EXPLORING THE THEORY AND PRACTICE OF ECOLOGICAL WISDOM IN TRADITIONAL HOME GARDENS OF TWO ETHNICS IN INDONESIA

インドネシアの二部族の伝統的な家庭菜園における生態学的知恵の理論と実践の探求

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Environmental Science and Landscape Architecture Course

Department of Environmental Horticulture

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Chiba University Doctoral Dissertation

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Abstract

Topic on green open space has been studied over time and links to various subjects and impacts related to its aesthetics and function for the ecosystem to provide amenities for users. It generates projects and policies to pursue landscape sustainability. Yet, the current landscape problem is more complex nowadays. This situation encourages designers to actively not only integrate the natural environment into the design process but also apply ecological wisdom on-site. Ecological wisdom is defined as the ability to integrate ecological knowledge and site characteristics to create a good property design that requires minimal intervention. It originates from the idea of re-learning local culture, which has been proven to integrate human behaviour dsand nature to produce a sustainable landscape.

Integrating green open space planning and design with ecological wisdom could enhance landscape harmony and sustainability. However, study on green open space and ecological wisdom has developed independently despite the approaches often used in urban and environmental development. Therefore, this dissertation explored the theory and practice of ecological wisdom for green open space planning and design development. Specifically, I explored the following question: (1) How does the relation between green open space and ecological wisdom in research? (2) what is the distinction between Traditional Ecological Knowledge and Ecological Wisdom in cultural landscape research? And (3) How does the ecological wisdom in micro-scale green open space, especially in the traditional home gardens? This dissertation attempts to answer those three questions in the following studies.

The first study explored the research trend and hot topic in green open space and ecological wisdom research using Vos Viewer software to identify the relationship between both topics. This study found that research on green open space and ecological wisdom are not linked to each other and never discussed in literature.

The second study was conducted to define the distinction between TEK and EW and examine the similarities of both by analysing keywords and themes of literature using Vos Viewer and NVivo Software. The study found that research on traditional ecological knowledge and ecological wisdom converges, especially on the topic of indigenous cultural capital, ecosystem services, and sustainability, while the distinction lies in their definition, agent, source, and scope.

The third study is representing the exploration of ecological wisdom practice on micro level green open space in cultural landscape heritage, especially traditional villages. It was a continuing study from the second research and attempted to identify and analyse the ecological wisdom of traditional community with different landscape characteristics. Sundanese traditional home garden could be categorized as a kind of mountainous settlement ecotype, while Madurese traditional home garden could be categorized as dry farmland settlement ecotype. We tried to investigate the traditional ecological knowledge and tacit knowledge by tracing it from interview and observation towards spatial characteristic and home garden space use and defining the ecological wisdom on site. Interestingly, this study found that the home garden layout of both study site shows the response to climatic condition in different ways depending on the site character.

This study contributes to investigate the linkage of green open space and ecological wisdom then clarify the distinction between traditional ecological knowledge and ecological wisdom in research. It also fills the gap of green open space studies in ecological wisdom perspectives, especially in micro-scale landscape. In conclusion, green open space development needs ecological wisdom approach to enhance landscape harmony and sustainability of site. Therefore, research on ecological wisdom related to green open space needs to further explore, especially in Indonesia.

Keywords: green open space, ecological wisdom, Vos Viewer, keyword network analysis, traditional home garden, cultural landscape, thematic analysis

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Chapter 1. Introduction

1.1 Study Background

Environmental sustainability is facing problem in landscape degradation as an effect of industrialization and urbanization. Nature exploitation was done to fulfil human needs. However, at the same time, it also should be maintained for sustainability so that the human need could be continuing fulfilled. It indicates the friction between human desired-prosperity and ecosystem integrity (Commission on Environment, 1987; Steffen et al., 2011; J. Wu, 2013). Therefore, sustainable landscape development is needed and become the greatest challenge now days (J. Wu, 2013). Sustainable landscapes described as landscape that support environmental quality and conservation of natural resources. It sometimes, called as environmentally friendly landscape or native landscape to make it more understood in visualization (Rodie & Streich, 2009). It emphasizes on achieving balance between human needs and environmental integrity, which requires economic and social development that always interact with nature. Thus, sustainability landscape development should be accommodated three dimensions: environment, economy, and society, that known as triple bottom line (Elkington, 2004).

Green Open space development is considered as a way to provide a viable environment for people following the space function and activities in it. It also considered as an important response to environmental crisis and realization of sustainable landscape development (Syahid et al., 2017). Green open space (GOS) is defined as an area (elongated or clamped) with multiple purpose and activities on it, completed by vegetation, either it grows naturally or intentionally planted (Sitorus et al., 2018). It also known as open space that filled by green space. Current study on green open space, has widely been discussed to various topic such as physical activity (Bernhart et al., 2020; H. Wang et al., 2019), urbanization (Malaque & Yokohari, 2007; R. F. Putri et al., 2020), climate change (Ariyaningsih et al., 2022; McCarthy,

2012; Muryanto et al., 2018; Sulistiyono et al., 2022), ecosystem services (Bortolini et al., 2018; Depietri & Orenstein, 2020; Munajati et al., 2021; Turpie et al., 2017), thermal comfort (Edhy et al., 2021; Fadhlurrahman & Nasrullah, 2020; N. A. Putri et al., 2021), sustainability (Dewi et al., 2018a; Muljono et al., 2021; Setiowati et al., 2019), and so on. Therefore, it plays an important role in urban sustainability through its environmental, social, and economic benefits either in macro, meso, or micro scale.

The existence of green open space allows interaction between human and nature. There are arguments that life's quality in the cities can be more sustainable and resilient through enhancing nature with green infrastructure, patterns, and lifestyles (Beatley & Newman, 2013). Some scholars have also suggested that staying close to nature can have a positive influence on psychological, physical, and social well-being (Bernhart et al., 2020; Chaix et al., 2014; H. Wang et al., 2019; Windhager et al., 2011). These theories and practices share the same practical wisdom in balancing the desire for development with the desire for ecological and environmental protection. Environmental protection is likely to be compromised when competing with development (Fu et al., 2016a). It indicates that having knowledge alone may not be enough. An ecological wisdom will be needed to recognize the importance of ecological knowledge and the ability to apply this knowledge in green open space planning and design (Fu et al., 2016a; W.-N. Xiang, 2016b). Ecological wisdom is defined as the ability to integrate ecological knowledge and site characteristics to create a good property design that requires minimal intervention (Forester, 2019a; Patten, 2016a; X. Wang et al., 2016c; Young, 2016). It originates from the idea of re-learning local culture, which has been proven succeed to integrate human behaviour and nature to produce a sustainable landscape (Fu et al., 2016; Min & Lee, 2019; Zhang et al., 2016; S. Zheng et al., 2018b). Ecological wisdom is a relatively new concept that emerged in 2014 and still established by many international academic societies and publications. The concept of ecological wisdom influences various landscape planning and

design practices as a fundamental framework for achieving sustainability and resiliency. In 2019, Springer-Nature Press published an ecological Wisdom book series, signed that ecological wisdom had been a vital socio and ecological discourse (Young & Lieberknecht, 2019a).

Integrating green open space planning and design with ecological wisdom could enhance landscape harmony and sustainability (Wagner et al., 2016b; B. Yang & Li, 2016b). However, study on green open space and ecological wisdom has developed independently despite the approaches often used in urban and environmental development. Moreover, research in ecological wisdom sometimes indistinct to research about traditional ecological knowledge, since both topics examine the cultural landscape as a heritage site (M. Li et al., 2020b; Permana, Iskandar, et al., 2019).

Traditional home garden is a kind of green open space which exist around the traditional settlement. It represents the harmonized interaction between human and their living environment for a long time. The existence of architectural configuration and function of traditional home garden has been shown as adaptive planning and design towards potential and hazard in the landscape. Therefore, it could be categorized as a kind of cultural landscape heritage. Since cultural heritage may contains with ecological wisdom, it is important to documenting and theorizing ecological wisdom of traditional home gardens for sustainable adaptive design, especially in micro-scale landscape.

Generally, Indonesian traditional home garden is a tropical home garden with high biodiversity in plant and livestock. It has role not only as food suppliers but also as social space for inhabitant. It also known as a kind of traditional agroforestry system which vary in diversity base on the physical-ecological condition, economic of households, and culture (Hodgkin, 2001; B., N. P. Kumar, 2004; V. Kumar & Tripathi, 2017). Indonesian home garden widely known as a term *pekarangan*. It is a terminology for home garden in the context of agroforestry

in its relation to livelihood of the household and environment (Kaswanto & Nakagoshi, 2014). However, in fact, Indonesian traditional home garden has various term based on its culture and ethnicities. For instance, studies towards Sundanese home garden reveals that it has specific elements in such spatial layout rules. It also commonly called as *buruan* (Gunawan, 2019). Another type of traditional home garden is a shared home garden that named *taneyan lanjang*. It consists of specific elements that represents social relation between inhabitants (Maningtyas & Gunawan, 2017a; Setiani et al., 2022a). Study on Indonesian traditional home garden mostly related to ethnobotany study (Irawan et al., 2019; Iskandar et al., 2018; Mutaqin et al., 2020; Purnomo et al., 2018; Roshetko et al., 2017; Sujarwo & Caneva, 2015), medicinal plants (Chandra & Wanda, 2017; Rahayu et al., 2020; Ramadhani et al., 2021), biodiversity (Agustina et al., 2019; Hakim et al., 2018; Widianingsih et al., 2019), and no study discuss about ecological wisdom. Most of those studies was conducted in villages and rural areas. However, rare of them which took traditional settlement as study area. Therefore, the original concept of traditional home garden in Indonesia still need to explore, especially related to ecological wisdom concept.

In the present of study, we explore the theory and practice of ecological wisdom for green open space planning and design development. Specifically, the following question are explored: (1) How does the relation between green open space and ecological wisdom in research? (2) what is the distinction between traditional ecological knowledge and ecological wisdom in cultural landscape research? And (3) How does the ecological wisdom in micro-scale green open space, especially in the traditional home gardens?

1.2 Purpose

This research aims to explore theory and practice of ecological wisdom for green open space planning and design development through continuous study with specific objectives as follows.

1. Analysing analyze the relation of green open space and ecological wisdom in research
2. Defining the convergence and distinction of traditional ecological knowledge and ecological wisdom
3. Investigating the ecological wisdom applied in traditional home garden in two major ethnicities in Indonesia, which lived in different landscape characteristics.

1.3 Literature Review

Ecological wisdom is a relatively new concept that emerged in 2014 and still established by many international academic societies and publications. The concept of ecological wisdom influences various landscape planning and design practices as a fundamental framework for achieving sustainability and resiliency. In 2016, Springer-Nature Press published an ecological Wisdom book series, signed that ecological wisdom had been a vital socio and ecological discourse (Young & Lieberknecht, 2019b).

Ecological wisdom defined as a set of willingness and ability to integrate ecological knowledge and site familiarity. It should do to create a good property design that requires minimal intervention in gaining landscape sustainability over time (Patten, 2016a; X. Wang et al., 2016c; B. Yang & Young, 2019). It consists of evidence-based knowledge, either explicit or implicit, originates from the multi-disciplinary background and across generations (W. N. Xiang, 2014). Environmental sustainability facing many problems in landscape degradation as an effect of industrialization and urbanization. It also indicates the friction between human desired-prosperity and ecosystem integrity. In this issue, ecological wisdom encourages an interdisciplinary approach to enhance sustainable landscape development (X. Wang et al., 2016c).

We analyzed 60 documents that published from 2011 to 2022 in August 2022 using bibliometrix (R package) in R Studio. The study revealed that the distribution of ecological

wisdom studies fluctuated from 2012 to 2022, got a peak in 2016 with an increasing trend. It shows how the interest in ecological wisdom studies has increased over time.

The annual scientific production showed in Figure 1. Although the time search conducted from 2011 to 2021, the most of primary studies published since 2016. It should be noted that the ecological wisdom studies in the context of sustainable landscape development had been emerged since 2016 and still exploring nowadays. It also indicated that contemporary and

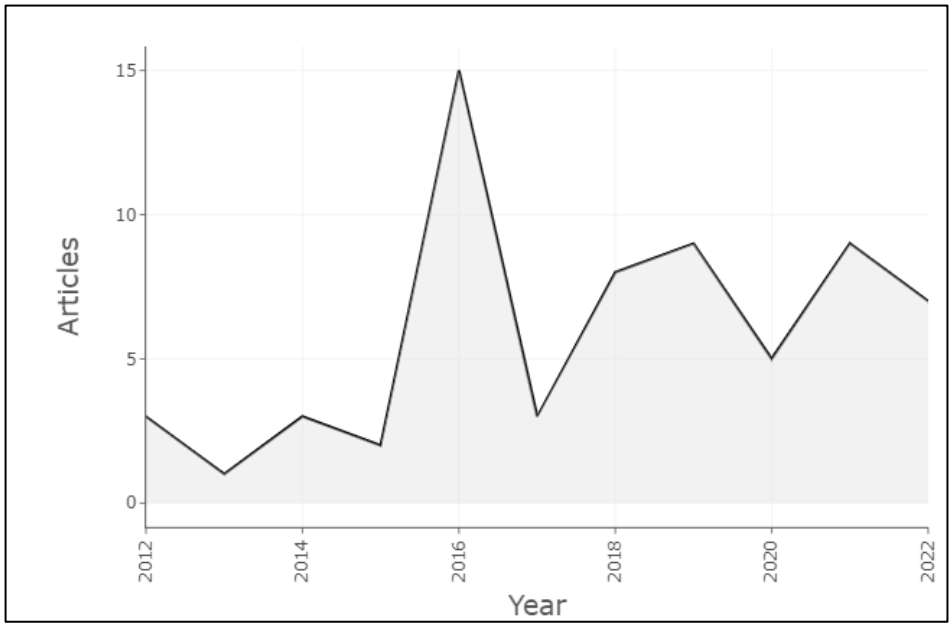


Figure 1. The Annual scientific production

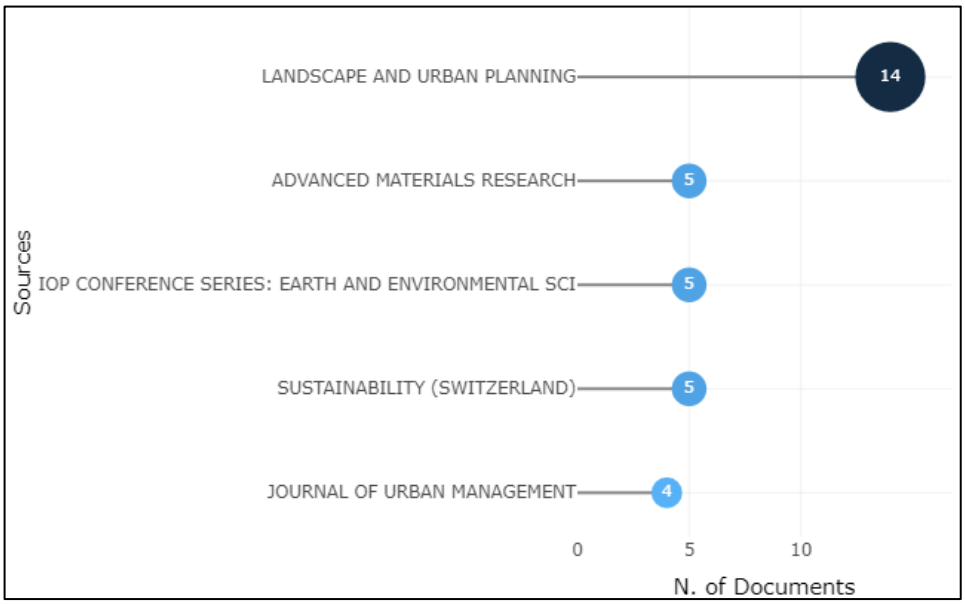


Figure 2. The most influential publication in ecological wisdom studies

relevant studies included in the analysis. Moreover, the graphic trend line in Figure 1 showed that ecological wisdom research is still relevant today.

Figure 2 shows that study on ecological wisdom primarily published in the reputable journal regarding the published sources. It should be noted that a study on ecological wisdom is essential to discuss.

The most influential studies also identified by ordered publication based on the number of citations. Figure 3 shows the big 10 of the citation number. Figure 3 also indicates that the most influential studies in ecological wisdom research were published in 2016, either discussing concept (K. H. Liao & Chan, 2016; Patten, 2016b; X. Wang et al., 2016a; X. Wang & Xiang, 2016; W. N. Xiang, 2014; W.-N. Xiang, 2016a) or learn ecological wisdom from built landscape (Fu et al., 2016; Yan et al., 2020; B. Yang & Li, 2016a; Young & Lieberknecht, 2019b; S. Zheng et al., 2018a).

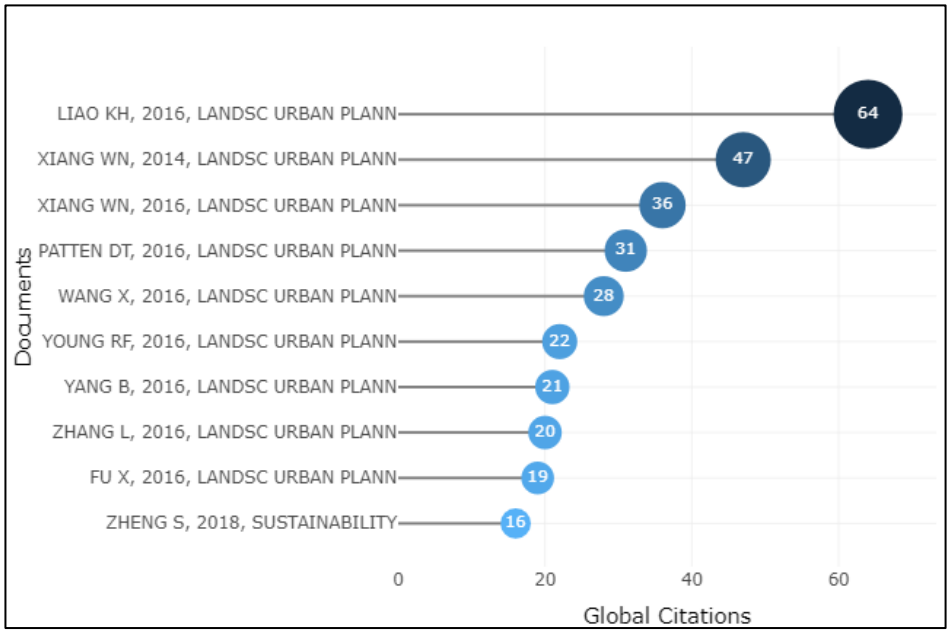


Figure 3. The most influential studies

Thematic map analysis towards 50 keywords of primary studies showed that studies on ecological wisdom could be categorized in 5 clusters that mapped into 3 quandrants (Figure 4). The First quadrant is motor themes. It represents the hot topics, well-developed and relevant terms for structuring the conceptual framework (Aria & Cuccurullo, 2017). None of study

categorized in this quadrant means ecological wisdom studies still wide to explored. The second quadrant is basic themes. It represents the basic topics, which are significant for the domain and cross-cutting to its different areas (Aria & Cuccurullo, 2017). The cluster of sustainable development and ecology was categorized as it which means both themes not well developed yet, and which thus can be characterized as basic research themes. Some of studies

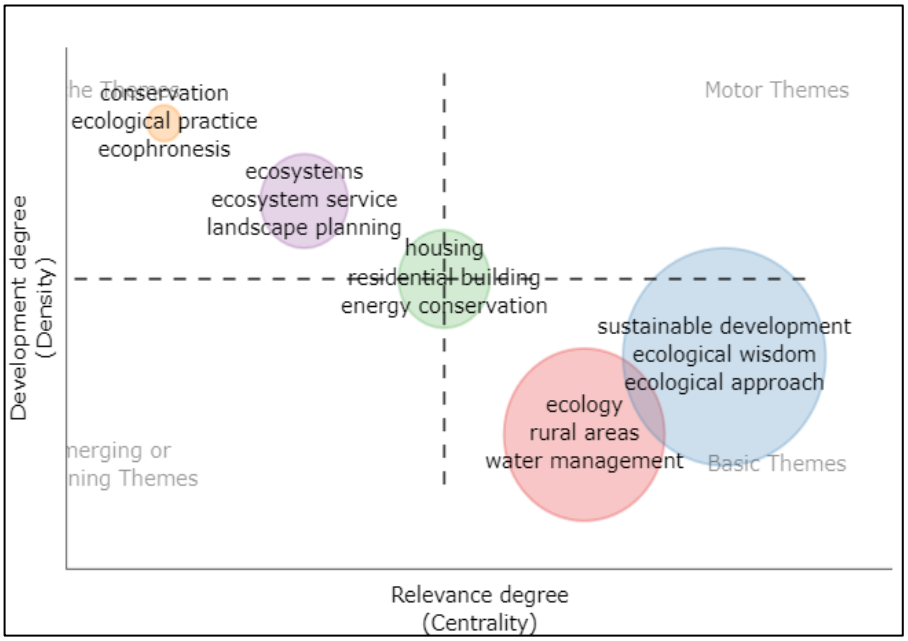


Figure 4. Thematic Map Analysis

that categorized as basic themes mostly discussed about water management (J. Liu et al., 2021; Serrao-Neumann et al., 2019; Vetter & Rieger, 2019), ecological culture (D. Li & Zhang, 2012), human settlement (Akbar et al., 2020b; Lin et al., 2021b; Tang & Zhang, 2016; Winarto et al., 2015), micro-climate (Ma et al., 2019b), and urban planning (Douglas et al., 2018a; K. Liao et al., 2016; Serrao-Neumann et al., 2019; Wagner et al., 2016b; B. Yang & Li, 2016b; Zhang et al., 2016). The third quadrant is emerging/declining themes. It represents peripheral topics which not fully developed or marginally interesting for the domain (Aria & Cuccurullo, 2017). No cluster categorized as it. The fourth quadrant is niche themes. It represents niche topics which strongly developed but still marginal for the domain under investigation (Aria & Cuccurullo, 2017). The cluster of conservation and ecosystem mapped as niche topic which

means both themes strongly presence and could be influence the research development in the future. Some of studies that categorized as niche topic discussed about ecosystem services (Harahap, 2016; Patten, 2016a), ecological practices (Akbar et al., 2020b; Radaei et al., 2020; J. J. Wu & Bai, 2012; B. Yang & Li, 2016b; Yuan et al., 2018), and ecophronesis (W.-N. Xiang, 2016b). Furthermore, the algorithm placed cluster of housing in very central of the thematic map. It means this theme is most discussed and related to the other clusters of the strategic map (Aria & Cuccurullo, 2017). It was related to keyword such as energy conservation (Qin & Li, 2021; Xiong & Yang, 2017a), housing (J. S. Jeong & Ramírez-Gómez, 2017; Panda & Ray, 2021), residential building (Jin et al., 2011; J. Li & Liu, 2012; J. J. Wu & Bai, 2012; Xiong & Yang, 2017b), architectural design (Bystrova, 2019; Zhang, 2018), ecological construction (Cheng et al., 2015; L. Yang et al., 2013; Yuan et al., 2018).

Research on ecological wisdom was conducted in a particular site, either an urban area or a traditional village. The selected study site usually has one or a combination of some characteristics, the first characteristic is site with unique landscape feature. (B. Yang & Young, 2019) stated that reverence to nature is a primary principle to obtain ecological wisdom. The way the community expressed their respect for their landscape created the sustainability of the living environment. Landscape with unique spatial feature encouraged the community to adapt to it and generated ecological wisdom. Therefore, some primary studies on site represented community reverence to nature and revealed the interaction of landscape feature with people adaptation (Ma et al., 2019b; Saboonchi & Fard, 2020; Yuan et al., 2018).

The second characteristic is historical and preserved site. The historical and preserved site represents a time-honored eco-design product that might contain ecological wisdom. It is an evidence-based study to acquire ecological wisdom from the past for new knowledge. Some studies conducted in the historical site are traditional settlement (Chen et al., 2020; Chu et al., 2018; County et al., 2020; Zheng et al., 2018b; Zhou et al., 2018), nomadic settlement (Eng,

2019), agricultural heritage area (M. Li et al., 2020b), and historical drainage system area (Zhang et al., 2016).

The third characteristic is site with environmental problem or limitation. A site with environmental problem or limitation mainly was chosen as a study area. In this context, ecological wisdom used to solve the landscape problem to create an ideal site. Some of them are in urban areas, mainly residential and industrial areas that face environmental challenges (Casazza, 2020; Douglas et al., 2018a; Fu et al., 2016b; Long et al., 2020; Patten, 2016a; Wagner et al., 2016b). The other studies took place either in challenging living environments (Radaei et al., 2020) or environmental problems (Forester, 2019b; B. Yang & Li, 2016b). Since most primary publication was an evidence-based study, it might presume that environmental problems encouraged people to transform their ecological knowledge to gain ecological wisdom.

The last characteristic is site with abundant natural resource. The exploration of ecological wisdom in site with abundant natural resource is mainly related to how people interact and manage the ecological factor and conserve their natural resource. Most of the study conducted in the traditional village (Kakoty, 2018; Modeen, 2021a; Muhdhar et al., 2018; Permana, Iskandar, et al., 2019), while others conducted in a historical agricultural system (M. Li et al., 2020b).

Research related to theme “housing” is potential to become motor themes in the future. Therefore, further improvement related to this topic should be continued to explore. It includes research about energy conservation, housing, residential building, architectural design, buildings, ecological concepts, and ecological construction. However, topic about home garden still limited to discuss from ecological wisdom perspective. Considering the characteristic of

study area, traditional home garden may have high potential to be the site cases since it could be categorized as heritage site that needs to preserve and has abundant natural resources.

Chapter 2. Methodology

2.1 Theoretical Framework

(Young, 2016) suggest that the source of wisdom is found in knowledge from the compilation of experience and research, collective stories, as well as scientific theories. Therefore, (B. Yang & Young, 2019) proposed a conceptual model of knowledge to wisdom transformation as shown in the Figure 5.

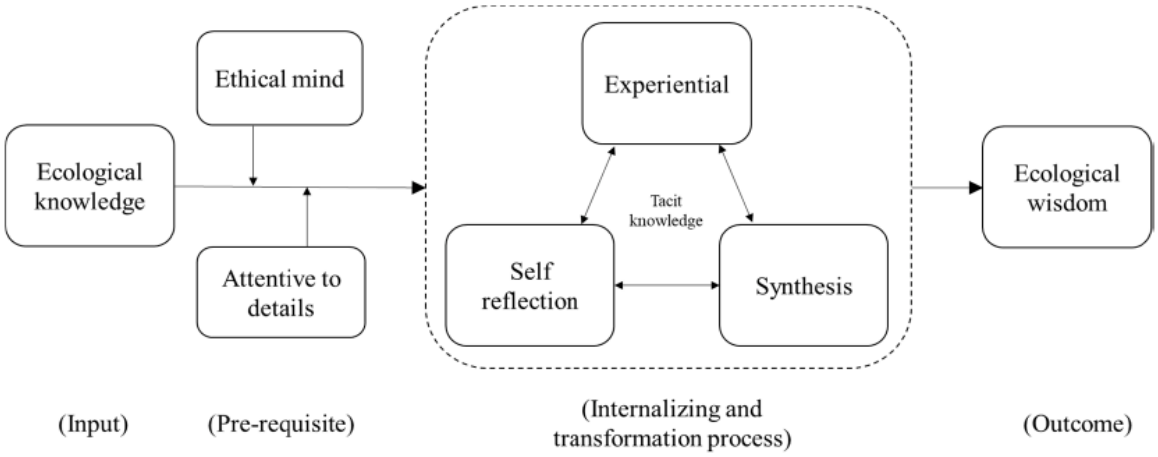


Figure 5. Conceptual Model of Knowledge to Wisdom Transformation (redrawn from Young and Yang 2019)

In this model, the transformation viewed from an individual's perspective which intended that ecological wisdom resulted by tacit knowledge from ecological knowledge as an input (Figure 5). It also involves self-reflection, experience, and synthesis in process.

Ecological knowledge as a base knowledge for ecological wisdom development, could be distinguished into factual knowledge and procedural knowledge. Factual knowledge told about "*knowing that*" whereas procedural knowledge told about "*knowing how*" (Gugerell & Riffert, 2011). The factual ecological knowledge is needed when the designer facing the ecological problem on site. However, the knowledge base for ecological wisdom exceed beyond the ecological science (B. Yang & Young, 2019)(Palmer, 2012). There are two pre-condition before knowledge to wisdom transformation proceed. Firstly, the person should have

ethical mind. Factual knowledge need ethical guidance to execute fairly and respectfully to either society and biosphere (Jeste et al., 2010). Without ethical mind, human could be greedy in utilizing resources and it will be the beginning of environmental deterioration. The second pre-condition is attention to detail in dealing with design issue. Landscape is a complex system that need to threat holistically. It consists of elements that are interrelated and interactive each other. Therefore, this pre-requisite is very important on ecological wisdom development. Finally, the level of readiness for both determines the successfulness of ecological knowledge to wisdom transformation process.

The further step is internalization and transformation process which produced tacit knowledge. Tacit knowledge is knowledge which resulted from interaction between self-reflection, experience, and synthesis. The interaction and assimilation between factual knowledge and tacit knowledge constantly worked on ecological wisdom development (B. Yang & Young, 2019). The Cambridge dictionary define self-reflection as the thinking activity about own feelings and behaviour, and the reasons that may lie behind (Cambridge Dictionary, 2016). Factual knowledge with self-reflection could encourage wisdom in a person to the next level. On the other hand, there are experience knowledge that also plays an important role for wise decision making (Fazey et al., 2006). It increases the scientific knowledge and wisdom simultaneously and encourage the capability of designer to appreciate the ecology. Further, the last step to obtain ecological wisdom is synthesis. It is the combination of experience and scientific knowledge that accumulated for years would deliver ability to combine information from various sources to be a coherent whole. This ability will be helpful to solve new challenges and problem in the future and encourage the creativity of designer.

However, this model still lacks on knowledge cycle mechanisms. Therefore, Min and Lee (2019) proposed and updated that conceptual framework by adding externalization stage as a process of knowledge conversion from tacit to explicit (A. Min & Lee, 2019a). Ecological

wisdom categorized as an socialization stage in SECI model (Dubberly & Evenson, 2011) where tacit knowledge shared and accumulated by direct experiences. Therefore, it needs to externalize by creating new and explicit concept that could be re-used for completing existing ecological knowledge (A. Min & Lee, 2019a) as shown in Figure 6.

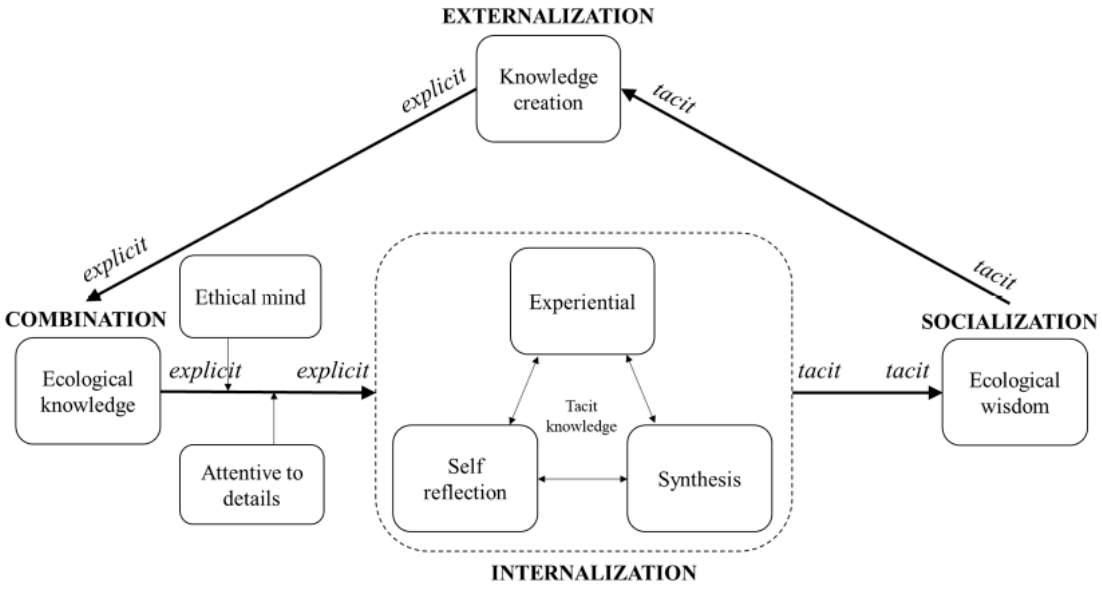


Figure 6. The updated version of knowledge-to-wisdom transformation cycle analogous to the SECI model (modified by Min and Lee (2019))

Acquiring ecological wisdom needs externalization process. It in line with (B. Yang & Young, 2019) that argue regarding documenting, communicating, and theorize ecological wisdom for wiser ecological knowledge creation (B. Yang & Young, 2019).

2.2 Research Method

2.2.1 Systematic Literature Review

In the majority of research reports, case reports, and expert opinion papers, literature reviews can be found in the introduction and discussion parts. Because the writers are likely to only include significant studies in a given field and only those that are most congruent with their beliefs or the findings of their research, all of these types of literature reviews may be impacted by selection bias. Additionally, it is well recognised that studies with good results—those with statistically significant findings of either benefit or harm—are more likely to get

published and to appear in high impact journals. So that they can provide a fair and objective assessment of the literature, systematic reviews seek to identify all studies that address a certain subject The methods used to find studies for systematic reviews have been created specifically to find the contradictory studies that might be published in conference proceedings or low impact journals but are not indexed in bibliographic databases and could counterbalance the findings of the more readily identifiable positive studies (Nightingale, 2009).

A systematic literature review aims to include all published information on the subject, while also evaluating the quality of this evidence, and synthesises scientific evidence to answer a specific research question in a transparent and reproducible manner. By relying on explicit, systematic techniques to eliminate bias in the selection and inclusion of research, to evaluate the quality of the included studies, and to sum up them objectively, the SR approach seeks to reduce the risk for bias and promote transparency at every stage of the review process (Liberati et al., 2009; Petticrew, 2001)

When the inclusion and exclusion criteria for the review are not firmly specified a priori or when they restrict the inclusion of studies in a way that can skew the results, selection bias in systematic reviews can occur. Creating a protocol that explicitly states the following elements is the first step in conducting a systematic review: 1) the review's goals and objectives; 2) the inclusion and exclusion criteria for research; 3) the process for identifying studies; and 4) the analysis strategy. Changes to a systematic review's protocol should only be made when absolutely necessary because they can increase bias. To reduce the danger of selection bias, at least two reviewers should independently evaluate papers for inclusion into the review (Nightingale, 2009). The reasons for exclusion should be made explicit in the review's results section. Many journals now demand that a PRISMA (formerly QUOROM) statement and flow diagram be included in the review's outcomes section (Moher et al., 2009) as shown in Figure 7.

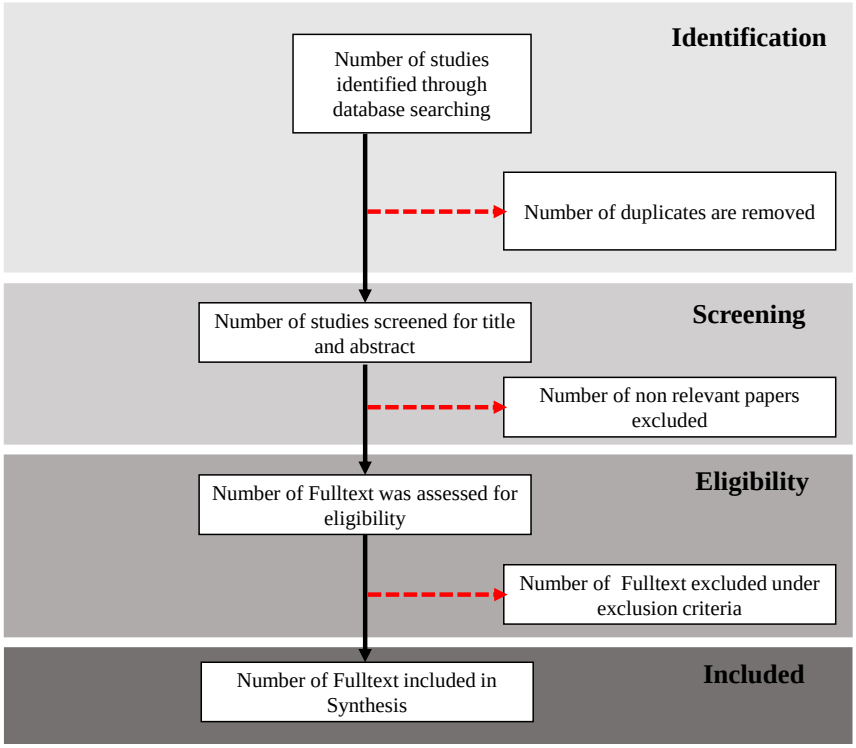


Figure 7. The PRISMA workflow for reporting systematic review (redrawn from Moher et.al 2009)

2.2.2 Co-occurrence Word Analysis by VOS Viewer

Co-word analysis has been acknowledged as a suitable method to map the relationships among concepts, ideas, and issues (Callon et al., 1991). It is comparable to co-citation or co-occurrence analysis (Small, 1973). Co-word analysis has been used to demonstrate research breakthroughs in a variety of domains (Hu et al., 2013). In co-word analysis, it is presumed that words taken out of papers could stand in for a certain line of inquiry, subject, or area of study. If two keywords appear together in a publication, they indicate that the two study areas they stand for are connected (Cambrosio et al., 1993). Stronger correlation between keywords in pairs results from higher co-word frequency, which can further imply that two keywords are connected to a certain research topic. Therefore, co-word analysis could be useful in identifying patterns and trends in a certain discipline (Ding et al., 2001).

VOS viewer is a computer programme that created for creating, visualising, and exploring scientific bibliometric maps. The programme is available for free at

www.vosviewer.com and can analyse all types of bibliometric network data, such as citation relationships between publications or journals, collaboration relationships between researchers, and co-occurrence relations between scientific terms (van Eck & Waltman, 2018).

The algorithm used in this program is almost similar with multi-dimensional scaling (MDS). VOS viewer produces a cluster that is automatically displayed in color on the map. The clustering algorithm operates with a parameter (ɣ) that can be changed to obtain more or fewer clusters and displays the co-word map analysis based on the co-occurrence of the term in papers. The advantage of VOS viewer is that it uses the text mining function to identify the combination of noun phrases relevant to mapping and integrated clustering approaches to examine co-citation network data and co-occurrence. Although many programs analyse text units and matrix similarities, the visualizations provided by VOS viewer are an advantage (van Eck & Waltman, 2014) and interactive program options and functions make it easy to access and explore.

2.2.3 Thematic Analysis

Thematic analysis is a qualitative data analysis method that involves searching through a data set to identify, analyse, and report on repeated patterns (Braun & Clarke, 2006). It is a method for describing data, but it also incorporates interpretation in the processes of selecting codes and developing themes. Thematic analysis is distinguished by its adaptability to a wide range of theoretical and epistemological frameworks, as well as to a wide range of study questions, designs, and sample sizes (Kiger & Varpio, 2020).

While some scholars have described thematic analysis as belonging to ethnography (Aronson, 1995) or being particularly suited to phenomenology (Joffe, 2011), Braun and Clarke (2006) argue that thematic analysis can stand alone as an analytic method and be seen as foundational for other qualitative research methods (Braun & Clarke, 2006). Indeed, the principles of thematic analysis, such as how to code data, search for and refine themes, and

report findings, are applicable to a variety of other qualitative methods, including grounded theory (Watling & Lingard, 2012) and discourse analysis (J. Taylor et al., 2012). Because of this flexibility, Braun and Clarke (2006) refer to thematic analysis as a method rather than a more strictly prescribed methodology.

When attempting to understand a set of experiences, thoughts, or behaviours across a data set, thematic analysis is an appropriate and powerful method to employ. It is less suited to examining unique meanings or experiences from a single person or data item because it is designed to search for common or shared meanings. Finally, because thematic analysis is relevant to other qualitative research methods, the steps of thematic analysis are similar to those of grounded theory, ethnography, and other qualitative methodologies that rely on coding and searching data sets for themes as part of their processes (Braun & Clarke, 2006; Kiger & Varpio, 2020).

The research construct's themes through thematic analysis to reframe, reinterpret, and/or connect data elements. Thus, themes are more than just organisational tools for categorising and labelling data. While thematic analysis processes involve the researcher developing organisational and classification labels to describe the data, thematic analysis also includes data interpretation and transformation processes. But, if thematic analysis does not belong at the purely descriptive end of the analysis spectrum, it also does not belong at the highly interpretive end of the spectrum. Thematic analysis is not typically used to engage in data interpretation and transformation with the goal of developing theory, which is the primary goal of grounded theory (Glaser & Strauss, 2017). Thematic analysis, on the other hand, falls most naturally in the middle, involving more than just description and classification but not going as far as to create theory.

Thematic analysis is one of the easier qualitative techniques to understand and use when compared to many others. Thematic analysis is quite accessible to less experienced researchers

since it does not require the use of theory to inform analysis, and because there are published explanations and examples of the usage of this analytical method (Braun & Clarke, 2006). It is also an effective technique for data analysis that enables researchers to summarise, highlight, and evaluate a variety of data sets. Additionally, because so many other types of qualitative analysis are built on its methodologies, Braun and Clarke (2006) claimed that researchers should master it as their first qualitative analysis technique (Kiger & Varpio, 2020).

2.2.4 Survey Method

The definition of survey research is "the gathering of data from a sample of people through their responses to questions." A variety of techniques can be used to find participants, gather data, and instrument the study in this type of research. The methodologies used in survey research might be quantitative (such as using numerically rated items in surveys), qualitative (such as utilising open-ended questions), or a combination of both (i.e., mixed methods). Surveys are extensively utilised in social and psychological research due to their frequent use in describing and examining human behaviour (Brant et al., 2015).

The most popular data collection techniques for survey research are questionnaires and interviews. Individually or in a group, professionally conducted or self-administered, questionnaires normally contain several items that reflect the objectives of the research. In addition to legitimate and credible research tools, questionnaires may also incorporate demographic questions (DuBenske et al., 2014). Interviews can be conducted over the phone, on a computer, or in person. They offer the advantage of allowing you to see the interviewee's nonverbal response(s) so you can then clarify your own question. An interviewer may make inquisitive remarks to learn more about an issue or subject and may ask for clarification of an imprecise response (Singleton et al., 2017). Interviews can be expensive and time-consuming, making them generally unworkable for big samples (Brant et al., 2015). To lower the possibility of measurement and non-response error and to more effectively match the study methods to

the intended sample, some authors support the use of mixed methods for survey research when no single approach is sufficient to satisfy the specified research purposes (Don A. Dillman et al., 2014; Singleton et al., 2017).

2.2 Research Flow and Dissertation Structure

This research consists of two parts. The first part is exploring the theory of ecological wisdom and its relation to the green open space topic. It consists of two studies which conducted systematic literature review towards ecological wisdom theory and search evidence about it relationship to green open space topic. This study is involving co-occurrence keyword analysis using Vos Viewer software and thematic analysis using NVivo software.

The second part is exploring the practices of ecological wisdom in traditional home garden of two ethnics in different landscape characteristics. It was survey research which involving site observations, interviews, and literature investigation to explore ecological wisdom that applied on site. The qualitative data was analysed using thematic analysis in NVivo software. In discussion, the analysis result of both study area was compared to find the specific characteristics of their ecological wisdom.

