



Public Service Provisions for Land Resource Planning

Teeraphat Kitjarak ¹, Shubham Pathak ², Xinlin Qi ³, Thussaneeya Boripis ^{4*}

¹ Public Administration Program in Faculty of Humanities and Social Sciences, Phetchabun Rajabhat University, Thailand.

² School of Accountancy and Finance, Center of Excellence in Sustainable Disaster Management (CESDM), Walailak University, Thai Buri, Tha Sala and 80160, Thailand.

³ School of Marxism, Hezhou University, 3261 Xiaohe Avenue, Babu District, Hezhou, 542899, China.

⁴ School of Political Science and Public Administration, Walailak University, Thai Buri, Thailand.

Abstract

This study explored the intricate nexus between public service provision and land use planning, specifically focusing on the conservation of local plant species in Tambon Khao Phanom, Amphoe Khao Phanom, Krabi Province. The research aimed to explore, understand, and analyze Thailand's land use resources, planning, and implementation. This study employed a multi-method research approach to gather an exhaustive set of data and insights. The researcher collected data from documentation research and secondary data sources in this research study. Based on the grounded theory, this research adopts the triangulation method. The data analysis was done using the 5P model and strengths, weaknesses, threats, and opportunities. This multidisciplinary approach integrates the one-map method with the Sustainable Development Goals (SDGs). The findings depict the lack of adequate implementation of government policies and awareness among the landholders, which are required for sustainable community development. This study underscores the critical synergy between public service delivery and land use planning, highlighting their collective potential to advance community well-being and sustainable development.

Keywords:

Land Resource Planning;
Plant Genetic Resources;
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Public Service; Thailand 4.0.

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1- Introduction

Land use planning is essential for peaceful, robust, prosperous growth and development. In developing countries like Thailand, land use results in economic development and equal distribution of available land resources. This provides for resilient communities and sustainable development. The government in Thailand caters to several initiatives and research projects to explore and provide an in-depth understanding of the existing framework and to provide for improved policy-level formulation and implementation. The Royal Initiative's Project for Conserving Plant Genetic Resources, spearheaded by Princess Maha Chakri Sirindhorn, focuses on human resource development and safeguarding beneficial plant genetic resources [1]. One of the leading universities collaborates on this project, emphasizing personnel training and plant genetic resource conservation in Southern Thailand.

Sub-district Administrative Organizations (SAOs) are crucial local government units that provide public services and environmental conservation [2]. They contribute to Thailand's "Thailand 4.0" vision by adopting new roles under the New Public Service (NPS) paradigm, which stresses community-driven development and societal connections [1]. Due to land use and demarcation disputes, Khao Phanom SAO faces challenges in public service provision and environmental preservation. This study addresses these issues by investigating the unification of land boundary demarcation (One Map)

* **CONTACT:** thussaneeya.bo@wu.ac.th

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and land use philosophies to enhance public service planning and optimize land resource utilization in line with the Royal Initiative's Project [1].

The study contributes by developing strategies for integrating land use planning with biodiversity conservation, implementing the one-map approach for conflict resolution, analyzing Khao Phanom SAO's public service provision under NPS, and providing insights into sustainable land resource utilization for conserving indigenous plant species and Thailand's biodiversity heritage.

New local regulations are being updated, and inadequate policies of land use are being resolved, along with a positive mindset and behavioral approach among the landholders and local communities. The initiatives from this research provided for Geographic Information System (GIS) enabled mapping of the land use map to reduce discomfort, clarify the region's geographical, economic, and social harmony, and enhance the conservation of natural, social, and cultural resources. The various stakeholders, under the leadership of local government agencies, would strengthen the ties between the private and public sectors, resulting in sustainable development.

1-1-Research Objectives

This study investigated public service planning and land resource utilization for the conservation of plant genetic diversity in the local land resources of the Khao Phanom Sub-district Administrative Organization, Khao Phanom District, Krabi Province, in alignment with the Royal Initiative Project for Conservation of Plant Genetic Diversity (H.R.H. O.P. Sirindhorn) of the 7th Five-Year Plan (October 1, 2564–September 30, 2569). The specific objectives of this study were twofold: first, the execution of the H. R. H. O.P. Sirindhorn plant genetic diversity conservation project, aimed at harnessing local plant resources within the scope of 10 villages located in Khao Phanom Sub-district, Khao Phanom District, Krabi Province; and second, to analyze the public service provision by the Khao Phanom Sub-district Administrative Organization (SAO) about land resources to facilitate the preservation of indigenous plant species. The research aims to fulfill the objectives of exploring and designing the recommendations for strengthening land use resources and planning and implementation in Thailand. The sub-objectives of this research include:

- To respond to the royal initiative of the Royal Initiative Plant Genetic Conservation Project (O.P.S.P.) according to the P.P.S.P. Master Plan, 5-year period seven (1 October 2021 - 30 September 2026).
- To study the organization of public services: planning and utilization and land resources for the conservation of plant species in the local resource base, land of the Khao Phanom Sub-district Administrative Organization, Khao Phanom District, Krabi Province.

1-2-Research Question and Research Scope

Researchers have studied the area, context, and physical environment. Information from government officials and secondary data allowed the researchers to discover research questions. The Khao Phanom Subdistrict Administrative Organization area faced land use problems from pain points, causing the researchers to design the research. The following is the research question to explore, understand, analyze and solve the long-term problem of land resource use to enhance and conserve plant species in the local resource base.

- What are the current initiatives and land use frameworks in Thailand?
- How do governmental research projects and policies assist sustainable development?
- What are the implications and strategic approaches to strengthen and enhance sustainable development?

The research explores the current policy implications of the existing framework under the implementation of the Plant Genetic Conservation Project initiated by His Majesty the King, NRCT, to conserve local plant species/native trees, which are natural resources of the local area in the target group of 10 villages, Khao Phanom Subdistrict Administrative Organization (SAO), Khao Phanom District, Krabi Province. The broad scope explores and analyzes the provision of public services (Public Service: PS) of Khao Phanom Subdistrict Administrative Organization in terms of land resources to use land for conserving local plants. To ensure the inclusion and guidance of the Sustainable Development Goals, this research has adopted the 5P model, which deals with the People, Planet, Prosperity, Peace, and Partnership towards attaining SDG 1, SDG 2, SDG 6, SDG 9, SDG 10, SDG 11, SDG 13, and SDG 15.

