering engines to immerse users in a fully digital representation of a landscape. Key concepts include:

Immersion: Users feel present within the virtual environment, enabling spatial awareness and scale perception.

Interactivity: Navigation through pathways, adjustment of views, and testing of design scenarios in real time.

Simulation: Environmental processes such as lighting conditions, vegetation growth, seasonal changes, and water flows can be simulated to enhance design evaluation.

Augmented Reality (AR)

Augmented Reality (AR) enhances landscape design by enriching real-world environments with digital layers of information and visualization. Through the use of technologies such as GPS positioning, computer vision, and advanced spatial mapping, AR overlays interactive 3D landscape elements, contextual annotations, and dynamic simulations directly onto physical sites. This integration allows designers, planners, and stakeholders to visualize proposed interventions within their actual environmental context, fostering a clearer understanding of spatial relationships, scale, and functionality. By merging the physical and digital realms, AR supports more informed decision-making, enables real-time design modifications, and enhances participatory engagement in the landscape design process. Key concepts include:

Contextual Visualization: Viewing a proposed tree line, water feature, or plaza directly on-site through a smartphone or AR glasses.

Real-Time Modification: Testing alternative plant palettes, furniture arrangements, or lighting designs instantly.

Blended Experience: Allows stakeholders to compare "before" and "after" conditions without fully leaving the real-world environment.

3.2 Technical Applications in Landscape Design

Design Development and Presentation

- VR enables designers to conduct virtual site visits, where stakeholders can experience a park, garden, or plaza at full scale.
- AR supports on-site visualization, showing clients how a design will integrate with existing topography, vegetation, and infrastructure.

Stakeholder and Community Engagement

- VR facilitates participatory planning, allowing communities to walk through proposed designs and provide feedback.
- AR supports public consultations by enabling citizens to see proposed urban green corridors or recreational areas on their own devices.

Environmental Simulation

- VR can simulate sunlight patterns, shadow casting, wind flows, and seasonal vegetation changes, enabling performance-based design decisions.
- AR assists in evaluating stormwater features, green roofs, or shading structures directly in the field.

Education and Training

- Landscape architecture students use VR for virtual design studios and site analysis in remote locations.
- AR enhances field-based education by overlaying plant information, historical maps, or ecological data during site visits.

Construction and Maintenance Support

- VR supports construction sequencing visualization, helping contractors understand grading and planting phases.
- AR enables facility managers to access hidden infrastructure (e.g., irrigation lines, drainage systems) by overlaying digital models on the real site.

3.3 Benefits of VR and AR in Landscape Design

Enhanced Spatial Understanding: Stakeholders perceive scale, proportion, and circulation patterns more effectively.

Improved Communication: Complex ideas are conveyed intuitively through immersive experiences.

Error Reduction: Early detection of design flaws before physical construction.

Increased Stakeholder Participation: Interactive tools empower communities to co-create and influence design outcomes.

Sustainability Support – Simulation of environmental scenarios promotes climate-resilient designs.

Technical Challenges

Hardware Limitations: VR requires high-performance graphics systems and headsets; AR depends on device precision and battery life.

Data Integration: Converting BIM or GIS data into VR/AR environments requires interoperability through platforms such as Unity, Unreal Engine, or Twinmotion.

Cost of Implementation: Professional VR/AR setups remain expensive for smaller firms.

User Comfort: Motion sickness and limited field-of-view in VR can reduce usability.

Accuracy and Scale: AR models may suffer from geolocation errors, affecting precision.

Future Trends in VR and AR for Landscape Architecture

Mixed Reality (MR): Integration of VR and AR for seamless transitions between real and virtual environments.

AI-Augmented VR/AR: Intelligent systems suggesting design improvements during immersive walkthroughs.

Cloud-Based Collaboration: Multi-user VR/AR sessions for distributed teams and stakeholders.

Holographic Visualization: Use of holograms for large-scale public engagement with landscape proposals.

Integration with Digital Twins: Linking VR/AR to real-time sensor data for adaptive landscape management.

4. INTEGRATION OF DIGITAL TECHNOLOGIES: TOWARD SMART LANDSCAPES

The digital transformation of landscape architecture does not occur in isolation through individual tools like GIS, BIM, or VR. Its full potential emerges when these technologies are integrated into a unified digital ecosystem that supports planning, design, construction, monitoring, and adaptive management. This convergence enables the concept of Smart Landscapes—landscapes that are data-driven, interconnected, and capable of responding dynamically to environmental and social changes.

Smart landscapes represent a paradigm shift where ecological, technological, and social systems are interwoven, supported by real-time data flows, advanced simulations, and collaborative decision-making platforms.

4.1 Core Components of Smart Landscape Integration

GIS + BIM Synergy

- GIS provides large-scale geospatial context—topography, hydrology, climate, and socio-economic data.
- BIM provides detailed, object-based modeling of designed landscape elements—planting beds, irrigation systems, hardscapes, and infrastructure.
- Integration enables macro-to-micro design workflows, where regional environmental data informs site-specific design, and detailed BIM data feeds back into regional planning systems.

VR/AR for Immersive Stakeholder Interaction

- GIS-BIM models can be exported to VR/AR environments for real-time visualization, simulation, and participatory design.
- VR supports immersive design validation, while AR provides on-site contextual overlays, enabling collaborative decision-making across disciplines and communities.