As a conclusion, this study proposed a guideline to applied ecological wisdom of traditional home garden for green open space planning development. To summarize, Table 1 shows the profile of each study.

Furthermore, this dissertation is organized into six chapter that described as follows.

a. Chapter 1 described the background of the undertaking studies, purposes, and literature review about ecological wisdom studies development.
b. Chapter 2 consists of theoretical framework of this study, research method, research flow, and dissertation structure

c. Chapter 3 provides exploration towards the research trend and hot topic in green open space and ecological wisdom research using Vos Viewer software to identify the relationship between both topics.

d. Chapter 4 defines the distinction between TEK and EW and examining the similarities of both by analyzing keywords and themes of literature using Vos Viewer and NVivo Software.

e. Chapter 5 explore ecological wisdom of traditional home garden in two ethnicities in Indonesia using survey research and thematic analysis

f. Chapter 6 provides summary and general discussion, study limitation, and future works.

Table 1. Summary of study profile

Component	**Study 1**	**Study 2**	**Study 3**
Objectives	▪ to identify the trends and hot topics in green open space and ecological wisdom research ▪ to determine a potential topic for future research related to both subject areas.	▪ to review and define the distinction between traditional ecological knowledge and ecological wisdom ▪ based on its definition, agents, sources, and research scope. ▪ To analyse the relationship ▪ between keywords used by scholars and identify the connection and convergence of the ▪ thematic code. ▪ To construct a conceptual framework describing the TEK and EW ▪ relationships in research and propose potential areas for research improvement.	▪ to explore the ecological wisdom applied in traditional home garden includes knowledge, the spatial characteristics, and the space use and function underlies ecological wisdom in two major ethnicities in Indonesia, which lived in different landscape characteristics. ▪ to compare ecological wisdom characteristics of both study area.
Data Collection	Literature survey in scopus database	Literature review through PRISMA process	Site observation, semi-structured interview, desk study
Sample	283 published	56 primary studies	57 site cases
Data Analysis	Co-occurrence word analysis	Keywords occurrence analysis, thematic analysis	Thematic analysis

Chapter 3. Trends And Hot Topics in Green Open Space and Ecological Wisdom Research

3.1 Introduction

Recently, the need for green open spaces has increased along with an increase in knowledge about its benefits and roles for life quality, especially in urban areas where green open space is essential for increasing biodiversity, such as through the remnant habitats. Some benefits of green open space in urban areas include air and water purification, mitigation of the effects of environmental pollution, carbon sequestration, microclimate regulation, urban, recreational, spiritual and habitat for therapeutic wildlife value and social integration. Green space improves the quality of the environment, urban tourism, active and passive recreation and other urban ecological functions (Kaplan & Kaplan, 1989; Randall et al., 2003). The ecological benefits bestowed in green areas range from protecting and maintaining biodiversity to help in the mitigation of change. As urban green open spaces contribute to human and social wellbeing, they are essential for liveable and sustainable cities (M. Rakhshandehroo et al., 2017).

On the other hand, there is an ecological wisdom concept that has emerged since 1980s, and was declared as a new concept of landscape development in 2014. It is defined as good property design that require minimal intervention ecologically and socially (Young & Lieberknecht, 2019a)]. This idea originated from the concept of returning to the local culture, which has been proven over the years to integrate human behaviors and nature to produce a sustainable landscape. The ecological wisdom concept emphasizes on ideas, principles, and strategies that have historically been proven, specifically to the location and context, and leads to the creation of long-term sustainability.

Both green open space and ecological wisdom play an important role on sustainable landscape development (Dewi et al., 2018b; Ferris et al., 2001; Kakoty, 2018; Patten, 2016c;

Shi & Woolley, 2014)]. They improve the life quality by fulfilling the human basic needs on space in the landscape according to human value and their way of life. Firmansyah (2016) stated that smart city development should be supported by local wisdom to maintain the sustainability of landscape (Firmansyah, 2016)].

The study on green open space and ecological wisdom has developed over time and links to various subjects and impacts. Scopus identified at least 290 papers since 1971, which discussed about the green open space topic and 101 papers since 1984, which discussed about the topic of ecological wisdom. However, both research subjects developed somewhat independently despite their approaches often used in urban and environmental development as an effort to achieve a sustainable landscape and thereby sustainable development goal (SDGs) (Kusmarni & Holilah, 2018)], (Dewi et al., 2018b)]. Research development on green open space topic has expanded to various topic including its role for ecology (Barghjelveh et al., 2016a)] (Hasyim et al., 2019; Priyono et al., 2019)]. Moreover, in locality context, some research on ecological wisdom are related to green space such as traditional garden (A. Min & Lee, 2019b)], biodiversity (Ali Ikhsan et al., 2018a; Darmadi et al., 2019; Rennesson, 2019)], and protected forest (R. Maru et al., 2016)]. Finally, it is challenging to identify a relationship between both topics and obtain a direction for future research, which would be useful for sustainable landscape development.

The bibliometric analysis of green open space and ecological wisdom research discussed in this research was to identify the trends and hot topics on both subjects. Furthermore, the findings from this research could determine the potential research for future. Bibliometric analysis evaluates the progress and development of knowledge on the topic of research (Tupan et al., 2018)]. It is applied to the literature and metadata publications to understand the paradigm and dynamics of the development of science (Su & Lee, 2010)].

The concept of science contained in a document is seen through the use of co-word. Co-word analysis is based on the co-occurrence analysis of words or keywords from two or more documents used to index documents as mentioned by Diodato 1994 in (Tupan et al., 2018)]. It is intended to analyze content, patterns, and trends of a document by measuring the strength of a term. Co-word analysis is used to calculate the number of keywords of research documents that appear simultaneously in the article under study. These keywords are determined by the author. Thus, the relationship between the documents becomes stronger when more of the same keywords occur in document collection (C. Chen, 2014)]. Furthermore, the distribution of this co-word is determined by its co-occurrences in a co-word map. The essential and unique terms featured in the title and abstract are analyzed to represent a concept.

VOSviewer is a free computer program for visualizing and exploring maps of bibliometric knowledge. The algorithm used in this program is almost similar with multi-dimensional scaling (MDS). VOSviewer produces a cluster that is automatically displayed in color on the map. The clustering algorithm operates with a parameter (ɣ) that can be changed to obtain more or fewer clusters and displays the co-word map analysis based on the co-occurrence of the term in papers. The advantage of VOSviewer is that it uses the text mining function to identify the combination of noun phrases relevant to mapping and integrated clustering approaches to examine co-citation network data and co-occurrence. Although many programs analyze text units and matrix similarities, the visualizations provided by VOSviewer are an advantage (van Eck & Waltman, 2014)] and interactive program options and functions make it easy to access and explore.

3.2 Materials and Methods

3.2.1 Data Collecting

The data were collected from the Scopus database using “green open space” or “ecological wisdom” as keywords in article title, abstract, and keyword on December 18, 2019.

The string ("…") was used to narrow the findings. We collected English research article documents, which were published in the last decade from 2009 to 2019.

Currently, the Scopus platform is the largest academic article database and covers science and social science fields. (Falagas et al., 2008) stated that Scopus has higher consistency and conformity than other leading indexers, such as the Web of Science and Google Scholar (Falagas et al., 2008)].

In the data collection stage, 283 documents related to the topics of green open space and ecological wisdom were found. The documents metadata used in the analysis stage included author(s), title, abstract, citation, publication year, references, and sources. The publication information was downloaded as a CSV file for further processing by the VOSviewer application. The Scopus analysis of document result also was downloaded to describe the publication data in brief, and descriptive analysis was conducted to analyze the trend between them.

3.2.2 Data Analysis

Text data were extracted from the title and abstract of the document for analysis using the VOSviewer built-in text mining function (van Eck & Waltman, 2018) and counting the words by the full counting methods. VOSviewer offers two counting techniques: full counting and binary counting. The full counting method is all occurrences of a term in a document (in this case, title and abstract for each article) used to assess co-occurrence relationships among terms. Binary counting refers to term calculation only using the presence or absence of a term in a document (Gobster, 2014). Nevertheless, van Eck and Waltman (2014) stated that neither method is not significantly different, especially for a small data set (van Eck & Waltman, 2018)**]**.

Based on the full counting method, 7739 terms were found and filtered into 87 terms occurred a minimum of 20 times to qualify. Furthermore, 75 most relevant terms were chosen to display and analyzed by excluding the unrelated or familiar words and merged repetitive words by applying the thesaurus files. The hot topic terms were also analyzed by calculating their average score of citation based on their occurrences. It was conducted by normalizing the citation score, which was divided by mean and color range from 0.5 to 2.5 and more.

3.3 Result and Discussion

3.3.1 Publication Overview

The number of publications is an important factor to show the development trends in scientific research. Regarding the methodology previously described, 283 research articles related to green open space and ecological wisdom research from 2009 to 2019 were found. 215 documents were related to the green open space field, while 68 documents were related to the ecological wisdom field. Figure 8 shows the number of documents per topic per year. In general, the research interest in both fields is increasing annually. After stagnancy in 2009, the increase in number of publications has fluctuated and reached a peak in 2018. Upon zooming

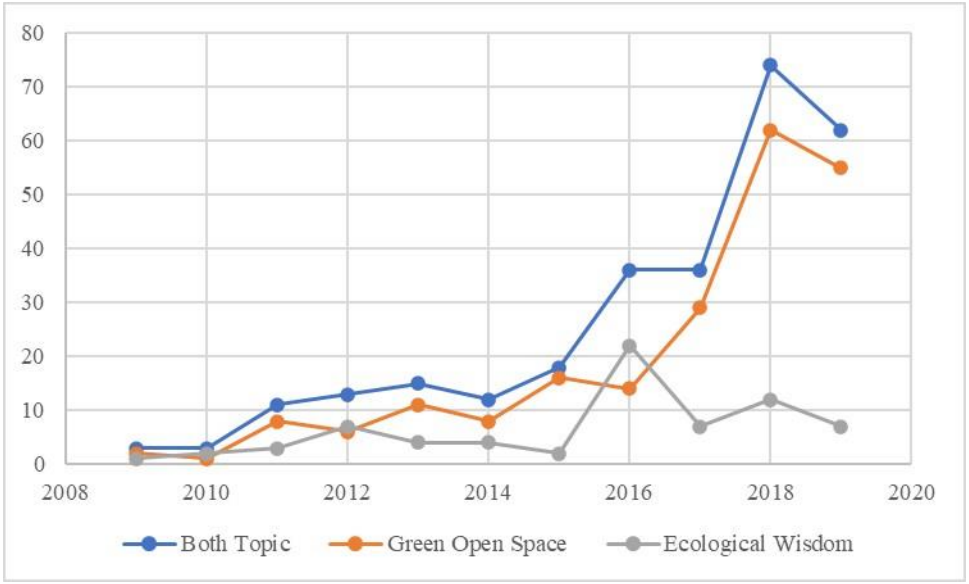


Figure 8. The number of documents by year according to Scopus data

out, it is seen that the green open space topic was discussed more extensively as compared to the ecological wisdom field. The ‘orange line’ in figure represents the green open space topic, which increased significantly in 2017, whereas the ‘grey line’ which represents the ecological wisdom topic and is relatively stable, fluctuated from 2015 to 2017, and reached a peak in 2016.

The publication source of document collection was also identified and 104 sources that published both topics were found. In all, 22% of documents were published in “IOP Conference Series Earth and Environmental Sciences” from 2017 to 2019 followed by “Landscape and

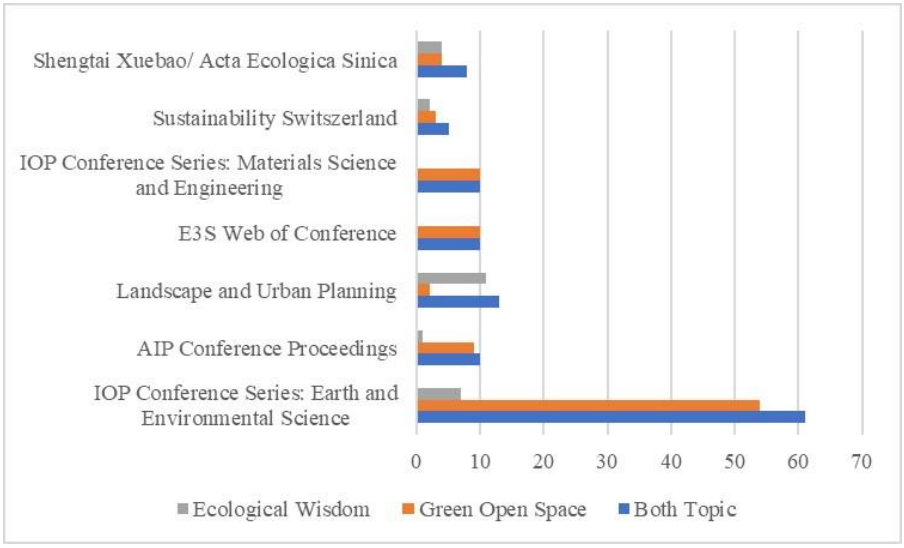


Figure 9. The number of documents by source according to Scopus data

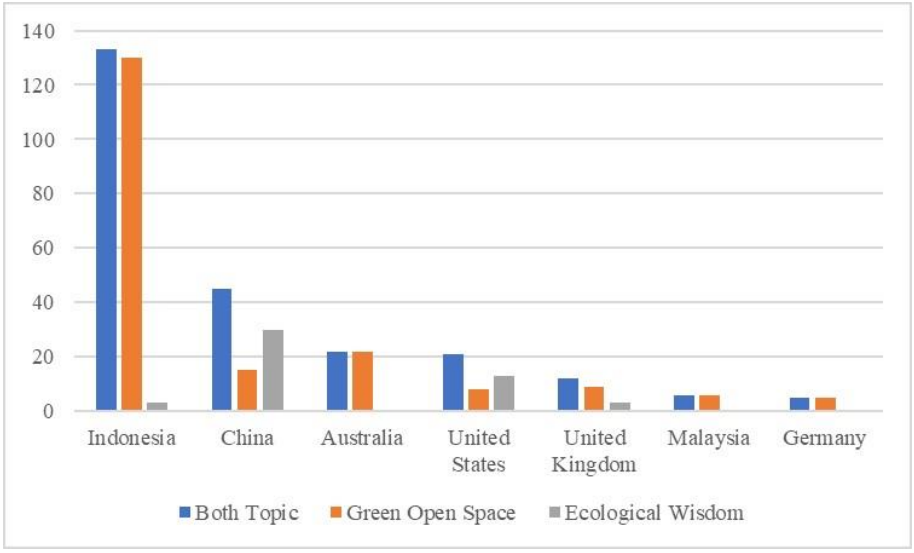


Figure 10. The number of documents by country according to Scopus data

Urban Planning" (4.5%), "AIP Conference Proceeding" (3.5%), and "IOP Conference Series Materials Science and Engineering" (3.5%). Most articles were published in 100 other journals less frequently. Upon zooming out of the data analysis in Figure 9, it was found that most of the green open space research were published in international conference proceedings, while ecological wisdom research were published in international journals.

Interestingly, when arranged by country, most document collections came from Indonesia and China, followed equally by Australia and the USA (Figure 10). Therefore, it could be assumed that these four countries were most interested in these topics. Further, Figure 3 shows the trend of both topics by country. It reveals that the green open space topic is mostly discussed in Indonesia and Australia, whereas ecological wisdom is mostly discussed in China and the USA.

3.3.2 Research trends in last decades

To analyze the research trends from 2009 to 2019, we extracted 7739 terms from tittles and abstracts of 283 documents collected using VOS viewer's text mining function. From this stage, we found 87 terms occurred at least 20 times and filtered them through the thesaurus file into the 75 most relevant terms. Figure 11 shows the results of the term co-occurrence map to show the trends in green open space and ecological wisdom research.

There are four clusters identified by VOS viewer and are illustrated in different colors: red, green, blue, and yellow. We labelled each cluster manually based on the observed keywords that most expressed linked all terms in the cluster. For example, in the red cluster, green open space and urban area are terms with high occurrences and can express all terms in the cluster; consequently, we named this cluster as the urban green space cluster. Similarly, the green, blue, and yellow clusters were labelled as environmental quality, sustainable planning, and landscape development, respectively.

Figure 11 shows the term map of the document collection. There are 75 terms divided into 4 clusters. The red clusters contained 27 terms related to urban green space fields, such as green open space, settlement, flooding, policy, water, urban forest, and urban area. The green clusters contained 17 terms related to the environmental quality topic such as environment, quality, resident, child, park, and activity. Similarly, the blue cluster contained 16 terms related to sustainable planning such as ecological wisdom, sustainable, planning, nature, influence,

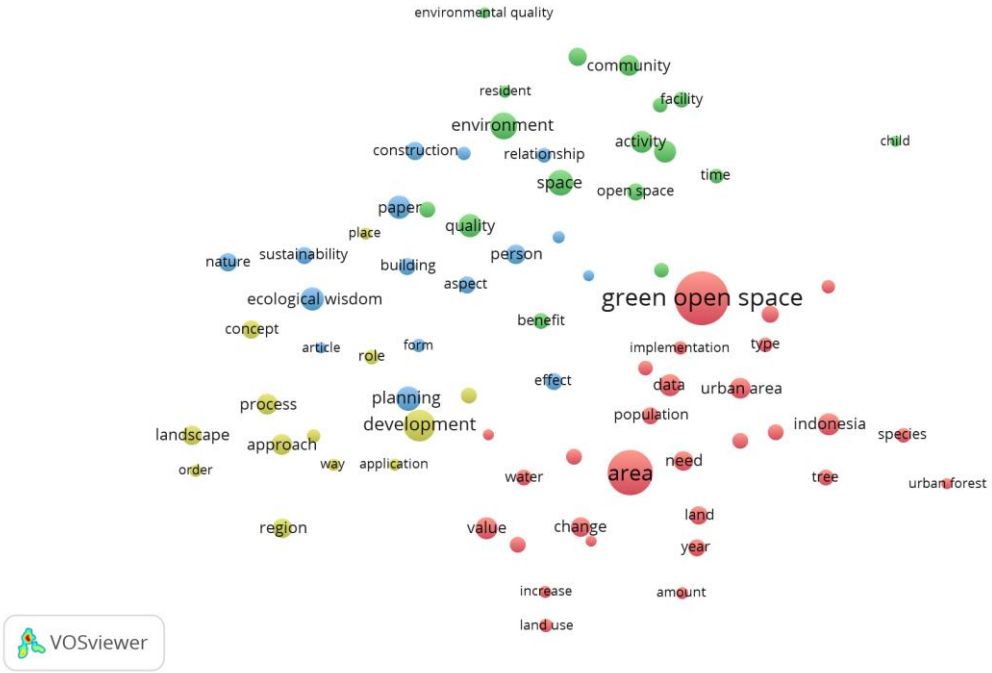


Figure 11. The Term Co-occurence Map of Document Collection

and construction. Finally, the yellow cluster is a landscape development cluster that discusses 13 terms such as landscape, development, approach, concept, function, and role.

The total link strength (TLS) indicates the total strength of the link of a term with another term (van Eck & Waltman, 2018)]. It is used to predict the trend of research. Table 2 shows that the red cluster contained the highest number of terms and had the highest total link strength value, followed by the green, yellow, and blue clusters. This indicated that the research trend

Table 2. The most relevant term in green open space and ecological wisdom research

Cluster	Terms	TLS
Urban green space (red points)	Green open space, Area, Value, Urban Area ,Indonesia, Data, Need, Change, Population, Land, Jakarta, Year, Water, Settlement, Distribution, Number, Policy, Type, ,Tree, Effort, Land use, Government, Species, Implementation, Increase, Amount, Addition, Flooding, Urban Forest	49734
Environmental quality (green points)	Environment, Quality, Space, Activity, Community, Park, Factor, Open Space, Facility, Life, Health, Use, time, Benefit, Environmental Quality, Resident, Child	27702
Sustainable planning (blue points)	Planning, Paper, Sustainability, Ecological wisdom, Effect, Person, Nature, Building, Construction, Aspect, Relationship, Form, China, Influence, Importance, Article	19046
Landscape development (yellow points)	Development, Landscape, Process, Region, Approach, Concept, Function, Role, Order, Information, Place, Way, Application	24746

in the last decade focused urban green space topics and was supported by environmental quality, landscape development, and sustainable planning topics.

Moreover, the relevancies of term indicated the larger differences of two distribution over noun phrase. The noun phrase with high relevance has significantly bias distribution towards other noun phrase and tend to represent specific topics covered by the text data. Whereas the low relevance noun phrase had less equal distribution towards another noun phrase and tended to represent general topic, which was not to be representative of any specific topic (van Eck & Waltman, 2018). Table 3 shows 10 terms with the highest relevance representing the most specific topic discussed in document collection. The specific terms tended to have little occurrences. It indicated that these terms are still limited to be discussed and potential to be a research topic in the future.

On the other hand, the location between cluster also described the closeness of the study (van Eck & Waltman, 2018)]. Figure 11 shows that green, blue, and yellow clusters were located close to each other and diffused, so there were no clear boundaries. It represented the convergence between environmental quality, landscape development, and sustainable planning

Table 3. The highest relevance noun phrase in green open space and ecological wisdom research

Terms	Occurrences	Relevance	Cluster
Tree	49	2.75	Urban Green space
Species	47	4.55	Urban Green Space
Urban forest	25	7.86	Urban Green Space
Child	28	2.71	Environmental Quality
Ecological wisdom	110	2.07	Sustainable Planning
Nature	68	2.53	Sustainable Planning
Landscape	78	3.73	Landscape Development
Process	85	2.43	Landscape Development
Region	76	2.12	Landscape Development
Order	31	3.72	Landscape Development

topics, meaning that research collaboration among researchers of these topics was conducted. Convergence itself is defined as a condition in which boundaries between filed of science are blurred and processed to combine with another field. Generally, some innovative solutions come out of convergence (D. Jeong & Koo, 2016)].

3.3.3 Relation Between Green Open Space and Ecological Wisdom Topic

Van Eck and Waltman (2018) stated that terms with a high relevance score tend to represent specific topics covered by the text data, while terms with a low relevance score tend to be general and not as the representative of any specific topic (van Eck & Waltman, 2018)]. The green open space term had the highest occurrences value (562 occurrences), but low relevance (0.52 relevance). It meant that the green open space term has been widely discussed and correlated with a variety of topics. This was proven by the link number of the green open space terms. The green open space term became the core of the topic discussion and connected to 73 other terms, except the ecological wisdom term (Figure 12a). This indicated that the green open space term and ecological wisdom term never appeared together in document collection

or that neither topic had a correlation in research. In other words, there has never been research discussing both topics together in the last ten years.

Next, the ecological wisdom term occurred 110 times in the document collection with a relevance score of 2.07. According to van Eck and Waltman (2018), this term is explicitly used by the researcher and is still limited to discussion (van Eck & Waltman, 2018)]. It is described in Figure 12b, where the ecological wisdom term is linked to only 30 other terms, especially in the sustainable planning cluster. Based on its location, the ecological wisdom term is close to sustainability, nature, and place terms. This indicates that research on ecological wisdom is often correlated with sustainability concept, nature, and is specific to a location.

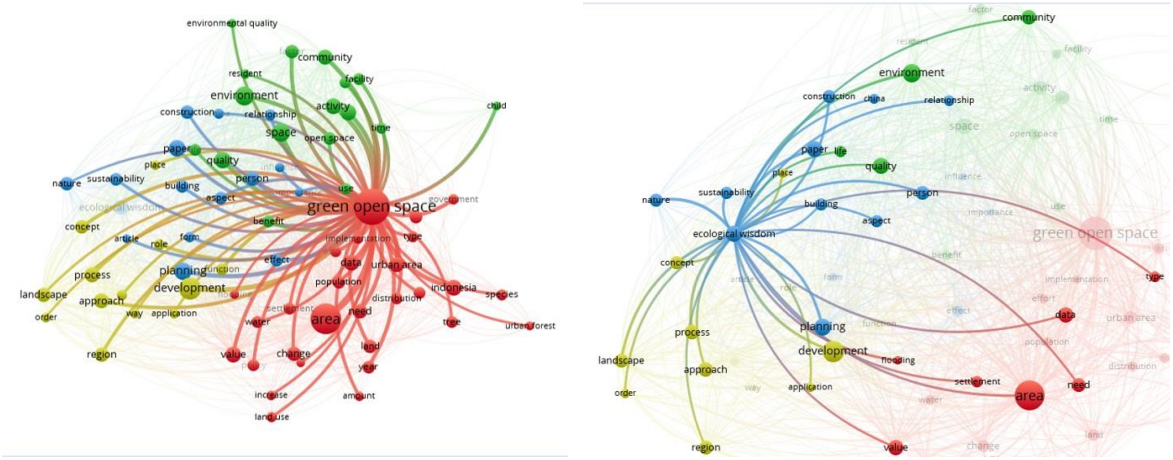


Figure 12. Green Open Space (a) and Ecological Wisdom (b) Network

3.3.4 Indonesia and China's Trends in Research

Indonesia and China are two countries that appeared more than 20 times in the document collection. Indonesia as a term occurred 94 times and linked to 39 terms, while China occurred 37 times and linked to 16 terms (Figure 13). Noticeably, the link strength value of both terms related to the green open space term and ecological wisdom term are interesting.

The link strength of Indonesia and the green open space term were 271 times. This meant that Indonesia and the green open space term have been mentioned 271 times in document collection rather than with the term ecological wisdom. This strengthens previous estimates

that most research on green open space was conducted in Indonesia. The number of links to Indonesia also evinces various research topics in Indonesia. This term connected to 37 terms and covered all clusters. It indicated that the green open space research in Indonesia might be discussed in various points of view, and it would be useful in policy making process for regional planning in Indonesia.

In contrast, the link strength of Indonesia and ecological wisdom term was found 0 time. It meant that both terms have never been mentioned together and hardly in any research on ecological wisdom. This might be caused by the term ecological wisdom itself that is very rarely used by Indonesian researcher rather than other related term like “local wisdom”, “traditional ecological knowledge”, or “indigenous knowledge”. Ecological wisdom and Ecological knowledge are closely linked in existing literature and relatively similar in the research of traditional ecological knowledge (K. H. Liao & Chan, 2016)]. However, the distinct of both areas lies on their sustainability proven by time. The traditional ecological knowledge should be coming from experiences gained from life and becomes a moral value rather than

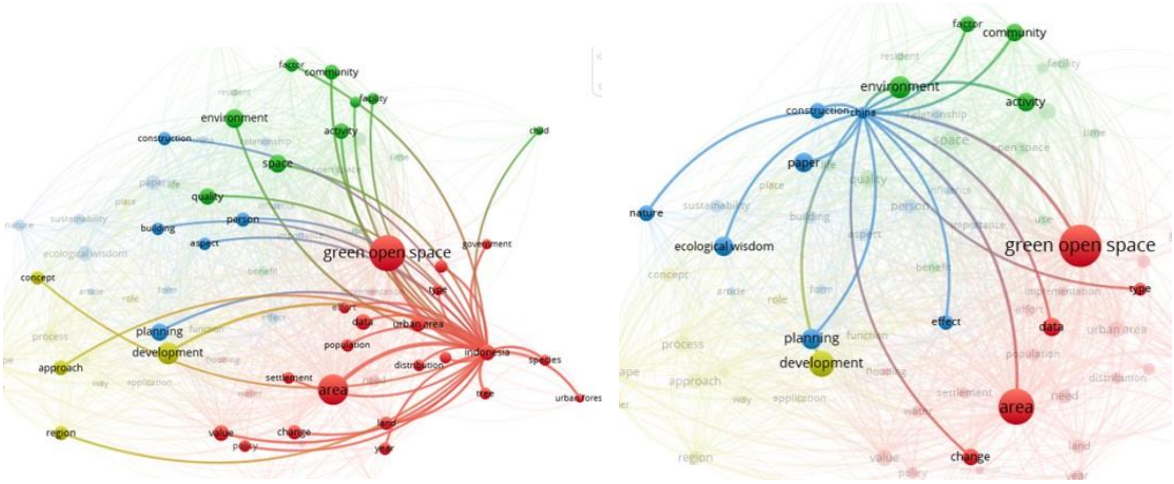


Figure 13. Indonesia (a) and China (b) research trends according to both topic

material thing. It potentially fades with changes in knowledge in technology. While ecological wisdom is the combination of knowledge and practice coming from good property that evidently sustains with minimal intervention.

On the other hand, the Chinese term linked to green open space and ecological wisdom term had 57 strength and 22 strengths respectively. This indicated that the discussion on ecological wisdom was conducted extensively by China as compared with other countries in the document collection. Nevertheless, the China term also occurred together with the green open space term significantly more than the ecological wisdom term. These data indicated that discussion about ecological wisdom is still minimal and could become a potential research topic.

3.3.5 Hot Topic Analysis

The emerging topic can be a hot topic to be discussed through the citation. We attempted to perform hot topic mapping on a collection document to examine this possibility. We calculated the visualization score by average citation and the weight by the occurrences. The overlay

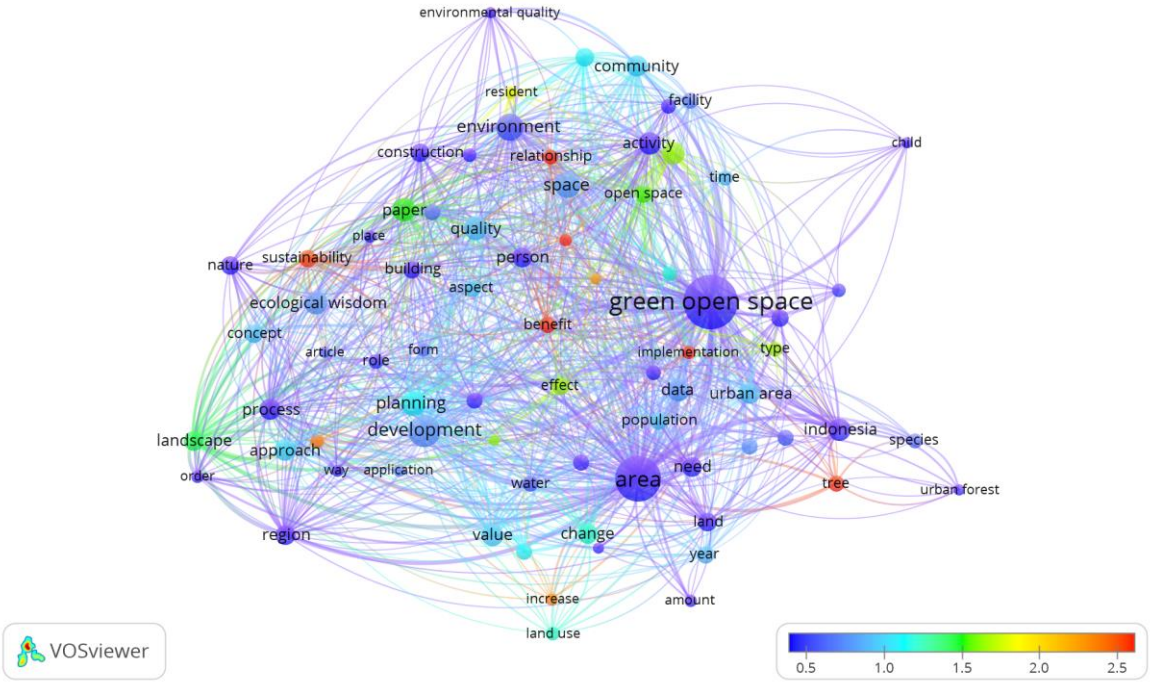


Figure 14. Hot Topic map of both areas through citation analysis

colors appeared as a rainbow and the color range was set as 0.5-2.5 to normalize the score divided by the mean. The “heat” or citation impact ranged from blue (cold) to red (hot) corresponding to the normalized scores from 0.5-2.5 with a score of 1.5 (green) signifying the

average impact. The terms represented by circles were colored to reflect the average citation impact on the term rather than by cluster, as seen in Figure 14.

Ten terms became hot topics (yellow-orange-red color) in document collection and came from all clusters of different compositions (Table 4). The urban green space cluster contributed three

Table 4. The hot topic of document collection base on citation impact

Term	Color	Occurrance	size	Cluster
Implementation	red	37	Small	Urban Green Space
Increase	Orange	32	Small	Urban Green Space
Tree	red	49	Small	Urban Green Space
Benefit	red	52	Small	Environmental quality
Resident	Yellow	34	Small	Environmental quality
Importance	orange	27	Small	Sustainable planning
Influence	Red	31	Small	Sustainable planning
Relationship	Red	47	Small	Sustainable planning
Sustainability	orange	58	medium	Sustainable planning
information	orange	35	small	Landscape Development

terms: “implementation”, “increase’, and “tree”, while the environmental quality cluster contributed two terms: “benefit” and “resident”. Further, the sustainable planning cluster became the highest contributors with four terms: “importance’, “influence”, “relationship”, and “sustainability”. Finally, the landscape development cluster was the smallest contributor with just one term “information”.

3.3.6 Potential Research

The green open space and ecological wisdom approach is often used in urban and environmental development as an effort to achieve a sustainable landscape. However, these two subject areas have been developed independently, as confirmed in previous findings.

Therefore, the identification of potential research is needed to enrich studies and build a future direction for research, which would be useful for sustainable landscape development.

We conducted density visualization to identify potential research in both areas in the document collection. Density visualization is a type of VOSviewer's visualization, which indicates the weight of items. It is useful to investigate the topic that appears most and less frequently to discuss document collection by determining the weight of item occurrences and visualizing it by rainbow color. The red areas present the most significant number of items and the highest weights of elements, followed by yellow, green, and blue. The red areas indicate that researchers widely use the words. The words in the yellow area allow researchers to be further investigated, and the words in green and blue areas are the terms that remain to be extensively discussed and have the potential to be explored in future research.

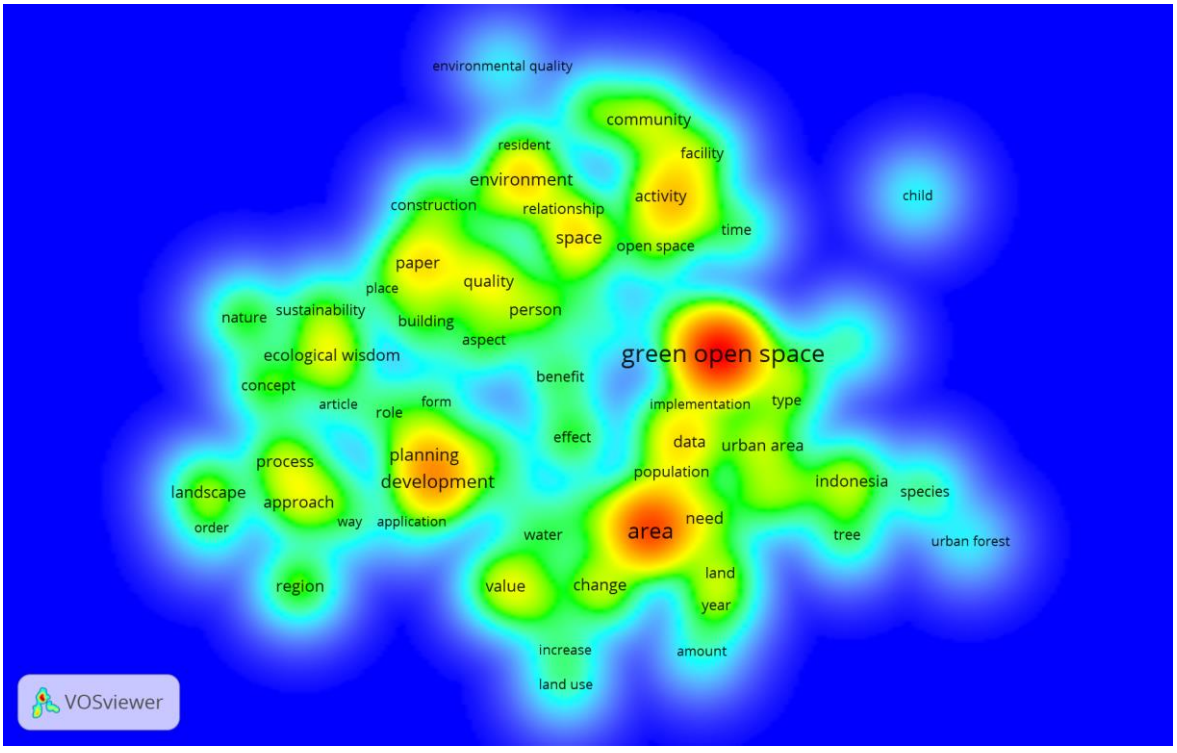


Figure 15. Terms density visualization of both field

Figure 15 reveals the terms with the highest density were "green open space" and "area". This indicated that both terms were not specific and widely used in various research topics. Many other words were in yellow and green. Moreover, the blue area could be assumed to have many

potential topics for further investigation related to green open space and ecological wisdom. There are 35 terms located in the yellow area, 15 in the green area, and 18 in the blue area.

According to Table 3 and Figure 15, it was seen that 44% terms had the potential to be researched in the future. However, we could filter these terms by considering previous findings, especially on publication overview and hot topic analysis to determine the most potential research topic in the field of green open space and ecological wisdom. Finally, we found six terms with high potential for future research due to their high citation impact on science, “increase”, “tree”, “importance”, “benefit”, “influence”, and “sustainability”. Future research on green open space or ecological wisdom should be focused on these terms. Moreover, the findings showed that green open space and ecological wisdom topic did not related each other, and the research, which link both topic in sustainability scope could be considered to fill this lack of study in the future.

3.4 Conclusion

Green open space and ecological wisdom research have become interesting topics discussed in line with the increasing public awareness of the importance of being friendly to the environment. This is evinced by the increase the number of documents related to both topics over the last decade. The trends in both areas were grouped into 4 clusters: urban green space, environmental quality, sustainable planning, and landscape development. Hot topic analysis revealed 10 terms with high citation impact (number of average citations > 7 citations) and 7 of these came from urban green space and sustainable planning cluster. Overall, there are numerous opportunities to conduct future research in this field, mainly associated with the terms “increase”, “tree”, “importance”, “benefit”, “influence”, and “sustainability”.

Chapter 4. Traditional Ecological Knowledge versus Ecological Wisdom: Are They Dissimilar in Cultural Landscape Research?

4.1 Introduction

Cultural landscape has been defined as the representation of a composite work of nature and human society over time, influenced by the physical environment and social, economic, and social forces (Unesco, 1999), and the creation of a cultural landscape involving planning and design processes by humans based on their knowledge, experience, and belief system towards their living environment. Therefore, cultural landscapes represent a way of life. It encourages people to create spaces for living, building a story through time and place (K. Taylor et al., 2015).

However, human and biophysical changes have become a current issue in environ-mental sustainability. Interaction between humans and nature generates a cultural landscape that can sometimes be sustainable and cause destruction. Ecology, as a basis of landscape design, has been highlighted as evidence of the importance of integrating nature into the landscape design process. In line with this issue, there are some ideas to return to tradition and acquire indigenous knowledge and wisdom from cultural landscape heritage as a basis for sustainable development (A. Min & Lee, 2019a).

Considerable research has been conducted on cultural landscape as a subject of interest, once it is about traditional ecological knowledge (TEK). TEK also called by other names including indigenous knowledge or native science, refers to the evolving knowledge acquired by indigenous and local peoples over hundreds or thousands of years through direct contact with the environment (Berkes et al., 1995). It is concerned with the relationship of living beings (including humans) with their traditional groups and environment. The study of TEK argued for an effort to enhance environmental sustainability by learning how the indigenous

population adapts to natural changes. However, numerous studies have reported the changes and losses of TEK, especially in medicinal, nutritional, and agricultural knowledge, in small societies (Gómez-Baggethun et al., 2010; Gómez-Baggethun & Reyes-García, 2013; Monteiro et al., 2006; Turner & Turner, 2008). In addition, since TEK formed a philosophical concept, there are difficulties in implementing landscape design to measure its work.

Furthermore, a novel concept has emerged in the landscape and urban planning fields called ecological wisdom (EW). EW is defined as the best expertise of pure improvisation for and from ecological practice that enables a person or community to make not only ethical judgement but also take circumspect action on ecological practices (W.-N. Xiang, 2014). Hence, this concept requires the ability to achieve the unity of moral knowledge and noble-minded actions in ecological practice, and the ability to conduct excellent ecological practice research (B. Yang & Young, 2019). In the eco-landscape design field, EW is defined as a suitable property design with minimal social or ecological intervention. It originates from the idea of re-learning local culture, which has been proven to integrate human behaviour and nature to produce a sustainable landscape (A. Min & Lee, 2019a).

However, there is a disagreement regarding the similarity between EW and TEK. Liao and Chan (2016) contended that TEK and EW are relatively indistinct. Both are closely linked in the literature (K.-H. Liao & Chan, 2016) and are referred to as the knowledge-practice-belief complex. Moreover, Xiang (2016) attempted to conflate terminology into *ecophronesis* terms, which emphasizes the application of knowledge in wise action (W. N. Xiang, 2016). Nevertheless, there are other points of view that equalizing TEK and EW could be misleading at the time because knowledge without wisdom could be abused (Ford & Martinez, 2000). Research on EW often overlaps with TEK since both examine the cultural landscape as a heritage site (M. Li et al., 2020a; Modeen, 2021b; Okui et al., 2021; Permana, ISKANDAR, et

al., 2019; Schniter et al., 2021), and the question is what is the exact difference between TEK and EW? There is no clear framework to guide research on either topic.

The objective of this study is to review and define the distinction between TEK and EW based on its definition, agents, sources, and research scope. We also analysed the relationship between keywords used by scholars and identified the connection and convergence of the thematic code. We then construct a conceptual framework describing the TEK and EW relationships in research and propose potential areas for research improvement. The remainder of this study is organized into five sections. Section 2 describes the material and method used, while Section 3 explains the results of the keyword and thematic analysis. The discussion is provided in Section 4 by defining the distinction between TEK and EW and then proposing a conceptual framework for research improvement. Finally, Section 5 presents the conclusions of this study, which serves as a limitation and potential topic for future research. Hopefully, it can help scholars develop research on both topics and avoid bias in theoretical discussions or scope of research.

4.2 Material and Methods

In this study, a systematic literature review was conducted of English articles, review papers, and book chapters in the cultural landscape context to answer the research ques-tion. It critically assessed all relevant literature on the designated research topic through a transparent systematic process (Campos et al., 2020; Kotera et al., 2020; Santos, 2016). The key steps adopted in this study include literature data collection, selection of relevant literature, data analysis and synthesis, and then reporting the review findings. The research question proposed in this study concerns the differences between TEK and EW. Therefore, it focuses on data from empirical and concept studies that are being used by researchers on both topics.