2- Literature Review

2-1-Land Use Planning

Land use planning is a complex process that significantly impacts regions and communities. It involves managing land resources, considering urban development, environmental conservation, infrastructure design, and socio-economic growth [3]. GIS and RS technologies have been instrumental in analyzing land use changes, monitoring cities, and simulating urban expansion [4, 5]. Effective planning integrates empirical data from surveys and interviews to gain

insights into urban expansion and conservation programs [3, 6]. Tenure-responsive land use planning recognizes the influence of planning and tenure security on spatial transformation and development [7]. Ecological support and conservation prioritization are crucial in land-use management decisions to prevent natural capital degradation [8, 9]. Addressing land use classification inconsistencies and considering the implications of plans on urban growth and sustainability are essential [10, 11]. Public participation is vital for identifying regional meetings, resources, and strategies [12]. Conserving environmentally critical areas through urban planning ensures healthy urban living [13]. Ecosystem-based and traditional land use planning preserves biodiversity and functional ecosystems.

2-2-The Significance of Land Use Planning

Land-use planning is crucial for sustainable development, as it creates a balanced allocation of land resources. It harmonizes various land uses while prioritizing environmental preservation and community well-being [14]. Effective planning mitigates urban sprawl, reduces resource consumption, and encourages compact, resource-efficient urban patterns [15]. It preserves critical natural resources, safeguards ecologically sensitive areas, and conserves essential water bodies, contributing to biodiversity preservation [16]. Planning determines infrastructure placement to meet future requirements, foster economic growth, and enhance economic resilience. Well-conceived communities promote walkability and green spaces and reduce traffic congestion, enhancing residents' quality of life. Land use planning is influenced by social, environmental, and economic factors and cannot solely control soil erosion [17]. It is essential for evaluating environmental carrying capacity and aligning spatial and regional planning with environmental considerations [18]. Planning addresses land degradation, soil erosion, and natural resource conservation, leveraging technologies for sustainable land management.

2-3-Principles of Land Use Planning

Several fundamental principles guide land use planning. Public participation emphasizes the involvement of all stakeholders. Flexibility suggests that plans should be adaptable to changing situations and challenges. Sustainability emphasizes environmental conservation, resource efficiency, and climate change resilience. Efficiency ensures optimal resource utilization and infrastructure development. Equity aims to distribute development benefits fairly across demographic segments. These principles guide developing and implementing responsive, adaptable, and sustainable plans. Planning involves defining goals, data collection and analysis, plan formulation, negotiation, implementation, and monitoring. Time-limited property rights are a critical aspect of land-use planning in Switzerland [19]. These principles and processes promote sustainable, equitable, and efficient land management practices.

Key Components of a Land Use Plan Land use planning encompasses various key components. Land Use Zones allocate land for specific purposes, managing urban growth and balancing objectives. Infrastructure Planning strategically positions transportation systems, utilities, and public facilities to support urban development [20]. Environmental Conservation safeguards natural assets and mitigates environmental impacts through regulations and conservation measures [11]. Housing and Population forecasting influences housing development and density decisions to cater to future population requirements. Economic Development focuses on strategies to boost business growth, tourism, and economic diversity. A comprehensive Regulatory Framework ensures adherence to the land-use plan and promotes orderly urban development [21].

2-4-Public Service (PS)

Public services provide essential services through government programs and policies guided by professionalism, ethics, accountability, transparency, and responsibility. They include government agencies, not-for-profit organizations, and charities with broad social and cultural objectives [22, 23]. Ethical leadership promotes public service motivation and employee normative commitment [24]. It instills moral values, influences ethical behavior, and impacts job performance [25]. Public service ethics are tied to accountability, accommodating societal needs, and adhering to community norms and values [26].

The effectiveness of the public service code of ethics in controlling corrupt behavior underscores the importance of ethical conduct [27]. Public service motivation research highlights the ethical orientation associated with the willingness for self-sacrifice and the intrinsic drive to serve the public good. Digitalization, accounting, and accountability have garnered attention in public services research [28, 29]. Conversations between society and government foster closer ties and ensure effective public service delivery through citizen participation in ICT-enabled governance. Administrative reforms and ICT are critical in citizen empowerment, managerial innovation, and enhancing public service delivery.

2-5-Plant Genetic Conservation Project under the Royal Initiatives Her Royal Highness Princess Maha Chakri Sirindhorn

Launched in 1993, the Royal Initiative-inspired Conservation of Plant Genetic Resources project aims to promote understanding and appreciation of Thailand's diverse resources. It has formulated a resource-information system for

widespread dissemination [1]. The project, rooted in Queen Sirikit's commitment to conserving rubber trees and other species since 1960, identifies and safeguards resources vulnerable to extinction, fosters them in secure environments, evaluates their attributes and utility, and develops long-term resource management strategies. It also educates the public about the value of conservation and Thailand's plant genetic heritage. Historically woven into Thai culture, many plant species may face marginalization or extinction due to environmental dynamics, societal needs, and consumer preferences. This project, an extension of Queen Sirikit's efforts, adopts contemporary scientific methodologies to enlighten the Thai community about the legacy and potential of numerous plant species [1].

2-6-The "One Map" Initiative for State Land Boundary Management in Thailand

The "One Map" initiative, a state land boundary adjustment plan at a 1:4000 scale, is supervised by the National Land Policy Committee under the National Land Policy Committee Act B.E. 2561. Approved by the Cabinet in 2018 and 2019, it aims to be a cornerstone for sustainable land and soil resource management, addressing land tenure, housing, and enhancing land-related services. Guided by the "One Land, One Map" doctrine, it promotes a structured state land management system, clear agency roles, efficient law enforcement, and public awareness of state land boundaries [1].

The initiative ensures precise state land boundary representations, optimizes resource allocation, and fortifies state land protection. It facilitates information access for officials, expedites services for citizens, and allows the public to ascertain land use and rights [1]. Following legal procedures, the project mitigates land boundary disputes between the government and the public. It safeguards the public's legal land rights, as reaffirmed by the Cabinet in 2022. The National Land Policy Committee is committed to public outreach, knowledge dissemination, and addressing the implications of the "One Map" initiative on impacted individuals and communities.

The researchers conducted a preliminary study of the area, context, physical environment, and information from Khao Phanom District officials, which found that there was land encroachment, the use of public roads as private property, and the misuse of land. This led the researchers to find a research question related to the Khao Phanom Subdistrict Administrative Organization's problem with land use. From the pain point, the researchers designed research to solve the problem of land resource use in the long term.