IoT and Sensor Networks

- IoT-enabled devices collect real-time environmental data (e.g., soil moisture, air quality, water levels, pedestrian flow).
- Data is fed into GIS/BIM environments to update models dynamically.
- Example: Soil moisture sensors integrated with BIM-linked irrigation systems to optimize water usage.

Digital Twins for Landscapes

- A Digital Twin is a dynamic, data-linked virtual replica of a physical landscape, continuously updated via IoT and GIS inputs.
- Enables monitoring, simulation, and predictive management of ecosystem performance.

Applications

- Monitoring urban heat island mitigation through vegetation growth.
- Real-time flood risk assessment through hydrological simulations.
- Predictive maintenance of green infrastructure.

AI and Machine Learning

AI enhances smart landscapes by enabling predictive analytics and generative design:

- Predicting vegetation growth under varying climate conditions.
- Optimizing irrigation schedules based on weather forecasts and sensor data.
- Generating planting layouts that maximize biodiversity and carbon sequestration.

Machine learning algorithms identify patterns in urban microclimates, pedestrian usage, or stormwater flows to guide adaptive design interventions.

4.2 Smart Landscape Workflow

A typical integrated workflow might include:

Data Acquisition: Remote sensing, GIS databases, and IoT sensors collect baseline conditions.

Design Development: GIS data feeds into BIM for detailed, parametric modeling of the site.

Immersive Visualization: BIM-GIS models exported to VR/AR for stakeholder validation and refinement.

Construction and Implementation: BIM supports 4D/5D sequencing (time and cost), linked with environmental constraints.

Operation and Maintenance: Digital Twins, AI, and IoT ensure adaptive management, monitoring performance against sustainability targets.

Feedback Loop: Continuous data updates refine GIS-BIM models, enabling iterative improvements.

4.3 Technical Benefits of Integrated Smart Landscapes

Holistic Decision-Making: Integration ensures that micro-level design aligns with macro-level ecological and social systems.

Dynamic Adaptation: Real-time monitoring allows landscapes to adapt to changing conditions (e.g., drought, flooding, urban growth).

Performance-Based Design: Simulations of carbon sequestration, energy savings, and hydrological resilience guide design choices.

Stakeholder Empowerment: Immersive VR/AR engagement increases transparency and inclusivity.

Lifecycle Sustainability: Integrated systems support sustainable management across planning, construction, and operation phases.

4.4 Challenges in Integration

Data Interoperability: Limited compatibility between GIS, BIM, VR/AR, and IoT platforms.

Computational Demands: Real-time simulations and digital twins require high processing power and cloud-based infrastructure.

Standardization Gaps: Absence of universal data exchange protocols for landscape BIM and GIS integration.

Cost and Expertise: High initial investment and requirement for interdisciplinary technical expertise.

Ethical and Privacy Issues: Real-time data collection from public landscapes raises surveillance and privacy concerns.

4.5 Future Directions

Cloud-Native Digital Ecosystems: Centralized, cloud-based environments enabling seamless data sharing across disciplines.

AI-Driven Generative Design: Automated production of optimized landscape alternatives based on sustainability goals.

Immersive Mixed Reality (MR): Blending AR and VR for collaborative, real-time design across dispersed teams.

Blockchain for Landscape Data Integrity: Secure storage of environmental data for transparent decision-making.

Net-Zero and Climate-Adaptive Landscapes: Smart landscapes integrated with renewable energy systems, carbon accounting, and climate adaptation strategies.

Challenges and Limitations

The challenge lies not only in adopting individual technologies but in orchestrating them into coherent, interoperable workflows.

Academic/Technical: When effectively realized, smart landscapes evolve into *living infrastructures*—systems that are sustainable, adaptive, and future-oriented, fundamentally reshaping the interaction between people, ecological processes, and digital technologies.

Concise/Impactful: Properly implemented, smart landscapes function as living infrastructures—adaptive, sustainable, and future-ready environments that transform how people, nature, and technology coexist.

Elaborated/Descriptive: Through successful integration, smart landscapes transcend traditional design to become *living infrastructures*—dynamic and intelligent environments that ensure sustainability, adapt responsively to changing conditions, and redefine the interconnected roles of people, natural systems, and technological innovation.

Data interoperability: Persistent challenges arise in harmonizing data across platforms such as GIS, BIM, and VR, where differences in file formats, standards, and software compatibility limit seamless integration.

High implementation costs: Significant financial investment is required for advanced hardware, specialized software licenses, and continuous training, posing barriers for smaller firms and public-sector projects.

Technical expertise requirements: Effective use of digital technologies demands a workforce with advanced technical skills in modeling, simulation, and data management, highlighting the need for ongoing professional development.

Ethical and privacy considerations: The collection, processing, and visualization of spatial and community-related data raise concerns around data security, consent, and equitable access to digital landscapes.