4.2.1 Data Collecting and Data Selection

The literature data were obtained from the Scopus database by following the PRISMA process, (Dale et al., 2019; Kotera et al., 2020; Loch & Riechers, 2021; Shamseer et al., 2015) as shown in Figure 16. The search strategy was developed to identify the relevant literature by adopting search terms with a logic model: traditional ecological knowledge and cultural

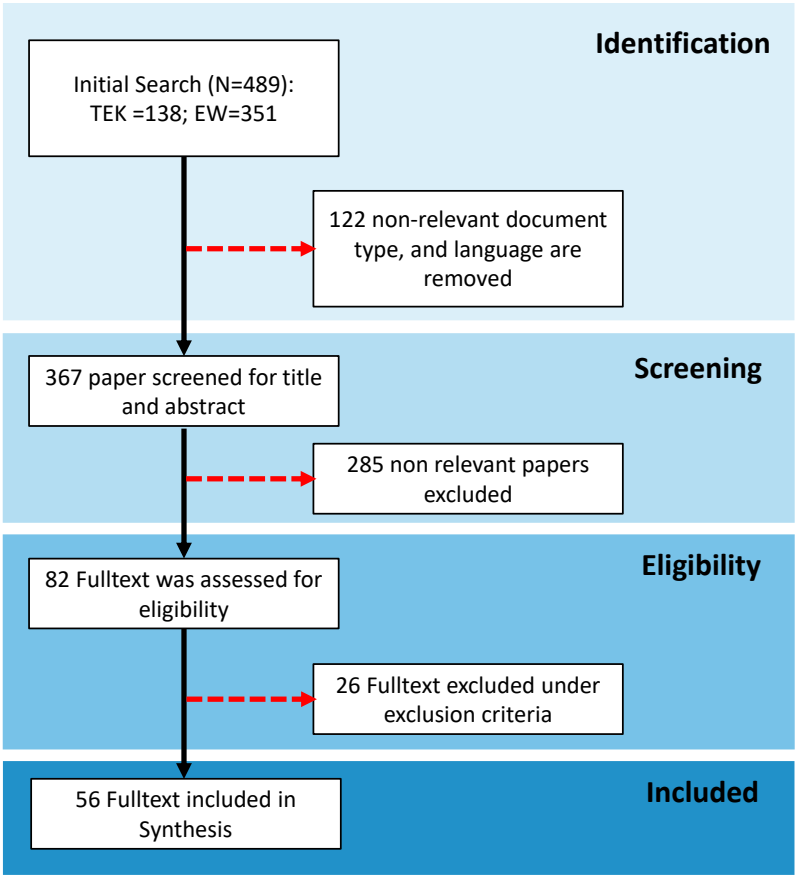


Figure 16. Data Collecting and Selection Process

Table 5. The inclusion and exclusion criteria

Inclusion Criteria	Any studies discussing TEK or EW in the context of the cultural landscape
	Studies on TEK or EW conducted in traditional landscape
Exclusion Criteria	Studies discussing TEK or EW in the context other than cultural landscape
	Studies on TEK or EW conducted other than traditional landscape

landscape, and ecological wisdom towards relevant titles, abstracts, and keywords from 2017 to 2021 in January 2022 as the latest references in the last five years. The consideration of timeframe is also because the topic of EW began to be widely discussed after 2015

(Manningtyas & Furuya, 2020a), while TEK has been and continues to grow. The initial search found 138 for TEK and 351 for EW studies that continued to the selection process, involving inclusion and exclusion criteria based on the title and abstract. Details of inclusion and exclusion criteria created in Table 1. Finally, 31 TEK and 25 EW studies that were included in the analysis.

4.2.2 Data Analysis and Synthesis

In the first step, the bibliometric data of the primary studies were analyzed using co-occurrence through all keywords in the articles. It is used to examine the relation of keywords used in the context of given topics. This step results in a co-occurrence keyword map in thematic clusters using VOS Viewer software (van Eck & Waltman, 2014, 2018). Based on the full counting method with the minimum number of keyword occurrences, 49 terms were found after excluding unrelated words. Furthermore, the terms were clustered into thematic clusters based on their relationships in the literature using cluster analysis. The cluster analysis was run using a random start value and 10 iterations, and the resolution of the cluster was set at a 0.5 value. Terms belonging to the same cluster have a close relation rather than terms in different clusters (Manningtyas & Furuya, 2020a). Each cluster is then labelled manually by observing the keywords that can express the cluster's content.

Second, a comparative analysis was conducted to define the distinction between TEK and EW in cultural landscape research. An open coding technique was used during the initial coding stage. The selected content of the text was used as a code, and each code was reanalysed to create themes and categories. All coding processes were conducted using NVivo software (Adu, 2019). The results were then synthesized using tables and diagrams to interpret and discuss the findings. Finally, this study elaborated on the findings to describe the im-plications of these insights for future research.

4.3 Result

4.3.1 The thematic cluster of keywords

The Thematic cluster analysis of keywords was conducted to examine the relation of keywords that are used in the primary studies and overviewing studies related to TEK and EW. The keyword mapping results showed two thematic areas in cultural landscape research: indigenous knowledge and environment, visualized by red circles, and sustainable ecology and

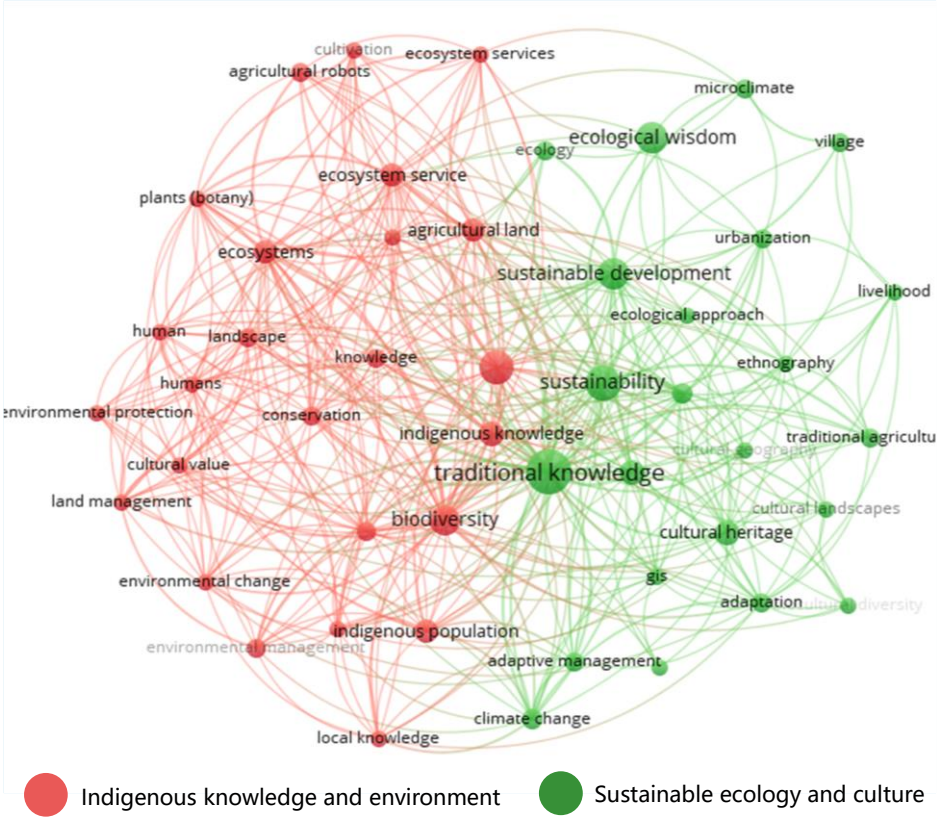


Figure 17. Keywords mapping

culture, visualized by green circles (Figure 17). The keywords in the same cluster represent the closeness of the studies among the publications (van Eck & Waltman, 2014). Table 6 lists the keywords belonging to each cluster.

Most of the keywords were collected in circles and were located close to each other. Figure 2 also shows that the red cluster tended to diffuse into the green cluster. This indicates convergence between the studies. Convergence can be understood as a condition in which the

boundaries between fields of science are blurred and tend to diffuse. This represents collaboration among multidisciplinary researchers on such topics in that area (D. Jeong & Koo, 2016). Therefore, figure 17 proves the close study of TEK and EW in cultural landscape literature.

Moreover, further identification of keywords (Figure 18a) shows that the keyword TEK belongs to the red cluster. This indicates that the study of TEK in cultural landscape research

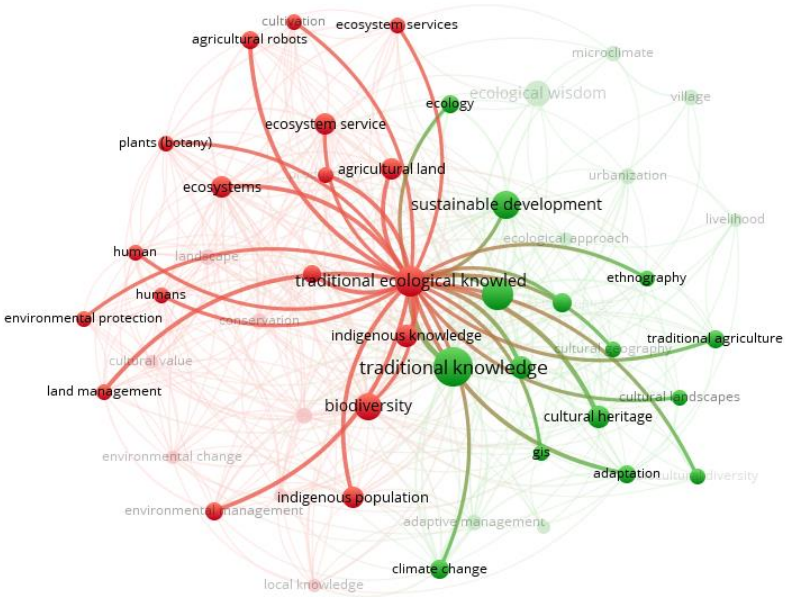
Table 6. Keywords of each cluster

Cluster	**Keyword**
Cluster 1: Indigenous knowledge and environment (red nodes) N = 25	Agricultural land, agricultural robot, biodiversity, conservation, cultivation, cultural value, ecosystem services, ecosystem, environmental change, environmental management, environmental protection, human, indigenous knowledge, indigenous people, indigenous population, knowledge, land management, landscape, local knowledge, management practice, plants (botany), productivity, **traditional ecological knowledge**
Cluster 2: sustainable ecology and culture (green nodes) N = 23	Adaptation, adaptive management, biocultural diversity, climate change, cultural geography, cultural heritage, cultural landscape, ecological approach, **ecological wisdom**, ecology, ethnography, GIS, land-use change, landscape ecology, livelihood, microclimate, sustainability, sustainable development, traditional agriculture, traditional knowledge, urbanization, village

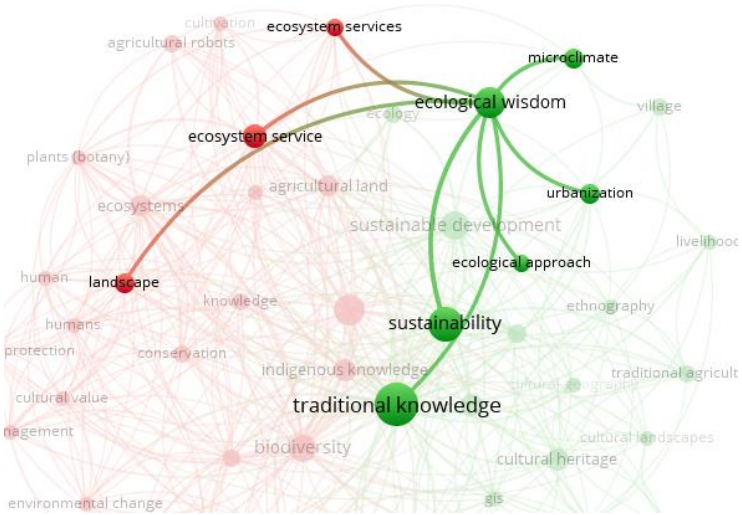
is closely related to the theme of indigenous knowledge and the environment. TEK is also connected to 32 keywords from both clusters, which represents a wide range of its discussion in research. However, keyword EW belongs to the green cluster. This means that the study of EW is closely related to the theme of sustainable ecology and culture. EW was connected to only seven keywords from both clusters (Figure 18b). This indicates that the topic of EW remains limited to discussion and requires further exploration (D. Jeong & Koo, 2016; Manningtyas & Furuya, 2020a). Interestingly, the keywords TEK and EW were not linked to each other. This means that TEK and EW were neither mentioned together in the primary studies nor correlated in this research. This condition represents the distinct points of each

study. However, some keywords related to EW were also related to TEK, particularly in terms of ecosystem service, sustainability, and landscape. This means that the discussion of EW is connected to TEK while discussing such topics (Manningtyas & Furuya, 2020a). Moreover, the term EW is linked only to keywords such as microclimate, urbanization, and ecological approaches. This represents the scope of EW research that can be specialized to these terms.

4.3.2 Comparative Analysis



(a)



(b)

Figure 18. TEK (a) and EW (b) network in primary studies

A comparative analysis was conducted towards the content of primary studies to define the distinction between TEK and EW, both in reviews and empirical cultural landscape research. A comparison of the results is presented in Table 7. The details of the distinction between TEK and EW are described below.

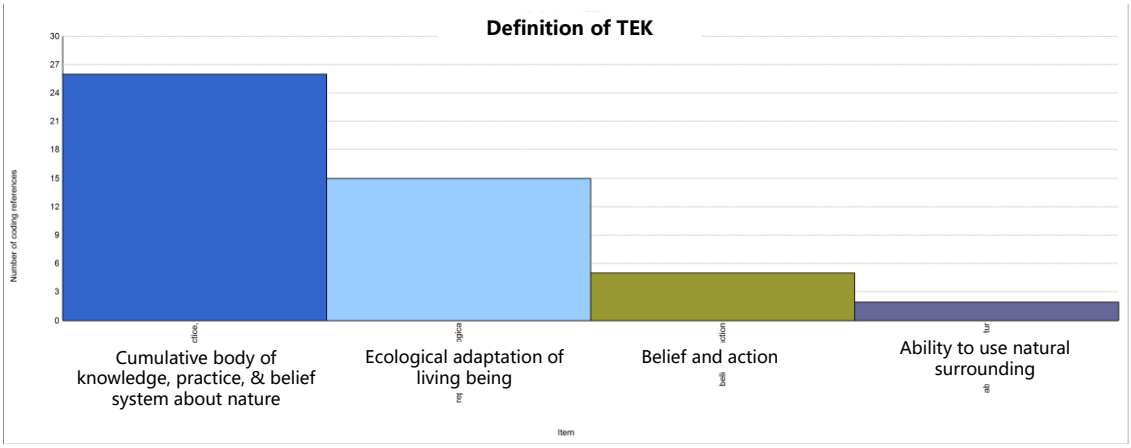
Table 7. The comparison analysis of TEK and EW

Component	TEK	EW
Definition	**Knowledge** about nature and environmental surrounding gained from practice experience and belief system of indigenous people	**ability** to integrate knowledge on ecological theory and practical experience to understanding the landscape system on spesific site to produce prudent actions or goods.
Agents	Indigenous community and traditional culture	Person, community, or organization with ethical mind, either old or current generation
Sources	Adaptive process. Empirical observation and experience in interaction with nature	Ecological knowledge (scientific or traditional), practice experience, tacit knowledge
Research Scope	Ecosystem and cultural resource management; ecosystem and social system resilience, ethnobotanical knowledge; sustainable production	Ecological planning and design practices; ecological policymaking; sustainable landscape, and urban-rural management

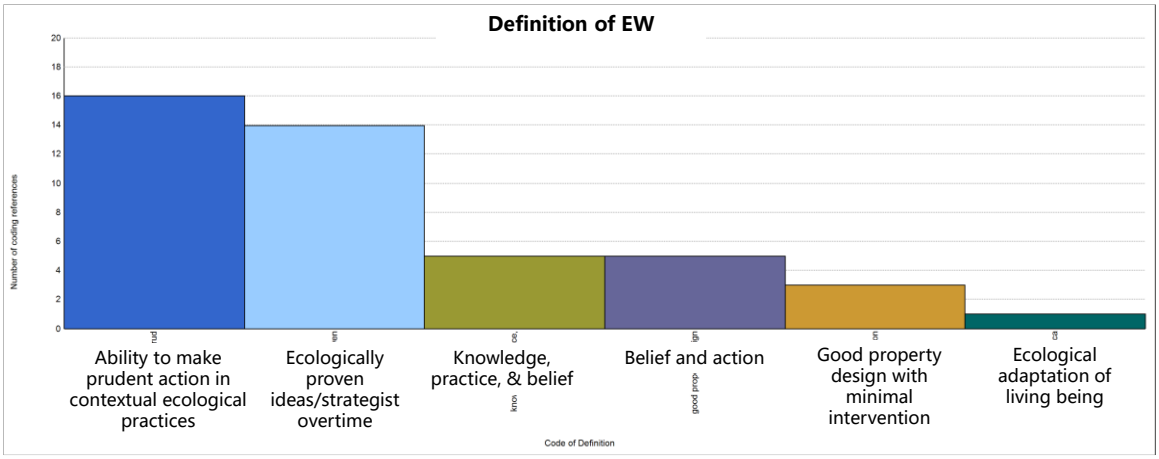
4.3.2.1 Definition

An analysis of the TEK literature showed that scholars understood TEK using four definitions. The first definition and the most cited statement (26 times) came from Berkes (2000) who defined TEK as a cumulative body of knowledge, practice, and belief systems about nature and its environmental surroundings (Fikret Berkes, 2000). It is an adaptive process that is passed down through generations through cultural transmission. TEK is interpreted as the knowledge to manage and interact with nature (Athayde & Silva-Lugo, 2018; Llano et al., 2021; Partasasmita et al., 2020; Schmitz et al., 2021; Uchida & Kamura, 2020). It is experiential knowledge created by ethnic groups or indigenous people because of dynamic interaction with their familiar local ecosystem, (Loch & Riechers, 2021) which also becomes an original instruction for caring for the surrounding environment (Nelson & Shilling, 2018). Another

definition describes TEK as a representation of the ecological adaptation of living beings (Ba et al., 2018; Easdale & Aguiar, 2018; Guo et al., 2021). It includes action and belief systems toward nature based on the experiences of indigenous people. TEK is also interpreted as the ability to use the natural surroundings (Velázquez-Rosas et al., 2018). The utilization of natural resources is limited to fulfilling the daily needs of indigenous people and communities and is mostly reversible. Thus, the TEK terminology emphasizes the knowledge of indigenous people that is generated from experience in interaction with nature. Figure 19(a) shows the definition of the TEK based on the number of coding references.



(a)



(b)

Figure 19. The Definition of TEK (a) and EW (b) is based on the number of coding references respectively

Meanwhile, EW is mostly (16 times coded in references) defined as the ability to make prudent action in contextual ecological practices (Douglas et al., 2018b; Forester, 2019c; Young & Lieberknecht, 2019c; Zheng et al., 2018a). In particular, it is related to the ability to integrate ecological theory and practical experience to understand the landscape system on specific sites to produce real and permanent goods (Forester, 2019c; W.-N. Xiang, 2016a; B. Yang & Young, 2019). Another discus-sion describes EW as a good property design, idea, or strategy that has been ecologically proven over time (Y. C. Chu et al., 2017; M. Li et al., 2020a; Lin et al., 2021a; A. Min & Lee, 2019a; Radaei et al., 2021). EW has been successfully implemented through trial and error and has become a good example of an eco-design product. Therefore, it can be used to create sustainable landscape planning and design. Moreover, EW is also related to the knowledge, beliefs, and actions of people or communities, which generates an understanding of nature (Schwann, 2018; B. Yang & Young, 2019). Belief and action in EW require the ethical mindset of people or communities toward nature as a basis for making interventions (B. Yang & Young, 2019; Young & Lieberknecht, 2019c). In brief, the

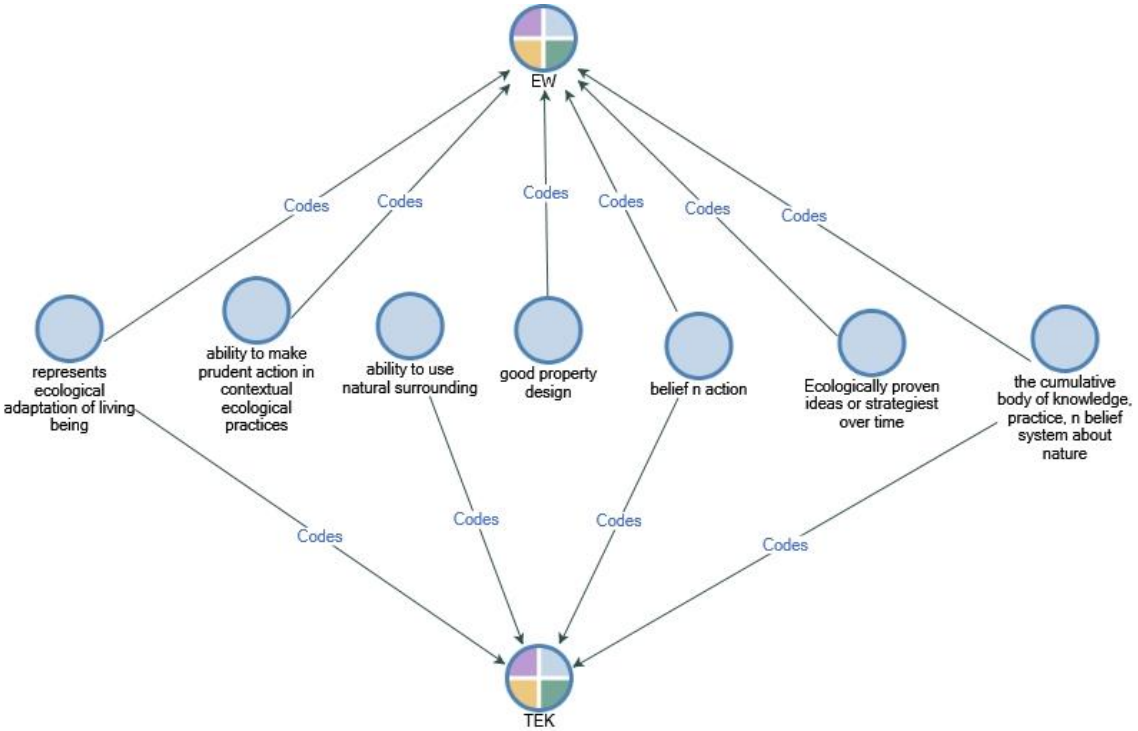


Figure 20. The comparison diagram of Definition between TEK and EW

terminology EW emphasizes the ability to combine ecological knowledge, either scientific or traditional; experience and ethics to make a prudent judgment or product in response to the local context, either landscape characteristics and/or culture. Therefore, EW are attached to individual and community competencies and knowledge. Figure 19(b) shows the EW definition based on the number of coding references.

The comparative analysis results (Figure 20) show that the definitions of TEK and EW overlap on three codes: represents an ecological adaptation of living beings, the cumulative body of knowledge, practice, and belief system toward nature, and belief and action. This indicates that both TEK and EW are related. Moreover, three of the four definitions of TEK are also coded as EW definitions, which means that TEK is a part of EW because it requires knowledge to generate wisdom. However, both fields are distinct, especially in terms of their abilities. TEK is defined as the ability to use natural surroundings, while EW emphasizes the ability to make prudent actions or good designs that could ecologically prove over time. Therefore, TEK is vulnerable to changes rather than EW as it can be changed in line with natural conditions.

4.3.2.2 Agents

TEK is always associated with indigenous people, communities, and traditional cul-tures. Research on TEK has mostly focused on the adaptive process (Araia & Chirwa, 2019; Athayde et al., 2017; Ba et al., 2018; Easdale & Aguiar, 2018; Kronmüller et al., 2017; Y. Maru et al., 2020; McCall et al., 2021; Turvey et al., 2018), ethnobotany (Law et al., 2020; Llano et al., 2021; Mattalia et al., 2019; Pasta et al., 2020; Song et al., 2020; Stevens, 2020; Tokuoka et al., 2020; Velázquez-Rosas et al., 2018), landscape management (Bao et al., 2019; T.-M. Liu & Chang, 2019; Loch & Riechers, 2021; Partasasmita et al., 2020; Reyes et al., 2020; Venturi et al., 2021), and traditional farming (Giordano, 2020; Reyes et al., 2020; Schmitz et al., 2021;

Uchida & Kamura, 2020) of the indigenous community. These practices involve not only experienced knowledge but also norms and belief systems as part of traditional culture. They developed TEK as a form of adaptation in that knowledge, experience, beliefs, and norms are blended to become a guide for using and managing the ecosystem. The traditional belief system and norms applied in the traditional community have mostly become a driving factor for the existence of TEK. It also distinguishes the indigenous community from other communities. Therefore, indigenous communities and traditional cultures can be considered agents of TEK.

Furthermore, EW was developed either by a person, community, or organization because it is based on the human ability to act and do well in response to environmental conditions. Research on TEK has studied the ideas or strategies of persons or communities in dealing with environmental conditions, which is not limited to but includes indigenous (Akbar et al., 2020a; Bayrak et al., 2021a; Lin et al., 2021a; Ma et al., 2019a; A. Min & Lee, 2019a) and current community/people (de Pauw et al., 2014; Wagner et al., 2016a; B. Yang & Li, 2016a). The requirements to gain ecological wisdom are understanding both by science and/or experience, having an ethical mind, and having the ability to act effectively (B. Yang & Young, 2019).

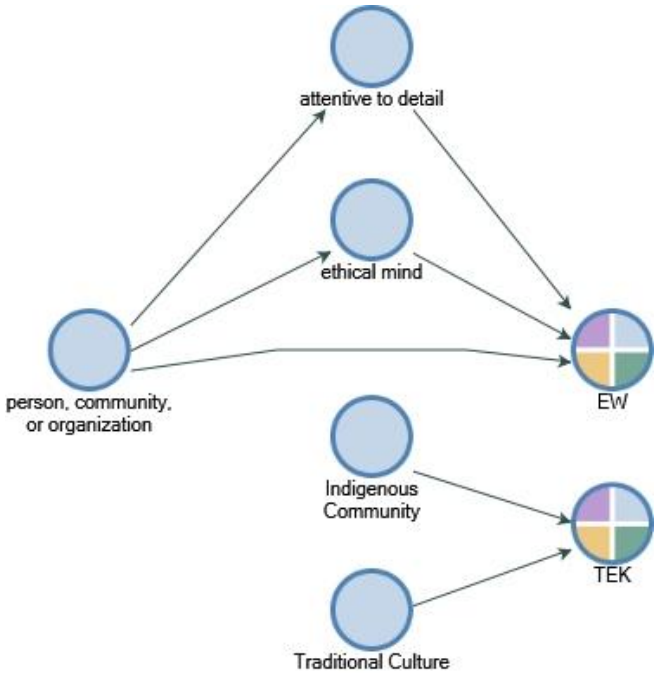


Figure 21. The comparison diagram of Agents between TEK and EW

However, because EW needs to be proven over time, most studies have been conducted on heritage sites or traditional settlements. Current ideas and products that could be considered EW products include biomimicry (Smets et al., 2020; B. Yang & Young, 2019), green infrastructure (Feng & Yamamoto, 2020; Mander et al., 2018; Sturiale & Scuderi, 2019; Voghera & Giudice, 2019), and the sponge city concept (Y. Chen, 2019; Deb, 2018; Zhai et al., 2021). All of these concepts have been proposed by the current generation, which emphasized nature's role as a laboratory and source of the idea that has been through trial-and-error experiments by the ecological system over time. A comparison diagram between the TEK and EW agents is shown in Figure 21.

4.3.2.3 Source

TEK is knowledge that comes from the adaptive process of indigenous people to-wards their environment. This is a long-term process that requires empirical observation (Deb, 2018; Guo et al., 2021; Mattalia et al., 2019), trial, and error in the resulting understanding of the

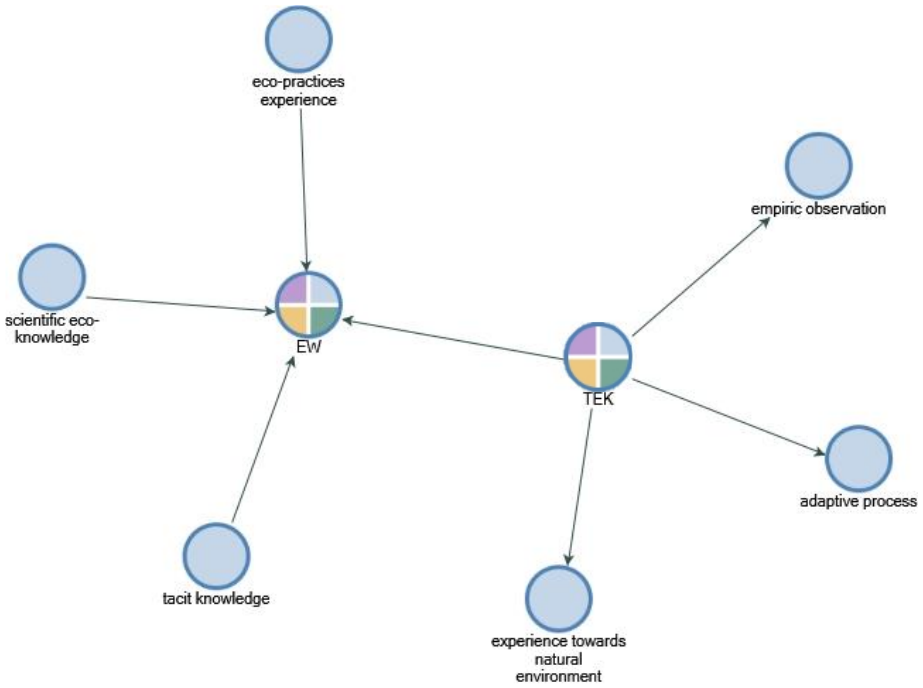


Figure 22. The connection diagram of Sources between TEK and EW

living environment (Law et al., 2020; Nelson & Shilling, 2018). It also involves beliefs and norms in the process of intervention toward nature (Turvey et al., 2018; Velázquez-Rosas et al., 2018). Based on these experiences, practical knowledge has been developed and handed down through generations. This knowledge would have existed if it had been practiced. Therefore, TEK in some areas is currently endangered, as it is no longer practiced by generations (Okui et al., 2021).

EW is an ability that comes from the accumulation and understanding of ecological knowledge (both traditional and scientific), ecological practice experience, and tacit knowledge (Casazza, 2020; A. Min & Lee, 2019a; Schwann, 2018). Experience in ecological practices enhances the understanding of agents toward the natural system. It does not have to come from personal experience yet involves sharing experiences with expertise (Schwann, 2018). Furthermore, tacit knowledge is defined as the knowledge and understanding that comes from the internalization and assimilation of self-reflection, experience, and synthesis (B. Yang & Young, 2019). Deep reflection on and understanding of these three kinds of knowledge over time would enhance wisdom toward nature. The connection diagrams for the sources of TEK and EW are shown in Figure 22.

4.3.2.4 Research Scope

Identification of the research scope of primary studies found that the research scope of TEK in the context of cultural landscape research is classified into ecological and cultural resource management, including conservation, restoration, and preservation (T.-M. Liu & Chang, 2019; Y. Maru et al., 2020; Reyes et al., 2020); ethnobotanical knowledge (Mattalia et al., 2019; Pasta et al., 2020; Stevens, 2020); ecological system resilience (Llano et al., 2021; Y. Maru et al., 2020; Wyllie de Echeverria & Thornton, 2019); indigenous cultural capital

(Ciftcioglu, 2021; Nelson & Shilling, 2018; Tashiro et al., 2019); and sustainable production and development (Ba et al., 2018; Guo et al., 2021; Law et al., 2020).

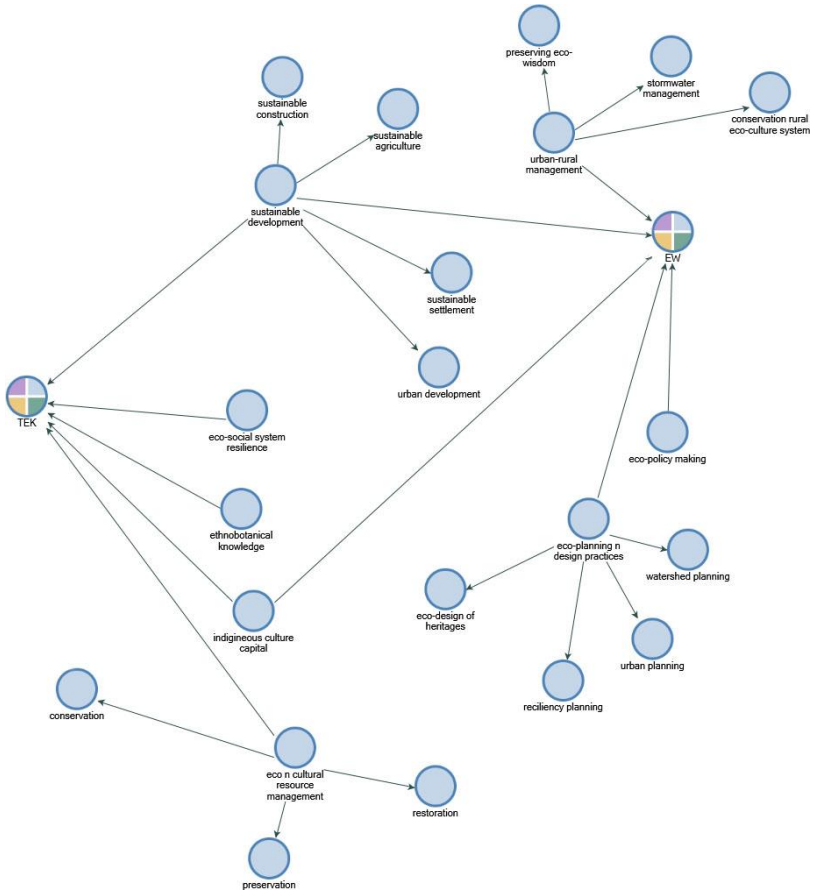


Figure 23. The connection diagram of Research scope between TEK and EW

Moreover, the EW research scope could be classified into four categories: sustainable development, which specified sustainable construction (Meng & He, 2019; Zheng et al., 2018a), sustainable agriculture (M. Li et al., 2020a; Wahono & Puspitawati, 2021), sustainable settlement, and urban development (Akbar et al., 2020b; Y. C. Chu et al., 2017; Lin et al., 2021a; Ma et al., 2019a; Zheng et al., 2018a; Zhou et al., 2018a); ecological planning and design practices, including eco-design of heritage sites (Lin et al., 2021a; A. Min & Lee, 2019a; Zheng et al., 2018a), resiliency and urban planning (Bayrak et al., 2021b; Darabi et al., 2019; Grose et al., 2019; Meng & He, 2019; Young & Lieberknecht, 2019c), and watershed planning (Radaei et al., 2021); urban-rural management, which specified preserving the ecological

wisdom of sites (M. Li et al., 2020a; Ma et al., 2019a), stormwater management (Radaei et al., 2021), and conservation of rural ecological and cultural systems (M. Li et al., 2020a; Okui et al., 2021; Schwann, 2018; Zhou et al., 2018a). The connection of codes (Figure 8) shows that TEK and EW reached a wide scope of research and induced convergence between both topics. The scope of TEK and EW overlapped when discussing indigenous cultural capital as the basis for sustainable development, (Bayrak et al., 2021b; Lin et al., 2021a; Schwann, 2018) as shown in Figure 23.

4.4 Discussion

4.4.1 Convergence and Distinction of Studies

Both thematic cluster analysis and comparative analysis of primary studies revealed that TEK and EW are relatively similar, especially in the literature on cultural landscapes. However, they were distinct at the same time. Based on thematic cluster analysis, all keywords in primary studies were located close to each other and shaped in a circle, which indicates the closeness of the study (D. Jeong & Koo, 2016; van Eck & Waltman, 2014). Although the primary studies are grouped into two clusters (Figure 1), indigenous knowledge and environment (red cluster) and sustainable ecology and culture (green cluster), the red cluster tends to diffuse to the green cluster. This diffusion represents their convergence in research. The convergence of both clusters indicates interdisciplinary collaboration among researchers on this issue to generate an innovative solution for the problem in the cultural landscape context (D. Jeong & Koo, 2016; Torrents-Tico et al., 2021). However, the observation of keywords TEK and EW reveals that TEK and EW are not linked to each other in primary studies. This indicates that neither topic was mentioned nor discussed together, which represents a distinction between studies. Compared to this study, previous research on measuring trends and hot topics in ecological wisdom showed that EW is still limited to discussion yet linked to 20 terms (Manningtyas &

Furuya, 2020a). This indicates that EW is rarer in a cultural landscape context rather than another field and needs to be further explored.

Furthermore, the comparative analysis attempts to define the distinction between both and found that TEK and EW differ based on the definitions used by scholars, agents, sources, and scopes. Based on this definition, TEK emphasizes knowledge, (Fikret Berkes, 2000; Kiage, 2019; Mattalia et al., 2019; Uchida & Kamura, 2020) whereas EW emphasizes the ability to act well (Douglas et al., 2018b; Forester, 2019c; Young & Lieberknecht, 2019a; Zheng et al., 2018b). TEK could be considered a source of EW because it requires knowledge to perform well (A. Min & Lee, 2019a; W.-N. Xiang, 2016a; B. Yang & Young, 2019). According to the agents, TEK is general knowledge that is held and developed by the old generation of the indigenous community and transmitted to the current generation through cultural transmission. EW can be developed by either the old or current generation (Douglas et al., 2018b; Schwann, 2018; Zheng et al., 2018a), either individually or collectively. Analysing the research scope of TEK and EW reveal that the study of TEK focuses on resource-based management, which is specific to ecological and cultural re-sources. EW tends to focus on place-based management, which is specific to urban and rural ecosystems. This is because EW mostly discusses the ability to act, judge, and create permanent goods in response to the local context (Young & Lieberknecht, 2019c). Moreover, TEK studies specifically discussed ethnobotanical knowledge and socio-ecological system resilience, while EW specifically studied sustainable construction and settlement, especially in traditional set-tlements that experienced urbanization. This study needed to understand the ecological wisdom that is applied in nature and arrange the concept of sustainability for our built environment (Meng & He, 2019; B. Yang & Young, 2019). EW also focuses on ecological planning and design practices, including resiliency planning, eco-design of landscape heritage, and environmental policy making. Studies on TEK and EW have been correlated when discussing indigenous cultural capital as the basis for

sustainable development. This study examines traditional knowledge, ecosystem services, and the wisdom of indigenous people regarding sustain-ability (Meng & He, 2019; Modeen, 2021b; Okui et al., 2021; Schniter et al., 2021). Therefore, the study of TEK and EW could be quite similar and linked to keywords, such as traditional knowledge, ecosystem services, and sustainability.

4.4.2 Conceptual Framework of TEK-EW Relationship in Cultural Landscape Research

To better understand the relationship between TEK and EW in cultural landscape re-search, a conceptual framework was proposed, as shown in Figure 24. This framework is derived from the conceptual model of ecological knowledge to the wisdom transformation process (B. Yang & Young, 2019) which was modified and combined with the TEK framework and the re-search scope of both topics.

Figure 24 shows the formation process from TEK to EW. The long-term interaction between the living environment (shown on the left side of Figure 24), indigenous communities, and their traditional culture developed TEK. TEK is defined as knowledge derived from the adaptive process of the indigenous community. It includes empirical observation, direct experience in dealing with nature, beliefs, and ethical systems. TEK is trans-mitted to the current generation through cultural means. On the other hand, our current generation learns about nature by researching and generating scientific ecological knowledge (SEK), as shown in the lower left of Figure 24. Both TEK and SEK are important contributors to ecological knowledge. Interaction and internalization between ecological knowledge, eco-practice experience, and tacit knowledge over time by involving an ethical mind and holistic approach could generate ecological wisdom at the individual level. In the context of cultural landscape research, TEK focuses on the study of eco-cultural re-source management, ethnobotanical knowledge of indigenous communities, and social-ecological system resilience. All studies

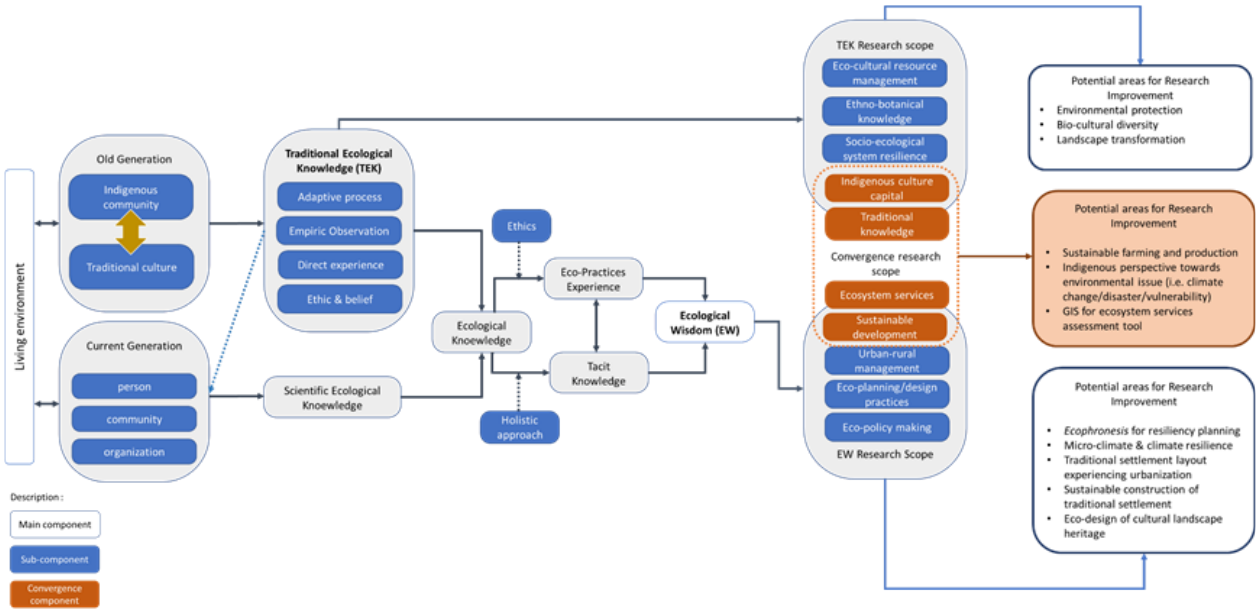


Figure 24. Conceptual Framework of TEK-EW relationship in Cultural Landscape Research

tended to explore studies linked to the current situation. EW focuses on the study of urban and rural management, ecological planning and design practices, and environmental policy making. These studies reveal the wisdom of ecological products/strategists to acquire it to create sustainable goods and policies involving scientific measurements. The convergence study between TEK and EW should be conducted within the scope of indigenous cultural capital, traditional knowledge, ecosystem services, and sustainable development. These studies involve the exploration of traditional knowledge and assessment of the ecosystem services of the cultural landscape as a kind of natural and cultural capital and use it as a basis for sustainable development.

Based on the prospect analysis of each primary study, potential areas for research improvement were proposed. In the future, studies on TEK in cultural landscape research could focus on traditional knowledge about environmental protection, bio-cultural diversity, and landscape transformation as a development for eco-cultural system resilience, management, and ethnobotanical studies. Meanwhile, a study on EW could be specified as an *ecophronesis* for resiliency planning, micro-climate and climate resilience, wisdom in building layout and

sustainable construction of the traditional settlement, and eco-design of cultural landscape heritage. Finally, the convergence study on TEK and EW should focus on sustainable farming and production from the indigenous community, indigenous people's perspective towards the current environmental issue and their adaptation, and the implementation of GIS to assess ecosystem services in the cultural landscape.