3- Material and Methods

This study employed a multi-method approach to gather an exhaustive data set and insights. The researcher collected data from documentation research and secondary data sources in this research study. The data sources included laws, regulations, orders, official documents from the Land Development Department and Tambon Administrative Organizations (TAOs) referring to Sub-district Administrative Organization (SAO), and relevant research studies. The methodology involved qualitative research, specifically documentary research, using public documents published by public and private sector organizations. These documents presented data, policies, and guidelines through laws, royal decrees, ministerial regulations, annual reports, and analyzed statistical data. The researcher also analyzed theories and the use of the one-map system, utilizing data from the Department of Lands to create a land-use map for the Khao Phanom Sub-district Administrative Organization (SAO) in Khao Phanom District, Krabi Province.

Documentation Research: A thorough data collection was achieved through various documents, including legal papers, regulations, official correspondence, and reports. These documents were primarily sourced from recognized institutions such as the Department of Land Development and the Sub-district Administrative Organization (SAO). This documentation provides a foundation for in-depth policy analysis and the extraction of vital statistical data.

Secondary Data Analysis: This approach involved a detailed review of publicly available government and private sector documents. Materials such as Royal Decrees, ministerial regulations, annual reports, and previously analyzed statistical documents were invaluable for insights into relevant policies and statistical facets.

Qualitative Research: This methodology delved deeper into the narrative content within public documents, uncovering implicit policy goals and tangible outcomes of these policies. This helped shed light on public service delivery and land resource management, specifically in Tambon Khao Phanom, Amphoe Khao Phanom, and Krabi Province.

This research, centres on Tambon Khao Phanom, presents an integrated approach to the intersection of public service and land-use planning, emphasizing local plant species conservation. This study was framed by a conceptual foundation that defines its methods and aims. This research aligns with His Majesty's project, which focused on preserving plant genetic resources, reflecting Thailand's dedication to biodiversity conservation and sustainable resource management. Spanning seven years, from October 1, 2021, to September 30, 2026, the research comprises three key activities:

Activity (Resource Survey and Collection): This phase entails a thorough survey of the local plant genetic resources. It captures data on native plant species, their distribution, abundance, and ecological relevance, serving as the groundwork for future conservation and planning endeavors.

Activity (Resource Conservation and Utilization): Building on Activity 2, this stage emphasizes biodiversity conservation and the potential utilization of these resources for community benefits.

Activity (Resource Development Planning for Public Services): This culminating activity integrates resource conservation with public-service planning. It evaluates how local land resources can be effectively allocated for plant species conservation while meeting broader community needs.

The secondary data analysis has been verified with the validity and reliability of the collected data and the analytical approach. The postulate of subjective interpretations and adequacy was adopted throughout the data collection process. The literary database and exploration of data were logically collected to exclude any limitation from the external validity and ensure data relevance. The adoption of grounded theory provided for baseline validity and reliability of the data (refer to Figure 1). The data analysis involved the streamlining of multiple interpretations and generated a protocol for explorative and explanative understanding of the available data.

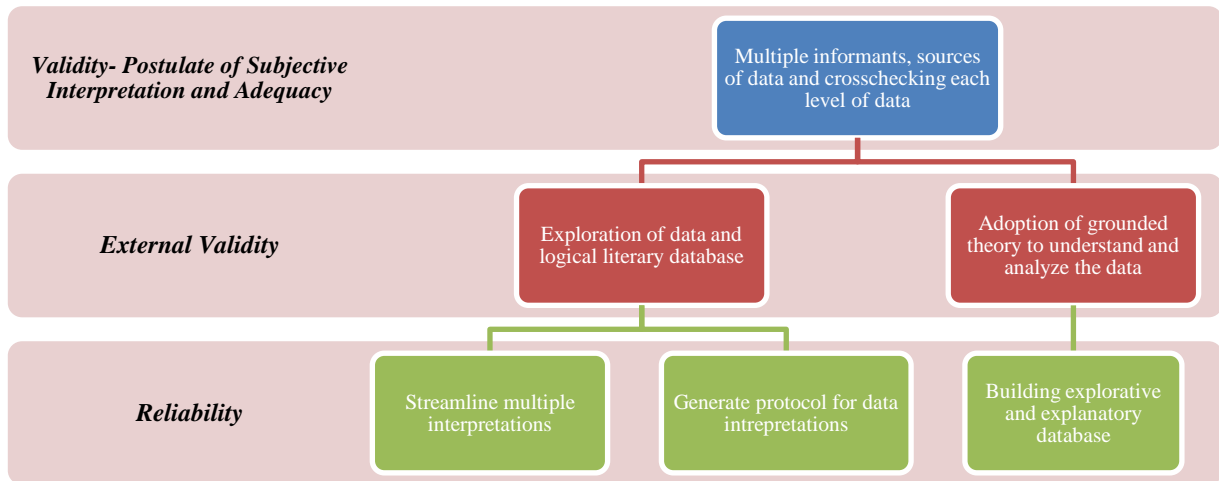


Figure 1. Process of ensuring data validity, accuracy, completeness and reliability

The one-map approach is central to this research methodology, which incorporates data from the Department of Land Development. It offers a comprehensive spatial perspective on Tambon Khao Phanom's land-use. By combining ecological data with land-use details, this study aims to develop a land-use strategy that prioritizes the conservation of native plant species. This interconnected and data-centric method ensures that land use planning aligns seamlessly with the study's conservation goals.

- **Step 1:** Understanding Challenges in Plant Genetic Resource Conservation: An Initiative under His Majesty's Royal Guidance;

This study aims to discern the hurdles and prospects in conserving local plant genetic resources inspired by His Majesty's Royal Initiatives. It seeks to optimize these resources to uplift local communities while preserving plant genetic diversity. The study dissects potential impediments, including technical intricacies, logistical complexities, and the need for community engagement. It also considers ecological, economic, and societal dimensions to create an enlightened strategy aligned with His Majesty's conservation ideals.

- **Step 2:** Theoretical Framework and Pertinent Documentation;

The research is underpinned by concepts of public service, land use planning, and the "One Map State Land" notion. Public services involve preserving resources and leveraging them to improve local communities [30]. Land use planning involves strategic land demarcation for sustainable development ("Plant genetic resources and food security: stakeholder perspectives on the International Treaty on Plant Genetic Resources for Food and Agriculture," 2012). The "One Map State Land" emphasizes uniform mapping protocols for fair and prompt public service [31]. The study also considers legislative and regulatory landscapes, aiming to discern their interplay and influence on the conservation project's rollout and its ripple effects on local communities.