Future Directions

- Digital Twins – Real-time, data-driven virtual replicas of landscapes for monitoring, simulation, and adaptive management.
- Artificial Intelligence (AI) and Machine Learning (ML) – Automated site analysis, predictive ecological modeling, and generative design solutions.
- Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) – Immersive, interactive platforms for collaborative design, stakeholder engagement, and participatory planning.
- Cloud-Based Platforms and Open-Source Tools – Enhanced interoperability between GIS, BIM, and visualization systems, with democratized access to advanced technologies.
- IoT-Enabled Smart Landscapes – Integration of sensors and real-time monitoring for adaptive water management, environmental control, and user behavior analysis.
- Blockchain for Data Integrity and Security – Transparent, secure data management for collaborative workflows and landscape project documentation.
- Climate-Responsive and Sustainable Systems – Design and operation of landscapes as resilient infrastructures capable of responding to environmental changes.
- Responsible Data Governance – Ethical handling of spatial, environmental, and community data to ensure transparency, privacy, and inclusivity.

CONCLUSION

GIS is no longer just a cartographic tool but a comprehensive decision-support system for landscape architecture. Its ability to integrate diverse datasets, simulate environmental processes, and support collaborative workflows makes it indispensable for designing landscapes that are ecologically resilient, socially inclusive, and spatially optimized. As GIS becomes increasingly integrated with other digital technologies—such as BIM, VR, and IoT—its role will expand from static analysis to real-time adaptive landscape management, making it a cornerstone of future smart and sustainable landscapes.

BIM is fundamentally reshaping the practice of landscape architecture by shifting from geometry-based design toward information-rich, collaborative, and lifecycle-oriented workflows. From terrain modeling to irrigation systems, and from planting schedules to long-term maintenance, BIM provides an unprecedented level of precision and efficiency. Despite challenges in adoption, the integration of BIM with GIS, AI, and digital twin technologies will firmly establish it as a cornerstone of smart, resilient, and sustainable landscape design.

VR and AR are not merely visualization tools but transformational technologies that reshape how landscapes are designed, communicated, and experienced. While VR immerses stakeholders in future landscapes, AR contextualizes design decisions within the existing environment. Together, they enhance collaboration, reduce risks, and promote sustainable and inclusive landscape development. With advancements in interoperability, AI, and mixed reality, VR and AR will play an increasingly central role in creating adaptive, intelligent, and human-centered landscapes. The integration of GIS, BIM, VR/AR, IoT, AI, and Digital Twin technologies is propelling landscape architecture into the era of Smart Landscapes. These landscapes are no longer static designs but dynamic, intelligent systems that continuously adapt to environmental, social, and technological conditions.

By embedding intelligence into the very fabric of landscapes, designers can ensure resilience against climate change, promote ecological balance, and enhance human well-being.

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CHAPTER 3
CULTURAL LANDSCAPE AND LOCAL IDENTITY

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INTRODUCTION

Landscape is thus an area which has acquired its identity through an indissoluble link between original rudiments. In this abstract frame, each terrain represents a unique reality. also, original identification with place leads to mawkish attachment to terrain and cultural values of the area, and promotes preservation and the values themselves. Original identification is thus an essential element of place, and could indeed be defined as the substance of place. It's around its identity matrix that a place is structured and distinguished from its geographical surroundings. The conceit of genius loci represents the distinguishable manifestation of original identity, and shortly expresses its palpable and impalpable aspects. A strong original identity favours sustainable development models, because sustainable development is predicated on the creation of original particularity.

1. WHAT IS LANDSCAPE?

Landscape is a ubiquitous word in English and other European languages with origins in Anglo- German language dating back to c. 500AD in Europe. The words – landskipe or landscaef (Jackson, J B., 1984) – and the sundries inferred were taken to Britain by Anglo- Saxon settlers. The meaning was a clearing in the timber with creatures, hooches, fields, walls. It was basically a peasant geography sculpted out of the original timber or weald, i.e. out of the nature with interconnections to patterns of occupation and associated customs and ways of doing effects. Landscape from its onsets thus has meant a man-made artefact with associated artistic process values. Then's a holistic view of geography as a way of seeing – its morphology performing from the interplay between artistic values, customs and land- use practices – lately critically explored by Wylie in his book Landscape (Wylie, J., 2007); it's what Olwig calls ‘an active scene of practice’ (Olwig, K R., 2007).

Cultural Landscape

The term" Cultural Landscape" is formerly officially honoured, being subject to growing scientific interest, while there's talk about the demand for geography. But indeed, moment the Cultural Landscape order is an uncommon term and is indeed perceived as an opaque conception by utmost people.

Numerous identify artistic geography with a given literal setting, a geographical area, to add up, a literal geography whose abecedarian factors are aesthetic and artistic. They view artistic geography as a trace of mortal exertion within a home, but reduced to a bare reactionary of great value that should be saved and defended. still, artistic geography is a important richer conception than is generally suggested. It contains and symbolizes a huge number of meanings and values, and therefore is used as the rich base on which to develop theoretical divagation. This is due to the fact that it serves as a tool to look into ordinary geographies, those within which people dwell.

The moment is ripe, for the way in which people perceive artistic geographies is being shaped by the European Landscape Convention's decisive benefactions. This is an innovative measure in discrepancy to other documents on the natural and artistic heritage because it refers both to geographies that might be regarded applicable from a literal standpoint singular element of exceptional character, and everyday cases, associated with quality or deterioration." This new conception expresses, on the negative, the want to face, in a global and anterior way, the matter of quality in places where people live, honoured as an essential condition. for individual and social good (in the physical, physiological, psychological and intellectual sense), for a sustainable development and as a resource which favours profitable exertion" (Council of Europe 2008, Rodewald 2009).