4.5 Conclusion

In this study, it is clear that research between TEK and EW are similar in the literature; however, both also have distinctions. The closeness study of TEK and EW represents convergence in this research. Studies on TEK and EW could be similar when related to topics such as ecosystem services, sustainability, traditional knowledge, and indigenous cultural capital. Further analysis of primary studies shows that the distinction between TEK and EW lies in the definition understood by scholars, agents, sources, and the scope of analysis of both studies. However, there was no clear framework to guide distinction research in either of these studies. Therefore, we propose a conceptual framework to better understand the relationship between TEK and EW, and their research scope, including convergence topics. We then suggest potential areas for research improvement in the cultural landscape field by dividing the areas into three categories: TEK research scope, EW research scope, and TEK-EW convergence topic. It would help scholars clarify the differences between TEK and EW in research. This study had limitations since only empirical and concept studies from journal articles, book chapters, and reviews are included in the analysis which excludes the conference paper so that some empirical studies may not be captured. Moreover, the topic of TEK has been studied for a long period and has been developed in many fields, followed by EW, which was originally discussed in the last few decades. Therefore, this study may not have been able to capture research trends in the cultural landscape prior to the proposed timeframe.

Chapter 5. Exploring Ecological Wisdom of Traditional Home Garden: Learning from Sundanese and Madurese Ethnicities of Indonesia

5.1 Introduction

5.1.1 Ecological Wisdom and Green Open Space

Environmental sustainability is facing problem in landscape degradation as an effect of industrialization and urbanization. Nature exploitation was done to fulfill human needs. However, at the same time, it also should be maintained for sustainability so that the human need could be continuing fulfilled. It indicates the friction between human desired-prosperity and ecosystem integrity. To solve this problem, a new concept has been emerged in the landscape planning and design field which known as ecological wisdom. Ecological wisdom is a relatively new concept that emerged in 2014 and still established by many international academic societies and publications. The concept of ecological wisdom influences various landscape planning and design practices as a fundamental framework for achieving sustainability and resiliency. In 2019, Springer-Nature Press published an ecological Wisdom book series, signed that ecological wisdom had been a vital socio and ecological discourse (Young & Lieberknecht, 2019a).

Ecological wisdom (EW) is defined as a set of willingness and ability to integrate ecological knowledge and site familiarity. It should do to create a good property design that requires minimal intervention in gaining landscape sustainability over time (Patten, 2016c; X. Wang et al., 2016b; B. Yang & Young, 2019). It consists of evidence-based knowledge, either explicit or implicit, originates from the multi-disciplinary background and across generations (W. N. Xiang, 2014). Regarding those issue, ecological wisdom encourages an interdisciplinary approach to enhance sustainable landscape development (X. Wang et al., 2016b).

One way to learn ecological wisdom is from cultural landscape heritage (A. Min & Lee, 2019b). Some of sites has been researched in relation to ecological wisdom such as Dujiangyan irrigation system (W. N. Xiang, 2014) and the Hongcun UNESCO World Heritage site (Zheng et al., 2018b). These cultural heritages, or vernacular architectures, embrace ecological wisdom as they are all evidence-based, time-honored, and they are artifacts of an individual's or a collective knowledge that has gone through transformation and internalization over time. Current studies in ecological wisdom mostly discussed about energy conservation (Qin & Li, 2021; Xiong & Yang, 2017a), housing and residential buildings (Ali Ikhsan et al., 2018b; Y.-C. Chu et al., 2017; Yan et al., 2020; Yanjun & Mengchen, 2021), architectural design (Barghjelveh et al., 2016b; Y.-C. Chu et al., 2017; K.-H. Liao et al., 2016; Qin & Li, 2021), ecological concept(D. Li & Zhang, 2013; A. Min & Lee, 2019c; Qin & Li, 2021) and ecological construction (Darabi et al., 2019; X. Wang & Xiang, 2016; W.-N. Xiang, 2016a; Zheng et al., 2018a). Most of those studies tried to acquire ecological wisdom from cultural landscape in macro or meso scale, yet limited study that attempts to acquire ecological wisdom from micro-scale landscape. Micro-scale landscape could be found around human living space. It could strongly represent the interaction between human and their living environment. Then, a question that come up to the surface is: Is it possible to acquire EW from micro-scale landscape?

On the other hand, Green open space (GOS) is defined as an area (elongated or clamped) with multiple purpose and activities on it, completed by vegetation, either it grows naturally or intentionally planted (Sitorus et al., 2018). It also known as open space that filled by green space. Study on green open space, has widely been discussed to various topic such as public policy (Alfatih et al., 2018; Angga & Saptenno, 2020), spatial planning (Aliman et al., 2017; Dollah et al., 2014; Sulma et al., 2017), landscape management (Angelia et al., 2018; Nufutomo & Elyza, 2018; Shirleyana & Sari, 2013; Sitorus et al., 2018; Wantouw et al., 2014),

biodiversity (Nisa et al., 2013; Rahmani et al., 2016), and so on. Therefore, it plays an important role in urban sustainability through its environmental, social, and economic benefits either in macro, meso, or micro scale. However, the study about trend and hot topic in green open space and ecological wisdom research (Manningtyas & Furuya, 2020b) was revealed that the topic of green open space and ecological wisdom was very little to discuss together. It indicates planning and design development of green open space not much considering ecological wisdom yet. Meanwhile, integrating green open space planning and design with ecological wisdom could enhance landscape harmony and sustainability.

5.1.2 Traditional Home Garden in Indonesia

Traditional home garden is a kind of green open space which exist around the traditional settlement. It represents the harmonized interaction between human and their living environment for a long time. The existence of architectural configuration and function of traditional home garden has been shown as adaptive planning and design towards potential and hazard in the landscape. Therefore, it could be categorized as a kind of cultural landscape heritage. Since cultural heritage may contains with ecological wisdom, it is important to documenting and theorizing ecological wisdom of traditional home gardens for sustainable adaptive design, especially in micro-scale landscape.

Generally, Indonesian traditional home garden is a tropical home garden with high biodiversity in plant and livestock. It has role not only as food suppliers but also as social space for inhabitant. It also known as a kind of traditional agroforestry system which vary in diversity base on the physical-ecological condition, economic of households, and culture (Hodgkin, 2001; B., N. P. Kumar, 2004; V. Kumar & Tripathi, 2017). Indonesian home garden widely known as a term *pekarangan*. It is a terminology for home garden in the context of agroforestry in its relation to livelihood of the household and environment (Kaswanto & Nakagoshi, 2014). However, in fact, Indonesian traditional home garden has various term based on its culture and

ethnicities. For instance, studies towards Sundanese home garden reveals that it has specific elements in such spatial layout rules. It also commonly called as *buruan* (Gunawan, 2019). Another type of traditional home garden is a shared home garden that named *taneyan lanjang*. It consists of specific elements that represents social relation between inhabitants (Maningtyas & Gunawan, 2017a; Setiani et al., 2022a). Study on Indonesian traditional home garden mostly related to ethnobotany study (Irawan et al., 2019; Iskandar et al., 2018; Mutaqin et al., 2020; Purnomo et al., 2018; Roshetko et al., 2017; Sujarwo & Caneva, 2015), medicinal plants (Chandra & Wanda, 2017; Rahayu et al., 2020; Ramadhani et al., 2021), biodiversity (Agustina et al., 2019; Hakim et al., 2018; Widianingsih et al., 2019), and no study discuss about ecological wisdom. Most of those studies was conducted in villages and rural areas. However, rare of them which took traditional settlement as study area. Therefore, the original concept of traditional home garden in Indonesia still need to explore, especially related to ecological wisdom concept.

To address those gaps above, this study aims to explore ecological wisdom applied in traditional home garden in two major ethnicities in Indonesia, which lived in different landscape characteristics. The ecological wisdom of traditional home garden was identified from the ecological knowledge of the households; spatial characteristics and layout of home gardens; and how the space of home garden being used by inhabitants. In the last section, this study tends to compare ecological wisdom characteristics of both study area. Specifically, in the present of study, the following questions are answered.

(1) What kind of ecological wisdom in Indonesian traditional home garden?

(2) How does the ecological wisdom apply in traditional home garden layout and its dynamic?

(3) How does the actual use of traditional home garden apply by current generations?

We assumed that traditional home garden contains with ecological wisdom. It could be detected from the spatial characteristics, space use and home garden function. Through this research, we attempted to provide scientific references on ecological wisdom in micro-scale green open space. It expected to provide valuable insight to promote ecological wisdom in green open space planning and design, especially in Indonesia.

5.2 Methodology

5.2.1 Study Area

The survey research was conducted in Java Island, Indonesia. It covers the Java mainland and Madura Island about 138.793 km2 which divide into six provinces. Java Island is surrounded by strait, sea, and ocean, which creates a humid tropical climate. The annual average temperature is around 25-32^{o}C and mean humidity 75% with high rainfall. The landscape of island dominated by volcanoes and river basin. At least 45 active volcanoes and 141 river basins exist on Java islands besides mountain, plateau, and coastal area. The river basin created by 45 big and long rivers along the island and serve abundance water resource for irrigation and daily life. These landscape form and geology condition influences the soil type and creates fertile soil on almost area of island. As area with high population density, Java islands become the habitation of 60% Indonesian people. There are four main cultural area which dominance on this island. They are Sundanese in West Java, Javanese in Central Java, and Madurese and Osingnese in East Java.

In the present of study, survey research was conducted by focusing on two ethnics: Sundanese and Madurese that includes in top-five most populous ethnicities in Indonesia. Both ethnic groups have distinct characteristics in culture and landscape geography. Sundanese people mostly living in west java, while Madurese people mostly living in east java, especially in Madura Island.

The sample site was determined by purposive sampling method with specific criteria: site status as traditional/cultural village, accessible in pandemic situation, and known as communities that preserve tradition. There are twelve traditional villages that was determined as sample site as shown in table 9. The Illustration for each sample site shown in the Figure 25.

Table 8. The distribution of sample site

Ethnicities	**Site code**	**Location**	**N of home garden**
Sundanese	S01	Sindang Barang Cultural Village	5
	S02	Urug Lebak Traditional Village	3
	S03	Cikondang Traditional Village	5
	S04	Marengo Traditional Village	10
	S05	Wana Cendana Cultural Village	4
	S06	Kampung Naga Traditional Village	15
Madurese	M01	Buddagan Village	5
	M02	Lobuk Village	2
	M03	Lenteng Village	2
	M04	Cangkreng Village	2
	M05	Plakpak Village	2
	M06	Kadur Village	2
Total Number of site cases			**57**

In this study, we observed indigenous Sundanese people that living in group led by a culture leader. They mostly develop their settlement in peak or hillside. The limiting number of home garden caused by the density of settlements which impact to limiting number and size of home garden found. The details of sample site lived by Sundanese is described as follows.

- Sindang Barang Cultural Village (S01)

  Sindang Barang Cultural Village (S01) located in Bogor, West Java, Indonesia with geographic coordinates in longitude 106,76194 and latitude -6,63021. It is an area that opened for cultural tourism on altitude of 350 to 500 meters above sea level. It is a highland

(a) (b)

Figure 25. Map of Study Area : West Java area lived by Sundanese (a) and Madura island lived by Madurese (b)

about 8600 m2 which located between two rivers. The soil type of this area is combination of regosol and latosol which categorized as fertile and stable soil. The mountainous and hilly landscape serves good view to Mount Salak and Mount Gede Pangrango surroundings.

Historically, Sindang Barang Cultural Village was built as a replica of Sundanese traditional settlement in the past to preserve historical and cultural values. The tangible cultural values were showed by the settlement pattern including cosmology, art, and physical elements. While intangible cultural value is presented by social life of cultural community. Every year thousands Sundanese people comes here to celebrate rituals for giving thanks to God and enjoying the view and culture.

The residents around this area mostly worked as farmer and merchant of small industry. There are more than 12.000 inhabitants lived in surrounding of Sindang Barang Cultural Village. They are still conserving Sundanese culture by performing regular rituals and conserving forest surroundings as a sacred place.

- Urug Lebak Traditional Village (S02)

Urug lebak traditional village located in the foothill of Mount Halimun Salak with elevation around 400 to 536 m above sea level. It has hilly and undulating landscape with flat to steep slope. There are three rivers run through this area and water spring from the sacred forest surrounding. The population of Urug Village is 5.191 people with 1.479 household heads. The population density reaches 1.296 people/km2.

There are some customary rules that applied in Urug village, led by their culture leader, such as farming rules, house building rules, rules to conserve their sacred forest. Some of annual ritual always held in this village and became the event for transmitting traditional knowledge by telling the Village's history to community. However, the growing population caused some rules no longer implemented, especially related to rules to build house and home garden. Therefore, it was hard to find traditional home garden in this site.

- Cikondang Traditional Village (S03)

  Cikondang Traditional Village located in Lamajang village, Pengalengan, Bandung, West Java. It is a settlement that surrounded by sacred forest as part of Mount Tilu. At the highest level of settlement area there are culture leader's house that called "*Bumi Adat*". It consists of more than 300 householders that worked as farmer and merchant. The settlement pattern is grouped with close distance between houses. Only few areas that still has home garden on site. The annual ritual still held by the community such as thanksgiving related to agricultural crops and water spring.

- Marengo Traditional Village (S04)

  Marengo traditional village located on Kanekes village, Lebak, Banten Province, in west java area. It is built on the hilly and mountainous landscape, formed a group settlement in the middle of forest. There are less than 100 householders which mostly worked as farmer and crafter which sell their crafts to visitor. They are led by culture leader that called as "*puun*" which lived on the highest level of settlement. Marengo Traditional Village was

dedicated as cultural tourism to learn about baduy and ancient Sundanese culture. They only used natural materials for daily life and refuse to use electricity. They also preserving any rituals related to agricultural activity.

- Wana Cendana Cultural Village (S05)

  Wana cendana cultural village located in Dago Village, Parung Panjang, Bogor, West Java. It is an area that built on the top hill and open for cultural tourism as well as eco-tourism since its area surrounded by forest. There are 42 members of wana cendana traditional community that lived and managed area around 20 Ha.

- Kampung Naga Traditional Village (S06)

  Kampung Naga traditional village is in Neglasari village with hilly and mountainous topography. It located on the valley with elevation more than 500 meters above sea level and steep slope. Therefore, they used to develop site engineering by build steps to avoid landslides. Furthermore, the indigenous community here is called as *"sanaga"*. They total 114 households which occupied an area of 15000 m^2 for settlement. While 35000 m^2 conserved as sacred forest and 50000 m^2 used as agricultural field.

Based on description above, Sundanese traditional settlement in this study primarily is a kind of mountain settlement ecotype. Sundanese choose the terraced and sloping land purposely as a living area and managed it according to their belief system. The settlement area is converging and grouped on hillside, developed to the north. It divided into three area according to the topography. The higher topography (peak and upper slope) is used for a sacred forest, granary, and main cultural house that lived by their culture leader. The middle topography is used as settlement area of commoner, while the lower topography is used to wet area, where the toilet, pond, and livestock cage are located. The lowest area located near the river used to paddy field.

Meanwhile, traditional home garden of Madurese people could be inhabited by three or more households. Therefore, this study focuses on investigating the original characteristics of their traditional home garden, rather than the numbers. The details of sample site lived by Madurese is described as follows.

- Buddagan Village (M01)

  Buddagan village located in Pamekasan regency, Madura Island, East Java. It is a village that known as cultural village since it still preserves the original layout of home garden. It also has been designated as cultural heritage of Pamekasan Regency and developed as cultural Edu-tourism. There five traditional home garden that known as *"tanean lanjhang"* here which has been established over decades. Each traditional home garden mostly lived by third to fifth generation since the home garden built and consist of three to twelve house building. It indicates that each traditional home garden lived by more than two households. The landscape characteristic of Buddagan village shows that this area located on the elevation more than 100 meters above sea level with slope around 3%. The soil type of this area dominated by regosol, mediterranean, and lithosol which categorized as soil with low fertility rate due to rough and sandy texture. Lithosol also categorized as barren soil since it less in organic and consist of aluminum and zink.

- Lobuk Village (M02)

  Lobuk village located in Bluto, Sumenep, Madura Island, East Java. It is a coastal area which most of resident work as fisherman and farmer as side job. The settlement area developed along the seaside with most of house building facing to the sea at south. The soil type categorized as lithosol and Mediterranean which has low fertility rate. The existing traditional home garden found in this site has been limited since it dominated by migrants. The longest traditional home garden in this site consists of 11 house buildings that some of them has been renovated to modern house. At this site, we visited traditional home garden

which still has traditional house and other element of "*tanean lanjhang*". Every year the villagers held celebration which called "*rokat tasek*" as a gratitude to God.

- Lenteng Village (M03)

  Lenteng village located in Sumenep District, Madura Island, East Java. It is a lowland which most resident worked as farmers. The soil type categorized as regosol and lithosol which suitable for dry farming. The traditional home garden in this area mostly has been modified as a response to the number of family members. We visited the longest traditional home garden that had been lived along three generation and consist of 18 house buildings.

- Cangkreng Village (M04)

  Cangkreng village located in Sumenep District, Madura Island, East Java. It is a lowland area which alluvial and lithosol soil. The land use is dominated by paddy field. The settlement was grouped and scattered between the farm field. Since it has been established over decades, the traditional home garden has developed and modified from original layout. The longest traditional home garden in this site consists of 24 houses building vis-à-vis to each other.

- Plakpak Village (M05)

  Plakpak village located in Pademawu, Pamekasan District, Madura Island, East Java. It is a lowland with elevation less than 100 meters above sea level and flat slope. The soil type dominated by alluvial and regosol which relatively high in fertility rate. The villagers work as farmer and small merchant as a side job. The settlement developed in group devided by farmland. Each group consists of some traditional home garden, while each home garden consists of 2 to 4 households.

- Kadur Village (M06)

  Kadur village located in Pamekasan District, Madura Island, East Java. It also a lowland with undulating landform. The elevation is less than 100 meters above sea level and with

gentle to steep slope. The soil type is dominated by regosol and lithosol which suitable for dry farming. The villagers worked as farmers and managed the farmland surrounding their home garden.

In summary, Madurese traditional settlement represents the kinship community with dry farmland ecotype. It was built on flat farmland and mostly developed from west to east according to family structure in an extended family. Therefore, Madurese's settlement always built scattered in small group housing divided by farmland.

The comparison between Sundanese and Madurese study area shown in table 8. The distinct characteristics in the culture and landscape geography might influence their local knowledge and wisdom on environmental adaptation.

Table 9. The comparison of Sundanese and Madurese study area

	Landscape Characteristic	**Culture characteristic**
Sundanese (West Java)	▪ Mountainous and hilly landform, ▪ Highland Settlement surrounded by forest and river ▪ Fertile soil with wet tropical climate	▪ religious and spiritual hierarchy manifested in physical landscape ▪ sacred forest believed as the abode of ancestral spirit ▪ hospitable
Madurese (East Java/Madura Island)	▪ Flat landform ▪ Lowland settlement surrounded by farmland ▪ Barren soil with dry tropical climate	▪ Kinship-based relation ▪ Hard worker ▪ Strong in social-norm system

5.2.2 Data Collection

The field survey was conducted from June to August 2021 and continued by literature survey till March 2022. We collected data from literature survey, interview and site observations, as described as follows.

- Literature survey

  We reviewed the present status of Sundanese and Madurese ethnicities from several ethnographic text, published research report, local chronicles to familiarize the local culture and belief system in both study areas. However, the data related traditional home garden of both is limited. Therefore, the literature survey functioned as basic information and data triangulation to test the data validity.

- Interview

  The interview technique was conducted towards culture leader/headman and householder that preserved traditional home garden. Firstly, we visited the culture leader/headman of each sample site. After introducing the research profile and guidance, we asked his permission to conduct an interview. It was a semi-structured interview to collect traditional ecological knowledge that applied on sample site. The interview conducted in Indonesian language and being recorded by voice recorder. The summary of culture leader/headman transcription is showed in Appendix 1.

  The interview then continued to householder that still preserved traditional home garden, by applying snowball sampling technique based on recommendation of culture leader/headman. The interview process also accompanied by local interpreter since most traditional people did not familiar yet with the other language. We asked permission of respondent to conduct an interview after introducing the research profile and guidance. It was a structured interview with open-ended questions to collect information about ecological knowledge related to home garden and nature; home garden use and importance; and spatial characteristic of their home garden. Overall, there were nine questions asked to respondent which is a householder or the eldest member in the home garden. The interviewee response was noted on sheet and back up with voice recording. The details of householder's interview transcription are showed in Appendix 2.

- Site Observation

  Site observation was conducted after each interview. We identified elements, layout, and functional use of home garden then measured the home garden size, air temperature, and wind direction and speed in the home garden. Furthermore, the geotagged photos of each site case were took using open camera apps to obtain the geolocation data. Site observation also functioned as triangulation data of interview stage.

5.2.3 Data Processing and Analysis

The audio data was transcribed into text data and compiled with interview notes. While the image data and field notes of site observations was compiled into folder. We created three file folders in NVivo software: interview folder, site observation folder, and literature survey folder; then upload all data, respectively.

The coding stage of interview data was processed in two cycles by applying deductive-inductive coding approach. At the first cycle coding, we created nodes based on interview question and coded the interview data to suitable node (deductive approach). Next, the keyword of each response was created as a new child node and the similar keyword was coded in the same node. The second cycle coding was conducted by applying thematic analysis and content analysis simultaneously towards interview data, literature data, and image data from site observation (inductive approach). We revised and re-arranged the nodes' structure based on thematic analysis, then developed themes based on three-unit analysis, it was traditional ecological knowledge, spatial characteristics, and space use of home garden. The node list as the result of cooding process is showed in the Appendix 3 while the details of coding process of interview data is showed in Appendix 4.

The environmental data was proceeded and analyzed using Google Earth Engine (GEE). We created a boundary map of Sundanese and Madurese study area as a base map, then importing geolocation data of each sample site. The landscape map including elevation, slope,

landform, precipitation, air temperature, wind speed, and landcover were overlayed to boundary map to obtain environmental data. We also re-drew 12 home gardens layout using Sketch Up web as study cases.

The ecological wisdom on site was analyzed based on the conceptual framework of knowledge to wisdom transformation by (B. Yang & Young, 2019). In this model, the transformation viewed from an individual's perspective which intended that ecological wisdom resulted by tacit knowledge from ecological knowledge as an input. It also involves self-reflection, experience, and synthesis in process. We identified traditional ecological knowledge of indigenous people on both study areas as an input of the process, then analyzed the spatial characteristics and the space use of their traditional home garden as the tacit knowledge and exploring the ecological wisdom embodied base on ecological wisdom principles proposed by (B. Yang & Young, 2019). The research framework of this study shown in the Figure 26. At last, the analysis result was synthesized by describing the findings using table, diagram, and illustration.

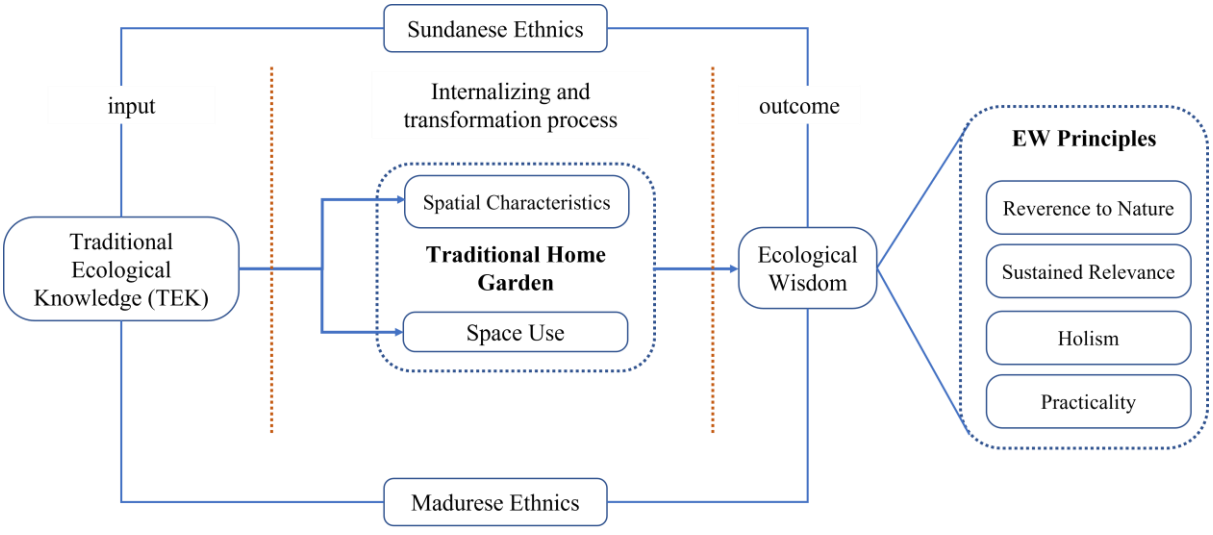


Figure 26. Research Framework (adapted from B. Yang & Young, 2019)

5.3 Result

5.3.1 Sundanese Traditional Home Garden

Sundanese traditional home garden mostly is a kind of yard that called as "*buruan*". It is a green open space with annual plants that used for daily need, consumption, or ritual purposes. However, although the sample site has been declared as traditional village, the existence of home garden is no longer prioritized due to the limited residential areas. All available home gardens are used as public goods to increase harmony and togetherness between community members. Since Sundanese traditional settlements distinguished by hierarchy that shown by topography, the design of traditional home garden could be divided into home garden of culture leader's house and home garden of commoner's house.

5.3.1.1 Sundanese Traditional Ecological Knowledge

Based on the result of coding process and themes construction, the themes visualization has been created using project map features to explore the connection between codes and cases. There are four categories of ecological knowledge which found from analysis, they are: perspective towards nature from elders, site management-related knowledge, animal husbandry and plants-related knowledge, and water management-related knowledge. The detail about each knowledge is described as follows.

a. Perspective towards Nature from Elders

The Sundanese elders is holding three concepts while interacting with nature. The first concept is "living with nature, not only living in nature". Human and nature are equal and protecting nature also means protecting themselves. In contrast, damaging nature means ruining themselves. The concept of living with nature then divided into six rules. The first rule is "do not change the God creation". Sundanese believed that everything from God has their own role and human should follows and doing his roles to manage nature and keeping the balance of God creation.

"While using the nature resources, there is a rule to do not cut or joining something. We should use it as it is and prohibit to change the God's creation. The home pattern is also do not add or subtract." (householder, S03B)

"Mountains cannot be melted down, valleys (plains) cannot be destroyed. Sasaka (sacred places) cannot be changed." (culture leader, S04)

"Something that has been long couldn't be shorten, and something that has been short couldn't be lengthen. It means do not change anything." (housholder, S04A)

Those rules require Sundanese to preserve nature for their life balance through concept *"Ngaraksa sasaka buana"*. It implies that fertile land must be maintained and remain fertile, water sources are not polluted, air is kept clean, all living things have their own living space according to the time and place (El Shabir 2014). Keeping the natural balance will help their life, and it becomes an obligation for them.

The name of "Sunda" is come from concept "Sun-Da-Ha" which shared Sundanese wisdom into three parts: the relationship between humans (SUN), relationship with nature (DA), and relation to the God as Creator (HA). Interaction between human needs should be prioritized the openness and togetherness between community members, while interaction with nature should be balance since Sundanese living with nature. The last concept is "Ha" which means all those action towards living being and nature should base on belief to God as Creator (Dahlan 2012).

The traditional Sundanese mostly built their traditional settlement on foot mountains due to understanding that mountain is a habitation of ancestral spirit and Gods, then, the forest is a gift from gods that served as the water source for human living. Therefore, forests on the mountain should be preserved for the sustainability of water and their life and the sacred forest resources do not use for private needs.

"Forest should be preserved for sustainability because we are living with nature." (Householder, S05C)

"We have sacred forest, which is not allowed to take any resources. Besides, there are mount forest that can use by community under permission of our culture leader. If you are cutting down a tree, it should be replaced by the new one." (Householder, S03C)

The other concepts are the application of *pamali* system and awareness to do not sell their land. *Pamali* is the law of sin or prohibition from doing something that is associated with punishment from the spirits of ancestors or God. It was transmitted along generation by oral

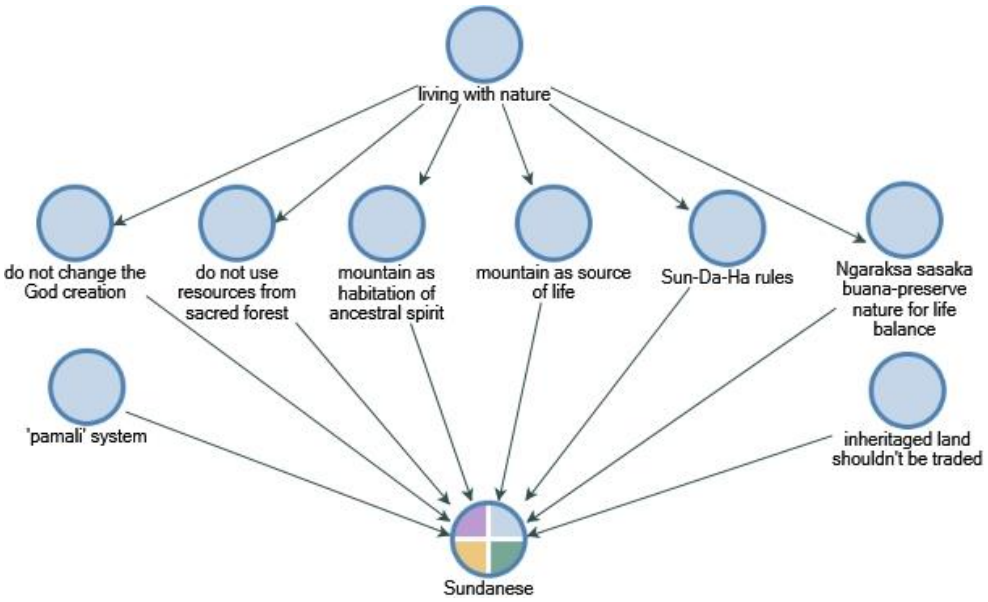


Figure 27. Conceptual Map of Sundanese perspective towards nature

tradition and proven to be able to maintain the traditions and rituals that have been believed by the community. Rules that categorized as *pamali* such as change the house layout and material and taking resources from sacred forest. The conceptual map of Sundanese perspective towards nature shown in the Figure 27.

"…the rules of society based on the "Pamali" (law of sin). As a result, people do not exploit the forest much, but plant their own in the environment around where they live, and even have to continue to preserve the forest as part of their ancestral will…"(householder, S01C)

"In the Kampung Naga, there are not many prohibitions, neither rule. Prohibition is enough with 1 sentence: PAMALI. There is a sacred forest that is guarded for the preservation of 2 protected forests. People live with nature. If someone maintains gardens and forests, those that fertilize springs automatically cannot be cut down. Nature will not cause disaster except because of human greed..." (culture leader, S06)

b. Site-management-related knowledge

The site management-related knowledge of traditional Sundanese consists of rules about ground management and traditional house. Regarding the ground's rule, traditional Sundanese knew at least 3 kinds of rules, they are *tri tangtu*, *luhur-handap*, and *warugan lemah*. Tri tangtu is a concept that divides everything into three part which detailed by *luhur handap concept*. The application of tri tangtu in landscape management divide living area into three parts: sacred

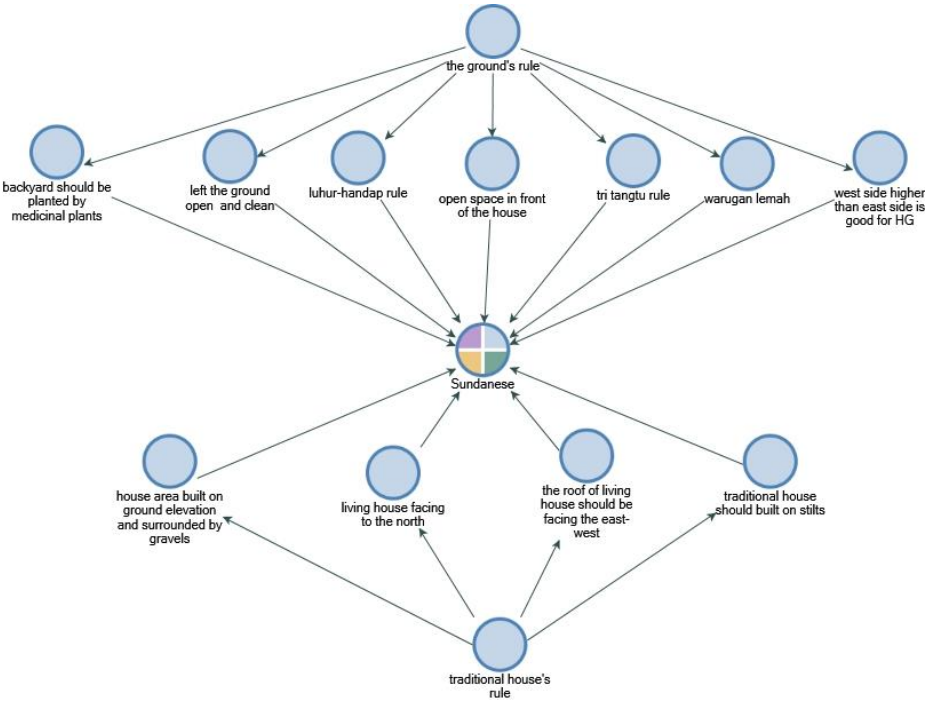


Figure 28. Conceptual Map of Sundanese site management-related knowledge

area, clean area, and dirty area. Then, it detailed by *luhur-handap* concept which place sacred area into the highest position, clean area in the middle, and the dirty area in the lowest area. The settlement area mostly located in the middle and categorized as a clean area. While *warugan lemah* is a traditional guidance to choose a good place for settlement, which literally

means “landform”. There is land that categorized as a good place to build a settlement base on *warugan lemah*, such as the flat area (*sumara dadaya*), the slope that facing to the north (*talaga hangsa*), area between hills (*singha purusa*), and area on the peak of hill (*ngalingga manik*) (Peradaban Sunda Kuno, 2022). It became guidance for culture leader to build their traditional settlements.

At home garden scale, all those rules also implemented in house and garden placement. The house represents the concept of *luhur* and area surrounding that used as garden represents the concepts of *handap*. The house building mostly built on elevated ground that has been flattened, while the home garden consists of open space with vegetation planted on the edges. There is some rules to build traditional house such as the culture leader house should facing to the north, while commoner house could be facing to north or south since the roof ridge leads west to east. Besides, all type of traditional house should be built on stilts that make it higher than surrounding. Conceptual maps of Sundanese site-management knowledge shown in the Figure 28.

c. Animal husbandry and Plants-related knowledge

In line with the development of agricultural knowledge, traditional Sundanese utilized plants and livestock as a component of their home garden. The consideration of planting and raising livestock is dependent on the households needs such as for kitchen needs, rituals, and so on. However, raising the livestock with 4 legs in home garden area is prohibited since settlement categorized as clean area. Therefore, traditional Sundanese mostly located their livestock out of settlement, near the paddy field. Furthermore, this study found that hanjuang plant (*cordyline fructicosa*) always planted in the sundanese home garden, especially for border plants. It is a symbol of boundary, especially for sacred place and believed as connector between the ancestor and their generation.

"Cultivating paddy fields with buffalo. Buffaloes are kept in the fields..there is a special care for buffalo. The cage is behind the house a bit far so it doesn't smell bad." (householder, S03B)

"hanjuang always use as border plants and used for rituals and symbol of boundary…" (householder, S01C)

"planting was done at the edges of home garden and functioned as border or hedgerows…"(culture leader, S05)

d. Water management-related knowledge

Traditional sundanese distinguish a concept for water management which known as *lemah-cai* concept. *Lemah* means soil, and *cai* means water. Both represent good settlement should be built in the fertile soil and has water spring around for daily life in the mountainous area. Water spring from mountain is essential for obtaining fresh water. Therefore, Sundanese understood that it should be preserved by conserving the forest (Dahlan 2012). In managing water, there is a rule to flow the water from the spring to the lower area to keep it always fresh and clean. While the fresh water flowing to home garden, it directed to a washroom that mostly located on the pond. Pond is one of characteristically element in the Sundanese home garden that used to save the water. It was implementation of the concept *"nu lamping diawian, nu datar diimahan, nu legok dibalongan"* which means sloping area for bamboo planting, flat land for housing, and basins for pond. The conceptual diagram for water management by Sundanese is shown in the Figure 29.

"the water source comes from springs in the mountains which are flowed by bamboo pipe to the washroom." (householder, S04D)

"we used to comes to water spring in the mountains to take the water for daily needs." (householder, S06F)

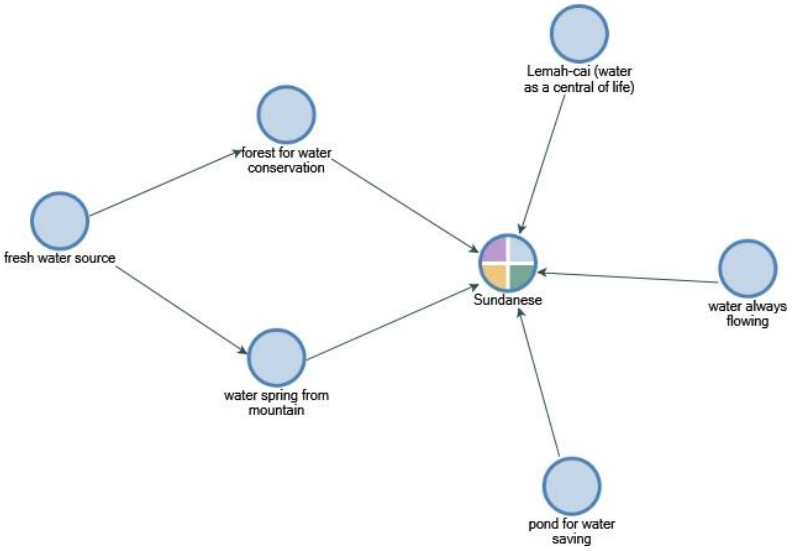


Figure 29. Conceptual diagram of Sundanese water management-knowledge

"one of the elder's message is to keep water flowing in this village to clean anything bad like poison,dirt, or disease." (culture leader, S03)

By those point of view, it could be assumed that Sundanese traditional home garden has diverse rules and knowledge in managing their natural surroundings. They also view nature at landscape scale and acknowledged that human being is a part of the landscape system. To sum up, we generate a list of Sundanese traditional ecological knowledge as shown in the table 10.

Table 10. List of Sundanese traditional ecological knowledge

TEK	Meaning
Living with nature	Human and nature are equal and protecting nature also means protecting themselves
Ngaraksa sasaka buana	Preserve nature for human life balance, maintaining universe
Sun-Da-Ha	Interaction between human needs should be prioritized the openness and togetherness between community members, while interaction with nature should be balance for sustainable life
Pamali	Taboo, something that prohibited to do
lojor teu meunang dipotong pondok teu meunang disambung	Do not change God creation yet use as its function.
Tri tangtu	Everything consists of 3 part

Luhur-handap	High (honor) and low (in structure)
Warugan Lemah	"landform", a traditional guidance to choose a good place for settlement
Lemah-cai	"Soil and water",good settlement should be built in the fertile soil and has water spring around for daily life

5.3.1.2 Spatial Characteristics of Sundanese Home Garden

The spatial characteristic of Sundanese traditional home garden was identified from observation geotagged photos result combined by spatial observations towards google earth view. Next, we re-drawn the home garden layout using Sketch Up web and made color symbol to differentiate functional elements into residential building (RB), yard (YA), vegetation (VG), functional building (FB), gravel pavement (GV), and fishpond (FP). In this paper, we only made 12 illustrations of home garden layout as the site cases.

a. Home garden layout

The observation towards home garden layout showed that there are some distinctions between culture leader's house and commoner's house. The house of culture leader known as

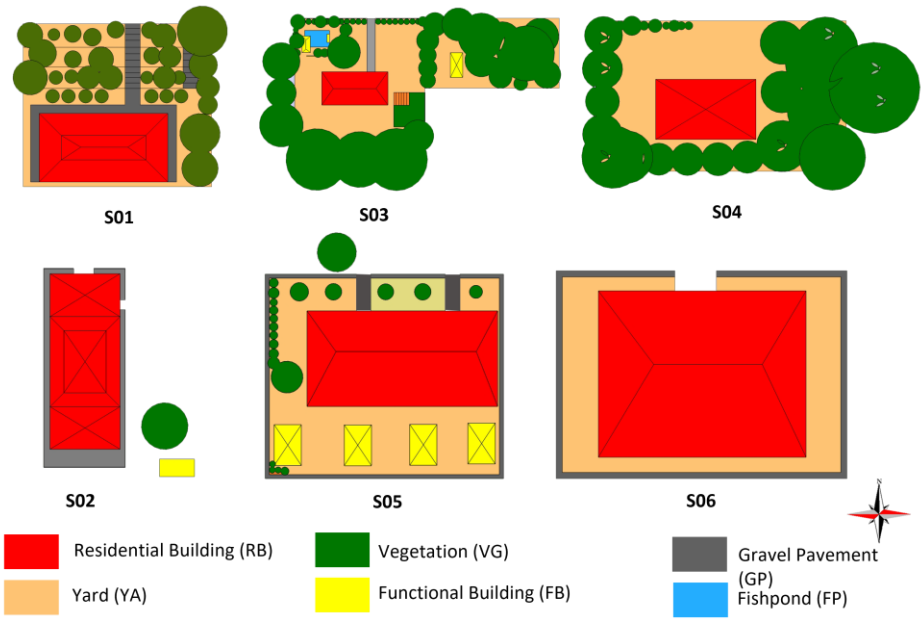


Figure 30. The current layout of Sundanese traditional home garden (culture leader's house)

"*imah gede*" or "*bumi ageung*". It either could be lived by the headman of community or only open for sacred rituals. Therefore, it generally has more complicated rules and principles rather than commoners. Figure 30 shows the current layout of traditional home garden in culture leader's house. The home garden size is varied in each site cases, however there are some similarities such as RB consistently facing to the north, while FB, which could be granary and/or washroom located out of the RB. An absence of FB means it used by public and located out of settlement area. Furthermore, VG mostly planted surrounding formed as a hedgerow to provide shading, while YA is left as an open space surrounding the house and uncovered by any plants or gravel. FP in the home garden only found in the site case with code S06, while in the other locations, the FP has been moved out of settlement area and used by community publicly.