- **Step 3:** Execution of Dual Core Project Activities;

The project focuses on conserving and sustainably utilizing native plant species and establishing a comprehensive database for informed decision-making [32]. It promotes sustainable harvest and cultivation methods for economic benefits while ensuring species sustainability [33, 34]. The database facilitates collaborative efforts between researchers, policymakers, and local communities [35], aiming to achieve a balance between conservation and utilization.

- **Step 4:** Public Service Facilitation - Strategizing and Harnessing Land Resources for Local Plant Species Conservation;

Effective conservation requires a comprehensive approach integrating local knowledge, sustainable land stewardship, and broader conservation goals. It involves participatory land-use strategies, ecologically mindful resource stewardship, communal collaboration, oversight, and synchronized policy frameworks [36, 37]. Public service facilitation emphasizes integrating local knowledge, promoting sustainable stewardship, and harmonizing initiatives with broader policy frameworks [38, 39].

- **Step 5:** A Map Illustrating Land Resource Utilization and Cultivation Areas (The Concept of One Map) within Khao Phanom Subdistrict Administrative Organization, Khao Phanom District, Krabi Province, Thailand;

Developing a comprehensive map reflecting land resource utilization and cultivation zones is crucial for land use planning, aligning with the "One Map" methodology. Integrating multifaceted data, ensuring transparency and accessibility, and periodic updates [40-42]. Recent research has focused on spatial zoning, optimizing cultivated land use, and evaluating land suitability [43-45]. The study of spatial allocation, community-engaged planning, and the application of GIS in agriculture is also highlighted [46, 47].

The researchers designed Figure 2 to be the Conceptual Framework for this study.

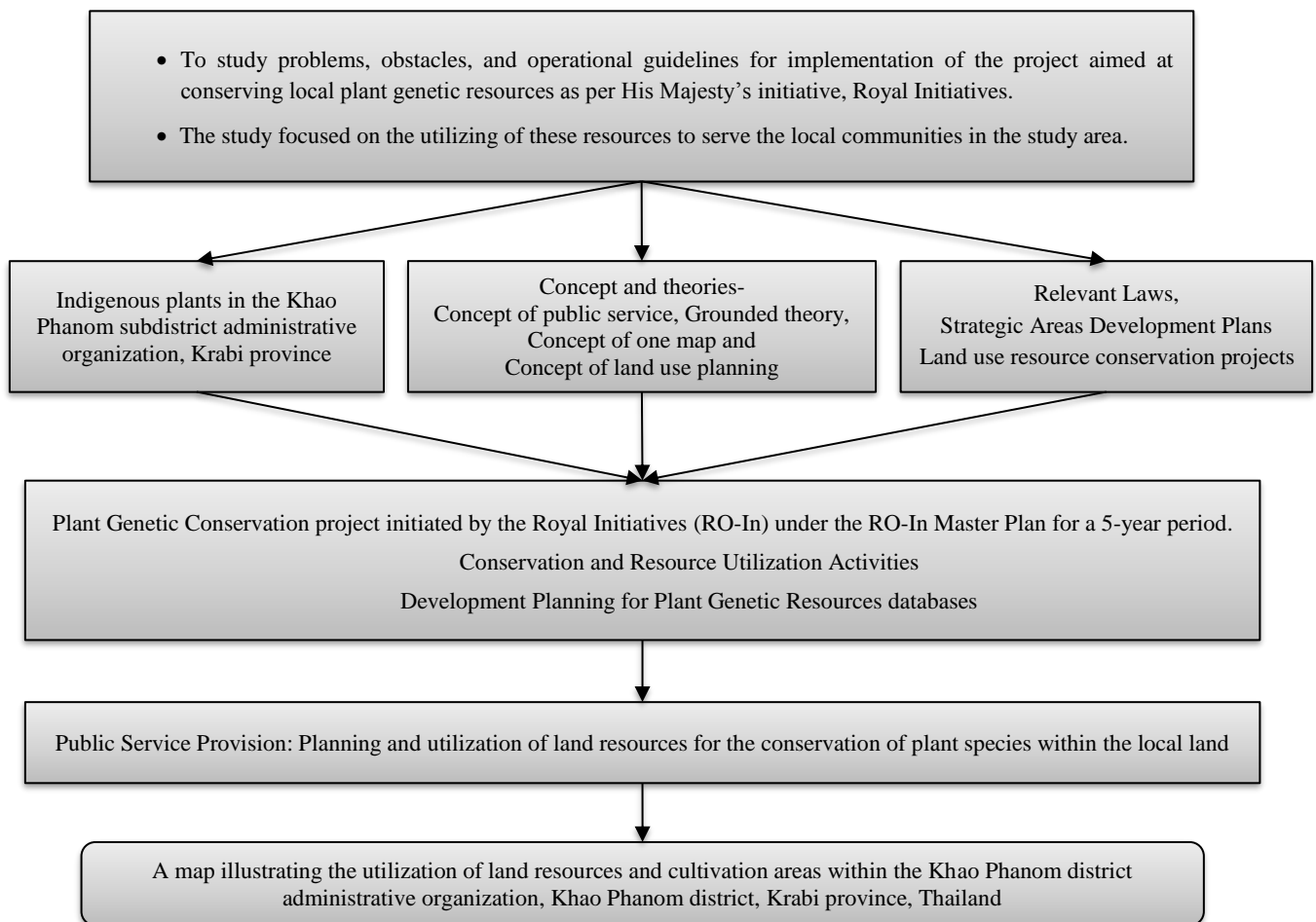


Figure 2. Conceptual Framework for this study

The study primarily concentrates on two fundamental research areas:

- Research Implementation in Alignment with His Majesty's Conservation Project;
- This facet delves into the execution of research activities aimed at fulfilling the objectives set forth by His Majesty's project to preserve plant genetic resources. These activities encompass resource surveys, collection, conservation, utilization, and development planning for public services.
- Provision of Public Services, Land Use Planning, and Resource Conservation for Indigenous Plant Species.

This research stream focuses on delivering public services, land utilization planning, and resource conservation initiatives concerning native plant species within Tambon Khao Phanom, Amphoe Khao Phanom, Krabi Province. The emphasis was on promoting sustainable land management practices and formulating effective strategies to achieve these goals (refer to Figure 3).