Introduction to Cultural Geographies as A Designation in World Heritage Spots

This section concentrates on the bracket of Cultural geographies in the environment of World Heritage in order to be suitable to discern which order could adequately represent the values associated with Hampi for itsre-nomination. Carl Saur, the American geographer, who's considered to have first formulated the conception of Cultural geographies in 1925, defined the part of nature and culture in a Cultural Landscape. The artistic geography is fashioned from a natural geography by a culture group. Culture is the agent, the natural area the medium, the artistic geography the result (Anschuetz K F *et. al.,* 2001).

1.1 Introduction to Hampi as a Cultural Landscape

Natural Landscape

The natural geography at Hampi is on one hand widely recognised for its beauty and on the other hand amended with symbolism from mythological references. The array of huge determinedness boulders rounded and putatively detached from one another are aimlessly arranged to give everlasting tinges of pink, ochre and slate in a geography that's the result of some three thousand million times of corrosion, which began underground but formerly upraised has redounded in this unique landscape. The Tungabhadra River flowing northeasterly adds its own dimension to this geography. Its vale is rich in boulders and scattered with lagoons, islets and lower pools of water. Large tracts under banana and coconut colonies add manmade texture to the geography. falls and chute in the upper rung versus nonstop flooding and a gentler course in the lower areas make this swash a thick element of the natural geography of Hampi (Fritz and Michell, 2003).

Mythological Geography

Hampi is extensively appertained to as the seat of the Vijayanagara Empire, a great megacity that was established then in the medial- 14th century. still, the association of this region as a mythological geography goes back thousands of times. While the Tungabhadra River forms the central chine, the geography it flows through is invested with religious meaning from different ages. The point is generally appertained to as Pampaksetra, literally the residence of goddess champaign, son of Lord Brahma, considered the Creator of the macrocosm in Hindu tradition. She's also believed to be the consort of Lord Shiva, the Destroyer in the trio of Hindu gods (Fritz and Michell, 2003).

Religious Practices and Religions

The deification of Goddess Pampa and Lord Virupaksha or Shiva continues to this day in the Virupaksha tabernacle complex on the banks of the Tungabhadra. Other embodies or forms of Shiva can also be set up in tabernacles or gemstone busts in the geography. Rock reliefs of goddess Kali appertained to as Ellamma are also worshipped in numerous areas.

Busts and icons of Rama, manifestation of Lord Vishnu and other numbers from the grand Ramayana can also be set up in this area in the colourful tabernacle complexes as well as along roads and pathways and on gemstone busts. Besides the main tabernacles and divinities, there are multitudinous other religions, gods and saints that have amended this spooked geography. Among these the cult of Alvars along with the deification of Tirthankaras, holy divinities in the Jain religion in the townlets of Anegondi and Kamalapura, and other corridor of the civic core are worth citation (Fritz and Michell, 2003).

Architectural Heritage

By the middle of the fifteenth century, the Vijayanagara area had attained the status of a conglomerate as it extended from the Bay of Bengal in the east of the Indiansub-continent to the Arabian Sea on the West and Krishna River in the north of the Deccan table to the fiefdom of Tamil Nadu in the South (Michell 2000). Two centuries of wealth and power are apparent in the plan for Vijayanagara, believed to be the largest for any of its coevals in the Indian environment. As only the solid masonry structures similar as bastion walls, gateways, tabernacles, sanctuaries, colonnades and tanks survive they give only a brief idea of the size and architectural complexity of this agreement at the time (Fritz and Michell, 2003).

Regional Area

Besides the civic core, royal and sacred centre, at the height of its substance, the megacity of Vijayanagara extended to include the sub civic agreement of Kamalapura, Malpannagudi, Anantashayanagudi, the small city of Anegondi and the burgeoning city of Hospet. Which indicate a region of lesser than 600 square kilometres under the influence of the megalopolis. It's also essential to mention then the part of this governance to establish a sophisticated irrigation system that's in use till moment. The Turrutu conduit still irrigates these lands with the water being used now for sugarcane and banana civilization. Though some corridor of the network is still in use, large tracts have been damaged or taken over by contemporary development and conditioning (Fritz and Michell, 2003).

Table 1. Components of Cultural Landscape Indratno (Imam., *et. al*., (2024))

Component	Main Element	Sub-Element
Materials	Natural Forms	Topography, geography, texture and surface, materials, vegetation.
	Manmade Forms	Budlings, roads, artifacts, agricultures
Immaterial	Beliefs	Values, religions, ideologies
	Behaviours	Buildings, roads, artifacts, agricultures
Links	Time/Process	History

Local Identity

Original identity is a vital element in civic development and acts as an important aspect to the quality of functionality in geography. A good original identity is a major magnet for people and businesses as well as supporting metropolises in engineering social and profitable metamorphosis of the original point. Council of Europe (2000) refocused out that geography is an important contributor to the quality of life for people, especially in original areas. A crucial aspect in erecting the distinctness with each area is to give a better sense of identity and to help in the understanding of the identity of such a place. still, similar identity has been lost due to the civic development process, and the loss of oneness has come a common problem that presto- changing terrain are facing.