On the other hand, the commoner's house is more flexible either on house orientation or elements. It called "*imah*" or "*bumi*" which lived by a single family. Figure 31 shows the current layout of sundanese traditional home garden in commoner's house. The home garden

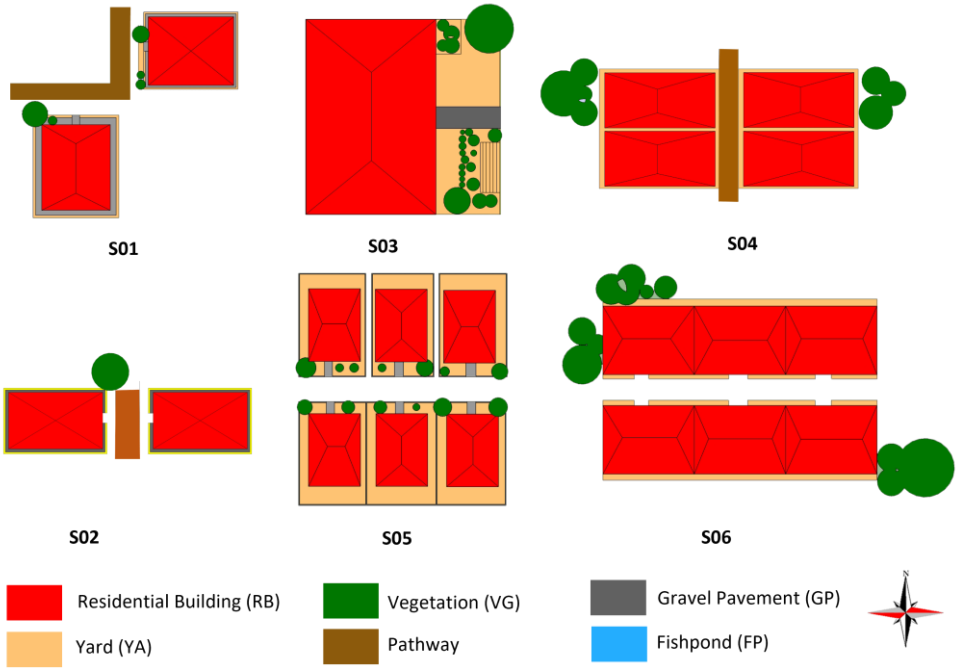


Figure 31. The current layout of Sundanese traditional home garden (commoner's house)

mostly found in small sizes and tend to be shared home garden rather than privates. It consists of RB which consistently facing to the pathways and marked marked by ground elevations that reinforced with gravel as pavement and retainer. VG was planted randomly in group at the edges and used by public. While the ground mostly left uncovered. Most of home garden area was un-bordered, while some site cases only use bamboo fence to define the boundary and creating the axis from entrance to the door's house. FB was not found in this type because it located separately and used together with the residents in the village. The existence of home garden in the sundanese traditional village was limited due to the denser settlement. Therefore, it minimizes in size and the function served together with the other community members.

The measurement towards site elevation and slope in table 3 shows that the culture leader's house located higher than commoner's house, except for site code S05 and S06 that has limited settlement area. It represents the Sundanese philosophy "*luhur-handap*" which placed leader on the highest nodes which close to the ancestral spirit. Furthermore, all site cases located on undulating to moderate sloping and the slope of culture leader's house consistently steeper than commoner's house. Building a house in sloping area is required as manifestation of concept *"lemah-cai"* which allow water always to be flows. Moreover, observation towards landform shows that all of Sundanese site cases located on upper to lower slope, peak, and valley. The orientation of culture leader house determined the development of traditional settlement especially for site case number S01, S03, and S04 where the settlement area developed to the north side. However, this principle no longer applied in site case number S02, S05, and S06 due to land limitation for settlement.

Table 11. The elevation and slope data between culture leader's house and commoner's house

Site cases	Culture leader's house			Commoner's house (in average)		
	Elevation (m)	**Slope (%)**	**landform**	**Elevation (m)**	**Slope (%)**	**landform**
S01	384	4.6	upper slope	372	4.5	Lower slope
S02	444	9.3	upper slope	330	8.6	Lower slope
S03	1007	7.7	Upper slope	894	6.2	Lower slope
S04	391	14.5	Upper slope	386	8.2	Upper slope
S05	136	10.3	Peak/ridge	136	10.3	Peak/ridge
S06	617	7.9	valley	617	7.9	valley

b. Home Garden's elements

Based on the layout of Sundanese traditional home garden and interview towards householders, the elements of traditional home garden have been formulated as follows.

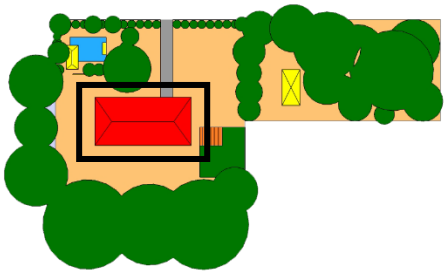
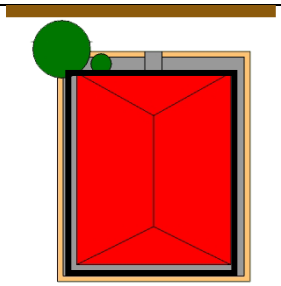
- Residential building

The residential building of Sundanese is called *imah.* It is a house that raise on plinths with hollows under the house building. The culture leader's house could be called as *imah gede*. It bigger in size rather than commoner's house because served meeting and discussion hall inside. It functioned as a central of ritual activity and sometimes as a guest house for visitor. The detail characteristics of Sundanese residential building is shown in the Table 4.

"the highest level of slope is reserved for the king/culture leader to build a big house (imah gede) that facing to the north…" (culture leader, S01)

"the resident houses located in the north side of culture leader house at the lower level.." (culture leader, S03)

Table 12. The characteristic of Sundanese residential building

Component	Culture leader's house	Commoner's house
Local name	*Imah gede / bumi ageung*	*Imah / bumi*
ilustration		
Size	30 x 12 m^2 or 8 x 12 m2	8 x 6 m2
Layout in home garden		
Orientation	Built on higher topography, facing to the north (the sacred forest caretaker)	Built lower than culture leader, facing to the north/south/square/pathways
Material	Bamboo woven, palm fiber, cobblestone for stilts	
Land base	Ground elevation covered by gravel	
architecture	A house raised on large stone plinths that elevated 50 cm above the ground. The space underneath used for chicken cage if any	

- Functional building

The elements that categorized as functional building in the Sundanese traditional home garden are granary (*leuit*) and/or washroom (*tampian*). Originally, both elements are rarely existed in the home garden, but should be located out of the main house. Current layout of home garden shows that washroom was built above the fishpond using the stone plinths, however in most cases, the toilet has been built in the house building, especially for traditional village that also served cultural tourism like the site case number S01 and S05. The other cases still use river instead of washroom.

"Tampian and balong located in the front yard, in front of the house to keep the cleanliness of the house. Someone should be clean up before entering the house." (Culture leader, S03)

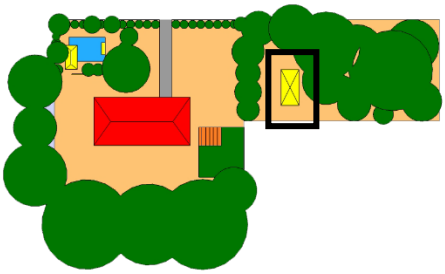
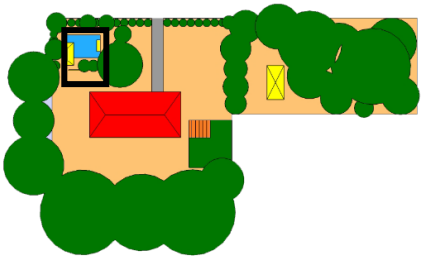
"There are no bathrooms or toilets in the houses. Bathing activities are usually done outside the house or on the river…" (householder, S04)

On the other hand, granary that originally is a public facility of the traditional village was moved in the house building and transformed into "*goah*", a room that used to save rice that located in the kitchen. At the settlement level, granary was located at the east side of culture leader's house facing to the north or west. The detail characteristics of functional building in Sundanese home garden is shown in the Table 13.

- Yard

Yard in Sundanese home garden is an open space that located in front of the house or sometimes in back yard as well. It called as '*buruan*' and left as open space for circulation and social gathering or sometimes for sun dried the crops or making seedbed. At the settlement scale, the yard is called *buruan gede* or *alun-alun* that used to cultural activity and central space of community. It always located in front of imah gede (culture leader house) and become an orientation for commoner's house. As support kitchen needs, the edge of yard is planted with fruit trees and/or spices plants and could be shared to neighbors. Figure 32 shows the illustration of yard in the Sundanese home garden.

Table 13. The characteristic of Sundanese functional building

Component	**Granary**	**Washroom/toilet**
Local name	*leuit*	*tampian*
ilustration		
Size	1.5 x 2.5 m2	2 x 3 m2
Layout in home garden		
Orientation	Located on the east/west of the culture leader house on the high topography, facing to the north or west	Located on lowest topography and built above the fishpond, facing to the residential building
Materials	Bamboo matting, wood, palm fiber, cobblestone for plinths	
Land base	Stone plinths 30-50 cm height above the ground	Stone plinths 50 cm height above the water level
Architecture	Low and long roof covering the body of building, form an acute angle	Simple building with low roof coverage by bamboo matting

"the front yard left as an open space for circulation between community members." *(householder, S03C)*

"the front yard is an open space that used to preparing rituals." (culture leader S03)

"Between house and the bamboo fence there is buruan (front yard) that planted by medicinal and sacred plants." (householder, S01A)

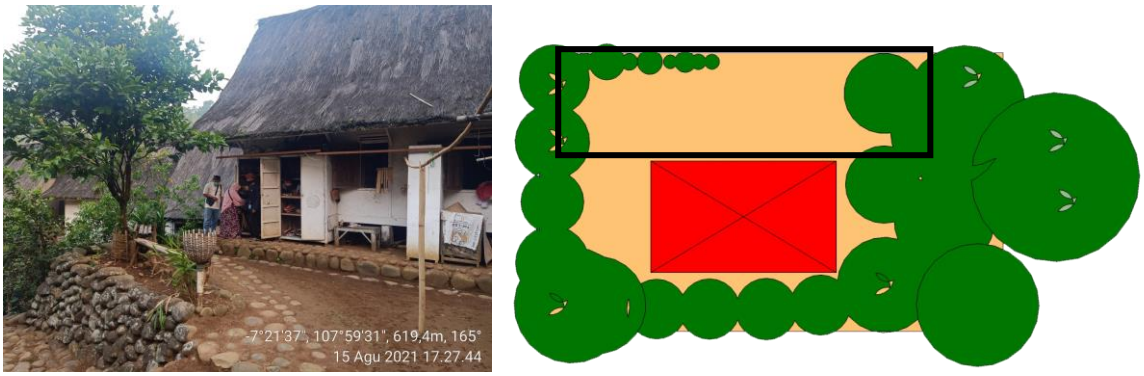


Figure 32. Illustration and layout of yard in the Sundanese home garden

- Boundary

The boundary of Sundanese traditional home garden could be a bamboo fence that wattled in triangle shape (*kandang jaga*) and tied to shrubs or short tree. The wattled bamboo fence is a symbol of Sundanese life philosophy *tri tangtu tri buwana* that means 3 important aspect that should be keep in mind is the Sundanese believed not only to their self-competence, but also in God willing and natural resource surrounding. The bamboo fence also used to separate clean and dirty/wet area in the settlement.

The *Cordyline fructicosa* identified as border plants in Sundanese culture. It believed as connector for the landowner and their ancestor. It used not only for home garden but also for bordering agricultural area and any other land use. However, in secluded settlement (case S01, S04, & S06), the bamboo fence mostly replaced to the ground elevation that covered by river stone or gravel as retainer. The gravel pavement is used to restrain muddy and flowed the raindrop. The house area left un-bordered to strengthen social bounding of community.

"While at the west is the border area which is lined with red hanjuang (Cordyline fructicosa) plants. The red hanjuang is a symbol of the spiritual world, and it becomes a sign of his descendants." (Culture leader, S01)

"The boundary of the house area is made from elevated ground and is retained with stones to prevent erosion and form small ditches to drain rainwater." (householder, S06C)

- Vegetation

The vegetation in the Sundanese home garden generally used for consumption and ritual purpose. Usually it consists of fruit tree, spice, and herbs plants for consumption, medicinal, or kitchen needs. While flower plants mostly needed for ritual purpose. The spice/herbs garden mostly located near the kitchen on the east side of home garden. It considers the sunlight direction, especially for sunrise and ensure the plants obtain the morning sunlight. Meanwhile, the annual plants or trees and flower plants mostly planted at the edge as a hedgerow and give shading effect. However, the existence of vegetation is varied in all site cases. For dense settlement, the vegetation planted as edge of home garden and could use by public. The plant selection preferences are based on its function rather than aesthetics.

"The house with home garden, usually plants fruit trees on their edges and made their front yard as an open space." (householder, S05B)

"Then, borderd by bamboo fence as barrier combined with hanjuang plant (cordyline sp.) as hedgerows, there are house building area that built vis-a-vis facing to north-south, while the circulation path follows the east-west direction." (householder, S06D)

- Fishpond

The fishpond in Sundanese home garden located on the lowest area. It could be at front, beside or behind the house. Pond is an important element that functioned as fish cultivation and water storage. The water source is coming from spring that flowed to the washroom. The traditional washroom and toilet that named *'tampian'* is built above the pond. The wastewater from '*tampian*' then drainage to the pond and consumed by organism in the pond. At this pond, wastewater is filtered by traditional water filter that called '*bubu*'. Then, the filtered wastewater

from the pond streamed to the rice field then going to river. The sundanese believed that water should be flowed. Therefore, they flowed water from the springs to their settlement and agricultural land while implemented water management. However, the fishpond in site cases no longer exist due to land limitation. In most cases the existence of pond grouped out of settlement area and categorized as wet area on the lowest slope, while the other prefer to use river instead of making a fishpond.

"pond is needed to save water for emergency like fire and it built depend on the land availability". (culture leader, S03)

"pond is built in front of the house for raising fish and as waste water reservoir from the washroom". (householder S03B)

5.3.1.3 The Space Use of Sundanese Traditional Home Garden

The space use of Sundanese traditional home garden was identified through interview and on-site observation. The qualitative data was coded based on time of activity and displayed in table 14. To better understand the type and spatial layout of the activity in the home garden, the household's activity map has been created as shown in Figure 33. In this analysis we displayed the activity map of culture leader's house in the site case number S03.

Table 14. Type of Sundanese home garden space use by time

Type of Activity	Time				Intensity	Location
	Morning to afternoon	Evening to night	inciden tally	anytime		
Sitting on the terrace				■		terrace
Preparing rituals			■			yard
Bathing				■		Washroom
Drying crops	■					Yard
Saving crops			■			Granary
Sweeping	■					Yard
Harvesting kitchen plants				■		Garden
Doing handicraft		■		■		Terrace
Drying cloths	■					Yard
Social gathering			■			Yard
Playing	■					yard

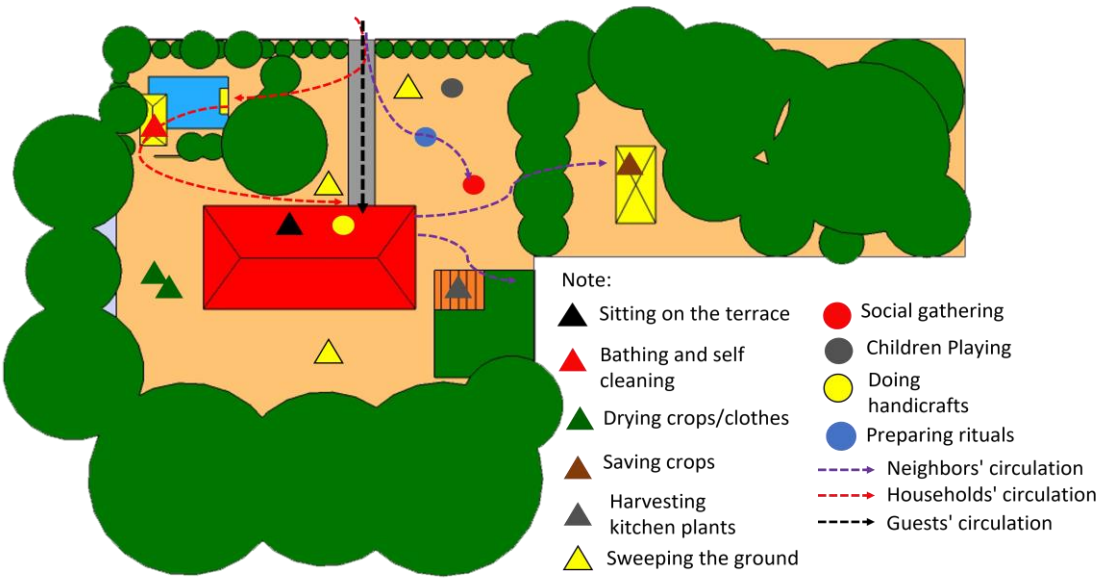


Figure 33. Activity map in the Sundanese home garden based on subject observation

Observation towards Table 14 showed that yard has been used mostly in the morning to afternoon. It used for many activities related to daily personal activities, such as drying crops and clothes and sweeping the ground; or social activities such as social gathering, playing, and preparing rituals.

Furthermore, private personal activities were conducted at home, especially on the terrace. It allowed inhabitants to communicate with other family members that doing in the home garden and oversee the home garden situation.

5.3.1.4 Ecological wisdom embodied in Sundanese Traditional Home Garden

Ecological wisdom is defined as capability to combine ecological knowledge and practical experience in understanding landscape system on site and generates ecologically sustainable landscape design and/or actions (Grose et al., 2019; Manningtyas & Furuya, 2022; B. Yang & Young, 2019). It could be learned from cultural heritage that has been proven sustainable overtime (A. Min & Lee, 2019a; D. Min & Lee, 2022). Furthermore, according to the conceptual framework of TEK and EW relationship in cultural landscape by (Manningtyas

& Furuya, 2022) and conceptual framework of ecological knowledge to wisdom transformation process by (B. Yang & Young, 2019), traditional ecological knowledge and ethics has an important role in generates ecological wisdom, besides practical experience.

Based on analysis towards traditional ecological knowledge, spatial characteristics, and home garden space use, the ecological wisdom embodied in the Sundanese home garden are follows.

- Ecological wisdom in dealing with topographic conditions

  All of Sundanese site cases located on high topography and near the water spring. It influenced by knowledge and belief about the *luhur-handap* rule, and *lemah-cai* rule that asked Sundanese to develop their settlement on the slope landscape (Gunawan et al 2019.; Sudarwani, 2016; Wessing, 2008). In practice, the Sundanese home garden was built on flat to slopy ground elevation that covered by gravel. It showed that Sundanese has been done simple site engineering to build their house and home garden (Dahlan et al., 2012; Wessing, 2008). The house building was built on plinths which adapted to unstable ground. Furthermore, the utilization of river stone and gravel as grounds retainer indicates wisdom in dealing with undulating landscape. Moreover, steps were built to connect home gardens in different level to allowing water flow.

  The site management-related wisdom indicates that Sundanese view towards nature is at landscape level. Therefore, they plan and managed their living area as a part of a whole landscape system. Home garden was defined as a part of the settlement which categorized as clean area based on the *tri tangtu* concept (Almaviva, 2006; Barat, 2021; El Shabir, 2014). Therefore, it was built flat and uncovered by any vegetation to allow open circulation and providing social space.

- Ecological wisdom in dealing with climatic conditions

Since all of Sundanese traditional village in this study located in high elevation, analysis towards air temperature, precipitation, and wind speed shows that all site cases have average air temperature around 20°C to 25°C with high humidity around 65-80%.

The layout of Sundanese traditional home garden in all site cases shows the separation of wet and dry area. The washroom always located out of house buildings, either in the home garden or in the lowest area of settlement. It indicates response towards climatic conditions of site. The separation wet area such as toilet and washroom from main house building could reduce the humidity (Sardjono, 2011) then increase thermal comfort.

Furthermore, analysis towards home garden elements also shows that house building, and home garden layout was sensitive to orientation. Sundanese traditional house, generally facing to the north, especially for culture leader, and determine the direction of settlement development (M. Arief Wibowo, 2022). North and south direction allowing house building to get enough sunlight, improving air quality, and reducing humidity (El Shabir et al, 2014). Moreover, open space and hedgerows surrounding the home garden allows air movement and filters wind from mountains and valleys making it more comfortable (El Shabir, 2014). On the other hand, utilization natural material for house building and home garden elements was adapted to climatic conditions. Bamboo material and wooden planks was dominantly used as wall and floor of house building. It functioned as heat insulation during the day which will be released at night. Moreover, Roof material used combination of *Imperata cylindrica* leaves, *Etlingera solaris* leaves, and palm fiber as cover. It allows air exchanging through the roof by wind flowing and maximum heat from sunlight is reduced by *Etlingera solaris* leaves underneath (El Shabir, 2014).

To sum up, traditional knowledge and perspective towards nature has influenced Sundanese people to live with nature and managed their environment at landscape level based on their traditional ecological knowledge. In micro level, the implementation of Sundanese traditional ecological knowledge could be traced from spatial characteristic and home garden space used. Both variables show the ecological wisdom in Sundanese traditional home garden in dealing with topographic and climatic conditions. For better understanding of the ecological wisdom process in the Sundanese traditional home garden, the conceptual framework has been created as shown in the figure 42. Moreover, the details of ecological wisdom in Sundanese traditional home garden is showed in Table 15.

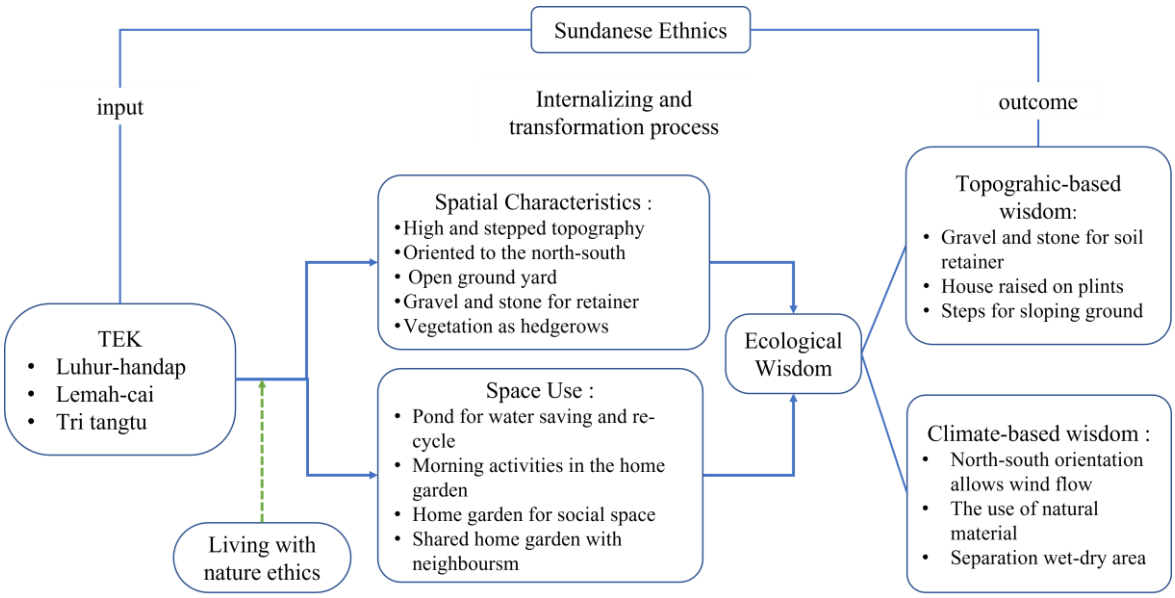


Figure 34. Ecological Wisdom process of Sundanese Traditional Home Garden

Table 15. List of ecological wisdom in Sundanese traditional home garden

Aspect	**Form of Ecological Wisdom**
Topographic-based response	House is raised on plinths/stilts, adjusted to topographic condition
	Stone and gravel are used as soil retainer at the edges of house building and home garden
	Built the fishpond at the lowest area of home garden/settlement for water saving

	Steps at sloping ground to allow the water flow and connecting the home gardens
Climatic-based response	North and south orientation of each houses allowing the wind flow and reducing humidity
	Separation of wet (toilet and pond) and dry (living) area in the home garden to reduce humidity and increase thermal comfort
	Hedgerows surrounding home garden serves as wind breaker from the peak and valleys
	The use of natural material for house building serves as heat insulation

5.3.2 Madurese Traditional Home Garden

Madurese traditional home garden mostly is a kind of courtyard that called '*tanean lanjhang'*. It is an open space that is surrounded by buildings and formed an axis from the entrance to the center of the courtyard. The buildings surrounding the courtyard are housing that represents three or more householders. The Madurese traditional home garden is consisting of the eldest house, the daughter houses ordered from west to east, kitchen, and cowshed respectively in front of the house, and a house on stilts that named '*kobbhung*' as a centre. Most traditional houses are built facing to the south. However, the current generation also built the house facing to the north. It caused some old element has been moved behind the house building.

5.3.2.1 Madurese Traditional Knowledge

Based on the result of coding process and themes construction, the themes visualization has been created using project map features to explore the connection between codes and cases. There are four categories of ecological knowledge which found from analysis, they are: perspective towards nature from elders, site management-related knowledge, animal husbandry

and plants-related knowledge, and water management-related knowledge. The detail about each knowledge is described as follows.

a. Perspective towards nature from elders

Generally, traditional Madurese adhere to concept *"bappa-babbhu-guru-rato"*. It a concept which encourages Madurese to give their respect and obedience towards their parents, their teachers, and their leader. Therefore, suggestion and obligation from parents, especially, should be followed and maintained along generation. This concepts then detailed into elder's message that hold by current generation such as inherited land should not be traded but should be preserved as family legacy. Therefore, the layout of home garden also could not be changed. The conceptual map of Madurese perspective towards nature is shown in the figure 34.

Inherited land was related to the ancestral spirit. Madurese assumed that their forefather always settled in their living space, especially home garden. Therefore, selling the inherited land considered as selling their elders. Moreover, loyalty towards family is strong and considered as their pride. It because family is the most helpful member to facing landscape problem and developing agriculture.

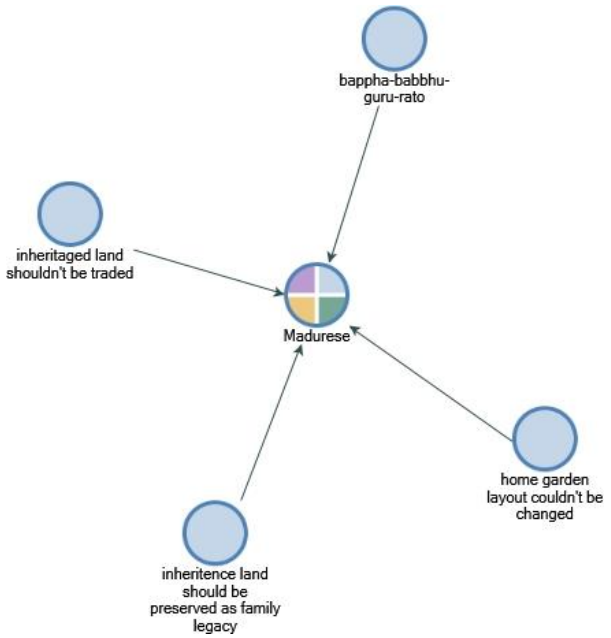


Figure 35. Conceptual map of Madurese perspective towards nature

"Since the tanean has been inherited to generation, the layout of tanean still maintened as its origin." (Householder, M01A)

"Inherited land should not be sold because it is for a living…" (householder, M03B)

"tanean spatial layout cannot be changed." (Householder, M05B)

b. Site management-related knowledge

The site management-related knowledge in traditional Madurese consists of rules about ground management and traditional house. Regarding the ground's rule, Madurese elders has been left a message for their generation to build housing on flat area. The backyard of home garden should be planted by medicinal plants and left the ground of the front yard open and clean (should not be planted). Moreover, building a living house should facing to the south because it believed will give them luck and happiness. Therefore, the layout of home garden should not be changed. The original layout of home garden consists of *kobbhung* at the west end of home garden, located in the middle of yard, in front of the parent's house. The house of daughters is built at east side the parent's house depend on the number of daughters. In front of each house living there are kitchen and cowshed that built side by side under the same roof.

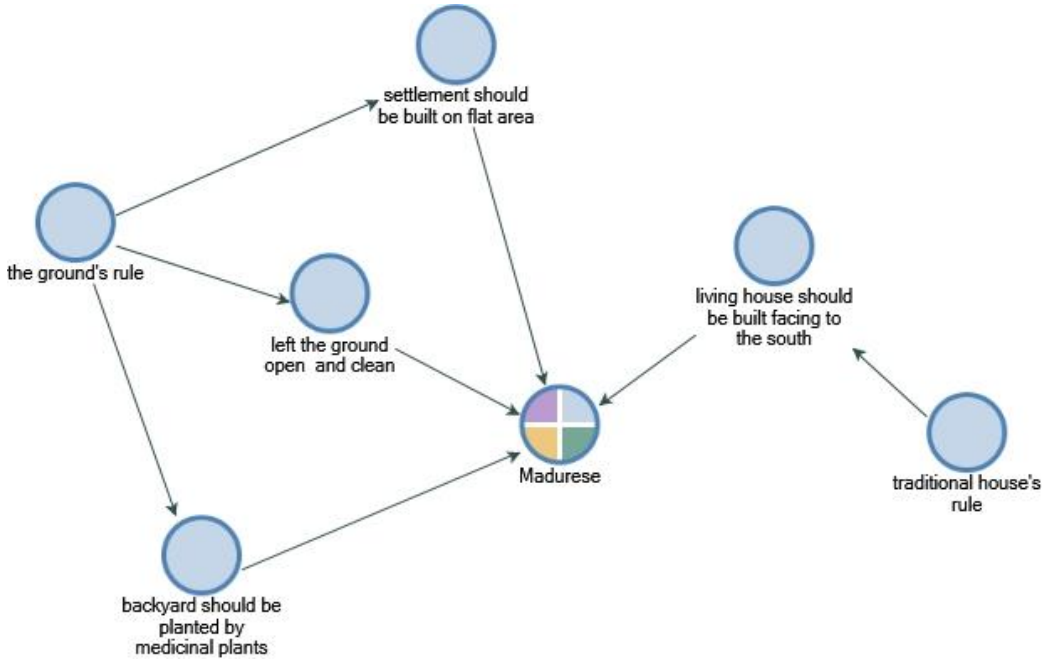


Figure 36. Conceptual map of Madurese Site management-related knowledge

The yard left as open space between buildings, while surrounding home garden screened by trees and bamboo plants as border and hedgerows. The conceptual map of Madurese's site management-related knowledge is shown in the Figure 35.

"Tanean (yard) must be clean of grass / weeds or growing and not plant in the middle of the tanean (yard)." (householder, M02A)

"Yard must be empty. Currently starting to be planted, but originally empty. In front of the house, there is a "panggungan" - a place to tie up cows that need to be bathed. In the past, every house had a "panggungan" for tying cows..." (headman, M01)

"…the elders lefta word that behind and beside the house planted by medicinal plants, like kunyit (curcuma longa), temulawak (Curcuma zanthorrhiza), and others…" (householder, M04A)

c. Animal husbandry and garden plants-related knowledge

Dry climate and bare land encouraged Madurese to fulfill their daily needs independently by growing plants and livestock in their home garden. The consideration of planting and raising livestock is based on economic purpose of the households. Cow and buffalo is the most common livestock raised by Madurese people. They raised cow and buffalo as family saving and as field labor as well. The cowshed is one of element in Madurese home garden, indicates the valuable role of livestock for Madurese life.

"yes, cows are raised for farm labor and savings for school fees.." (household, M01C)

"the cowshed was built in front of the house to monitor the cow condition anytime" (headman, M01)

" we raised a livestock for farm labor and sell it later.." (householder, M06B)

Furthermore, this study found that *Jaran* tree *(Lannea coromandelica)* has important role in Madurese traditional home garden. It is used to tie a cow or buffalo when it needs to be

washed, as border plants, and give a shade in the yard. The medicinal, kitchen, and fruit plants should be planted in the backyard or vacant area between the house building.

"In the past, every house had a platform for tying cows that made from Jaran tree (Lannea coromandelica)." *(headman, M01)*

"Jaran tree is used to bamboo fence reinforcement and as a border for home garden area." (householder, M04A)

d. Water management-related knowledge

Water is a scarce element since Madura Island dominated by limestone soil and dry climate. Therefore, Madurese digging a water well to fulfill daily need. A water well could be built in the home garden or their farmland and used by all household in the home garden and sometimes used by another home garden as well, depend on water availability. To save water usage, home garden resident use shared bathroom that located in the backyard of home garden. Moreover, wastewater from the bathroom is soaked into the ground directly to increase water infiltration. Watering plants in the home garden use water stream surrounding instead of fresh

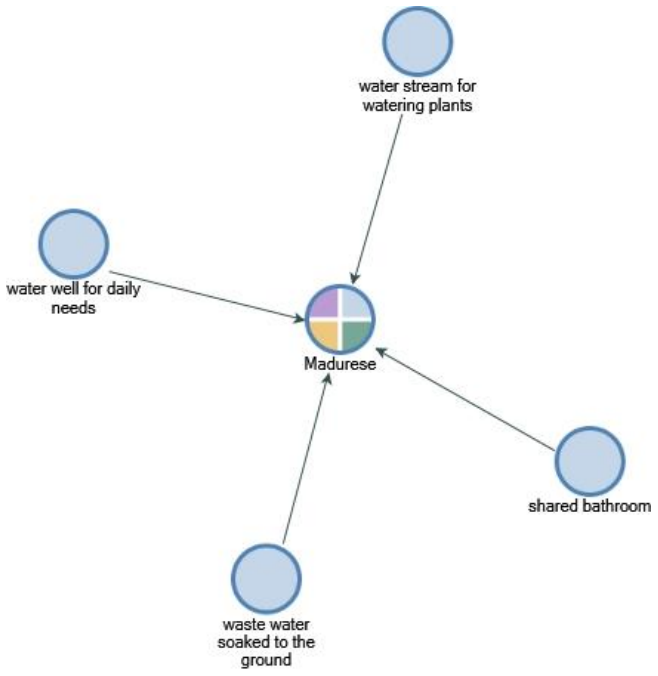


Figure 37. Conceptual map of Madurese Water management-related knowledge

water from the well. The conceptual map of madurese water management-related knowledge is shown in Figure 36.

"the water source is come from wells that located outside the home garden (shared with other household member). Originally, Water is moved by water container (pekolan aing) to fill the bathtub in the bathroom, but currently, water has been flowed through a pump to the reservoir and bathroom." (householder, M01D)

"the bathroom is used together by all home garden residents…" (householder, M04B)

Based on those point of view it could be assumed that Madurese traditional home garden has simple rules and knowledge in managing their natural surroundings. They also view nature at site scale and acknowledged home garden site as a part of elder's heritage and pride. Therefore, the traditional ecological knowledge of Madurese is a kind of elder's messages that transmitted through oral tradition into generation. To sum up, we generate a list of Madurese traditional ecological knowledge as shown in the table 16.

Table 16. List of Madurese traditional ecological knowledge

TEK	Meaning
Buppa'-babbhu'-guru-rato	giving respect and obedience towards parents, teachers, and leader
Inherited land should be preserved	
Home garden layout could not be changed, Yard should be clean	
House should be built facing to the south for luck	
Digging the well to obtain water for daily life	

5.3.2.2 Spatial Characteristics of Madurese Home Garden

The spatial characteristics of Madurese traditional home garden was identified from observations to geotagged photos result combined by spatial observation towards google earth view. Furthermore, the home garden layout has been re-drawn using Sketch up web. The colour symbol also used to differentiate functional elements into some categories such as residential

building (RB), Yard (YA), Vegetation (VG), Functional Building (FB), Pavement (PV), and Water Well (WW).

a. Home Garden Layout

The observation towards home garden layout in all Madurese site cases shows the variety in the number of element and layout. However, it still represents concept of *tanean lanjhang* that emphasize in the extended yard corresponding to house building in the home garden. The Madurese home garden layout could be divided into two types of layouts. The first type is the original layout of *taneyan lanjhang* (Figure 37). The original layout of Madurese traditional home garden is found in site code M01A, M01B, M01C, M01E, and M05A that indicates by functional building located in front of house buildings which located on the north side of home garden. Moreover, *kobbhung*, as one of the functional buildings that has a role as home garden remarks, located in the middle of yard facing to the east as an entrance.

Furthermore, the second type is the current layout which has been adapted to land limitation and the increasing of family member. It was found in site case M01D, M02,

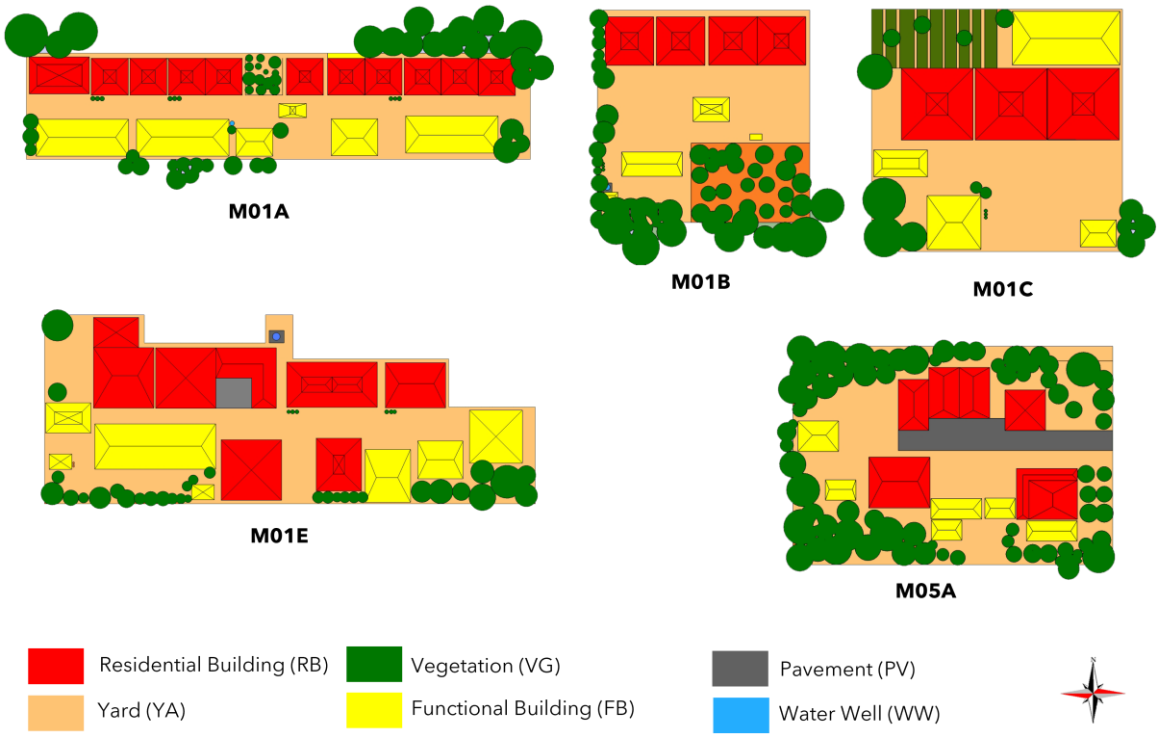


Figure 38. Original layout of Madurese traditional home garden shown by site cases

M03,M04, M05B, and M06. The current layout shows the influence of modernisation that indicates by pavement that covering yard and the orientation of house building that facing to north and south. Moreover, the location of functional building is vary depending on the land availability. Figure 38 shows the current layout of Madurese traditional home garden.

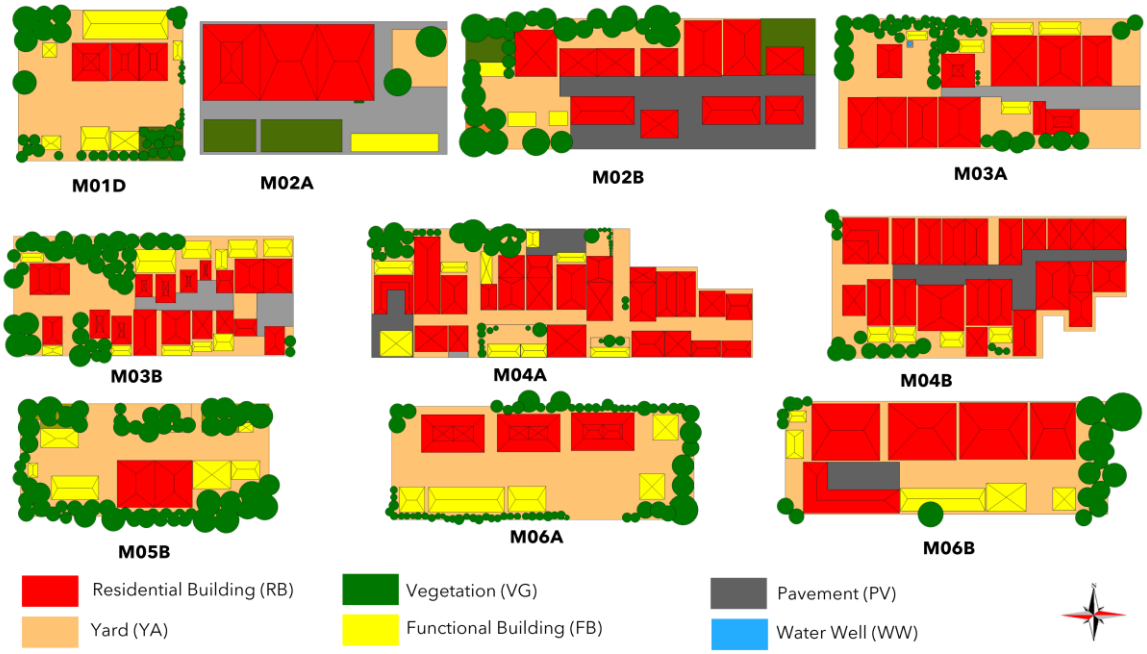


Figure 39. Current layout of Madurese traditional home garden shown by site cases

The measurement towards elevation and slope (Table 17) shows that All site cases located on low topography less than 120 m above sea level. The site selection for home garden based on their farm location. Housing area including home garden located close to the dry farmland. It causes the ecological characteristic of home garden might be similar to the farmland surrounding. All site cases located on flat slope less than 5%. It categorized as flat area based on USDA classification. Although some site cases located on higher topography, the home garden area still flat. It because the Madurese elders believe that housing including home garden should be built on flat area to facilitate any activities. Most of site cases located on warm slope either upper or lower. While site case in the middle area of island categorized as lower flat slope.

Table 17. The elevation and slope data between culture leader's house and commoner's house

Site code	Elevation (m)	Slope (%)	landform	Site code	Elevation (m)	Slope (%)	landform
M01A	110	3.0	Upper slope	M03B	7	0.9	Lower slope
M01 B	102	3.3	Lower slope	M04A	9	0.4	Lower slope
M01C	102	3.1	Lower slope	M04B	9	1	Lower slope
M01D	97	2.9	Lower slope	M05A	85	4.4	Upper slope
M01E	103	1.9	Lower slope	M05B	90	4.7	Upper slope
M02A	0	0	Lower slope-flat	M06A	85	4.4	Upper slope
M02B	0	0	Upper slope	M06B	91	3.2	Upper slope
M03A	7	0.9	Lower slope				

b. Home Garden Elements

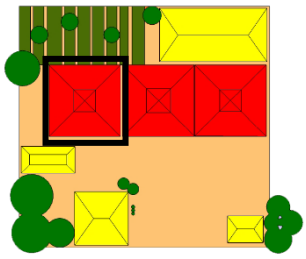
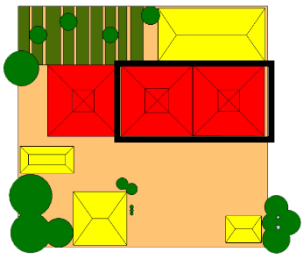
Based on the layout of Sundanese traditional home garden and interview towards householders, the elements of traditional home garden have been formulated as follows.