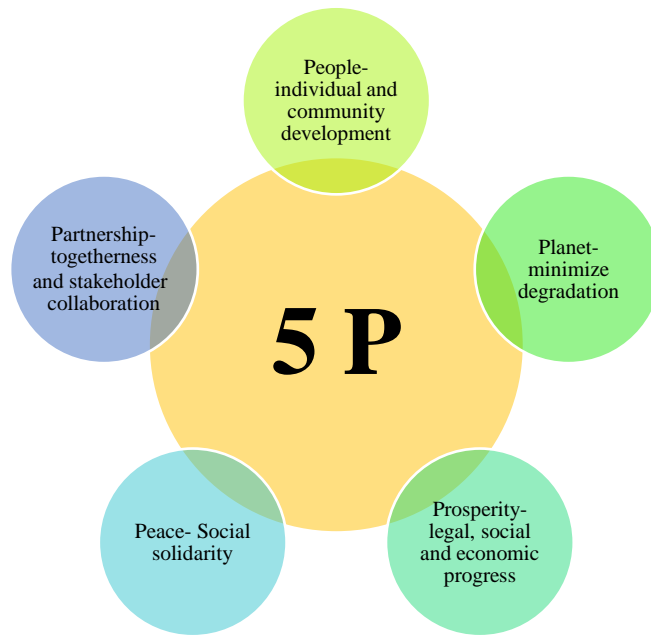


Figure 3. 5P model

This research adopts the triangulation (Triangulation) method based on the grounded theory. It is an important method for checking the reliability of information. Cohen & Manion (1994) [46] mention that the term “Triangulation” is a form of triangulation that academics follow to ascertain and analyze the collected information. The researchers designed a theoretical triangulation using the perspective of public service theory to explain and used it as theoretical verification and validation. The triangulation method provided for the embedded grounded theory to analyze the data. The data analysis provided a detailed understanding of legal acts, public service policies, such as the results of public service provision in land resource allocation, and planning for the conservation of local trees in each village, of which 10 villages have plans for the preservation of local trees to continue to exist in the future (refer to Figure 4).

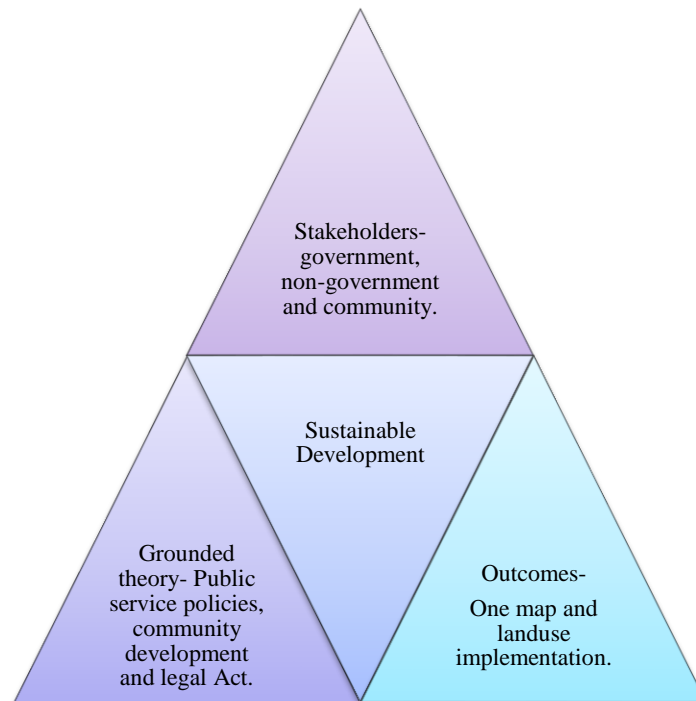


Figure 4. Triangulation method implying grounded theory for this research

The researcher has emphasized the importance of developing an integrated plan and formulating policies on education, culture, and heritage conservation to be included in the local development plans. Thailand has given importance to integrating such plans into the operations of the sectors that play such roles. The adopted integrated plan includes a human resource plan, a work plan, and a budget plan.

Community members are represented to demonstrate their participation in conservation efforts through documents such as action plans and performance results that reflect true community ownership. The meeting representatives jointly developed a public service plan for conserving local plant wisdom as a strategic plan for local administrative organizations. Local representatives explain the conservation of local plant species. Please participate in preparing a local public service plan for plant conservation with representatives who are truly local people who express their opinions in preparing the joint plan.

The data analysis used strengths, weaknesses, threats, and opportunities. To ensure the robustness of the collected data and provide comprehensive recommendations, SWOT has been amalgamated with the 5P model to support the core findings of this research [48–51] (Figure 5). The theoretical underpinnings reviewed through the vast literature provided for the cumbersome analytical discussions. The resulting recommendation would benefit the stakeholders involved in policy generation and have adequate policy implications.



Figure 5. SDG related with this research

Through these research pursuits, this study seeks to contribute significantly to the realization of His Majesty's vision to conserve plant genetic resources and ensure the sustainable utilization of local land resources in Tambon Khao Phanom, Amphoe Khao Phanom, Krabi Province.

4- Results

This study presents an overview of the outcomes obtained from the implementation of the project aimed at conserving local plant genetic resources, as per His Majesty's Royal Initiative. This study focused on utilizing these resources to serve local communities in the target area, which comprises ten villages within Tambon Khao Phanom, Amphoe Khao Phanom, Krabi Province. Researchers have designed land utilization plans for the Tambon Khao Phanom, Amphoe Khao Phanom, and Krabi Province, as shown in Figure 6.

A comprehensive analysis of public service provision by the Sub-district Administrative Organization (SAO) within the context of land resources for the conservation of local plant species in Tambon Khao Phanom offers a compelling illustration of the intricate relationship between public services and land use planning. This analysis underscores the critical importance of aligning public service objectives with land use strategies to maximize community benefits while adhering to established guidelines and principles for responsible governance and equitable resource allocation.

One key aspect of this analysis revolves around the strategic alignment of public services with land resources, as is evident in SAO's adherence to its strategic objectives. Notably, the focus on "development-level maintenance of public benefits" reflects a conscientious effort to leverage land resources to improve local communities. This synergy between public service goals and strategic planning exemplifies a forward-thinking approach to community development in which the utilization of land resources extends beyond economic considerations to encompass broader societal well-being [52, 53].