In the civic development process, identity is the key to a private reality and all private realities are in a dialectic relation with the society (Christmann, 2003). It has been recognised as an important factor with which a megacity or region can make, modify or reshape a close relationship with their citizens and businesses through pride. Selman and Swanwick (2010) have suggested the significance of realising geography oneness in ultramodern geography development processes to increase ties between residers and the terrain. To identify the individualities that are recognised by the citizen can help interpreters to ameliorate the image of the place towards the asked quality, and thus distinguish the megacity from other municipalities and regions in the global competition, which will enhance citizens' sense of belonging and attract professed people and investments. still, due to the dynamic characteristics of the identity, it has not been defined precisely.

Identity is a product process with multiple situations and changes with girding factors, similar as terrain and time (Lin, 2002, Hall, 1997). Identity of a place is also viewed in relation to the literal heritage and the traditional characteristics of the region (Deffner, 2007). thus, the original identity should give durability for development, conserving the traditions of original communities as the megacity changes over time; most importantly it provides possibilities for civic recuperation to develop a sense of home, security and community for the original residers. also, Pritchard and Morgan (2001) used the relationship between culture, place identity and actors' representation to support that the view of original identity is a combination of literal, social, profitable and political processes. colourful types of identity have been classified throughout time similar as place, civic, indigenous, public, artistic, particular, community and geography etc. All these individualities have been proven to contribute to the identity of an original place. similar view has also increased the difficulty in secerning the different individualities, especially for original identity.

2. DIFFERENT SITUATIONS OF IDENTITY

One of the major difficulties in defining original identity is the different position of individualities.

National Identity

National identity as a conception is logically thick from generalities similar as nation and nationalism. They're embedded in a common history and particularly strong in terms of group social identity. Hence, eliciting strong emotional responses (Lewicka, 2011). Besides public identity can take numerous forms, objects and events, monuments and observances, all contribute meaningful symbols to the public identity (Vale, 2008). National identity is a natural process that needs a considerable quantum of time and history to accumulate and evolve. intelligence is the main factor of it with two confines artistic and political. (McCrone and Bechhofer, 2010). The number of common attributes that contribute to the public identity also have the capability to strengthen the bond of public people blood ties; race; language; region; religion and custom. (Stebelsky, 1994).

Regional Identity

Regional identity has been defined as a special kind of miracle that's formed throughout literal and territorial socialisation (Raagmaa, 2002). The word 'region' is well known as a common description for a set area that a group of people generally uses. still, there's no agreement as to what scale of home may be covered by it (Pollard, 1998). utmost experimenters understand the term as "social constructs" (Paasi, 2010). The indigenous individualities are 'internal' products of societies interact with their physical and social terrain and the internal reflection of the space in people's mind and recollections (Raagmaa, 2002, Paasi, 2003) Regional identity may also place emphasis on original artistic or indigenous peculiarity, occasionally indeed expressed in political and artistic conduct. It's expressed in numerous different ways, for illustration, Paasi (1986) identifies in his four shapes model in indigenous identity conformation territorial, emblematic, institutional and socio- spatial knowledge shapes. Hence, from an indigenous position, identity includes the participation of the region in physical, artistic and social life. still, the process of discovering identity at an indigenous position is far too big as it's hard for people to witness (Tuan, 1977).

Urban Identity

Urban identity starts to concentrate on lower gauged geographies compare with the former two individualities. It's one of the essential parameters in achieving a good living terrain as it encourages people to watch and feel responsible for the terrain that belongs to them (Oktay, 2002). Because metropolises are constantly changing, and evolving new forms, the complex commerce between natural, social and erected rudiments has created civic identity (Oktay, 2005). The most significant determinant of the civic identity is the original civic environment that's formed by all physical and natural rudiments, in particular the civic terrain created over generations. either, the term is largely affiliated to the hearthstone's living period the longer one has lived in the megacity, the more attached they feel to it (Lalli, 1992). analogous to public and indigenous identity, civic identity is also viewed as a development of original characteristics through history, but from a much lower scale which involves further relations between the original terrain and its residers.

And there are differences in people's gests of girding surroundings, which will impact their passions to the civic living place (Oktay, 2005). Hence, it is n't only considered from the historically significant structures, but also through the elaboration of the original civic environment with respect to mortal exertion, erected form and nature, which are also significant in the creation of 'a sense of place'.

Original Identity

To probe indeed further into the detail on individualities, analogous idea of original individualities is developed. The conception of identity in numerous inquiries across different academic fields is n't so much related to the whole megacity, on the negative, it's used together substantially with civic corridor and bordering agreements. The conception has been developed as early as themed-nineties, Lynch (1960) has defined a quarter as the place that has calm and safe thoroughfares, availability to diurnal business that proved able to support one's life on a day- to- day base, and similar capability of furnishing necessary services is considered as an identity. latterly on, Zube (1991) claimed that one cannot understand global marvels without looking into the original dimension, which brought the focus of geography identity to a much lower scale which is more nearly involved with citizens' life. numerous experimenters have used the "neighbourhood" to describe similar content (Bonaiuto *et. al*., 1999). And road and diggings are common scales that have been concentrated on in the field (Moughtin, 1992). This is because they typically play an important part due to the identical rates played in people's day to- day life; hence it's influential on the image of a megacity and exposure of people. As similar, thoroughfares are the most dominant rudiments in the forming of the megacity image and thus the design needs to pay particular attention to them (Lynch, 1960).