- Residential Building

Madurese residential building is called *"roma"*. It is a traditional house that consists of terrace and bedroom. The first house in the home garden is named *roma tongghu* which interpreted as parent's house. Then, the following house after it is house that was built for daughter that has been married. Therefore, a home garden space in Madurese settlement could be consists of three or more householders. The details of residential building characteristics is shown in the table 15.

Table 18. The characteristic of Madurese residential building

Component	Parent's house	Daughter's house
Local name	*Roma tongghu*	*roma*

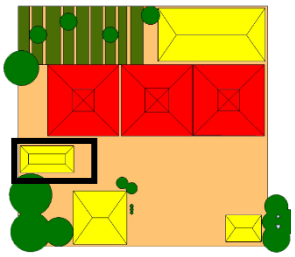
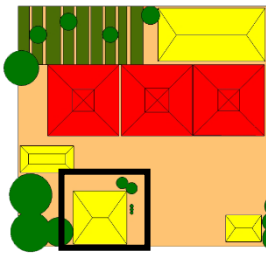
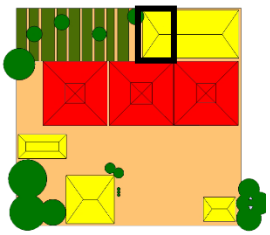
ilustration		
Size	8 x 8 m2	8 x 6 m2, 12 x 8 m2
Layout in home garden		
Orientation	Located in the north side of yard, facing to the south	Located in the north/south side of yard, facing to the south/north, originally built from west to east
Material	Brick, cement plaster, bamboo matting, wood, ceramic tile, roof tile, bamboo	
Land base	Ground elevation up to 40 cm above the ground	
architecture	The doors decorated with Madurese carvings combination of green, red, and flower shape) The roof decorated by 2 chicken combs carving	more look like modern house. The roof shape is vary depend on householder's needs

- Functional Building

The elements that categorized as functional building in Madurese home garden are prayer shed (*kobbhung/langar*), washroom (pakeben), kitchen (*dapor*) and cowshed (*kandang*). The existence of prayer shed indicates the independence and being landmark of a home garden since it was built in front of the first house, on the center of yard. While the kitchen and cowshed are built in front of each house. It was built under the same roof and only separated by a sheet

of bamboo woven. The details of functional building in Madurese traditional home garden is shown in the Table 19.

Table 19. The characteristic of Madurese functional building

Component	**Prayer shed**	**Kitchen and Cowshed**	**Washroom**
Local name	*Kobbhung/langghar*	*Dapor-kandang*	*pakeben*
ilustration			
Size	5 x 3 m2	10 x 7 m2	1.5 x 3 m2
Layout in home garden			
Orientation	Located on the middle or end of west side of yard - Terrace and a room open to the east for multi-use	Located on the south yard facing to the house or backyard - Cowshed-kitchen side by side in one building	Located backyard or near the water well or edge of yard-Bathroom and toilet in different room
Material	Bamboo matting, wood, board, roof tile, bamboo		Brick, cement plaster, zinc board, wood
Land base	Stone plinths 50 cm height above the ground	Ground elevation 10 to 20 cm	Ground elevation 30 cm
architecture	Raised on plinths, open room to the east and closed to 3 other side	low ceiling building coverage by bamboo matting	Square building with 2 rooms : bathroom and toilet, low ceiling

- Yard

The yard in Madurese home garden is an open space surrounded by buildings. It called as ‘tanean’ and used for circulation, social gathering and sun-dried the crops. Originally, the ground yard is uncovered. However, it has been paved now days to accommodate social gathering needs. Its pattern formed an axis from the entrance to the small mosque on the west end/center of yard. Therefore, the entrance of yard usually from the east. All of cases show that yard mostly flat and clean from any vegetation, even a grass. It is a part of elder’s message to keep the yard clean from anything to make easier for all activities. The width of yard is varied depend on the number of building area. It is narrower when the number of residential building increased. Figure 39 shows the illustration of yard in Madurese traditional home garden.

- Vegetation

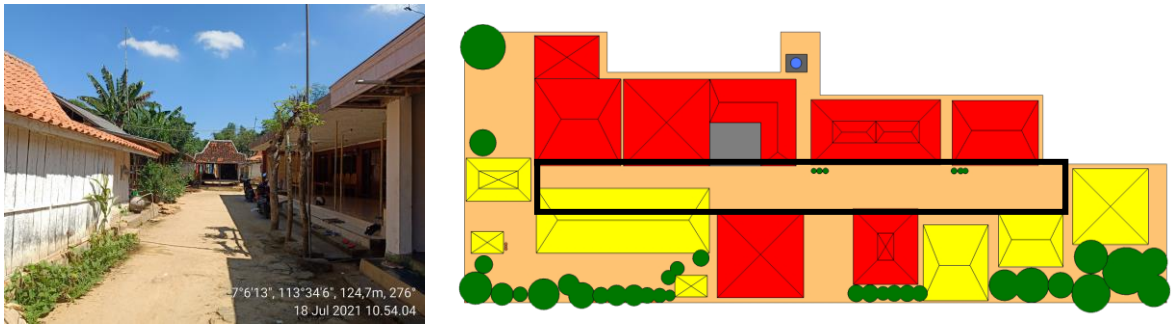


Figure 40. Illustration and layout of yard in the Madurese home garden

The vegetation in the Madurese home garden generally used for consumption, cattle feed, medicinal, and sale. It is kind of fruit tree, spice & herbs, and forage grass that planted along the edge and the backyard or vacant area around or between the buildings. One of important species that always found in the sitecases is *Lannea coromandelica*. It used as hedgerows and ‘panggungan’-place for tying the cattle. The ‘*panggungan*’ arranged from 3 *lannea coromandelica* trees planted in line and connected by bamboo slats. Now days, the younger generation starting to plant trees in front of buildings, but still in the edge of yard for shading. Some species mostly found in the Madurese home garden such as *Mangifera indica*, *Annona*

squamosa, *Musa sp.*, *carica papaya*, etc. The plant selection preferences is based on its function rather than aesthetics

- Water Well

Water well is the main water source for all inhabitants in the home garden. It located on the edge of home garden either north or south. One water well could be used by some home garden surrounding. Sometimes, water well not built in the home garden, but in the farm instead. It pumped and flowed by pipe to the bathroom. The tub in the bathroom built permanently in large size and used for water storage as well. Since madura landscape categorized as dry land, fresh water from well used for consumption and bath. Figure 40 shows the illustration of water well in the Madurese home garden

5.3.2.3 The Space Use of Madurese Home Garden

Figure 41. Illustration and layout of water well in the Madurese home garden

The space use of Madurese traditional home garden was identified through interview and on-site observation. The qualitative data was coded based on time of activity and displayed in table 19. To better understand the type and spatial layout of the activity in the home garden, the household's activity map has been created as shown in Figure 41.

Table 20. Type of Madurese home garden space use by time

Type of Activity	Time				Location
	Morning to afternoon	Evening to night	incidental	anytime	
Drying crops	■			■	Yard
Family meeting		■		■	Langghar/kobbhung
Social gathering		■	■		Yard and terrace
Ritual celebration		■	■		yard
Bathing the cow	■			■	Yard
Drying crackers	■				Yard
Drying clothes	■				Yard
Feeding cow	■				Garden behind the house
Gardening	■			■	Behind the house

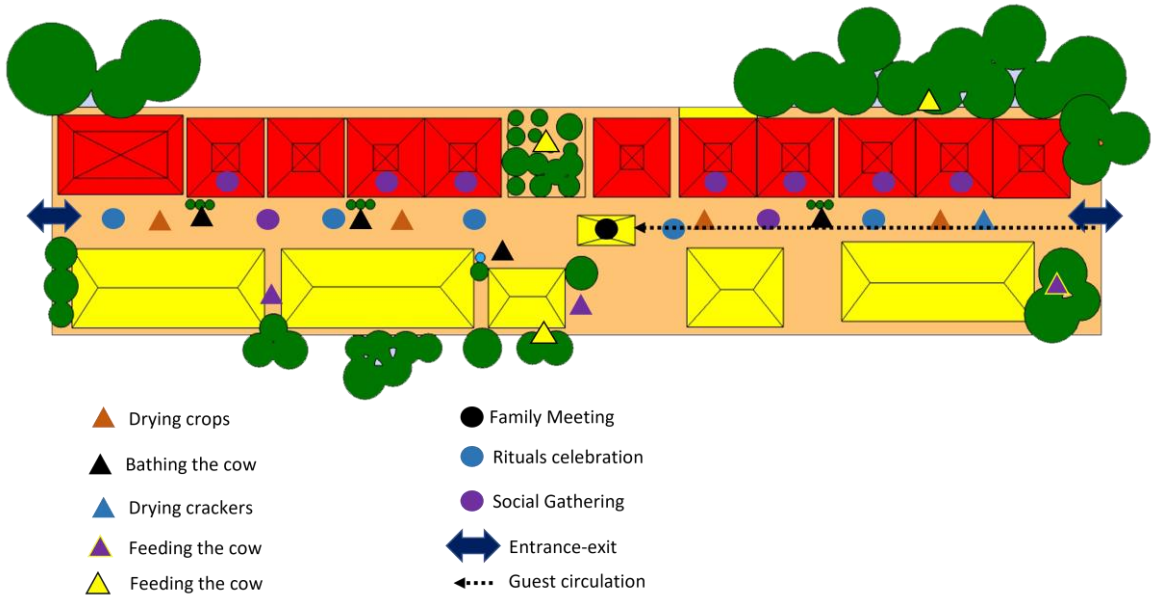


Figure 42. Activity map in the Madurese home garden based on subject observation

Based on Table 20, work activity was done in the morning to afternoon, while social activity was done from evening to night as adaption of hot weather on site. On the other hand, yard has been used as multi-purposed space since it accommodates either personal activity or

social activities. Moreover, although each householder carries out their activities independently, the utilization of home garden space was shared each other depending on member needs.

5.3.2.4 Ecological wisdom embodied in Madurese Traditional Home Garden

As stated above, ecological is acknowledged as capability to integrate ecological knowledge, site characteristics, and practical experience to produce good property design or prudent judgement in response to local context (Forester, 2019c; Manningtyas & Furuya, 2022). Madurese traditional home garden contained by some ecological wisdom in dealing with climatic condition, water scarcity and dry land, as follows.

- Ecological wisdom in dealing with climatic condition

  All madurese traditional home garden in this study located in lowland area with average air temperature around 27°C to 33°C and humidity around 70-90%. Therefore, the layout of Madurese traditional home garden indicates in response to environmental condition. Madurese separates their house living from kitchen and bathroom to reduce heat and humidity. Moreover, the configuration of home garden elements, that facing to the south-north with yard in between and entrance on the west-east side, allows the wind flow and accelerate the wind speed to increase thermal comfort.

  Furthermore, analysis towards home garden elements also shows that house building, and home garden layout was sensitive to orientation. Madurese traditional house, generally facing to the south while the other functional building is facing to the north (Fitria et al., 2008; Maningtyas & Gunawan, 2017b). North and south direction allowing house building to get enough sunlight, improving air quality, and reducing humidity (El Shabir et al, 2014). Moreover, open space and hedgerows surrounding the home garden allows air movement and provide shading around home garden (Maningtyas & Gunawan, 2017b; Setiani et al., 2022b).

- Ecological wisdom in dealing with dry land and water scarcity

Madura island is categorized as dry land since it has low precipitation (200 mm in a year on average) and limited surface water. Therefore, Madurese digs a water well in their home garden or farm field. It can be used by home garden member and neighbours as well depending on agreement.

Furthermore, to dealing with food scarcity due to the dry and barren soil, madurese utilized their home garden to plant any kind of fruit trees as a hedgerow. It helps to provide shading and food for consumption or for sale (Maningtyas & Gunawan, 2017b; Setiani et al., 2022b; Sudikno & Surjono, 2008).

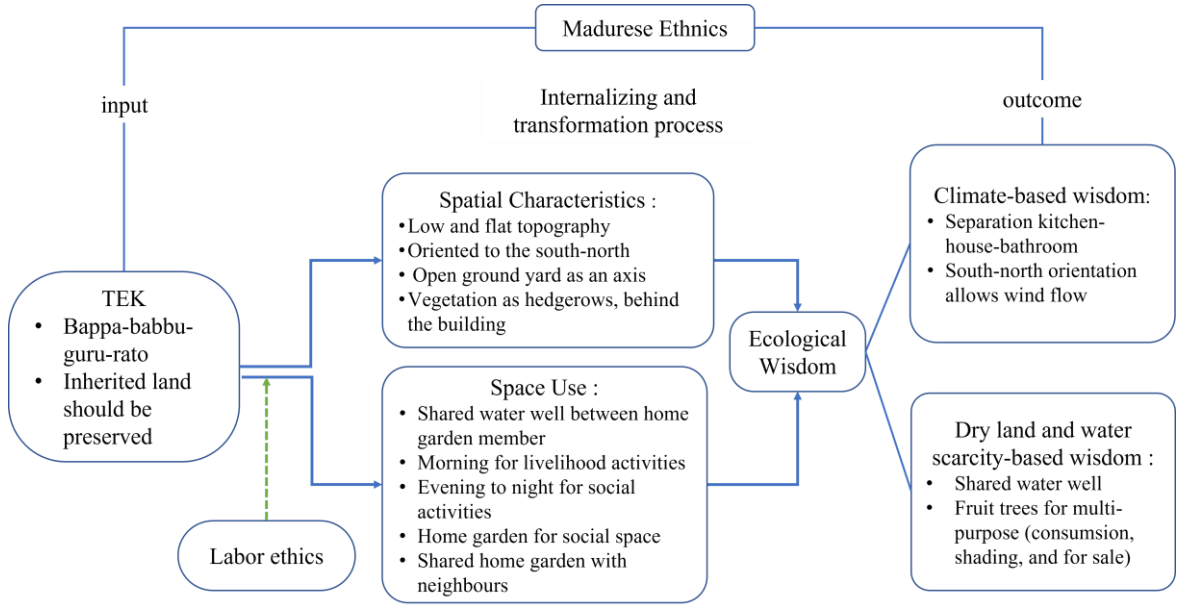


Figure 43. Ecological Wisdom of Madurese Traditional Home Garden

To summarize, this study reveals that Madurese traditional home garden design and layout is a response towards environmental conditions. Although traditional ecological knowledge and Madurese perspective towards nature stands at site level, they managed their home garden more practical and use the home garden space for multi-purpose. For better understanding towards ecological wisdom of Madurese traditional home garden, a conceptual framework has been created as shown in the Figure 43. Moreover, the details of ecological wisdom in Madurese traditional home garden are showed in Table 21.

Table 21. The list of Ecological wisdom in Madurese traditional home garden

Aspect	Form of Ecological Wisdom
Climate-based response	Separating kitchen dan bathroom from main house building to reduce heat and humidity
	Large terrace and window allowing air movement
	South-north orientation increasing the air quality
	Trees and hedgerows surrounding provide a shading
Dry land and water scarcity response	Shared water well for home garden inhabitants/family member
	Shared home garden between family member
	Planting fruit trees for multi-purposed use (consumption/economy)
	Separating bathroom and toilet and use bathroom as water storage

5.4 Discussion

5.4.1 Comparison of Sundanese and Madurese Ecological Wisdom in Traditional Home Garden

Sundanese traditional villages in this study represents the characteristic of mountain settlement ecotype which divide settlement based on elevation (Dahlan, 2012; Darmayanti, 2016). They purposely built their settlement on mountainous topography as implementation of their belief system and has been established for hundred years (Citra Pratiwi, 2016; Kustianingrum et al., 2013; Nurjanah, 2006). Moreover, landscape characteristics of West Java provide abundant natural resources and high in biodiversity. Therefore, traditional Sundanese that live in the mountains interact with nature intensively by utilized natural resources surrounding, such as water spring and wood from the forest. The high intensity of interaction with nature increasing reverence and holistic thinking of Sundanese to natural environmental surroundings and generating ecological wisdom especially in meso-scale landscape. Sundanese traditional home garden, that called as *buruan*, is a part of the settlement which always keep

clean, safe, and comfortable for living with minimum cost and energy (Farid, 2021; Park et al., 2019; Yolanda Agustine & Andi Gunawan, 2016).

On the other hand, Madurese traditional villages is consisted by some traditional home garden that called taneyan lanjhang (Maningtyas & Gunawan, 2017b; Setiani et al., 2022b; Sudikno & Surjono, 2008). It represents dry-farm settlement ecotype that divide group of housing with farmland and causes settlement look scattered (Maningtyas & Gunawan, 2017b; Rochana, 2012; Sudikno & Surjono, 2008). Moreover, landscape characteristic of madura island is a type of site with environmental limitation especially due to dry tropical climate and barren soil (Fitria et al., 2008; Rochana, 2012; Sudikno & Surjono, 2008). Therefore, Madurese depending their life on their work (labour ethic) rather than land productivity (land ethic). It influences Madurese perspective towards nature which is at the site level. The interaction between Madurese and their natural surrounding is limited to fulfil daily needs which then generating ecological wisdom that more practical but dynamic according to the changing of daily life. It could be seen from the dynamic of Madurese home garden layout as one of result of this study.

However, both Sundanese and Madurese traditional home garden has similar decision in managing their home garden, especially about open ground yard and designing the hedgerows. Both study area developing shared home garden and left home garden borderless to enhance social relationship with the other inhabitants (Almaviva, 2006; Farid, 2021; Maningtyas & Gunawan, 2017b; Setiani et al., 2022b; Sudikno & Surjono, 2008; Wessing, 2008). Moreover, yard as main element of home garden is used intensively as multi-purposed space. To sum up, table 22 shows the comparison between Sundanese and Madurese Traditional Home Garden as follows.

Table 22. The comparison of Sundanese and Madurese Traditional Home Garden

Component	STHG	MTHG
Landscape Characteristic	Unique landscape feature; Mountainous with high biodiversity and natural resources	Environmental limitation; dry tropical climate and barren soil
Dependence on nature	Intensive interaction with nature	Independence, labor ethic rather than land ethic
knowledge and wisdom characteristic	High awareness and reverence towards nature – tend to philosophical Holistic thinking and action	Practical rather than philosophical
Scale	Ecological wisdom in meso-scale landscape (landscape-based)	Ecological wisdom in micro scale landscape (site-based)
Space use management	Yard serves as open space for multi-purposed use	
	Developing hedgerows and shared home garden	

5.4.2 Strategic to Green Open Space Planning

Home garden is a kind of micro-scale green open space that available around the living space. It could strongly represent the interaction between human and their living environment. This study attempted to provide scientific references on ecological wisdom in micro-scale green open space and promoting ecological wisdom approach for green open space planning, especially in Indonesia.

The spatial characteristics of Sundanese and Madurese traditional home garden shows that both of ethnicities develop their home garden as multi-purposed space and planting edible plants as a hedgerow. Open space always left unplanted due to high intensity of use. Therefore, plants are planted surrounding and functioned as boundary. It also serves as wind breaker and wind control to enhance thermal comfort on site.

Understanding towards ecological wisdom might help green open space planner to enhance landscape harmony between social and ecological character of site. Moreover, designing green open space in Indonesia need to provide open space for multi-purposed uses and developing edible garden as site boundary. Furthermore, awareness towards wind direction also might increase thermal comfort in green open space.

5.5 Conclusion

This study aims to explore ecological wisdom applied in traditional home garden of Sundanese and Madurese, which lived in different landscape and cultural characteristics. Traditional Sundanese mostly lived in mountainous and hilly landscape with strong belief system influenced by nature, while Madurese lived in lowland and flat landscape with strong social and norm system. Therefore, Sundanese traditional home garden could be categorized as a kind of mountainous settlement ecotype, while Madurese traditional home garden could be categorized as dry farmland settlement ecotype.

The ecological wisdom of traditional home garden was identified from the ecological knowledge of the households; spatial characteristics and layout of home gardens; and how the space of home garden being used by inhabitants. This study found that Sundanese traditional ecological knowledge is more diverse and philosophical than Madurese, yet more simple elements and layout in spatial characteristic. Both ethnicities also use home garden as multi-purpose space especially for social activities.

We attempted to compare the ecological wisdom of both ethnicities and found that intensity of interaction with nature and unique landscape feature could encourage ecological wisdom especially for taking holistic thinking and action based on land ethic. However, environmental limitation could encourage ecological practical wisdom.

In this study, ecological wisdom in green open space already studied in micro-scale landscape (home garden) based on qualitative approaches. For the future, quantitative approach and mix-method is potentially applicable to gain more useful and interesting findings.

Chapter 6. Conclusion

6.1 Summary and General Discussion

Through three studies, this work explored theory and practice of ecological wisdom in its relation to green open space and cultural landscape, especially towards traditional home garden of Sundanese and Madurese ethnicities in Indonesia. The summary of the most important findings is presented as follows.

The first and second study represents the exploration towards ecological wisdom theory from literature survey and reviews. The first study applied co-word analysis towards more than 200 published papers and identify word relation. It found that GOS and EW are never linked to each other which indicates that the development of GOS has not considered the ecological wisdom approach yet. Furthermore, we conducted the second study as systematic review to deeper understanding towards ecological wisdom concept and research practice. We found that both TEK and EW convergence in some research topic that made both indistinct in the literature. However, both also distinct at the same time related to definition, agent, source, and research scope. Therefore, exploring ecological wisdom of green open space design will be involving exploration in traditional ecological knowledge as well. It is in line with conceptual framework of knowledge to wisdom transformation that proposed by (B. Yang & Young, 2019).

The third study is representing the exploration of ecological wisdom practice on micro level green open space in cultural landscape heritage, especially traditional villages. It was a continuing study from the second research and attempted to identify and analyse the ecological wisdom of traditional community with different landscape characteristics. Traditional Sundanese mostly lived in mountainous and hilly landscape with strong belief system influenced by nature, while Madurese lived in lowland and flat landscape with strong social and norm system. Therefore, Sundanese traditional home garden could be categorized as a kind

of mountainous settlement ecotype, while Madurese traditional home garden could be categorized as dry farmland settlement ecotype. We tried to investigate the traditional ecological knowledge and tacit knowledge by tracing it from interview and observation towards spatial characteristic and home garden space use and defining the ecological wisdom on site. Interestingly, this study found that the home garden layout of both study site shows the response to climatic condition in different ways depending on the site character.

The Sundanese traditional home garden contained by diverse philosophical traditional ecological knowledge which transmitted orally by culture leader. It generated from long-term interactions towards nature and emphasized on message to live with nature and view human as a part of landscape system. Spatial characteristic of home garden represents the implementation of its philosophical value and their belief system. It then, generates the ecological wisdom in response to topographic and climatic conditions which consist of ethic and holistic action approach (B. Yang & Young, 2019).

On the other hand, Madurese traditional home garden consist of simple rules which generated from a philosophy to give respect towards parents/elders. It influenced Madurese traditional ecological knowledge to preserved parent's heritage without changed it. Spatial characteristics of Madurese home garden represents the implementation of its norm value and then, generates the ecological wisdom as a response to climate, soil, and hydrological conditions which more practical rather than philosophical (B. Yang & Young, 2019).

According to the first study's finding, study on ecological wisdom still hard to find although many cultural studies has been published. The third study shows that Indonesian cultural heritage might conceal any kind of ecological wisdom which could inspire the contemporary landscape planning and design. It is an intellectual property that need to reveal, documented, theorized, then communicated as a new shared knowledge (A. Min & Lee, 2019,

B. Yang & Young, 2019). Furthermore, according to second study, the third study also approved the influence of traditional ecological knowledge towards ecological wisdom. Knowledge and perspective towards nature influence people in managing their environment. It shows high interaction and dependence towards nature has encouraged the reverence and holistic thinking/action in managing living environment, while environmental limitation might encourage the practicality.

This study contributes to investigate the linkage of green open space and ecological wisdom then clarify the distinction between traditional ecological knowledge and ecological wisdom in research. It also fills the gap of green open space studies in ecological wisdom perspectives, especially in micro-scale landscape. In conclusion, green open space development needs ecological wisdom approach to enhance landscape harmony and sustainability of site. Therefore, research on ecological wisdom related to green open space needs to further explore, especially in Indonesia.

6.2 Limitation

This study explored theory in ecological wisdom especially in cultural landscapes related to green open space. However, since study on ecological wisdom mostly discussed about traditional settlement or landscape planning inspired by indigenous practices towards nature, study on ecological wisdom in green open space planning and design still need further explored, especially in various level of analysis.

In this study, ecological wisdom in green open space already studied in micro-scale landscape, that is home garden. All of research in these studies was conducted based on qualitative approaches. Moreover, empirical studies only done towards two traditional ethnicities in Indonesia. It will be interesting to investigate the other types of green open space from the other ethnicities, even different country.

6.3 Further works

This dissertation has been explored the theory and practice of ecological wisdom in two ethnicities in Indonesia and found out study on ecological wisdom in Indonesia still need to be further explored. For the future, analysis towards ecological wisdom in public park and another heritage garden still need to be explored. All of research in these studies was conducted based on qualitative approaches. For the future, quantitative approach and mix-method is potentially applicable to gain more useful and interesting findings. It also needed to increase clarity and objectivity.

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APPENDIX

Appendix 1. The summary of culture leader/headman transcription (in Indonesian)

Site Code	Question/Answers
Question 1: How does the Sundanese/Madurese people view towards nature? And what kind of elder's message about nature and living environment?	
S01	Masyarakat adat sunda beranggapan bahwa kita harus hidup dengan alam, bukan hidup di alam. Dengan kata lain apabila kita merusak alam sama dengan kita merusak diri kita sendiri dan masyarakat. Seperti pepatah sunda mengatakan *leuweung ruksak, cai beak, ra'yat balangsak* (hutan dirusak, airnya habis, dan masyarakatnya sengsara). Dalam membangun pemukiman orang sunda disebut warugan lemah adalah filosofi orang sunda untuk menata alam menurut kosmologi salah satunya adalah baheng aler: (tumpahan) memanjang ke utara, rumah dibangun dari timur ke barat menghadap lapangan/ alun-alun Dan memang, tanah bertingkat dipilih untuk pemukiman karena perlu membedakan tempat tinggal berdasarkan struktur social, yaitu ketua adat tinggal di tempat paling tinggi dekat dengan hutan keramat.
S02	Masyarakat Sunda memiliki filosofi, bahwa antara manusia dan alam merupakan satu kesatuan, manusia merupakan bagian dari sub sistem alam "*seke seler*" sehingga memiliki rasa yang sama dan ikatan lahir dan batin yang sangat kuat. Gunung sebagai sumber utama kehidupan, gunung juga diyakini sebagai salah satu tempat yang menyediakan unsur-unsur sistem tubuh bagi manusia berupa "*saripati*" yang ditransformasikan melalui "air". Sehingga kita perlu menjaga gunung dan hutannya agar air tetap tersedia.
S03	Ada pepatah adat yang *panjang tidak bisa dipotong, yang pendek tidak bisa disambung*, artinya kita tidak boleh mengubah makhluk ciptaan Tuhan Pemeo lainnya adalah *Ngaraksa Sasaka Pusaka Buana* sumber air tidak tercemar, udara tetap bersih, semua hidup benda memiliki ruang hidup sendiri sesuai dengan waktu dan tempat.

	Semua pesan sesepuh tersebut ditaati oleh satu aturan yang disebut *pamali*, dengan pengaturan seperti ini, masyarakat tidak banyak mengeksploitasi hutan, tetapi dituntut untuk membiasakan diri bercocok tanam di lingkungan sekitar tempat tinggalnya, bahkan harus terus menerus. melestarikan hutan sebagai bagian dari wasiat leluhur (Gunung Tilu masih lestari dengan pohon-pohon kayu, tanah miring untuk menanam bambu, tanah datar dibuat untuk rumah, tanah cekungan dibuat untuk kolam, tanah lembah dibuat sengkedan untuk sawah, dan memelihara saluran air). Cara menebang pohon pisang di Gunung Tilu (hutan adat) masih menyisakan pucuk agar hutan tetap lebat Daerah Cikondang di bawah kaki Gunung Tilu Di bagian paling bawah ada areal pertanian bawang merah Mencegah longsor Hutan adat tidak boleh terganggu. Pada bangunan rumah di tengah (bidang datar) menghadap ke utara (*sabilulungan*) di bawah ada parit, sengkedan dan sawah, di atas ada hutan. Menggarap sawah dengan kerbau. Kerbau dipelihara di sawah...ada orang yang merawat kerbau secara khusus.Kandangnya di belakang rumah agak jauh supaya tidak bau.Tradisi tidak akan hilang karena diwariskan ke generasi berikutnya.
S04	Gunung tidak bisa dilebur, lembah (dataran) tidak bisa dihancurkan Sasaka (tempat keramat) tidak boleh diubah Arah utara-selatan rumah dan bentuk rumah tidak boleh diubah
S05	kehidupan di bumi terdiri dari tiga unsur, yaitu makhluk cicing' (makhluk tidak bergerak), 'mahluk nyaring (kebangkitan), dan 'mahluk eling' (sadar).'mahluk cicing' adalah tumbuhan, sebagai makhluk yang tidak dapat bergerak. 'Makhluk keras' adalah hewan, sebagai makhluk yang bangun dan bergerak bebas dan berkeliaran, sedangkan 'makhluk eling' adalah manusia, sebagai makhluk yang memiliki kesadaran berdasarkan pikiran dan hati nurani.
S06	Di Kampung Naga banyak larangan dan tidak banyak aturan Larangan cukup dengan 1 kalimat pamali Di Kampung Naga ada hutan terlarang yang dijaga kelestarian 2 hutan lindung hutan yang menyuburkan mata air tidak boleh ditebang turun secara otomatis.Alam adalah Rahman

	Rahim dan tidak akan menimbulkan bencana kecuali karena keserakahan manusia. Hutan tidak boleh dirusak, harus dirawat dan dilestarikan.
M01	Pesan dari orang tua adalah pekarangan rumah ini tidak boleh dijual atau diubah, harus tetap seperti ini. orang tua berpesan jika ingin membuat rumah harus menghadap utara atau selatan, jika bentuknya sampai sekarang anak-anak muda tidak berani mengubah polanya, sebelum rumah-rumah di sini dibangun, didoakan terlebih dahulu.
M02	pesan leluhur adalah membangun rumah menghadap selatan/utara dan menjaga kebersihan lingkungan
M03	Generasi saat ini harus menghormati orang tua mereka dan mengikuti wasiat mereka. Tidak diperbolehkan mengubah tata letak elemen pada taman rumah apalagi menjualnya pada orang lain
M04	wasiat dari sesepuh, dibelakang rumah ditanam tanaman obat/jamu untuk jamu. Temulawak Kunyit. Di samping/belakang rumah. Lebar halaman belakang kurang lebih 5 meter. Di gang-gang antar rumah juga terkadang ditanami. Kebun rumah tidak boleh dijual kepada orang lain selain keluarga.
M05	Alam adalah tempat untuk melanjutkan hidup kita dan harus diwariskan kepada generasi kita. Sehingga harus dipelihara dan dilestarikan.
M06	Tanah warisan, kalau bisa jangan dijual agar bisa terus ditanami untuk anak cucu. Rumah harus menghadap ke selatan karena merupakan *"pancoran mas"* yang baik untuk anak cucu. Jika tidak ada tempat, bisa menghadap ke utara
Question 2 : Could you please, tell me about Sundanese/Madurese traditional home garden (description, importance, function, and/or philosophical value embodied in it)	
S01	Rumah dikampung adat biasanya Cuma ada buruan (halaman depan) Rumah menghadap ke alun2 atau ke timur. Atap/suhunannya pasti timur-barat. Filosofi lahir-meninggal/terbit-terbenam. Struktur sesuai Gerakan gempa.

	(di sebelah selatan menghadap utara) Rumah kepala adat-alun-alun-saung talu (barat rumah gede)- leuit (disebelah timur krn saat upacara yang memasukkan padi harus mengahdap ke timur krn percaya perjalanan manusia seperti matahari terbit dan terbenam. Saat memasukkan bahan pangan ke leuit diibaraatkan saat manuasia terbit (memulai kehidupan). Disebelah leuit ada pesanggrahan (di deretan sebelah timur) mengahadap ke alun2. Sedangkan dibagian barat merupakan batas wilayah yang dipagari dengan tanaman hanjuang merah. Hanjuang merah adalah lambing dunia atas sbg penanda bagi leluhurnyan supaya jika turun kedunia mjd penciri anak cucunya. Lbh spesifik lagi hanjuang siang (suji gede= penanda leluhur padjajaran) Di utara alun2 ada bale riungan. Kemudian di bawahnya ada rumah penduduk-kandang kerbau-sawah Makam leluhur di gunung. Air sumbernya dari mata air gunung dan sumur di bawah. Pagar hidup dari hanjuang. Baik di rumah maupun disawah. Halaman samping (glodok) untuk menjahit. Buruan ditanami tanaman obat. Pintu masuk di tengah ato pinggir..yang harus ada tepas (teras depan) Kamar ngkutin kontur. Bagian2 penting rumah sunda : buruan-tepas-r.tamu-r.keluarga-dapur Kamar mandi (tampian) di belakang airnya dari mata air. Pembuangan dibuang ke susukan lalu ke sungai. Susukan di belakang rumah
S02	Pada umumnya pola permukiman masyarakat di Kampung Urug mengelompok dengan titik pusat gedong gede (gedung besar), gedong luhur (gedung atas), dan gedong alit (gedung kecil). Rumah-rumah penduduk ini cukup variatif, ada yang berbentuk bangunan permanen dan bentuk semi permanen. Perumahan disini adalah rumah adat dengan persamaan bahan yang dipakai serta bentuk rumah yang mempunyai kolong serta lumbung padi yang bernama leuit. Bentuk rumah yang bercirikan pada tradisi kesundaan (julang ngapak dan jago anjing). Rumah adat di Kampung Urug memiliki karakter yang hampir sama dengan rumah adat Sunda pada umumnya. Rumah adatnya adalah

	rumah panggung berkolong yang terdiri dari tiga bagian ruangan, yaitu bagian depan, bagian tengah dan bagian belakang. Bagian depan digunakan menerima tamu yang datang. Bagian tengah digunakan sebagai tempat kmupul keluarga. Pada bagian tengah biasanya dibuat ruangan kamar tidur sang penghuni rumah. Sedangkan bagian belakang selain sebagai dapur, digunakan juga sebagai goah yaitu ruangan penyimpan persediaan beras. Yang menempati tempat tinggal di Kampung Urug, satu sama lain adalah masih saudara, di kampung ini dikenal dengan sebutan Tatali Kahuripan. Rumah ketua adat menghadap ke utara. Didepannya ada paniisan dan Gedung kecil yang menghadap keselatan (berhadap-hadapan dg rumah gede). Disebelah barat ada komplek leuit. Sedaangkan rumah penduduk berada pada ketinggian yang lebih rendah mengelilingi rumah ketua adat
S03	Kalo dulu tanah luas kolam harus ada pekarangan harus ada. Sekarang sudah 300 rumah sangat padat jadi sekarang dibebaskan. Kolam harus ada untuk pertolongan saat kebakaran (menanam cai). Di lokasi tanah adat tidak ada boleh ada bangunan lain selain rumah-leuit-tampian (dibuat diatas balong). Tampian diluar supaya najis tidak dibawa ke rumah. Tata cara masuk rumah seperti masuk kemasjid (harus bersih dan masuk dg kaki kanan) Jika ada perayaan adat buruan digunakan sebagai tempat bekerja. Sehingga buruan harus terbuka. Penanaman dilakukan di tepian/pagar. Saat hari pantangan abah di rumah pribadi. Hari pantangan Susunan rumah harus menghadap ke utara tidak boleh ke selatan. Di selatan ada makam leluhur. Kampung cikondang pelebarannya ke utara. Leuit harus dilokasi di pekarangan dan menghadap ke utara Balong di depan rumah + tampian..belakang rumah kosong Jalan masuk dari utara dan barat di timur ada hutan larangan Dulu balong harus ada untuk menjaga ada bahaya kebakaran. Kalo Panjang tidak boleh dipotong kalo pendek tidak boleh disambung : tidak boleh merubah apa pun.

	Tidak pelihara ternak. Dulu ada ternak ayam di kolong bale. Tanaman padi harus ada di sawah. Di buruan bebas seadanya saja tanaman. Yang harus ada hanjuang, pacing, sulangkar di buruan untuk ritual panen padi. Pengambilan sumberdaya hutan harus seijin abah Ilmu dari elders terkait ritual rumah-kampung-air bersih. Pembuangan ke kali. Balong tidak ditanami ikan. Karena ada binatang malam pemakan ikan. Fungsi tanaman : untuk sesaji (pinang) konsumsi sendiri.
S04	Tidak setiap rumah memiliki halaman. Prinsip hidup bertetangga.. kalau ada tanah dibangun rumah keluarga. Sawah jauh dari rumah. Pada dasarnya ada pekarangan..namun pertumbuhan penduduk semakin meningkat sehingga lahan semakin terbatas. Leuit terpisah dari rumah. Menghadap rumah tidak ada patokan. Jalannya diaspal dengan batu. Banyak air dari mata air di gunung. Mata air berupa sumur. Disana segera mandi dan mengambil air. Di MCK Kali (Walungan), ukuran rumah bervariasi tergantung kapasitas dan lokasi. Menentukan lokasi rumah tidak ada aturannya tergantung ketersediaan lahan. Aturan adat tidak tertulis tetapi dipercaya oleh masyarakat. Masak dengan kayu. Kamar mandi di area bawah dekat dengan sungai. Pesan leluhur: Gunung tidak bisa dilebur, lembah (dataran) tidak bisa dihancurkan. Sasaka (tempat suci) tidak boleh diubah. Arah utara-selatan rumah. Pekarangan/pekarangan sebagai pendamping untuk membuang sampah. dan tidak ditanam karena luasnya untuk jalan tetangga. Kebanyakan ditanam di samping atau belakang rumah. Kamar mandi ada di bawah.
S05	Dulu, harus ada kolam besar dengan halaman. Sekarang ada 300 rumah yang sangat ramai sehingga sekarang dibebaskan. Harus ada kolam untuk pertolongan saat terjadi kebakaran (menanam cai). Di lokasi tanah ulayat, tidak boleh ada bangunan lain selain rumah leuit-tampian (dibangun di atas balong). Tampin di luar agar najis tidak

	dibawa masuk ke dalam rumah. Tata cara masuk rumah seperti masuk masjid (harus bersih dan masuk dengan kaki kanan) Jika ada perayaan adat, permainan tersebut digunakan sebagai tempat bekerja. Jadi permainannya harus terbuka. Penanaman dilakukan di pinggir/pagar. Penataan rumah harus menghadap utara, bukan selatan. Di selatan terdapat makam leluhur. Desa ini melebar ke utara. Leuit harus berada di pekarangan dan menghadap ke utara Balong depan rumah+view..belakang rumah kosong Pintu masuk dari utara dan barat ke timur adalah hutan terlarang Dulu harus ada balon untuk mencegah bahaya kebakaran. Jika panjang, tidak dapat dipotong, jika pendek, tidak dapat digabungkan: Anda tidak dapat mengubah apa pun. Jangan memelihara ternak. Dulu ada ayam di bawah bale. Tanaman padi harus ada di sawah. Dalam perburuan hanya tanaman seadanya gratis. Yang harus hanjuang, mondar-mandir, sulangkar diburu untuk ritual panen padi. Ekstraksi sumber daya hutan harus diizinkan oleh abah Pengetahuan dari sesepuh tentang ritual air bersih-rumah-desa. Buang ke sungai-sungai. Balong tidak ditanami ikan. Karena ada hewan nokturnal yang memakan ikan. Fungsi tumbuhan : untuk membuat sesaji (pinang) untuk konsumsi sendiri.
S06	Buruan kalau ada bisa dipakai. Untuk warung hidup, bumbu-bumbu seperti salam, serai, pandan, cabai, dibagikan kepada tetangga. Namun kebanyakan tidak memiliki halaman karena sudah ramai. Untuk tanah garapan masing-masing memiliki SPT dan Hak Guna Bangunan atas izin Kuncen. Di Kampung Naga 1,5 ha untuk pemukiman dengan hak kepemilikan tanah ulayat. Dibatasi oleh alam dan pagar sebagai batas buatan. Bangunan tempat tinggal tidak boleh melebihi batas alam.

	Pagar bambu untuk membatasi pemukiman warga dengan MCK, Sawah, Tambak, Penumbuk Padi dll. Fasilitas umum disediakan di 4 arah Rumah uwungan timur-barat, pintu masuk rumah menghadap utara-selatan. Pintu bertemu dengan pintu kamar bertemu dengan kamar sehingga saat ngobrol dengan tetangga tidak mengganggu yang sedang istirahat. Atap rumah menghadap timur ke barat karena saat matahari terbit dari timur, cahayanya masuk ke lorong-lorong pemukiman sehingga memberi keseimbangan. Tidak ada perbedaan khusus struktur permukiman antara rumah tetua adat dengan warga lainnya, hanya bergantung pada ketersediaan tanah dan pondasi bangunan (besarnya rumah). Kecuali itu ada 1 bangunan yang dikeramatkan yaitu BUMI AGEUNG. Hanya dibuka pada saat upacara adat. Di Desa Naga, ada banyak larangan dan tidak banyak aturan. Larangan cukup dengan 1 kalimat pamali. Di desa Naga terdapat hutan terlarang yang dijaga untuk kelestarian 2 hutan lindung. Masyarakat hidup dengan alam. Jika ada kebun dan hutan yang harus dipertahankan, yang menyuburkan mata air tidak boleh otomatis ditebang. Alam adalah Rahman Rahim dan tidak akan menimbulkan bencana kecuali karena keserakahan manusia. Daripada mengambil kayu dari hutan, lebih baik datang dari luar. Batas desa sungai-hutan-jalan. Sakralnya ada kuburan leluhur, larangannya tidak boleh disentuh. Jika pekarangan cukup luas, bisa ditanami obat-obatan dan jamu tradisional. Pencahayaan dengan minyak tanah. Ternak domba-ayam-kambing. Keuangan dari kerajinan tangan. Dibuat setiap hari saat dia bebas dari pekerjaan di ladang. Membajak dengan cangkul/kerbau/traktor (ditarik dari atas). Kalau ada yang sakit di tandu juga. Sampah dibakar di empat area khusus di luar pagar pembatas sungai. Sampah dapur dibuang ke dalam balon untuk makanan ikan. Batas alam

	Sungai Timur Bukit Barat Selokan kecil utara-selatan. Batas buatan berupa gendang penjaga (pagar bambu). Di luar pagar pembatas adalah tempat yang kotor. Di luar pagar ada kolong, jamban, kandang kambing/domba, kolong rumah ayam. Sebelum memasuki pemukiman ada pancuran. Di sini airnya selalu mengalir sehingga bisa membersihkan racun. Jumlah penduduk 100 KK, 298 jiwa dengan 112 bangunan dikurangi fasilitas umum. Fasilitas umum berupa masjid, balai pertemuan, lumbung padi. Selain itu rumah warga dan Bumi Agueng. Masih cuci pakai sabun tapi tidak dibuang ke kolam tapi langsung ke sungai. Bangunan Sunda seperti manusia memiliki kepala dan kaki. Tahan gempa. Bentuk bangunan 2 pintu terlebih dahulu. Rumah dan dapur. Hanjuang selalu digunakan sebagai pagar karena sering digunakan dalam ritual dan sebagai simbol batas wilayah. Hasil kebun yang dijual berupa bambu, madu, uh, dll. Kebun warga di luar kawasan kampung Naga. Dapur berada di sebelah rumah karena tidak boleh ada pintu belakang. Pintunya terbuat dari anyaman yang tembus pandang dari dalam (siang hari) dan terang dari luar (malam hari) sehingga bisa melihat jika ada api. Batas-batas areal rumah dibuat dari tanah yang ditinggikan dan ditopang dengan batu-batu untuk mencegah erosi dan membentuk parit-parit kecil untuk mengalirkan air hujan. Lantai rumah terbuat dari bambu-palupuh sehingga jika ada air yang tumpah akan langsung jatuh (tidak becek). Di rumah disediakan GOA (tempat menyimpan beras di rumah). Budaya warisan dilestarikan, budaya modern dijamin. Hutan bukan untuk dirusak. Harus dirawat dan dilestarikan. Upacara Hajat Sasih 6 kali dalam setahun. Di desa naga hidup dengan alam. Leuit di setiap rumah berbentuk gowah untuk menyimpan hasil panen. Lumbung padi umum berada di pekarangan desa dekat batas bukit. Di samping rumah ada tempat sampah untuk dibakar di luar.