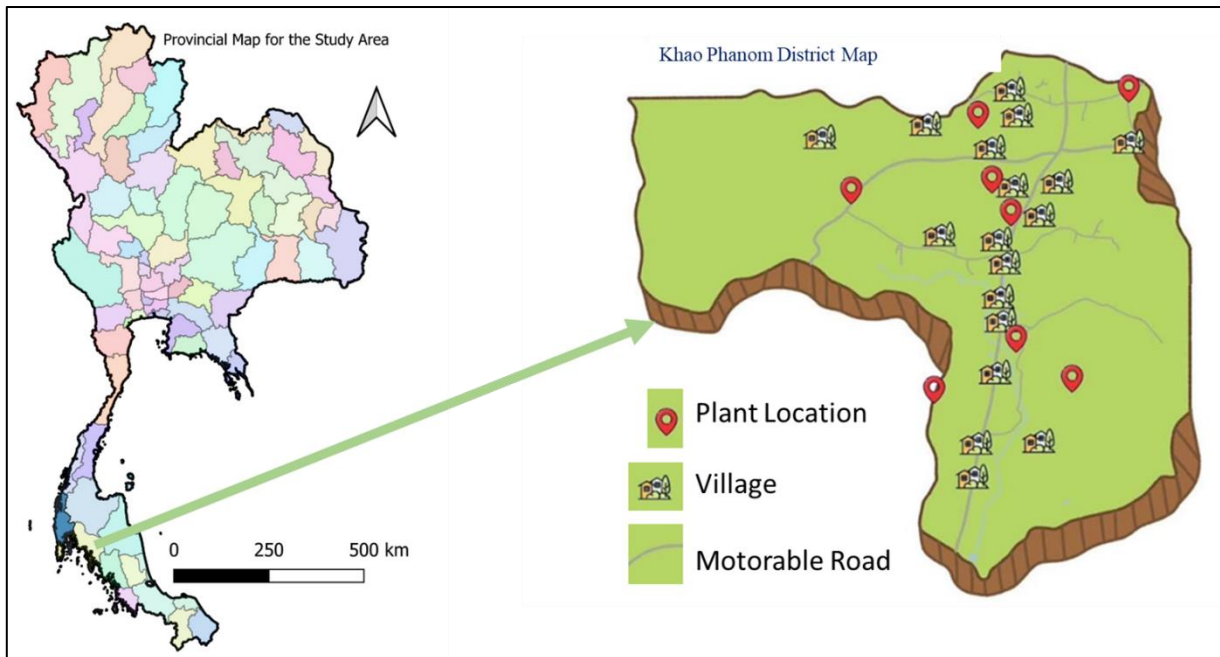


Figure 6. Land Utilization Planning for Tambon Khao Phanom, Amphoe Khao Phanom, Krabi Province

The study's reference to the Ministry of the Interior's publications, particularly reference numbers 0309/W794 and 0309/134, underscores the importance of adhering to established guidelines and legal frameworks in land-use planning and public service provision. These publications provide valuable insights into how public lands can be optimally utilized to bolster the local economy, support agriculture, create recreational spaces, and meet other community needs. Moreover, the requirement for seeking approval from relevant authorities for developmental modifications underscores the significance of transparency and accountability in the decision-making process, ensuring that land use planning aligns with broader public interests [54].

Stakeholders were selected to participate in the planning process by selecting village representatives from each of the 10 villages as legal representatives in the preparation of village public service plans and responsible for local public service plans. Local government agencies are responsible for implementing local government organizations' strategic plans, monitoring the results of operations according to the plans, and monitoring the implementation of the plans according to the management principles Plan, Do, Check, and Act (PDCA) [55]. NGOs must participate in implementing the plan, inspecting the plan, and proposing new plans for use in public services.

A crucial dimension of this analysis pertains to the concept of public land as a communal resource for the public's mutual benefit, as introduced in the citizen-centric approach of 2000. This concept embodies the principles of equity, inclusivity, and shared responsibility for land-resource management. This highlights the need for land use planning to consider the diverse needs and aspirations of the community, ensuring that the benefits derived from public land are accessible and equitable for all residents.

In conclusion, analyzing public service provision with land use planning in the Tambon Khao Phanom offers valuable insights into the collaborative and integrated approaches required for sustainable community development. The alignment of strategic objectives, adherence to established guidelines, and recognition of public lands as communal resources underscores the importance of responsible governance in shaping the future of communities. This case study is a compelling example of how effective public service provision can be intricately linked with prudent land use planning to foster the well-being and prosperity of local populations [56]. This highlights the significance of holistic and equitable resource management in benefiting all members of society. Therefore, the researcher designed a one-map land-use plan for the Tambon Khao Phanom, Amphoe Khao Phanom, and Krabi Provinces.

This study revealed a symbiotic relationship between public services and land-use planning in Tambon Khao Phanom, Krabi Province. The alignment of public service delivery with strategic local administrative plans, as exemplified by Strategy 4's multifaceted approach, signals a proactive and holistic approach to community development. The "Conservation of Plant Genetic Resources as per Royal Initiatives" project mirrors this approach, emphasizing biodiversity conservation and sustainable resource management. Land use planning is integral to public service provision, highlighting the intricate relationship between land resources and community development. The SAO's adherence to Ministry of Interior guidelines ensures that public land is harnessed to its full potential. It serves as a communal resource for local economic growth, agriculture, recreation, and various community needs. This approach is grounded in equity and inclusivity principles, aligning with the citizen-centric approach introduced in 2000. In summary, public services and land-use planning work together harmoniously to promote well-being and sustainable development in local communities.

5- Discussion

5-1- Sustainable Development Goal (SDG)

Sustainable development is required for the ASEAN region's current development scenario. Thailand, a leader among the ASEAN countries, strives to achieve all SDGs. However, there are several hurdles in planning and designing and the final implications of the policies being developed.

SDG 1: End poverty in all its forms everywhere is the essence of development in Thailand. The Thai population still struggles with poverty and requires robust policies and regulations to speed up the growth and development process. The government and supporting agencies have been implementing several research and community-level projects to ensure sustainable development in Thailand.

SDG 2: To end hunger, achieve food security and improved nutrition, and promote sustainable agriculture to ensure sustainable and resilient development. Thailand has vast natural resources and agricultural lands. The development process directly affects the land-use changes in the land use which may have positive or negative impacts.

SDG 6: Ensure the availability and sustainable management of water and sanitation for all, which are among the basic needs of human life. However, Thailand, especially in the rural areas, struggles to achieve adequate levels of resilient availability of resources. The planning in terms of land use and the ample capacities of the government departments and bodies results in accurate policy generation. The success still depends on the ground-level implications.

SDG 9: Building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation in Thailand and beyond is essential to ensure growth and development. The increasing population degradation of the already scarce natural resources requires a robust and effective land-use planning model.

SDG 10: Reduce inequality within and among countries is observed in the ASEAN region. Thailand has been entering associative and collaborative policies and regulatory frameworks to ensure the region's sustainable development. However, Thailand must create an adequate and accurate policy and implementation framework that will lead to exemplary experiences for all developing countries.