Affiliated Delineations of Original Identity

The description of the term "original identity" has been nebulous in the history; the lack of a formal description makes it hard to honor such an identity. still, other terms have been introduced that describe analogous ideas of original identity, which concentrate on developing an identity that applies to a small-scaly place, for illustration a megacity quarter or a road. These individualities all describe a subset or an aspect of original identity by different experimenters. Reviewing these individualities helps to prize and assay the common and distinctive features from each of them in order to estimate and form a true description of original identity.

Place Identity and Place Attachment

Place identity is an important factor to enhance the quality of civic life in metropolises that embrace environmental, profitable and social aspects (Proshansky, 1978). It's developed when a place is viewed as a significant part of life by the residers and suitable to fulfil their behavioural pretensions better than any druthers (Lynch, 1981, Williams *et al.*, 1992, Stedman, 2002). On the other hand, it's the connection between people and a collection of "recollections, interpretations, ideas and related passions about physical settings as well as types of settings" (Proshansky *et. al.*, 1983). thus, original identity should have at least two aspects durability and oneness.

Although place identity and place attachment have been defined ambiguously, they both partake common aspects that link them to each other. Proshansky (1978) has estimated the place identity from three aspects cognitive, affective and objective. The cognitive aspect focuses on the attributes of physical space, e.g. colour, size, distance, and the conscious beliefs of how to use a particular place (Proshansky *et. al.*, 1983). The affective aspect emphasises the 'passions and preferences' of a particular place, similar as sight, smell or sound. Whereas the objective conditions concentrate on how one can use the functionality handed by the place identity. Through literature review, this study epitomized 4 aspects of place identity and place attachment

- Physical Appearance, which change throughout time (Lynch, 1960).
- Individual gests and History (Lewicka, 2005).
- Functionality Capability to satisfy different stoner's conditioning. (Jacobs, 1961, Montgomery, 1998)
- Stoner interaction influenced by racial, racial or class identity (Rose, 1995).

Thus, it's easy to see that place attachment and place identity are two generalities that constantly lap due to the samples used in utmost of the exploration (Hernández *et. al.*, 2007).

Still, the two terms partake two common generalities an affective dimension that's the emotional bond between people and place, and a cognitive dimension related to the physical space that influences people’s lives (Rollero and De Piccoli, 2010).

Particular Identity

Firstly, the term is related to how people honor one another by their appearance and a bond to particular history and gests (Williams, 1973, Locke, 1975, Hume, 1896). For illustration, a person will be seen as having his own particular identity if he'd a unique physical appearance; feels else on the same subject; or behaves else from other people due to his unique life gests. In substance, it's how people honour the world and make each other unique through their commerce with the girding world from both a physical and spiritual aspect.

Latterly on, Proshansky (1978) further discerned the particular identity in geography study to how people “feel” about the girding terrain through their passions with the physical world and life gests. It represents the extent to which individualities believe the geography informs their tone- identity and also allows people to both personalise the terrain to more suit their functional requirements and allow the place identity to shift according to people’s conditions (Proshansky *et. al*., 1983). Hence it is n't hard to see that people’s identity is largely affiliated to the physical terrain and individualities frequently identify with places that reflect their own oneness (Kyle *et. al*., 2004).

The major aspect of particular identity focuses on the particular passions gained from two generalities

• The five senses of mortal nature (Proshansky, 1978, Sickels, 1868).

The senses by which people distinguish objects via the physical observation through their physical passions which are seeing, hearing, smelling, tasting and feeling.

• The memory of before gests (Locke, 1975).

The passions gained through their own gests, which concentrate on the knowledge over a period of time. thus, when facing or feeling certain familiar surroundings, the terrain would act as a detector for people to recall their recollections.

Although particular identity is related to general place identity in the physical terms, which reflect citizens' unique gests of the place in the particular terrain as well as others living in their unique regions (Proshansky, 1978).

Culture Identity

Culture forms the original character and the identity. Krause (2001) supported this point by introducing the idea that geography does n't only have spatial and structural characteristics, but also that artistic aesthetic expressions play an important part in geography image and identity development. A megacity is within the integrity of the artistic meaning and significance of its region.

The artistic integrity is influential in the development of the megacity; it's related to the literal events and it cannot be separated from its literal history. It's a collaborative treasure of the original community and is typically expressed through physical and spiritual heritage, e.g. monuments, literal spots and original carnivals.

Cultural identity is explosively related to people's particular identity; it makes citizens proud of their original heritage and identifies themselves with their municipalities. Artistic heritage serves to develop a positive image to external people as a unique position factor in the global competition. Throughout the literal time frame, culture has largely bedded into people's memory, thus, memory plays an important part in the artistic identity.

Not only the person- terrain commerce contributes to the place bond, but also the recollections of those gests and recollections of significant events, stories or people each contribute significantly to erecting the places' identity (Hidalgo and Hernandez, 2001).

Either, social recollections are also deeply bedded in original history, which contributes to the distinctness of the original place (Conway, 1997, Devine- Wright and Lyons, 1997). Different people, different ethnical or religious groups will also have different recollections, indeed at the same place, and they all contribute to the place's distinctness and durability in time.