	Tumbuhan obat di pekarangan rumah kaca lempeng polochio-kunyit-pandan. Area tanaman dipagari agar ayam tidak mengganggunya. Halaman yang tidak ditanami dijadikan ruang terbuka untuk jalan. Bumi ageung adalah rumah suci yang hanya dibuka untuk ritual. Bangunan 1 pintu tanpa jendela. Di belakang Bumi Ageung terdapat kompleks leuit. Posisi Bumi Ageung dan Leuit berada di posisi paling atas. Desa ini berbentuk huruf L. Arah masuknya masih utara-selatan. Bangunan rumah tersebut secara turun temurun berusia hampir 50 tahun. Areal lumbung tua dan areal pemujaan leluhur dipagari sebagai bentuk keramat dan rumah warga
M01	Dulu keluarga tidak mau pisah..area ini ditempati oleh keluarga. Sertifikat kepemilikan atas nama kakek (masih 1 nama) namun sudah diwariskan dan dibagi-bagi tanahnya namun tidak resmi. Fungsi tanean agar komunikasi antar keluarga tidak pisah. Fungsi kobhung untuk cangkrukan, ngobrol dan berkumpul antar keluarga Kalo musim panen digunakan untuk menjemur jagung. Kalo beras tetap beli. Diatas dapur ada tempat penyimpanan jagung dan disamping dapur pasti ada sapi. Tempat untuk Sapi Dibangun menyambung dengan dapur. Konsep taneyan lanjhang dari rumah, langghar, dapur, kendang berdempetan. Saya juga tidak tahu kenapa. Apa manfaatnya? Secara perawatan bisa memantau sapi setiap waktu. Saat ini ada dapur lain yang lbh higienis. Dapur lama tetap dipakai untuk membuat bubur pakan sapi dari jagung, singkong, pisang, dicacah kecil2 untuk penggemukan sapi. Sapi disini adalah sapi penggemukan bukan untuk ternak. Dibelakang sapi ada tempat kotoran sapi, dikumpulkan dan dibuat bokashi di belakang rumah (kebon). Dibelakang rumah ada sekitar 2 meter.

	Batasnya berupa dinding penahan. Tidak ada batas khusus, hanya berupa peninggian tanah sekitar 1 meter kemudian dalam tanean rata ke barat. Di tempat lain ada juga tanean lanjhang tapi tanahnya tidak rata. Pemilihan tempat tinggal memang mencari tanah yang rata karena tempat rata enak untuk bangunan. Sebenernya saya juga kurang tahu karena sudah daridulu demikian Jadi fungsi tanean ini selain jemur jagung dan acara sosialisasi, kamrad, mantenan, tanean memang harus kosong. Yang baru sekarang saya beri tanaman namun aslinya kosong. Yang ada didepan rumah ada panggungan – tempat untuk mengikat sapi yang mau dimandikan. Dulu setiap rumah ada panggungan untuk mengikat sapi. Tp sekarang sudah tidak selalu ada..1 panggungan untuk mengikat 2 sapi. Yang digunakan untuk panggungan adalah kayu jaranan. Aktivitas yang dilakukan di halaman. Saat seperti sekarang tidak ada aktivitas kecuali ada acara atau saat menjemur kacang tanah, jan=gung, kacang hijau, singkong dicacah. Acara mingguan ada kamrad bahkan hampir tiap malam berpindah-pindah tanean. Setiap minggu hbs maghrib ada tahlilan di makam di sebelah timur tanean. Ada makam keluarga di dalam tanean. Menjemur di sepanjang taneyan..masing2 rumah menjemur hasil panennya di tanean depan rumahnya.
M02	Tanah tanean merupakan warisan dari keluarga nenek-nenek. Karena setiap orang tua memiliki kewajiban untuk membangun rumah untuk putrinya ketika mereka menikah, area tanean dipenuhi oleh banyak bangunan rumah yang ditinggali oleh keluarga nenek, termasuk saya sebagai cucu mereka. sebagian besar bangunan rumah telah direnovasi menjadi arsitektur modern. namun tanean lanjhang tetap dipertahankan untuk kepentingan sosial antar anggota keluarga. Namun kebanyakan bangunan rumah dibuat teras yang lebih besar, sehingga tanean menjadi lebih sempit
M03	Tanean digunakan untuk perayaan gotong royong. Setiap hari untuk menjemur kerupuk sepanjang tanean dari jam 7 pagi - 5 sore.

	Jika ada pertemuan besar diadakan di tanean. Dari ampere ke tanean. Tanean sejak dari sesepuh. Yang berubah hanyalah bentuk bangunannya. Jika urutan tanean tidak berubah. Dari dulu lebar tanean sekitar 4 meter. Mulai dari barat ke timur total sekitar 13 rumah menghadap ke selatan (utara tanean). Dapur telah memasuki setiap rumah. Kendang di belakang rumah atau di samping rumah. Rumah pertama menghadap musholla. (total ada 18 rumah di sepanjang peternakan) Menanam tanaman bisa di pinggir bangunan atau di pagar. Tanam bunga untuk dekorasi. Untuk konsumsi dapur, cabai biasanya ditanam. Buah manga, pace, srikaya (sesuai keinginan pemilik). Ayam/unggas/burung. Bertani sendiri. Ayam dijual hidup-hidup. Burung lovebird yang dibesarkan – warna bulu dan nyanyian – untuk dijual. Merpati diperebutkan. Pasokan pangan berasal dari hasil pertanian (padi) membeli sayuran di pasar atau menanamnya di ladang. Produk hortikultura untuk konsumsi dan penjualan. Protein dari kendang itu sendiri. Nasihat tentang pengelolaan lingkungan. wasiat leluhur di belakang rumah ditanam tanaman obat/jamu untuk jamu. Temulawak Kunyit. Di samping/belakang rumah. Lebar halaman belakang kurang lebih 5 meter. Di long-longan juga kadang ditanam. Sumber air dari sumur. Pemakaian untuk diminum (dimasak dengan temulawak dan jahe untuk menghangatkan badan). Fungsi tanam untuk naungan : mangga Produksi: jahe jahe kunyit Kalau punya lahan luas ada pepaya juga. Ada pace/noni juga di depan rumah. Untuk pekarangan kadang diberi pupuk kandang dan disiram. Sebagian besar rumah dibangun di dataran. Kayu jaran digunakan untuk pagar agar pagar bambu tidak mudah roboh. Kendang dipagari agar hewan peliharaan tidak mengganggu ruang tamu.
M04	Tanean penting untuk jalan tetangga, menjemur padi, jagung, kalau ada keperluan kematian, perkawinan,

	Wafat : petang/maghrib-isya Kering: pagi-sore Roma pertama di utara. Dibangun tahun 1962 di tanah warisan. Kandang dibuat di belakang rumah.. diakses dari long-longan. Dapur di depan rumah Pertimbangan tata letak Ini adalah tradisi di sini. Kobhung baru adalah relokasi karena posisi sebelumnya tidak nyaman. Namun, yang digunakan untuk musyawarah masih yang pertama Tembakau, jagung, beras ditanam. Di tanean kates, kelapa, (di sebelah tanean). Sangat dingin. Buahnya dijual dan dikonsumsi Sapi di belakang menyimpan harta milik seseorang Benih pertama dibeli di toko pertanian. Selanjutnya, kultivasi diri Lauk pauk beli di pasar. Makanan pokok dari hasil pertanian (beras, jagung) Pengetahuan dari leluhur; tidak ada Tanah warisan, kalau bisa jangan dijual agar bisa terus ditanami untuk anak cucu Rumah harus menghadap ke selatan karena pancurannya baik untuk anak cucu. Jika tidak ada tempat untuk menghadap ke utara Ada 2 sumur. Air untuk minum, mandi, konsumsi rumah tangga Tanaman disiram dengan air sungai atau hujan. Pepohonan di ujung barat memiliki manga, petai, pepaya,
M05	Tujuan Tanean adalah untuk mencegah terputusnya komunikasi antar keluarga. Kobhung berfungsi sebagai tempat berkumpulnya keluarga, berbincang, dan terhubung. Ini digunakan untuk mengeringkan jagung saat musim panen. Beli beras kalau bisa. Fasilitas penyimpanan jagung terletak di atas dapur, dan harus ada sapi di sebelah dapur. Dapur dan Tempat Ternak Sapi Terhubung. Gagasan taneyan lanjhang terhubung dengan rumah, langhar, dapur, dan gendang. Juga, saya tidak yakin mengapa.

	Sapi dapat terus dipantau selama pemeliharaan. Saat ini ada dapur lain yang lebih bersih.
M06	Setelah menerima tanah sebagai warisan dari orang tua ibu, orang tua membangun Tanean. Jumlah rumah yang ditampilkan sesuai dengan jumlah keluarga anak perempuan, dan perempuan yang lebih tua dalam keluarga memiliki tanah tersebut. Karena setiap rumah milik kerabat, maka tanean dibiarkan sebagai area publik untuk tujuan sosial dan ekonomi. Limbah kamar mandi dibuang ke saluran drainase terbuka (sogsogghan) yang terletak di sekitar tanean. Ya, produk buah yang dijual dimaksudkan untuk memberikan keteduhan dan menurunkan suhu udara. Tanah Warisan tidak boleh dijual karena untuk pemusnahan pinguin. Membangun rumah harus mempertimbangkan selatan atau utara.

Appendix 2. Householder interview transcription (in Indonesian language)

Sample code		**Question/Answers**		
Profile				
		Pekerjaan	**Usia**	**Pendidikan**
S01	A	pedagang	59	SMA
	B	Petani	47	SMA
	C	Petani	50	SD
	D	Petani	44	SMA
	E	Petani	53	SD
S02	A	Petani	60	SD
	B	Petani	55	SMP
	C	Petani	52	SMP
S03	A	Petani	76	Sekolah Pertanian
	B	Pensiunan	88	SR
	C	Petani	53	SMA
S04	A	Petani	68	Tidak sekolah
	B	Petani	35	Tidak sekolah
	C	Petani	57	Tidak sekolah
	D	Petani	43	Tidak sekolah
	E	Petani	28	Tidak sekolah
	F	Petani	77	Tidak sekolah
	G	Petani	62	Tidak sekolah
	H	Petani	38	Tidak sekolah
	I	Petani	45	Tidak sekolah
	J	Petani	58	Tidak sekolah
S05	A	Petani	49	SMA
	B	Petani	38	SMA
	C	Petani	54	SMP
	D	Petani	38	SMA
S06	A	Pengrajin	56	SD
	B	Petani	69	Tidak sekolah
	C	Petani	36	SD

	D	Pengrajin	45	SD
	E	Pengrajin	37	Tidak sekolah
	F	Petani	47	Tidak sekolah
	G	Petani	50	SD
	H	Petani	38	SD
	I	Pengrajin	27	SD
	J	Pengrajin	38	Tidak sekolah
	K	Petani	35	SD
	L	petani	40	SD
	M	Petani	68	Tidak sekolah
	N	Petani	53	Tidak sekolah
	O	Petani	63	Tidak sekolah
M01	A	Petani	42	sarjana
	B	Petani	60	SD
	C	Petani	51	SD
	D	Petani	39	SD
	E	Pegawai	42	D3
M02	A	Nelayan	50	SD
	B	Nelayan	35	SD
M03	A	Pegawai pemerintah	26	sarjana
	B	petani	80	Tidak sekolah
M04	A	Perangkat desa	42	SMA
	B	Petani	30	Sarjana
M05	A	Pedagang	51	SD
	B	Petani	47	SD
M06	A	Petani	60	SD
	B	pedagang	56	SD

Sample code	Question/Answers
Category: Space Use	
Question 1: What does the function/role of home garden for you and your home?	

S01	A	Rumah di kampung adat biasanya ada buruan untuk ditanami tanaman keperluan dapur, sebagai obat, atau untuk keperluan ritual. Saat ini karena keterbatasan lahan, biasanya buruan sudah tidak ada lagi
	B	Buruan harus ada meskipun sempit untuk ditanami pohon buah-buahan
	C	Jika lahan sempit, tidak apa tidak ada buruan.
	D	Adanya buruan tergantung ketersediaan lahan. Jika ada bisa ditanami untuk keperluan dapur atau obat
	E	Karena masih ada lahan pertanian, buruan ad ajika masih ada sisa lahan disekitar rumah
S02	A	Buruan dipakai jika ada upacara/kegiatan sosial sehingga harus terbuka dan memudahkan sirkulasi. Tanaman di tanam secukupnya untuk peneduh
	B	Buruan sekarang sudah menyempit karena rumah-rumah semakin banyak. Biasanya dipakai untuk bermain anak-anak
	C	Buruan dibuat di depan rumah untuk menerima tamu atau dipakai jika ada hajatan.
S03	A	Dulu tanah luas, sehingga buruan harus ada. Di dalam buruan juga harus ada balong untuk menyimpan air. Buruan juga perlu jika ada acara hajatan atau ada tamu datang disambut di buruan.
	B	Pekarangan/Buruan harus ada yang lamping harus diawian, yang datar harus diimahan, nu legok dibalongan. Dalam membangun rumah di bagian tengah (area datar) menghadap ke utara (sabilulungan) di bawah ada selokan, sengkedan dan sawah, diatas ada hutan. Mengolah tanah sawah dengan kerbau. Kerbau disimpan di sawah..ada yang mengurus khusus kerbau. Kandangnya dibelakang rumah agak jauh
	C	Buruan ada di depan rumah dan ditanami tanaman bunga atau buah sebagai peneduh dan pagar. Kadang jadi tempat bermain untuk anak-anak
S04	A	Buruan harus bersih supaya mudah untuk sirkulasi. Dengan semakin padatnya rumah, buruan semakin sempit karena lahan yang ada dipakai untuk membangun rumah keluarga
	B	Buruan dipakai untuk area jalan/sirkulasi dan tepiannya ditanami tanaman untuk kebutuhan obat dan dapur. Kadang-kadang ada bunga untuk ritual juga.

	C	Buruan ada di samping rumah karena ada sisa lahan yang bisa dipakai untuk ditanami sebagai pembatas dengan jalan
	D	Buruan saat ini digunakan untuk sirkulasi sehingga harus bersih agar tidak menyulitkan orang lewat
	E	Buruan harus ada meskipun sempit untuk ditanami pohon buah-buahan
	F	Jika lahan sempit, tidak apa tidak ada buruan.
	G	Adanya buruan tergantung ketersediaan lahan. Jika ada bisa ditanami untuk keperluan dapur atau obat
	H	Karena masih ada lahan pertanian, buruan ad ajika masih ada sisa lahan disekitar rumah
	I	Buruan ada di belakang dan samping dimana ada lahan untuk ditanami pohon atau tanaman obat. Hasilnya bisa dimanfaatkan bersama tetangga juga
	J	Buruan ada di samping dan belakang rumah berbatasan dengan tebing jadi ditanami tanaman sebagai pembatas dengan tebing.
S05	A	Buruan ada di depan, samping, dan belakang rumah dan ditanami tanaman obat atau tanaman hias untuk ritual
	B	Buruan ada tapi sempit, ditanami tanaman untuk ritual
	C	Buruan harus bersih karena sering dipakai bermain oleh anak-anak
	D	Buruan ada di depan rumah untuk ditanami tanaman obat atau untuk ritual
S06	A	Buruan jika ada bisa dimanfaatkan. Untuk warung hidup bumbu dapur salam, sereh, pandan, cabe, digunakan bersama dengan tetangga. Namun kebanyakan tidak punya halaman karena sudah padat.
	B	Buruan ada di samping rumah untuk membatasi dengan jalan. Ditanami dengan tanaman obat atau umbi-umbian
	C	Buruan tidak ditanami karena digunakan untuk jalan sehingga harus bersih dari tanaman
	D	Jika ada kelebihan ruang tempat tinggal bisa dimanfaatkan untuk buruan. Buruan digunakan untuk menanam tanaman obat atau dibiarkan terbuka untuk area bermain anak-anak atau dipakai jika ada hajatan
	E	Buruan ada di belakang dan samping dimana ada lahan untuk ditanami pohon atau tanaman obat. Hasilnya bisa dimanfaatkan bersama tetangga juga

	F	Buruan ada di depan, samping, dan belakang rumah dan ditanami tanaman obat atau tanaman hias untuk ritual
	G	Buruan dibuat di depan rumah untuk menerima tamu atau dipakai jika ada hajatan.
	H	Buruan harus bersih supaya mudah untuk sirkulasi. Dengan semakin padatnya rumah, buruan semakin sempit karena lahan yang ada dipakai untuk membangun rumah keluarga
	I	Buruan dipakai untuk area jalan/sirkulasi dan tepiannya ditanami tanaman untuk kebutuhan obat dan dapur. Kadang-kadang ada bunga untuk ritual juga.
	J	Buruan ada di samping rumah karena ada sisa lahan yang bisa dipakai untuk ditanami sebagai pembatas dengan jalan
	K	Buruan saat ini digunakan untuk sirkulasi sehingga harus bersih agar tidak menyulitkan orang lewat
	L	Rumah di kampung adat biasanya ada buruan untuk ditanami tanaman keperluan dapur, sebagai obat, atau untuk keperluan ritual.
	M	Buruan ada di samping rumah untuk membatasi dengan jalan. Ditanami dengan tanaman obat atau umbi-umbian
	N	Buruan tidak ditanami karena digunakan untuk jalan sehingga harus bersih dari tanaman
	O	Jika ada kelebihan ruang tempat tinggal bisa dimanfaatkan untuk buruan. Buruan digunakan untuk menanam tanaman obat atau dibiarkan terbuka untuk area bermain anak-anak atau dipakai jika ada hajatan
M01	A	Tanean penting untuk komunikasi antar keluarga
	B	Tanean harus ada karena penting mengadakan acara hajatan atau pertemuan keluarga
	C	Tanean penting untuk tempat hajatan dan menjemur hasil pertanian
	D	Tanean harus tetap ada untuk tempat acara jika ada kegiatan sosial kemasyarakatan atau untuk menjemur jagung
	E	Tanean penting untuk memelihara sapi dan dipakai jika ada hajatan
M02	A	Tanean digunakan untuk sirkulasi anggota keluarga dan tetangga sehingga harus bersih

	B	Tanean penting untuk tempat hajatan, pengajian kamrad tiap minggu, dan sirkulasi anggota keluarga
M03	A	Tanean harus ada karena penting mengadakan acara hajatan atau pertemuan keluarga
	B	Tanean penting untuk tempat hajatan dan menjemur hasil pertanian
M04	A	Tanean harus tetap ada untuk tempat acara jika ada kegiatan sosial kemasyarakatan atau untuk menjemur jagung
	B	Tanean digunakan untuk sirkulasi anggota keluarga dan tetangga sehingga harus bersih
M05	A	Tanean penting untuk tempat hajatan, pengajian kamrad tiap minggu, dan sirkulasi anggota keluarga
	B	Tanean digunakan untuk sirkulasi anggota keluarga dan tetangga sehingga harus bersih
M06	A	Tanean harus tetap ada untuk tempat acara jika ada kegiatan sosial kemasyarakatan atau untuk menjemur jagung
	B	Tanean harus ada karena penting mengadakan acara hajatan atau pertemuan keluarga

Sample code		Question/Answers
Category: Space Use		
Question 2: What kind of activity carried out in the home garden?		
S01	A	Duduk dan bercengkrama di teras setelah dari sawah
	B	Membersihkan diri di tampian, menyapu halaman, menerima tamu di teras
	C	Menerima tamu di teras, memetik sayuran/bumbu dapur
	D	Duduk di teras, menjemur pakaian, menyapu halaman
	E	Menerima tamu di teras, memetik sayuran/bumbu dapur
S02	A	Menerima tamu, untuk sirkulasi, membersihkan diri di tampian
	B	Duduk di teras, menjemur pakaian, menyapu halaman
	C	Menerima tamu di teras, memetik sayuran/bumbu dapur
S03	A	Menerima tamu, membersihkan diri di tampian, mempersiapkan ritual, menyimpan padi ke leuit
	B	Menanam dan memetic bumbu dapur, menyapu halaman, menerima tamu

	C	Membersihkan halaman rumah, memetic bumbu dapur, mandi di tampian
S04	A	Menerima tamu di teras, memetik sayuran/bumbu dapur
	B	Duduk di teras, menjemur pakaian, menyapu halaman
	C	Menerima tamu di teras, memetik sayuran/bumbu dapur
	D	Menerima tamu, untuk sirkulasi, membersihkan diri di tampian
	E	Duduk dan menerima tamu di teras
	F	Membersihkan halaman agar mudah dilalui
	G	Duduk dan menerima tamu di teras
	H	Memetic buah/sayur/bumbu dapur di halaman
	I	Menerima tamu di teras, memetik sayuran/bumbu dapur
	J	Menerima tamu, untuk sirkulasi, membersihkan diri di tampian
S05	A	Duduk dan bercengkrama di teras setelah dari sawah
	B	Membersihkan diri di tampian, menyapu halaman, menerima tamu di teras
	C	Menerima tamu di teras, memetik sayuran/bumbu dapur
	D	Duduk di teras, menjemur pakaian, menyapu halaman
S06	A	Menerima tamu, untuk sirkulasi, membersihkan diri di tampian
	B	Duduk di teras, menjemur pakaian, menyapu halaman
	C	Menerima tamu di teras, memetik sayuran/bumbu dapur
	D	Menerima tamu, membersihkan diri di tampian, mempersiapkan ritual, menyimpan padi ke leuit
	E	Menanam dan memetic bumbu dapur, menyapu halaman, menerima tamu
	F	Membersihkan halaman rumah, memetic bumbu dapur, mandi di tampian
	G	Menerima tamu di teras, memetik sayuran/bumbu dapur
	H	Duduk di teras, menjemur pakaian, menyapu halaman
	I	Menerima tamu di teras, memetik sayuran/bumbu dapur
	J	Menerima tamu, untuk sirkulasi, membersihkan diri di tampian
	K	Duduk dan menerima tamu di teras
	L	Membersihkan halaman agar mudah dilalui
	M	Duduk dan menerima tamu di teras
	N	Memetic buah/sayur/bumbu dapur di halaman
	O	Menerima tamu di teras, memetik sayuran/bumbu dapur

M01	A	(a) penjemuran, (b) arisan, (c) pertemuan dan sosialisasi keluarga, (d) perayaan ritual (a) pagi sampai sore; (b-d) sore ke malam
	B	(a) mengeringkan tanaman; (d) perayaan ritual; c. memandikan sapi (a) pagi sampai sore; (d) petang ke malam; (c) pagi sekali seminggu
	C	(a) mengeringkan tanaman; (d) perayaan ritual; (c) pertemuan keluarga (a) pagi sampai sore; (b) insidental/dalam waktu yang dijadwalkan; biasanya pada sore hingga malam hari
	D	(a) mengeringkan tanaman; (d) perayaan ritual; (c) keluarga dan pertemuan sosial (a) pagi sampai sore; (b-d) insidentil/dalam waktu yang dijadwalkan; biasanya pada sore hingga malam hari
	E	(a) mengeringkan tanaman; (d) perayaan ritual; (b-c) pertemuan keluarga dan sosial (a) pagi sampai sore; (b-d) insidentil/dalam waktu yang dijadwalkan; biasanya pada sore hingga malam hari
M02	A	(a) mengeringkan ikan; (c) pertemuan keluarga (a) sepanjang hari; (c) kapan saja di rumah
	B	(a) memelihara ternak; (b-c) pertemuan keluarga dan sosial (a) sepanjang hari (kandang yang dibangun di taman); (b) waktu insidental/terjadwal, hampir sore sampai malam
M03	A	(c) pertemuan dan pertemuan keluarga; (a) mengeringkan tanaman; (d) perayaan ritual (c) petang ke malam; (a) pagi sampai sore; (d) insidental jika ada saat
	B	(c) pertemuan dan pertemuan keluarga; (a) mengeringkan tanaman; (d) perayaan ritual (c) petang ke malam; (a) pagi sampai sore; (d) insidental jika ada saat
M04	A	(a) mengeringkan kerupuk (produk rumahan); (d) perayaan ritual (pesta pernikahan, pertemuan keagamaan, dll.) (a) sepanjang hari; (d) insidental jika ada saat atau dalam jadwal yang ditentukan
	B	(b-c) pertemuan keluarga dan sosial; (d) perayaan ritual

		(b-d) kebanyakan di sore hingga malam hari dan akhir pekan atau hari libur
M05	A	(a) drying crops; (b) drying clothes; (d) rituals celebration (a-b) morning to afternoon; (d) evening to night
	B	(a) drying crops; (b) drying clothes; (d) rituals celebration (a-b) morning to afternoon; (d) evening to night
M06	A	(a) mengeringkan tanaman; (b) menjemur pakaian; (d) perayaan ritual (a-b) pagi sampai sore; (d) sore ke malam
	B	(a) mengeringkan tanaman; (b) menjemur pakaian; (d) perayaan ritual (a-b) pagi sampai sore; (d) sore ke malam

Sample code		Question/Answers
Category: Spatial Characteristic		
Question 3: How does the layout of your garden?		
S01	A	Karena tata letak kawasan ini mengacu pada kerajaan padjajaran, maka tata letak setiap elemen diperluas dari permukaan tanah tertinggi ke dataran rendah. tingkat tertinggi disediakan untuk raja atau lurah sedangkan tingkat terendah dibalik untuk rakyat jelata. rumah besar (di sini) dibangun dengan menghadap ke selatan sebagai pintu masuk. Di antara rumah dan pagar bambu terdapat buruan (halaman depan) yang ditanami tanaman obat dan keramat.
	B	Rumah ini menghadap ke arah alun-alun sehingga buruan juga menghadap ke alun-alun. Disamping dan depan rumah ditanami pagar hidup berupa tanaman buah dan lalapan. Pintu masuk ada di tengah lurus dengan pintu masuk rumah. Di belakang rumah terdapat tampian untuk mandi
	C	Rumah ini menghadap ke jalan. Batas area rumah berupa peninggian tanah yang diperkuat dengan batu kali. Sedangkan toilet memanfaatkan aliran sungai di bawah area permukiman
	D	Rumah ini menghadap ke arah jalan sehingga buruan juga menghadap ke jalan. Disamping dan depan rumah ditanami pagar hidup berupa tanaman buah dan lalapan. Pintu masuk ada di tengah lurus dengan pintu masuk rumah. Di belakang rumah terdapat tampian untuk mandi

	E	Rumah ini menghadap ke jalan. Batas area rumah berupa peninggian tanah yang diperkuat dengan batu kali. Sedangkan toilet memanfaatkan aliran sungai di bawah area permukiman
S02	A	areal rumah dibatasi pagar besi yang menghadap ke utara. Ada ruang antara rumah dan pagar untuk sirkulasi. Area sirkulasi di sekitar rumah diaspal kerikil agar tidak becek saat hujan
	B	Halaman rumah terletak di depan rumah. Tepiannya ditanami pohon peneduh dari buah-buahan
	C	Halaman rumah sangat sempit, hanya berupa tanaman pot yang dletakkan di depan pintu masuk
S03	A	Elemen taman rumah adalah rumah utama, buruan (halaman depan), leuit, dan tampian (toilet) dan balong (kolam). Tampian dan balong terletak di halaman depan, di depan rumah guna menjaga kebersihan rumah-sebagian harus dibersihkan sebelum masuk rumah. Di sisi lain halaman depan terdapat leuit untuk menyimpan hasil panen. Rumah menghadap ke utara, jarak dari pemakaman leluhur di selatan. halaman depan merupakan ruang terbuka yang digunakan untuk mempersiapkan ritual. areal tambak dan areal leuit dipisahkan oleh pagar bambu dan barisan tanaman pagar untuk menentukan areal ruang terbuka
	B	Halaman rumah terdiri dari ruang terbuka dan kolam serta tanaman pohon dan semak yang ditanam di tepian sebagai pagar hidup
	C	Halaman rumah terdiri dari halaman depan dan belakang. Halaman depan berupa ruang terbuka yang dibatasi pagar bambu
S04	A	Ruang tamu rumah dikelompokkan satu sama lain. Setiap rumah dipisahkan oleh elevasi tanah dan dikelilingi oleh batu kali, sedangkan tanahnya ditutupi oleh kerikil. MCK umum terletak di luar pemukiman, dekat mata air. Pekarangan depan dibiarkan sebagai ruang terbuka untuk sirkulasi antar anggota masyarakat.
	B	Buruan terletak di depan rumah dan diperkeras dg batu untuk memudahkan sirkulasi. Rumah berbentuk panngung dan tepiannya ditanami tanaman untuk kebutuhan dapur

	C	Buruan terletak di depan rumah dan diperkeras dg batu untuk memudahkan sirkulasi. Rumah berbentuk panngung dan tepiannya ditanami tanaman untuk kebutuhan dapur
	D	Buruan terletak di tengah 3 rumah yang saling berhadapan dan berupa ruang terbuka. Di salah satu sisinya terdapat pohon untuk penaung dan di ketiga sisi ada pintu akses ke halaman warga lainnya
	E	Buruan terletak di depan rumah dan diperkeras dg batu untuk memudahkan sirkulasi. Rumah berbentuk panngung dan tepiannya ditanami tanaman untuk kebutuhan dapur
	F	Buruan terletak di depan rumah dan diperkeras dg batu untuk memudahkan sirkulasi. Rumah berbentuk panngung dan tepiannya ditanami tanaman untuk kebutuhan dapur
	G	Buruan terletak di depan rumah dan diperkeras dg batu untuk memudahkan sirkulasi. Rumah berbentuk panngung dan tepiannya ditanami tanaman untuk kebutuhan dapur
	H	Ruang kosong disamping rumah digunakan sebagai buruan dengan area tanaman yang dibatasi batu kerikil dan lapangan terbuka untuk sirkulasi dan menerima tamu.
	I	Buruan terletak di depan rumah dan diperkeras dg batu untuk memudahkan sirkulasi. Rumah berbentuk panngung dan tepiannya ditanami tanaman untuk kebutuhan dapur
	J	Buruan terletak di depan rumah dan diperkeras dg batu untuk memudahkan sirkulasi. Rumah berbentuk panngung dan tepiannya ditanami tanaman untuk kebutuhan dapur
S05	A	sebagian besar bangunan rumah menghadap ke jalan utama. Jarang ada yang masih memiliki pekarangan rumah karena keterbatasan lahan. Rumah dengan pekarangan rumah, biasanya ditanami pohon buah-buahan di tepinya dan dijadikan halaman depan sebagai ruang terbuka.
	B	Di halaman rumah ada teras, dipan untuk duduk dibawah pohon, dan pancuran untuk cuci tangan dan kaki sebelum masuk ke dalam rumah sedangkan kamar mandi dibangun diatas kolam yng ada di belakang rumah

	C	Rumah menghadap ke jalan dengan akses langsung menuju pintu rumah panggung. Di kedua sisi terdapat tanaman hias dan pohon buah-buahan sebagai peneduh
	D	Di halaman rumah ada teras, dipan untuk duduk dibawah pohon, dan pancuran untuk cuci tangan dan kaki sebelum masuk ke dalam rumah sedangkan kamar mandi dibangun diatas kolam yng ada di belakang rumah
S06	A	the layout of kampung naga is started from the lowest area that functioned as pond and public toilet (tampian) for all community member. Then, borderd by bamboo fence as barrier combined with hanjuang plant (cordyline sp.) as hedgerows, there are house building area that built vis-a-vis facing to north-south, while the circulation path follows the east-west direction. in the center of area, there are open space and hall building, and also mosque as the center of social activity in Kampung Naga. on the highest level there are sacred building and leuit to store the agricultural crops from community members.
	B	Halaman depan digunakan sebagai area sirkulasi sedangkan halaman belakang digunakan sebagai area terbuka dan dilengkapi pojok tanaman dibatas tepi lahan. Pojok tanaman berisi tanaman hias dan obat yang ditutup dengan jaring agar tidak drusak ayam
	C	Ada sedikit ruang di halaman depan rumah yang dimanfaatkan untuk menanama berbagai macam tanaman obat sedangkan area lainnya dimanfaatkan sebagai ruang terbuka untuk sirkulasi warga. Hasil dari kebun di halaman dimanfaatkan Bersama-sama dengan tetangga dan sesama penghuni kampung
	D	Halaman depan digunakan sebagai area sirkulasi sedangkan halaman belakang digunakan sebagai area terbuka dan dilengkapi pojok tanaman dibatas tepi lahan. Pojok tanaman berisi tanaman hias dan obat yang ditutup dengan jaring agar tidak drusak ayam
	E	Rumah menghadap ke jalan dan ruang sempit di tepi tebing dimanfaatkan sebagai buruan untuk menanam beberapa tanaman obat dan bumbu dapur
	F	Ada sedikit ruang di halaman depan rumah yang dimanfaatkan untuk menanama berbagai macam tanaman obat sedangkan area lainnya dimanfaatkan sebagai ruang terbuka untuk sirkulasi warga. Hasil dari kebun

		di halaman dimanfaatkan Bersama-sama dengan tetangga dan sesama penghuni kampung
	G	Halaman rumah dibiarkan tidak berpagar sehingga dapat dimanfaatkan bersama untuk kebutuhan warga masyarakat
	H	Ada sedikit ruang di halaman depan rumah yang dimanfaatkan untuk menanama berbagai macam tanaman obat sedangkan area lainnya dimanfaatkan sebagai ruang terbuka untuk sirkulasi warga. Hasil dari kebun di halaman dimanfaatkan Bersama-sama dengan tetangga dan sesama penghuni kampung
	I	Halaman depan digunakan sebagai area sirkulasi sedangkan halaman belakang digunakan sebagai area terbuka dan dilengkapi pojok tanaman dibatas tepi lahan. Pojok tanaman berisi tanaman hias dan obat yang ditutup dengan jaring agar tidak drusak ayam
	J	Rumah menghadap ke jalan dan ruang sempit di tepi tebing dimanfaatkan sebagai buruan untuk menanam beberapa tanaman obat dan bumbu dapur
	K	Ada sedikit ruang di halaman depan rumah yang dimanfaatkan untuk menanama berbagai macam tanaman obat sedangkan area lainnya dimanfaatkan sebagai ruang terbuka untuk sirkulasi warga. Hasil dari kebun di halaman dimanfaatkan Bersama-sama dengan tetangga dan sesama penghuni kampung
	L	Rumah menghadap ke jalan dan ruang sempit di tepi tebing dimanfaatkan sebagai buruan untuk menanam beberapa tanaman obat dan bumbu dapur
	M	Halaman depan digunakan sebagai area sirkulasi sedangkan halaman belakang digunakan sebagai area terbuka dan dilengkapi pojok tanaman dibatas tepi lahan. Pojok tanaman berisi tanaman hias dan obat yang ditutup dengan jaring agar tidak drusak ayam
	N	Rumah menghadap ke jalan dan ruang sempit di tepi tebing dimanfaatkan sebagai buruan untuk menanam beberapa tanaman obat dan bumbu dapur
	O	Ada sedikit ruang di halaman depan rumah yang dimanfaatkan untuk menanama berbagai macam tanaman obat sedangkan area lainnya dimanfaatkan sebagai ruang terbuka untuk sirkulasi warga. Hasil dari kebun di halaman dimanfaatkan Bersama-sama dengan tetangga dan sesama penghuni kampung

M01	A	mulai dari pintu masuk/keluar di sisi timur dan barat terdapat pelataran yang memanjang dari timur ke barat. disekitar pekarangan terdapat 11 bangunan rumah yang menghadap ke selatan. Di tengah halaman terdapat rumah panggung (kobbhung) yang berfungsi sebagai musala dan tempat pertemuan tamu. Itu dibangun terbuka ke timur menghadap area pintu masuk. bangunan rumah menghadap ke selatan, sedangkan dapur dan kandang sapi menghadap ke utara. Setiap bangunan rumah perlu membangun dapur dan kandang sapi/kandang sendiri yang terpisah dari rumah. Ada beberapa tanaman obat dan buah-buahan yang ditanam di samping dan di belakang bangunan rumah. lalu ada 3 pohon jaranan (Lannea coromandelica) di depan rumah untuk merantai sapi pada jam istirahat. sumur air dibangun di sisi selatan pekarangan, di samping bangunan dapur
	B	Mulai dari pintu masuk di sebelah barat terdapat pelataran yang memanjang dari barat ke timur. di sebelah utara terdapat 4 bangunan rumah yang menghadap ke selatan, sedangkan di sebelah selatan terdapat bangunan dapur dan kandang sapi yang dibangun menghadap ke utara. Beberapa tanaman buah telah ditanam di samping kandang sapi seperti pohon pisang, pohon pepaya, pohon nangka, dan lain-lain. Di tengah pelataran terdapat kobbhung yang dibangun menghadap ke timur berdampingan dengan rumah tertua/pertama (roma tongghu).
	C	pintu masuk diakses dari selatan. Di sebelah barat pintu masuk terdapat 3 pohon jaranan (Lannea coromandelica), kandang sapi, dan bangunan dapur yang menghadap ke utara. Di seberangnya terdapat 3 bangunan rumah yang berjajar dari barat ke timur menghadap ke selatan. di ujung sisi barat terdapat kobbhung yang menghadap ke timur. di sisi timur juga terdapat bangunan dapur. itu dibangun di selatan, berhadapan dengan bangunan rumah ketiga. Kemudian, di area tengah terdapat pelataran yang memanjang dari barat ke timur. tanean merupakan tanah pusaka yang dibangun oleh keluarga nenek dan masih dalam bentuk aslinya sejak dibangun. Kini, tanean tersebut ditinggali oleh 3 bersaudara bersama keluarganya tidak ada. Sejak tanean diwariskan secara turun-temurun, tata letak tanean tetap dipertahankan seperti aslinya.

	D	pintu masuk diakses dari arah barat. Di sisi utara terdapat toilet dan 3 bangunan rumah yang menghadap ke selatan. Sedangkan di sisi selatan terdapat kandang sapi yang berdampingan dengan dapur dan musholla yang menghadap ke utara, kemudian kebun buah-buahan dan tanaman obat. di tengahnya terdapat pelataran yang memanjang dari barat ke timur tanean ini dibangun oleh keluarga nenek dan sekarang ditinggali oleh keluarga ibu saya. Setidaknya ada 4 generasi di sini keluarganya masing-masing. Beberapa bangunan rumah telah direnovasi dari bentuk aslinya dan sekarang dibangun dengan arsitektur modern daripada tradisional.
	E	pintu masuk diakses dari barat daya. Pelataran utama memanjang dari barat ke timur. Di sisi utara terdapat 5 bangunan rumah yang menghadap ke selatan. Sedangkan di sebelah selatan terdapat dapur dan kandang sapi yang saling silang. Di ujung sisi barat dan di tengah halaman terdapat kobbhung (rumah panggung) yang terbuka ke arah timur. toilet terletak di selatan, selain kobbhung di ujung sisi barat tanean adalah tanah milik keluarga nenek. orang tua memiliki kewajiban untuk membangun rumah untuk putri mereka ketika mereka menikah. Sehingga daerah ini ditinggali oleh keluarga besar dari keluarga ibu saya. Rumah tinggal telah direnovasi menjadi arsitektur modern dari yang asli dan tradisional.
M02	A	area pintu masuk/keluar di sisi timur dan barat dengan pelataran di tengah, memanjang dari timur ke barat. Di sisi utara terdapat 2 bangunan rumah yang menghadap ke selatan. Sedangkan di sisi selatan terdapat 2 bangunan rumah yang menghadap ke utara. Kami menanam beberapa tanaman bunga di dalam pot dan memajangnya di depan teras rumah sebagai pembatas dari jalan setapak.
	B	pintu masuk di sebelah timur dengan jalur lurus ke barat. Sebelas bangunan rumah dibangun berhadapan menghadap selatan dan utara, sedangkan kandang sapi diletakkan di ujung barat daya jalan setapak. Di ujung pekarangan terdapat tanaman pagar dari gabungan tanaman beluntas (pluchea indica) dan pohon jaranan (Lannea coromandelica).
M03	A	pintu masuk/keluar dapat diakses dari arah timur dan barat. Kedua gapura tersebut dihubungkan oleh pelataran yang juga berfungsi sebagai jalan

		setapak. Secara keseluruhan terdapat 12 bangunan rumah yang dibangun berhadap-hadapan di sisi utara dan selatan, dipisahkan oleh pekarangan. Letak dapur dan kandang sapi bervariasi antara di samping atau di belakang rumah. ruang di belakang bangunan rumah ditanami tanaman buah-buahan, obat-obatan, dan dapur. Di sepanjang lokasi terdapat 2 sumur air yang digunakan bersama oleh seluruh anggota keluarga.
	B	Ada 17 bangunan rumah yang dibangun berhadap-hadapan di bagian utara dan selatan, dipisahkan oleh pekarangan. Kandang sapi dibangun di samping atau di depan pemilik rumah jika ada. Sedangkan toilet dan dapur sudah menyatu dengan rumah utama. daerah tanean merupakan warisan dari keluarga nenek buyut untuk saudara nenek. Karena setiap orang tua memiliki kewajiban untuk membangun rumah untuk putrinya ketika mereka menikah, area tanean diisi oleh banyak bangunan rumah yang ditinggali oleh keluarga saudara kandung nenek.
M04	A	pintu masuk/keluar dapat diakses dari arah utara dan timur. Halamannya memanjang dari barat ke timur dengan 18 bangunan rumah dan 2 kandang ayam di sisi utara dan selatan berhadapan. Di ujung sisi barat-selatan terdapat musholla (bangunan untuk sholat berjamaah bersama anggota keluarga) kawasan tanean sudah dibangun sejak nenek moyang. Dia mewarisi situs dari orang tuanya dan membesarkan keluarganya di sini. Termasuk saya, hampir 4 generasi tinggal di sini sekarang
	B	pintu masuk diakses dari arah barat. Pekarangan berfungsi sebagai jalur sirkulasi anggota keluarga. Secara keseluruhan terdapat 24 bangunan rumah di sisi utara dan selatan berhadap-hadapan. tanean dibangun oleh keluarga nenek dan ditinggali oleh kerabatnya. Karena tanean ini mengacu pada kobhung/musholla yang sama di tanean tetangga, daerah ini masih memiliki kerabat dengan mereka. Setidaknya ada 3 generasi yang tinggal di tanean ini sekarang. seluruh bangunan rumah telah direnovasi menjadi arsitektur modern dan luas tanean lebih sempit dari aslinya.
M05	A	pintu masuk/keluar diakses dari arah timur dan diakhiri dengan kobbhung di ujung sisi barat. Antara pintu masuk dan kobbhung dihubungkan oleh tanean

		(pelataran). 5 Bangunan rumah dibangun di sisi utara dan selatan dengan rumah tertua/pertama selalu terletak di dekat kobbhung. di ujung sisi timur laut terdapat ruang kuburan keluarga. Kemudian, dibangun dapur di samping rumah, sedangkan kandang sapi dibangun di dekat pintu masuk tanean telah dibangun oleh orang tua setelah menerima tanah warisan dari orang tua ibu. Jumlah rumah tangga menunjukkan jumlah keluarga anak perempuan dan tanah yang dimiliki oleh perempuan tertua dalam rumah tangga tersebut. Karena setiap rumah adalah kerabat, tanean dibiarkan sebagai ruang terbuka untuk penggunaan ekonomi sosial dan pertanian
	B	pintu masuk/keluar diakses dari arah timur dan diakhiri dengan kobbhung di ujung sisi barat. Antara pintu masuk dan kobbhung dihubungkan oleh tanean (pelataran). 4 Bangunan rumah dibangun di sisi utara dan selatan dengan rumah tertua/pertama selalu terletak di dekat kobbhung tanean adalah tanah milik keluarga nenek. orang tua memiliki kewajiban untuk membangun rumah untuk putri mereka ketika mereka menikah. Sehingga daerah ini ditinggali oleh keluarga besar dari keluarga ibu saya. Rumah tinggal telah direnovasi menjadi arsitektur modern dari yang asli dan tradisional.
M06	A	pintu masuk/keluar diakses dari arah timur dan diakhiri dengan kobbhung di ujung sisi barat. Antara pintu masuk dan kobbhung dihubungkan oleh tanean (pelataran). Di sisi utara menghadap ke selatan, terdapat 5 bangunan rumah yang ditinggali oleh keluarga pemilik. Di sisi selatan terdapat sumur air dan toilet, serta kobhung kedua. tanean telah dibangun oleh orang tua setelah menerima tanah warisan dari orang tua ibu. Jumlah rumah tangga menunjukkan jumlah keluarga anak perempuan dan tanah yang dimiliki oleh perempuan tertua dalam rumah tangga tersebut. Karena setiap rumah adalah kerabat, tanean dibiarkan sebagai ruang terbuka untuk penggunaan ekonomi sosial dan pertanian
	B	pintu masuk dapat diakses dari utara dan timur. 3 bangunan rumah dibangun di selatan menghadap ke utara. Toilet dan dapur dibangun di samping rumah, sedangkan kandang sapi dibangun di belakang

		tanean adalah tanah milik keluarga nenek. orang tua memiliki kewajiban untuk membangun rumah untuk putri mereka ketika mereka menikah. Sehingga daerah ini ditinggali oleh keluarga besar dari keluarga ibu saya.