SDG 11: Making cities and human settlements inclusive, safe, resilient, and sustainable has been the focus of government intervention in Thailand's public and private sector policies. Community engagement has been adopted for the core national and local development plans. However, the communities still need to adopt a safe, healthy development approach in several aspects of Thailand.

SDG 13: Taking urgent action to combat climate change and its impacts is the platform on which Thailand must act to ensure climate change and its adverse impacts on Thailand and the ASEAN region. This research explores and provides cumbersome recommendations to curb these adverse impacts.

SDG 15: Protect, restore, and promote sustainable use of terrestrial ecosystems; sustainably manage forests; combat desertification; and halt and reverse land degradation and biodiversity loss. Thailand has a stretch of land boundaries connected to land and sea. This enables trade and development throughout the country. However, it has been observed that this development lacks adequate policy-level decisions to ensure sustainable growth and development.

The analytical interpretations of the combined 5P model and SWOT provided a holistic approach and vigorous recommendations (refer to Table 1). The following are the detailed analytical findings.

Table 1. 5P and SWOT

5P	Strengths	Weaknesses	Opportunities	Threats
People	Equity Existing of policy framework such as Thailand Policy 4.0	Lack of availability of land	One-Map approach ensures the clear and authentic boundaries Employment opportunities through land use planning under Thailand policy 4.0	Non-responsiveness of local communities towards globalization and/or social, economic, demographic and land use changes
Planet	Natural resource conservation, Geographical Information system enabled land use mapping and digitization under the Thailand policy 4.0	Lack of awareness for land conservation for public owned land	Balancing ecological requirements preservation and maintenance of cultural and religious heritage sites	Lack of government initiatives, policies and regulatory framework to ensure sustainable growth and development
Prosperity	Timeliness and preserving cultural and environmental heritage	Lack of economic development without land holdings	Socioeconomic needs enhancing community cooperation and strengthening	Despite of intentions, Thailand still remains middle income country
Peace	Public's welfare initiatives	Neighbourhood and family conflict due to unavailability for utilization of land use & Local authorities have conflicts for adequate land use	Aligning development plans Reduction conflicts between landowners' sense of ownership	Unavailability for utilization of land use resulting in conflicts and legal disputes
Partnership	Community development	Stakeholders including local and provincial level departments do not participate with private sector	Planning decisions strengthening of local government bodies and departments	Inaccurate land use policies at the national level resulting in inadequate land use policy implications at the ground level

Strengths: It was found that Thailand has an existing framework towards achieving equity among its population. Several policy frameworks, such as Thailand Policy 4.0 and Natural Resource Conservation, have been initiated and implemented in governance at all levels. Technological advancements such as utilizing the Geographical Information System (GIS) enabled land use mapping and digitization under Thailand policy 4.0 to provide a platform for all policy formulation and implementation [56]. The strengths include the timeliness of government initiatives and projects, preserving cultural and environmental heritage, enhancing and assisting the public's welfare initiatives, and striving towards community development in Thailand.

Weaknesses: Thailand has several weaknesses, from the national to the local level, in land use policies and regulations. The major weaknesses found in this research include lack of availability of land, lack of awareness for land conservation for public-owned land, and lack of economic development without land holdings. The conflicts were found to be considerably high among the landowners. For instance, neighborhood and family conflict due to unavailability for utilization of land use, and local authorities have conflicts for adequate land use. The non-participatory approach among stakeholders, including local and provincial level departments, and unwillingness towards participation with the private sector results in inadequate policies and regulations in Thailand [57].

Opportunities: This research found that the One-Map approach ensures clear and authentic boundaries. The opportunities include employment opportunities through land planning under Thailand policy 4.0, balancing ecological requirements, preservation and maintenance of cultural and religious heritage sites, catering to socioeconomic needs, enhancing community cooperation and strengthening, aligning development plans, reducing conflicts between landowners, inculcating a sense of ownership, assisting in planning decisions, and strengthening local government bodies and departments in Thailand.

Threats: Despite several positives, the study explored and found various threats in Thailand. These threats resulted in inadequate land use policy formulation and implementation. These included the non-responsiveness of local communities towards globalization and social, economic, demographic, and land use changes, as well as the lack of government initiatives, policies, and regulatory frameworks to ensure sustainable growth and development [56, 57]. Similarly, despite intentions, Thailand remains a middle-income country, which leads to limited or unavailable resources for land utilization, resulting in conflicts and legal disputes. Likewise, it was observed that inaccurate land use policies at the national level resulted in inadequate land use policy implications at the ground level.

The analysis of public service provision in Tambon Khao Phanom offers insights into applying essential governance principles, as outlined by the United Nations (2015). Equity is exemplified by the "One Map" concept, ensuring equal access to accurate geographical information. Timeliness enhances the overall service experience through prompt and efficient delivery. Ample service aligns with delivering the right services to the right geographical area, as demonstrated by Tambon Khao Phanom's approach to natural resource conservation and plant genetic resource care. Continuous service emphasizes consistency and prioritization of the public's welfare, ensured by assigning specific tasks to the village headman and designated personnel. Progressive service embodies continuous improvement in service quality and performance, as reflected in Tambon Khao Phanom's dedication to conserving plant genetic resources as per the Royal Initiatives and the 60% conservation rate target. The alignment of public service provision with Strategy 4 showcases a comprehensive approach to community development, emphasizing local religious and cultural activities and preserving cultural and environmental heritage. This analysis underscores the effective application of governance principles to enhance public service provision and community development in Tambon Khao Phanom.

5-2-Implementation Framework

Integrating land-use planning and biodiversity conservation in Tambon Khao Phanom is a pivotal step towards sustainable development, balancing ecological requirements with socioeconomic needs. Effective land use planning contributes to biodiversity preservation, maintaining ecosystem services and environmental health. As advocated in the literature, a holistic and inclusive approach aims to develop a replicable model that emphasizes the interconnectivity between land uses and considers ecological impacts in planning decisions (refer to Figure 7). The One-Map approach is a strategic tool for integrating data layers to provide a comprehensive overview of land use and biodiversity. It facilitates better decision-making by consolidating data on topography, land cover, species distribution, and human activity. Implementing the One-Map approach in Tambon Khao Phanom involves collecting accurate data, integrating it into a dynamic mapping platform, identifying areas of ecological significance, assessing proposed land use impacts, and aligning development plans with conservation goals.