Community Identity

Community is described as “a set of people with colourful kinds of participated rudiments, which can vary from a situation similar as living in a particular place, to other interests, beliefs or values” (Obst and White, 2005). Each community has their own characters, which leads to different geography characteristics (James and Gittins, 2007). Thompson and Travlou (2007) in their book “Open Space People Space” handed empirical substantiation of the benefits people could gain via commerce with original natural coffers, but failed to give sufficient findings to assess similar relations in practice. It's the surroundings and events that link the history with the present performing in a felt sense of consonance (Cuba and Hummon, 1993). Swanwick (2009) also suggested that communities are formed via physical and social commerce between humans and geographies, similar society factor is one of the major factors that affect the preferences for geographies.

Besides, during community geography changes, e.g. two communities intermingled together due to the development expansion, people tend to only support changes that enhanced a sense of position in which geographies act as a connection between people and their terrain (Stewart *et. al*., 2004). Another general finding is that long- term residers in the community tend to have the loftiest pointers of attachment and identity, which can be related to the history and recollections of their life at the place (Goudy, 1990, Rowles, 1990). Meanwhile, community identity is a reflection of heritage. In similar sense, geography features may ameliorate new rudiments, but if they are n't linked to the core community values, e.g. community culture, similar rudiments have a threat of destroying community identity (Stokowski, 1996).

Sense of Place

Sense of place is one of numerous characteristics that developed through the relations between people and original identity; it's a measure of the cerebral comfort of people at a particular place. Altman and Low (1992) substantiated the term as how people come emotionally involved in places in which they've a sense of belonging. It's also described as the distinctness that emerges from the particular histories or terrain at the original place.

It is n't only an important factor concerning the ultramodern geography planning process that maintain and forms the community's special places but also a good estimator of how people will interact with the girding terrain (Kaltenborn and Bjerke, 2002).

Sense of place has four distinctive factors durability, distinctness, tone-regard and tone- efficacity; a robust sense of place helps people to integrate their girding terrain, attracts beginners and makes people feel proud to live there (Twigger- Ross and Uzzell, 1996). A vast quantum of exploration has also been carried out on interoperating the factors that contribute to the sense of place.

- Physical appearance and mortal perception (Stedman, 2003a, Shamai, 1991, Vogt and Marans, 2004).
- Geographical characteristics (Brown *et. al*., 2002, Norton and Hannon, 1997).
- Residence history (Relph, 1976, Tuan, 1977).
- Individual's preferences (Hidalgo and Hernandez, 2001).
- Conditioning carried out at the place (Eisenhauer *et. al.,* 2000).
- Environmental relationship with the residers (Kaltenborn and Bjerke, 2002).

Sense of place is anticipated to bed with people and nature, thereby contributing to the aesthetic quality of the geography (Cross *et.al*., 2011, Walker and Ryan, 2008, Stedman, 2003b). It is n't only a commerce between people and the geographic characteristics, but also dynamic surrounds of social commerce and memory with girding natural coffers (Stokowski, 2002). Although natural resource is a traditional source for understanding sense of place, the paradigm places would have lesser emphasis on the commerce with private, emotional and emblematic natural places and particular bonds (Williams and Vaske, 2003).

Landscape Identity

Landscape identity is a social and particular construction in which the physical features of the area are factors in the construction process (Haartsen *et. al*., 2000, Turner, 2006). There are also different scale geography individualities similar as place, region, county or country, whereby larger scales contain lower bones (Stobbelaar and Hendriks, 2004).

Due to the fact that people contribute to geography individualities from social and artistic aspects, geography identity has been seen to unite occupants to each other and also distinguish them from other areas (Haartsen *et. al*., 2000). Landscape is also considered from the history to the future, history and unborn considerations also played an important part in defining the geography identity. Stobbelaar and Pedroli (2011) have linked two major individualities that contribute to the geography identity

Empirical Identity

This is the commerce between mortal and physical terrain (Mansvelt and Pedroli, 2003) which they declare also be known as "place identity". The main focus is how people absorb the physical aspect of original terrain.

Spatial Identity

Fastening on how people can combine into the geography, dwelling in it, and existentially perceiving its heritage (Stobbelaar and Hendriks, 2004). The identity is also known as geography character (Antrop, 1998). On the spatial scale, spatial identity has been partitioned into place identity and indigenous identity position (Mucher and Wascher, 2007), with place identity pertaining to a lower scale in the geography, particularly to striking, unique or literal objects that attracts people's attention.

3. COMMON FACTORS AND RELATIONS BETWEEN DIFFERENT INDIVIDUALITIES

Original identity can be summarised as a distinct, recognisable and harmonious pattern of rudiments in the small-scaled place, e.g. a municipality road that is distinguishable from another. Each different identity isinter- related with another, and together, they form a regular gyration that explains the entire structure of original identity. At an original position, Place Identity/ Attachment is the identity that focuses on farther fundamental issues, analogous as physical commerce, social exploits, dwellers' heartstrings of satisfaction and nonfictional heritage.

With these aspects together, they impact particular identity, which also concerns the commerce of people and the terrain but more importantly emphasises how people "feel" about the original area, and can be affected by both sensitive and memory aspects of experience of the original place. Because cultural identity focuses on the nonfictional heritage effect of the original area in people's memory it has a commerce with the memory aspect of particular identity. Together with particular identity, they would help to form a "community" and the community identity, and evolve community identity.