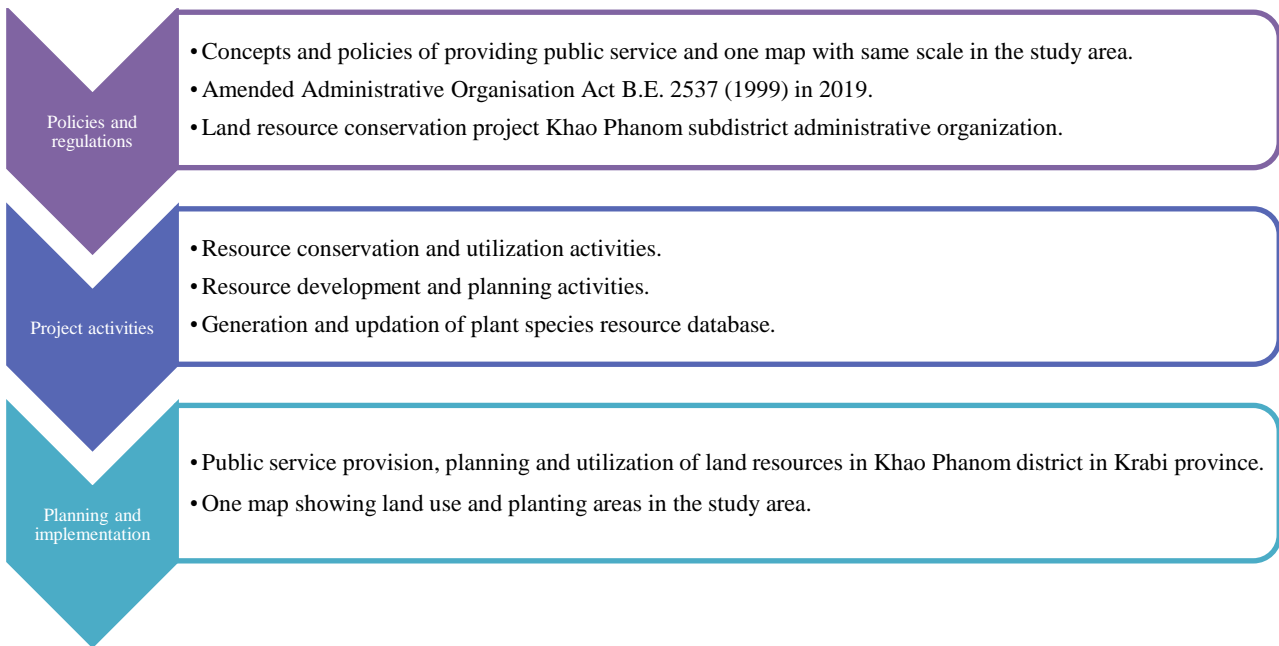


Figure 7. Implementation framework towards sustainable development of the Khao Phanom district

6- Conclusions and Recommendations

In conclusion, the implementation of this comprehensive plan for integrating land use planning with biodiversity conservation in the Tambon Khao Phanom represents a forward-thinking approach to sustainable development. The key steps in the implementation process, from stakeholder engagement to monitoring and policy integration, highlight the multifaceted nature of this endeavor. It is crucial to recognize the dynamic nature of this process, where ongoing adaptation and learning are integral to its success.

The significance of this plan lies not only in its immediate impact on land use and biodiversity but also in its potential as a model for other regions facing similar challenges. The collaborative and inclusive approach adopted in Tambon Khao Phanom can serve as a blueprint for integrating ecological considerations into land use planning, thereby contributing to the broader goals of environmental sustainability and conservation.

To promote holistic and sustainable development, it is essential to encourage integrated planning at the Sub-district Administrative Organization (SAO) level. This can be achieved by aligning all aspects of the SAO's work, projects, and budgets with policy-based integrated planning. By adopting this approach, SAOs can effectively incorporate initiatives from the Royal Initiatives of Her Royal Highness Princess Maha Chakri Sirindhorn into their local development plans. For instance, education, culture, and local heritage conservation initiatives can be integrated into SAO's development plans to contribute significantly to sustainable community growth. Such integration will ensure that development efforts are comprehensive and focus on improving the quality of life of all community members.

Community engagement encourages the active participation of local communities in the planning and execution of policies and projects related to education, culture, and heritage conservation. Community involvement fosters a sense of ownership and increases the likelihood of a project's success. Community engagement is a vital aspect of any policy or project related to education, culture, or heritage conservation. Encouraging active participation from local communities is essential to the success of such initiatives. Members can foster a sense of ownership by engaging in community planning and implementing policies and projects. This increases their investment in the project and enhances their understanding and appreciation of its value. Community engagement's numerous benefits include increased transparency, improved communication, and greater accountability. When local communities are involved in decision-making processes regarding education, culture, and heritage conservation, they are likely to support these initiatives fully. Consequently, the chances of project success have significantly increased. Therefore, it is crucial to prioritize community engagement in all policies and projects related to education, culture, and heritage conservation to ensure that they are successful and sustainable over time.

Sustainability ensures that policies and projects related to education, culture, and heritage conservation have long-term implications. These should include strategies for maintaining and continuing these initiatives beyond the initial implementation. Establishing a sustainable plan for policies and initiatives pertaining to education, culture, and preservation of local heritage sites is imperative. This must encompass comprehensive strategies that ensure the perpetuation and longevity of these endeavors beyond their initial implementation phase. These policy and operational recommendations aim to enhance the effectiveness of Sub-district Administrative Organization (SAO) efforts in education, culture, and local heritage conservation. By implementing these suggestions, SAO can contribute significantly to its communities' sustainable development and well-being, aligned with the principles of integrated planning and policy-based governance.

7- Declarations

7-1-Author Contributions

Conceptualization, T.K., S.P., and T.B.; methodology, T.K., S.P., and T.B.; software T.K., S.P., and T.B.; validation, T.K., S.P., and T.B.; formal analysis, T.K., S.P., and T.B.; investigation, T.K., S.P., and T.B.; resources, T.K., S.P., and T.B.; data curation, T.K. and T.B.; writing—original draft preparation, T.B.; writing—review and editing, T.K., S.P., X.Q., and T.B.; visualization, T.K.; supervision, X.Q.; project administration, T.B.; funding acquisition, T.B. All authors have read and agreed to the published version of the manuscript.

7-2-Data Availability Statement

Data sharing is not applicable to this article.

7-3-Funding

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7-4-Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of Walailak University (IRB No. 660034 and 1-10-2022).

7-5-Informed Consent Statement

Not applicable.

7-6-Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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