During the process of the elaboration of community identity, both physical and memory will be bettered to more satisfy people's conditions and preference, hence a better commerce across all aspects between physical terrain and people will be established, thus perfecting place identity attachment. In such a way, a regular gyration is formed. Besides, sense of place is a measure of cerebral comfort of people at a certain place, examining girding terrain, feeling and preference, social, nonfictional and cultural influence, and terrain and nature meanings. Different aspect has capability to connect with other different applicable individualities. Each link acts as a ground that incorporates the two sides. also, terrain identity's empirical identity and place identity both focus on physical aspect, and its spatial identity focus on commerce, mortal preference, nonfictional heritage which related to other individualities.

Aspects of Original Identity

The idea of commerce between mortal, place and space from different perspectives to decide a better quality of living terrain was also mentioned by Thwaites and Simkins (2007). In their book "Experiential Landscape", they suggested a deeper understanding of commerce between mortal and terrain from multiple confines can eventually feed in to the dynamic change of the evolvement of original oneness. Overall, the essay has formed the relationship between different individualities. And also, all the effective factors of different individualities could be summarised into four aspects physical, social, sensitive and memory, which are the common aspects of original position's identity.

Physical Aspect

Although there has been important debate on the difference between place identity, sense of place and geography identity, they all concentrate on one major conception the commerce between humans and the physical terrain, from both a physical observation and a spiritual feeling aspect. In all of the relative individualities, major literatures have all mentioned the conception of "physical terrain has a large influence on original people's passions and how they view their identity to the place". thus, it's egregious that physical aspect is truly a major aspect in original identity.

Social Aspect

Druggies are the crucial trait of civic places. Although each geography could have its own physical oneness, without druggies who see and use the identity, the term "original identity" would lose its meaning. In all the major literature on original identity, the authors all mentioned that original identity is n't only about how physical terrain contributes to the people but also how people contribute to the terrain to make the place more seductive and distinguished to the outside world, from the ultimate prospective, social exertion has been seen as an important way in which original people interact with their place to make it unique(Lynch, 1960, Altman and Low, 1992, Stedman, 2003a, Proshansky *et. al.*, 1983, Hidalgo and Hernandez, 2001, Stedman, 2002, Zube, 1991).

Sensitive Aspect

Places can be special to certain people because their memoir is linked to these places. Every mortal being has their own life experience in the history, composed the original geography with their own particular meaning; in this exploration, this is appertained to as sensitive. The sensitive significance of a geography lies in the associations with the spots. As druggies are a crucial trait of civic places, original identity is n't only about the oneness of the physical place and its functionality, but also the capability to give cerebral comfort (Jacobs, 1961, Carmona *et. al*, 2003). Grounded on different gests and habits, each individual stoner would feel else regarding one place. They typically dramatically impact the relations between the stoner and the terrain.

It's feedback from both physical and spiritual commerce between humans and the terrain, it provides a measure of how people attach to the area, and also an important foundation of how original identity evolves from time to time.

Memory Aspect

The ultramodern development of original identity focuses on the oneness of a micro area, similar as a megacity or a quarter. Such an area is within the integrity of the artistic meanings as it's a product of residers' daily conditioning. An important part of an area is its heritage from its history, which is a benefit of a traditional community having long dwelt there (Oktay, 2005). This is generally expressed through physical and spiritual heritage, literal spots and monuments for illustration. In principle, these palpable aspects are all a reflection of and uprooted from people's memory. Although colorful literature has been bandied the bias in the social recollections and people's particular memory, as they tend to be reinterpreted and filtered from history (Liu *et. al.,* 2009, Lewicka, 2008), the significance of memory in the original identity forming process is imperturbable. It's clear that culture and history all remain in people's memory, and grounded on these factors each region will develop their oneness from both physical and spiritual (social and sensitive) aspects.

Relations between different aspects

As the essay has pulled and categorised different languages into four aspects, they are known each involved in four aspects, and a new abstract frame is evolved by showing the commerce between each aspect.

- The physical aspect has a great impact on the social aspect due to mortal exertion taking place at the point.
- Physical and social aspects can impact sensitive aspect due to the senses generated when exertion is carried out at the physical point.
- Physical, social and sensitive aspects work together to produce the memory aspect throughout original history, this is because when original people carry out their quotidian exertion at the original point, throughout time, it gives them a special sensitive feeling and remembrances.

- Ultimately, people would conform the place to more suit their quotidian exertion or enhance the place to cover their precious sensitive heartstrings and memory, therefore the physical aspect would evolve via the collaborative effect of the other three aspects together.

CONCLUSION

In current geography proposition, there's considerable agreement about conceiving geographies holistically. That's to say, understanding the geography as a total cannot be done simply by assaying its elements. The commerce of the rudiments must be considered, especially the commerce of natural and artistic bones. It follows that geography history must also take a holistic view of a geography, integrating natural and mortal exertion as corridor of a single evolving system.

Local identity represents small- scale places, similar as megacity diggings or road position, to give features that produce a recognisable image of the place and its residers to separate from other places. It provides special passions through physical, social, sensitive and memory perspectives; similar passions include both positive and negative feelings. individualities, which are formed by colourful rudiments of the region, produce a bond between the girding terrain and its citizens through pride or other unique passions. It has multiple situations and different aspects. Original identity is more specifically concentrated on an original position, e.g. megacity road or megacity quarter, which acts as the abecedarian position and forms other situations of individualities (E.g. megacity position, indigenous position and public position).

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