Sample code		Question/Answers
Category: Traditional Ecological knowledge		
Question 4: What knowledge did the elders teach regarding environmental management?		
S01	A	atap rumah adat sunda harus menghadap ke timur-barat dan rumah adat dibangun di atas panggung karena berada di lereng. Sehingga bisa beradaptasi dengan gempa
	B	Rumah harus dibangun berbentuk panggung dan atapnya menghadap timur/barat
	C	"… aturan masyarakat berdasarkan "Pamali" (hukum dosa). Akibatnya, masyarakat tidak banyak mengeksploitasi hutan, tetapi menanam sendiri di lingkungan sekitar tempat tinggalnya, bahkan harus tetap menjaga kelestarian hutan sebagai bagian dari wasiat leluhur…
	D	Membangun rumah di area yang datar di lereng gunung yang dekat dengan sumber mata air
	E	Memilih tempat membangun rumah berdasarkan prinsip lemah-cai yaitu tanah yang subur dan dekat dengan air bersih
S02	A	rumah menghadap ke utara. Dibagian depan rumah ada paniisan yang hanya dimasuki saat ada upacara adat. Di sebelah utara paniisan terdapat Gedung kecil yang merupakan makam leluhur. Dibangun menghadap ke selatan. Antara paniisan dan Gedung kecil di sebelah barat terdapat komplek leuit yang dibangun menghadap utara selatan dengan jalur akses dari timur.
	B	Manusia harus menjaga keseimbangan dengan alam dan hidup bersama alam
	C	Membangun rumah menghadap utara dan berupa rumah panggung
S03	A	kami membuat kolam di area taman rumah untuk menyimpan air jika terjadi kebakaran. Saluran masuk tambak berasal dari kamar mandi, sehingga sumber air tambak berasal dari air limbah. Selain itu panjang tidak boleh

		dipotong, pendek tidak boleh disambung.. intinya tidak boleh mengubah ciptaan Tuhan
	B	“Saat menggunakan sumber daya alam, ada aturan untuk tidak memotong atau menggabungkan sesuatu. Kita harus menggunakannya sebagaimana adanya dan melarang untuk mengubah ciptaan Tuhan. Pola rumah juga jangan ditambah atau dikurangi.”
	C	“Kami memiliki hutan keramat, yang tidak boleh mengambil sumber daya apa pun. Selain itu, ada hutan gunung yang dapat digunakan oleh masyarakat atas izin dari tokoh budaya kita. Jika Anda menebang pohon, itu harus diganti dengan yang baru.”
S04	A	dalam membangun ada prinsip yang Panjang tidak boleh dipotong yang pendek tidak boleh disambung. Maknanya tidak boleh merubah apa yang sudah diciptakan Tuhan.
	B	“Gunung tidak bisa dilebur, lembah (dataran) tidak bisa dihancurkan. Sasaka (tempat suci) tidak dapat diubah
	C	“… aturan masyarakat berdasarkan “Pamali” (hukum dosa). Akibatnya, masyarakat tidak banyak mengeksploitasi hutan, tetapi menanam sendiri di lingkungan sekitar tempat tinggalnya, bahkan harus tetap menjaga kelestarian hutan sebagai bagian dari wasiat leluhur…”
	D	membuat rumah senantiasa pada lahan yang datar dan dibuat kolam di lahan yang cekung.
	E	Sebagai warga masyarakat harus patuh terhadap anjuran ketua adat dan tidak mengambil sumberdaya di hutan adat tanpa ijin agar tidak pamali
	F	Tidak boleh masuk dan mengambil kayu di hutan larangan dan hutan keramat
	G	Bentuk rumah tidak boleh dirubah dan meminta ijin ketua adat jika membutuhkan material dari hutan
	H	Halaman rumah harus bersih sehingga orang lain dapat lewat dengan leluasa
	I	Hutan harus dijaga agar air tetap mengalir
	J	Manusia harus menjaga keseimbangan dengan alam dan hidup bersama alam

S05	A	Gunung tidak boleh dilebur, lebak (dataran) tidak boleh dirusak. Sasaka (tempat keramat) tidak boleh dirubah.
	B	Sesuatu yang sudah lama bisa dipersingkat, dan sesuatu yang pendek tidak bisa diperpanjang. Artinya jangan mengubah apapun.”
	C	Hutan harus dirawat dan dilestarikan agar mata air tetap terjaga
	D	Lebih baik menanam sendiri daripada mengambil kayu dari hutan agar tidak pamali
S06	A	Hutan bukan untuk dirusak. Harus dirawat dan dilestarikan. Upacara hajat sasih setahun 6 kali. Di kampung naga hidup bersama alam.
	B	“Hutan harus dijaga kelestariannya karena kita hidup bersama alam.”
	C	“Kami memiliki hutan keramat, yang tidak boleh mengambil sumber daya apa pun. Selain itu, ada hutan gunung yang dapat digunakan oleh masyarakat atas izin dari tokoh budaya kita. Jika Anda menebang pohon, itu harus diganti dengan yang baru.”
	D	“… aturan masyarakat berdasarkan “Pamali” (hukum dosa). Akibatnya, masyarakat tidak banyak mengeksploitasi hutan, tetapi menanam sendiri di lingkungan sekitar tempat tinggalnya, bahkan harus tetap menjaga kelestarian hutan sebagai bagian dari wasiat leluhur…
	E	“Di Kampung Naga tidak banyak larangan, tidak ada aturan. Larangan cukup dengan 1 kalimat : PAMALI. Ada hutan keramat yang dijaga kelestarian 2 hutan lindung. Manusia hidup dengan alam. Jika ada yang memelihara kebun dan hutan, otomatis yang menyuburkan mata air tidak bisa ditebang. Alam tidak akan menimbulkan bencana kecuali karena keserakahan manusia…”
	F	“Salah satu pesan sesepuh adalah agar air tetap mengalir di desa ini untuk membersihkan segala sesuatu yang buruk seperti racun, kotoran, atau penyakit.
	G	
	H	“Salah satu pesan sesepuh adalah agar air tetap mengalir di desa ini untuk membersihkan segala sesuatu yang buruk seperti racun, kotoran, atau penyakit.
	I	“Kami memiliki hutan keramat, yang tidak boleh mengambil sumber daya apa pun. Selain itu, ada hutan gunung yang dapat digunakan oleh

		masyarakat atas izin dari tokoh budaya kita. Jika Anda menebang pohon, itu harus diganti dengan yang baru.”
	J	
	K	
	L	
	M	
	N	
	O	
M01	A	orang tua berpesan untuk membangun rumah selalu menghadap selatan dan pola tata ruang tanean tidak boleh dirubah. Tanean harus bersih dari rumput/gulma atau yang tumbuh dan tidak menanam di tengah2 tanean.
	B	orang tua saya lah yang membangun tanean ini. Mereka membuka lahan pertanian yang diwariskan ibuku bertahun-tahun yang lalu. Saat ini kawasan ini ditinggali oleh generasi kedua. Mereka adalah keluarga saya dan kerabat istri saya tidak ada saudara kandung. Saya hanya mempertahankan warisan orang tua saya. Beberapa tumbuhan yang ditanam di sekitar tanean berfungsi sebagai pembatas dan penghasil pakan
	C	tanean merupakan tanah pusaka yang dibangun oleh keluarga nenek dan masih dalam bentuk aslinya sejak dibangun. Kini, tanean tersebut ditinggali oleh 3 bersaudara bersama keluarganya Sejak tanean diwariskan secara turun-temurun, tata letak tanean tetap dipertahankan seperti aslinya. Tidak ada petunjuk mengapa tata letak harus seperti itu dan beberapa elemen terkadang tidak berfungsi.
	D	tanean ini dibangun oleh keluarga nenek dan sekarang ditinggali oleh keluarga ibu saya. Setidaknya ada 4 generasi di sini keluarganya masing-masing. Beberapa bangunan rumah telah direnovasi dari bentuk aslinya dan sekarang dibangun dengan arsitektur modern daripada tradisional. beberapa perubahan pada elemen material dan layout lebih ditekankan pada fungsinya bagi pemiliknya.
	E	tanean adalah tanah milik keluarga nenek. orang tua memiliki kewajiban untuk membangun rumah untuk putri mereka ketika mereka menikah.

		Sehingga daerah ini ditinggali oleh keluarga besar dari keluarga ibu saya. Rumah tinggal telah direnovasi menjadi arsitektur modern dari yang asli dan tradisional. Umumnya, area tanean harus polos dan bersih dari apapun kecuali bangunan. Namun tanah tanean ini memiliki kemiringan. Sehingga, terdapat tangga di beberapa area untuk mengatur kemiringan.
M02	A	Halaman harus bersih dari rumput dan gulma
	B	pesan leluhur : membangun rumah menghadap selatan/utara. Menjaga lingkungan agar tetap bersih
M03	A	daerah tanean merupakan warisan dari keluarga nenek buyut. Karena setiap orang tua memiliki kewajiban untuk membangun rumah untuk putrinya ketika mereka menikah, area tanean dipenuhi oleh banyak bangunan rumah yang ditinggali oleh keluarga nenek, termasuk saya sebagai cucu mereka.
	B	daerah tanean merupakan warisan dari keluarga nenek buyut untuk saudara nenek. Karena setiap orang tua memiliki kewajiban untuk membangun rumah untuk putrinya ketika mereka menikah, area tanean diisi oleh banyak bangunan rumah yang ditinggali oleh keluarga saudara kandung nenek. bangunan rumah yang ditinggali para sesepuh masih dalam bentuk aslinya. Namun, bangunan rumah baru yang ditinggali oleh generasi terakhir sebagian besar dibangun dengan arsitektur modern
M04	A	kawasan tanean sudah dibangun sejak nenek moyang. Dia mewarisi situs dari orang tuanya dan membesarkan keluarganya di sini. Termasuk saya, hampir 4 generasi tinggal di sini sekarang Area kandang ayam telah dibatasi dengan pagar bambu untuk menghindari unggas berkeliaran di sekitar rumah ya, Tanaman ditanam di antara rumah untuk tujuan pengobatan, konsumsi dan estetika, untuk peneduh dan penyejuk suhu udara area belakang dan pucuk rumah ditanami tanaman herbal untuk jamu/obat
	B	Tanean tidak boleh dijual atau diubah namun diwariskan pada anak-cucu
M05	A	Tanah warisan jangan dijual karena untuk penghidupan. Membangun rumah harus menghadap selatan atau utara. Urutan ahli waris mulai dari rumah barat ke timur

	B	daerah tanean merupakan warisan dari keluarga nenek buyut. Karena setiap orang tua memiliki kewajiban untuk membangun rumah untuk putrinya ketika mereka menikah, area tanean dipenuhi oleh banyak bangunan rumah yang ditinggali oleh keluarga nenek, termasuk saya sebagai cucu mereka.
M06	A	tanean ini dibangun oleh keluarga nenek dan sekarang ditinggali oleh keluarga ibu saya. Setidaknya ada 4 generasi di sini keluarganya masing-masing. Beberapa bangunan rumah telah direnovasi dari bentuk aslinya dan sekarang dibangun dengan arsitektur modern daripada tradisional. beberapa perubahan pada elemen material dan layout lebih ditekankan pada fungsinya bagi pemiliknya.
	B	Tanah warisan jangan dijual karena untuk penghidupan. Membangun rumah harus menghadap selatan atau utara. Urutan ahli waris mulai dari rumah barat ke timur

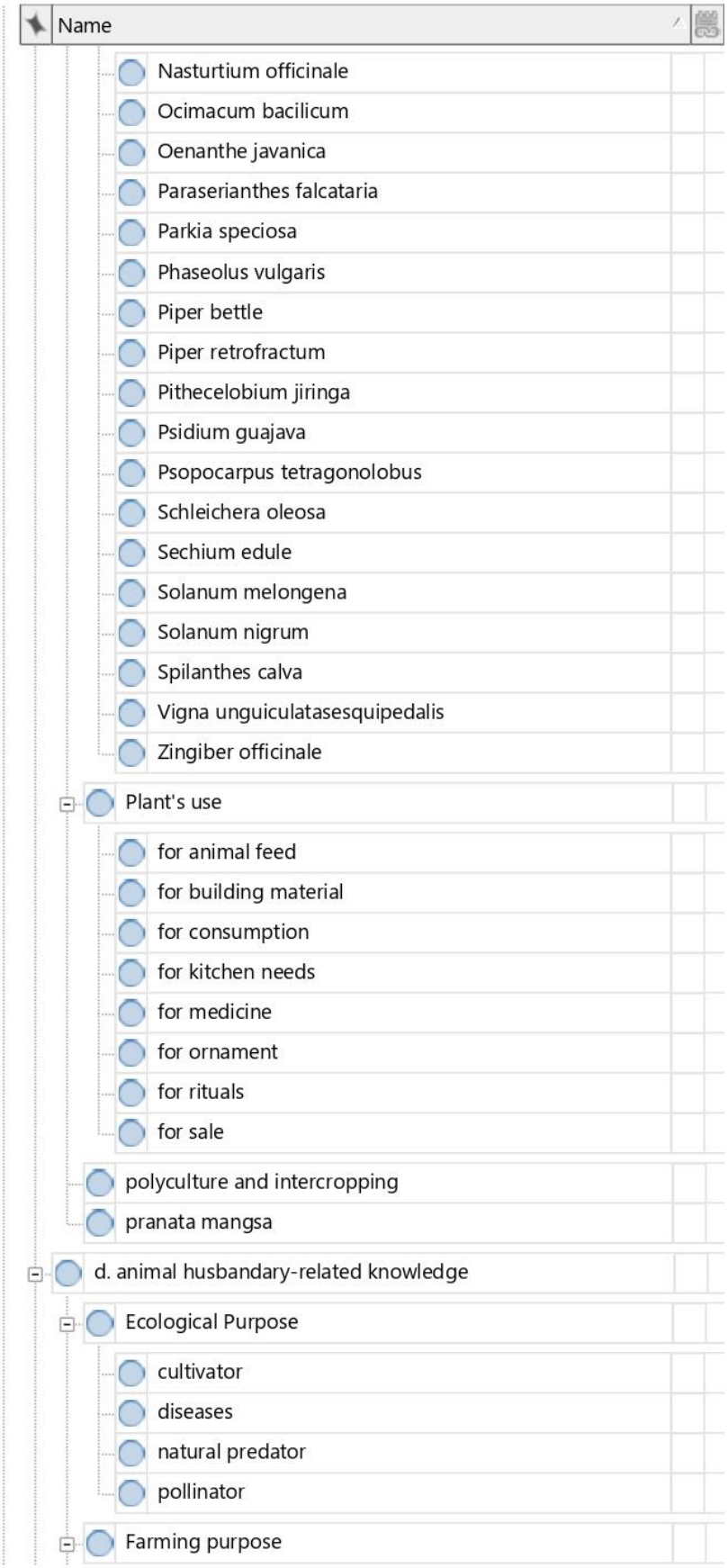
Appendix 3. Node List

Nodes

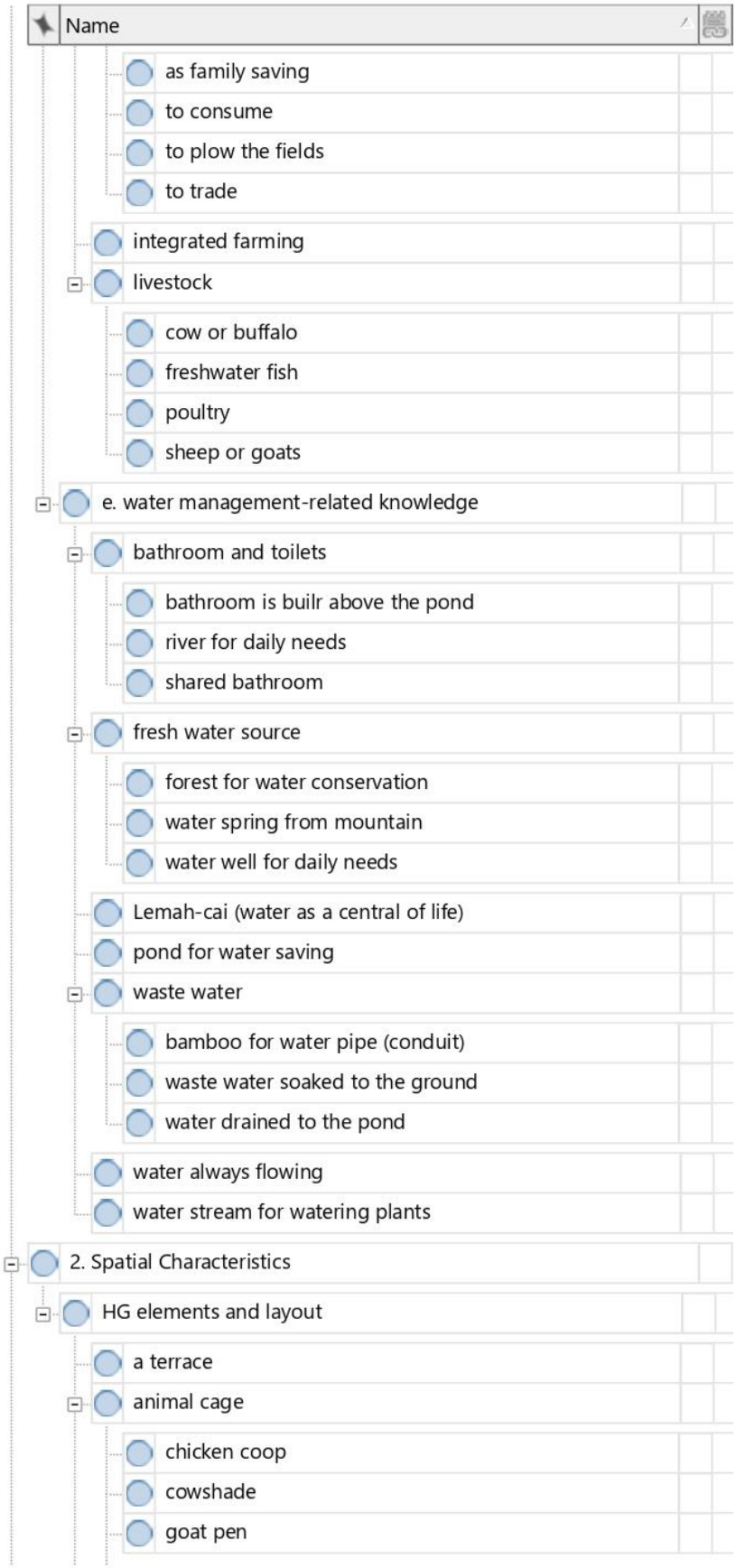
Nodes


Name
as border plants
as hedgerows
the ease in planting and harvest
plants species
acalypha siamensis
Albizia chinensis
allocasia macorhiza
Amomum lappaceum
Anacardium officinale
Annona squamosa
Arenga pinnata
Brassica oleraceae
Caladium bicolor
capsicum annum
Carica papaya L.
Cocos nucifera
coleus scutellarioides
Cordyline fructicosa
Cucumis sativus
Curcuma longa
Curcuma Zanthorriza
Erechites valerinanifolia
etlingera solaris
Gardenia jasminoides
Gigantochloa apus
Glochiodon borneense
Hibiscus rosa-sinensis
Impatiens balsamina
Imperata cylindrica
Ipomea batatas
Lannea coromandelica
Mangifera indica
Manglietia glauca
Manihot utillisima
Morinda citrifolia
moringa oleifera
Musa paradisiaca L.

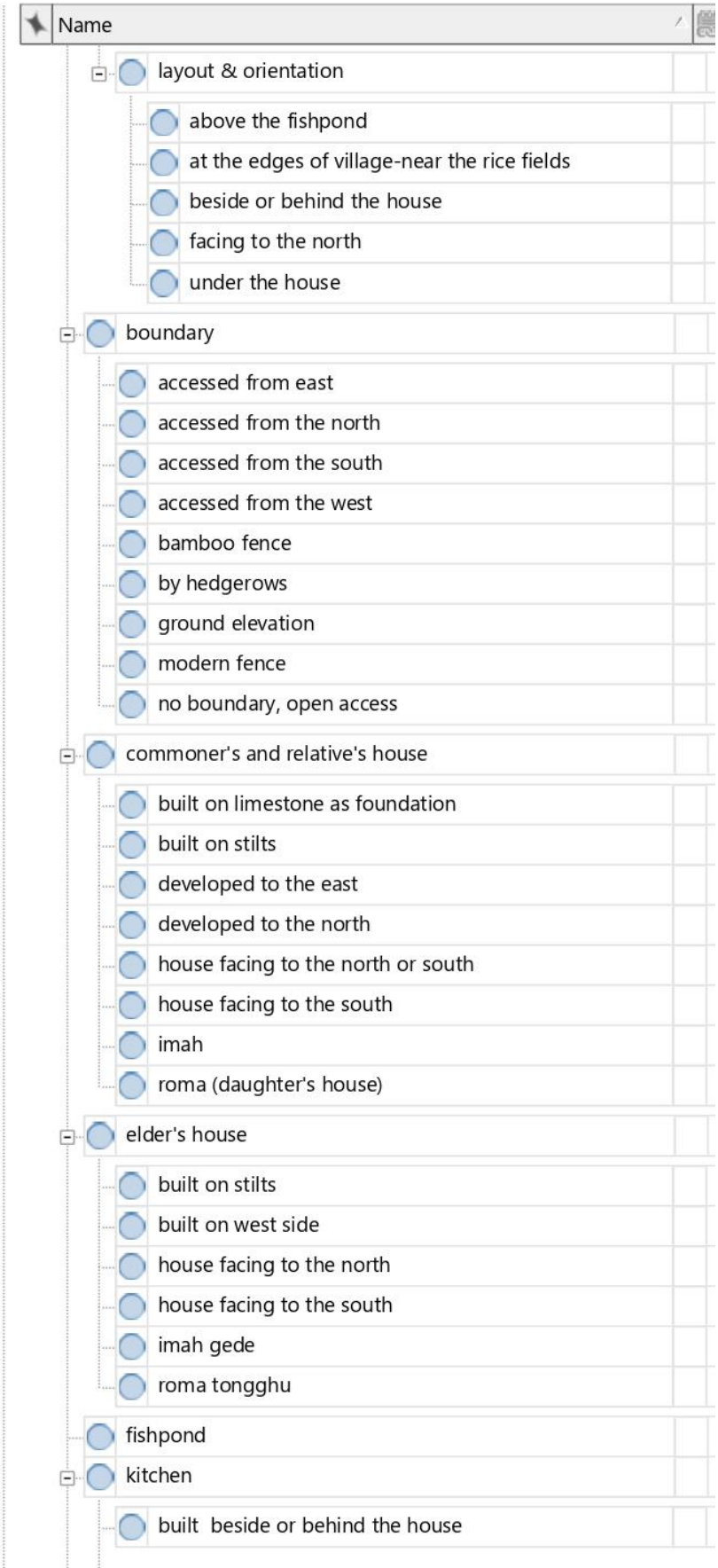
Nodes


Name
Nasturtium officinale
Ocimacum bacilicum
Oenanthe javanica
Paraserianthes falcataria
Parkia speciosa
Phaseolus vulgaris
Piper bettle
Piper retrofractum
Pithecelobium jiringa
Psidium guajava
Psopocarpus tetragonolobus
Schleichera oleosa
Sechium edule
Solanum melongena
Solanum nigrum
Spilanthes calva
Vigna unguiculatasesquipedalis
Zingiber officinale
Plant's use
for animal feed
for building material
for consumption
for kitchen needs
for medicine
for ornament
for rituals
for sale
polyculture and intercropping
pranata mangsa
d. animal husbandary-related knowledge
Ecological Purpose
cultivator
diseases
natural predator
pollinator
Farming purpose

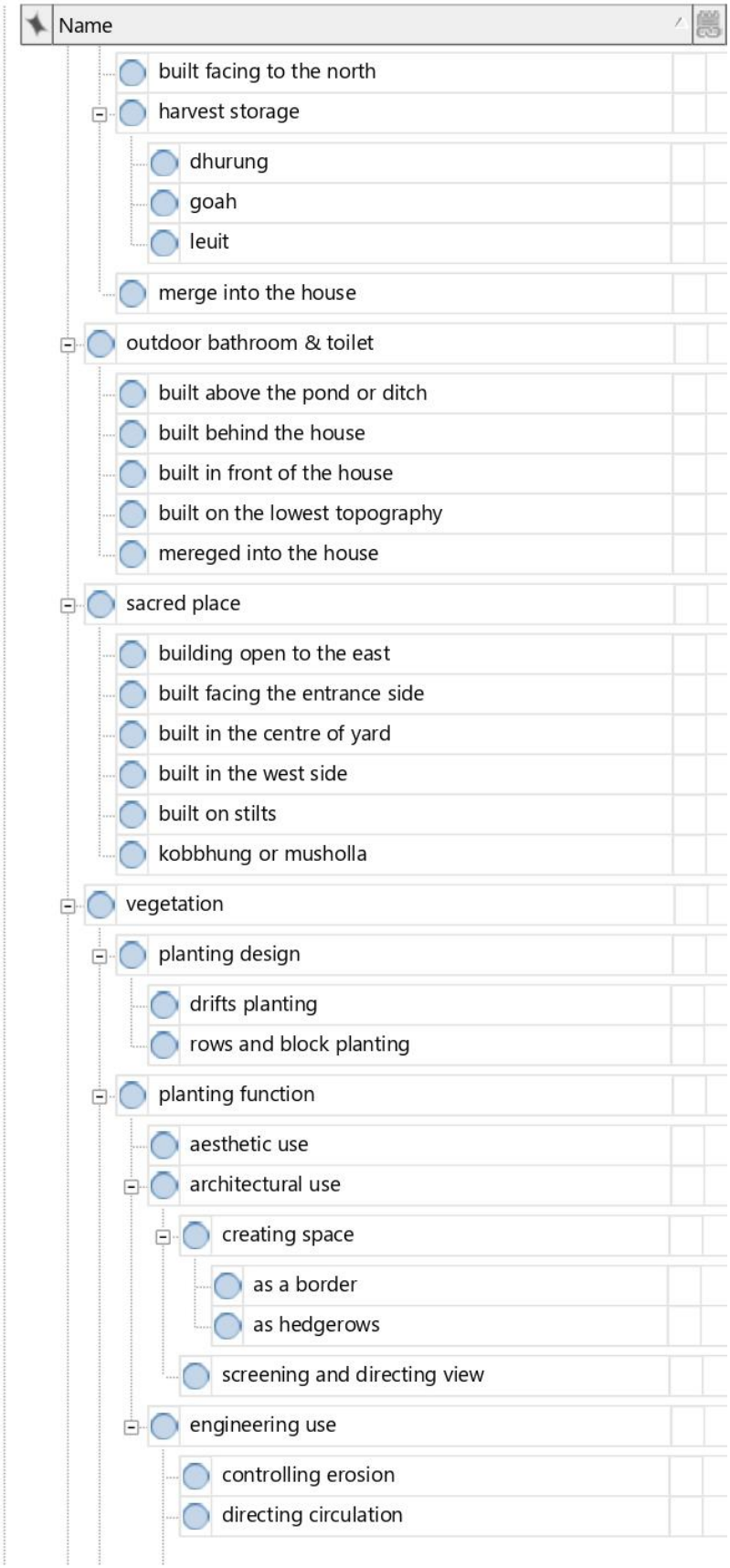
Nodes


Name
as family saving
to consume
to plow the fields
to trade
integrated farming
livestock
cow or buffalo
freshwater fish
poultry
sheep or goats
e. water management-related knowledge
bathroom and toilets
bathroom is builr above the pond
river for daily needs
shared bathroom
fresh water source
forest for water conservation
water spring from mountain
water well for daily needs
Lemah-cai (water as a central of life)
pond for water saving
waste water
bamboo for water pipe (conduit)
waste water soaked to the ground
water drained to the pond
water always flowing
water stream for watering plants
2. Spatial Characteristics
HG elements and layout
a terrace
animal cage
chicken coop
cowshade
goat pen

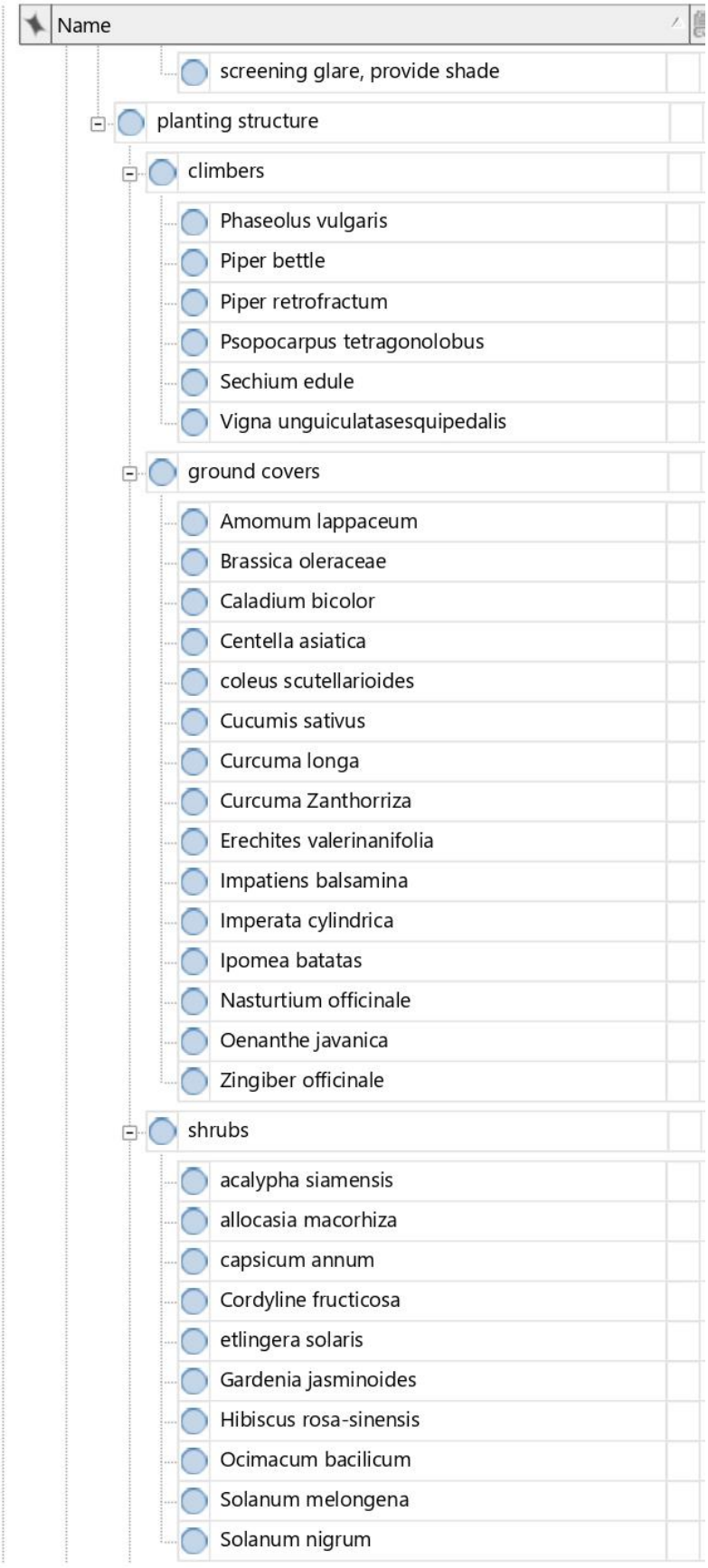
Nodes


Name
layout & orientation
above the fishpond
at the edges of village-near the rice fields
beside or behind the house
facing to the north
under the house
boundary
accessed from east
accessed from the north
accessed from the south
accessed from the west
bamboo fence
by hedgerows
ground elevation
modern fence
no boundary, open access
commoner's and relative's house
built on limestone as foundation
built on stilts
developed to the east
developed to the north
house facing to the north or south
house facing to the south
imah
roma (daughter's house)
elder's house
built on stilts
built on west side
house facing to the north
house facing to the south
imah gede
roma tongghu
fishpond
kitchen
built beside or behind the house

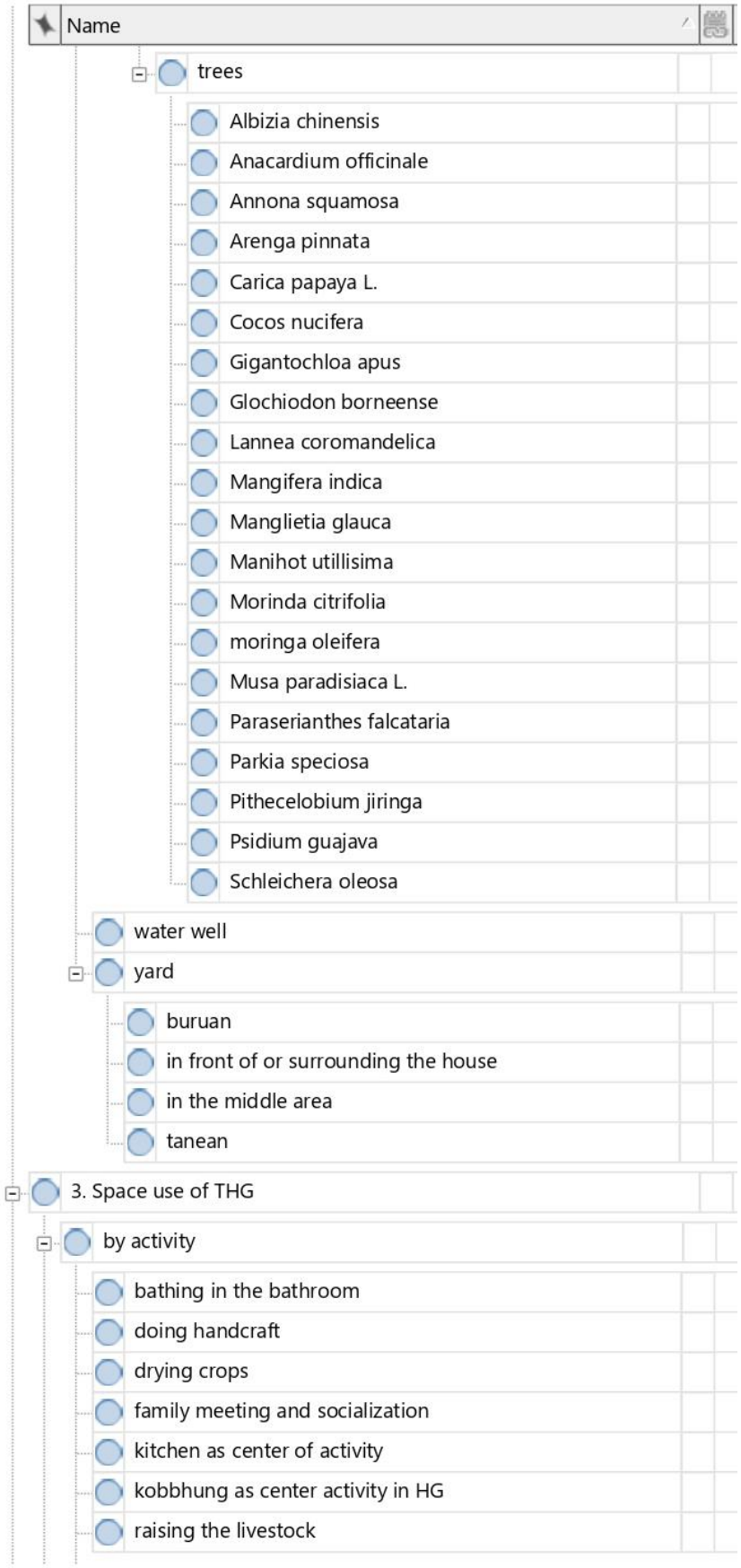
Nodes


Name
built facing to the north
harvest storage
dhurung
goah
leuit
merge into the house
outdoor bathroom & toilet
built above the pond or ditch
built behind the house
built in front of the house
built on the lowest topography
mereged into the house
sacred place
building open to the east
built facing the entrance side
built in the centre of yard
built in the west side
built on stilts
kobbhung or musholla
vegetation
planting design
drifts planting
rows and block planting
planting function
aesthetic use
architectural use
creating space
as a border
as hedgerows
screening and directing view
engineering use
controlling erosion
directing circulation

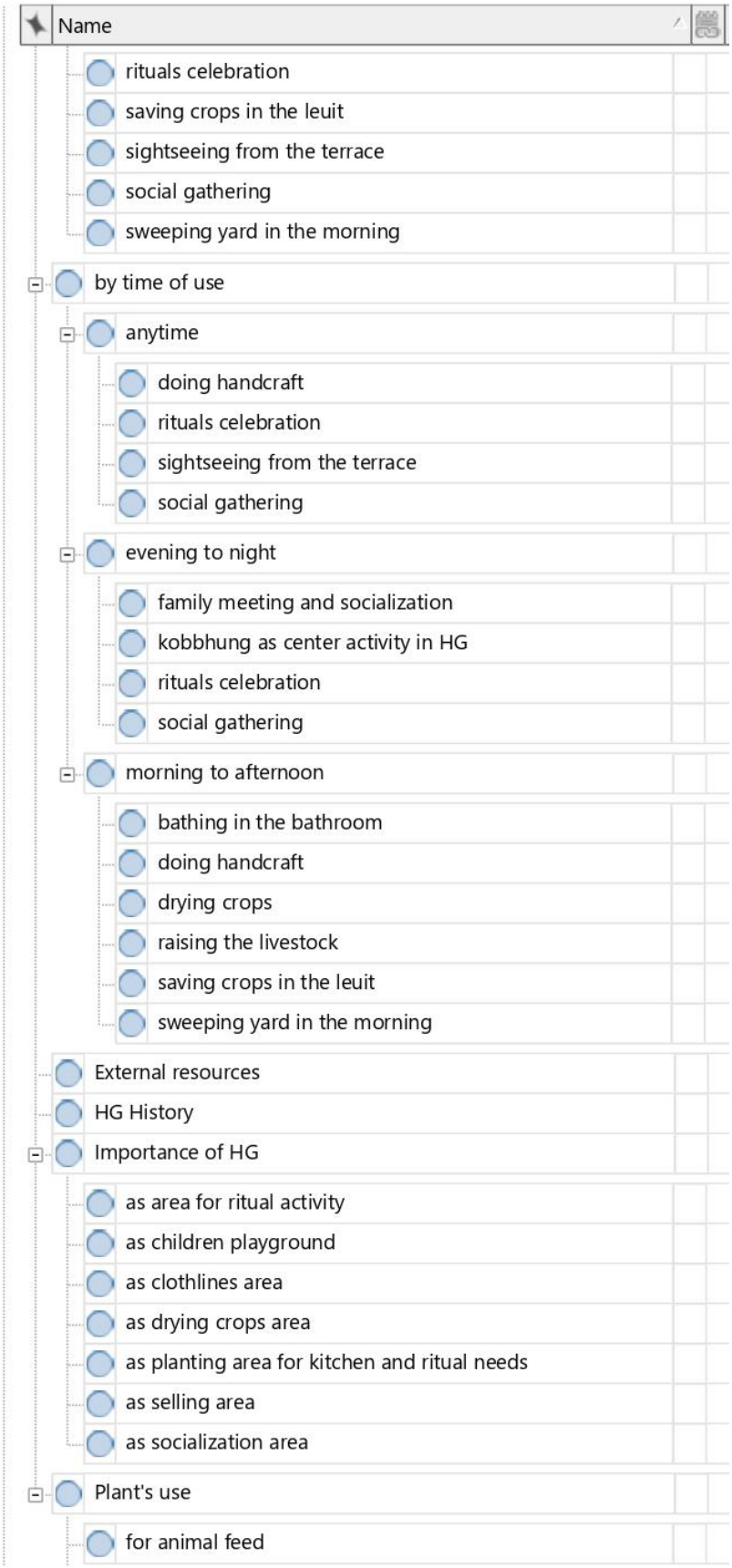
Nodes


Name
screening glare, provide shade
planting structure
climbers
Phaseolus vulgaris
Piper bettle
Piper retrofractum
Psopocarpus tetragonolobus
Sechium edule
Vigna unguiculatasesquipedalis
ground covers
Amomum lappaceum
Brassica oleraceae
Caladium bicolor
Centella asiatica
coleus scutellarioides
Cucumis sativus
Curcuma longa
Curcuma Zanthorriza
Erechites valerinanifolia
Impatiens balsamina
Imperata cylindrica
Ipomea batatas
Nasturtium officinale
Oenanthe javanica
Zingiber officinale
shrubs
acalypha siamensis
allocasia macorhiza
capsicum annum
Cordyline fructicosa
etlingera solaris
Gardenia jasminoides
Hibiscus rosa-sinensis
Ocimacum bacilicum
Solanum melongena
Solanum nigrum

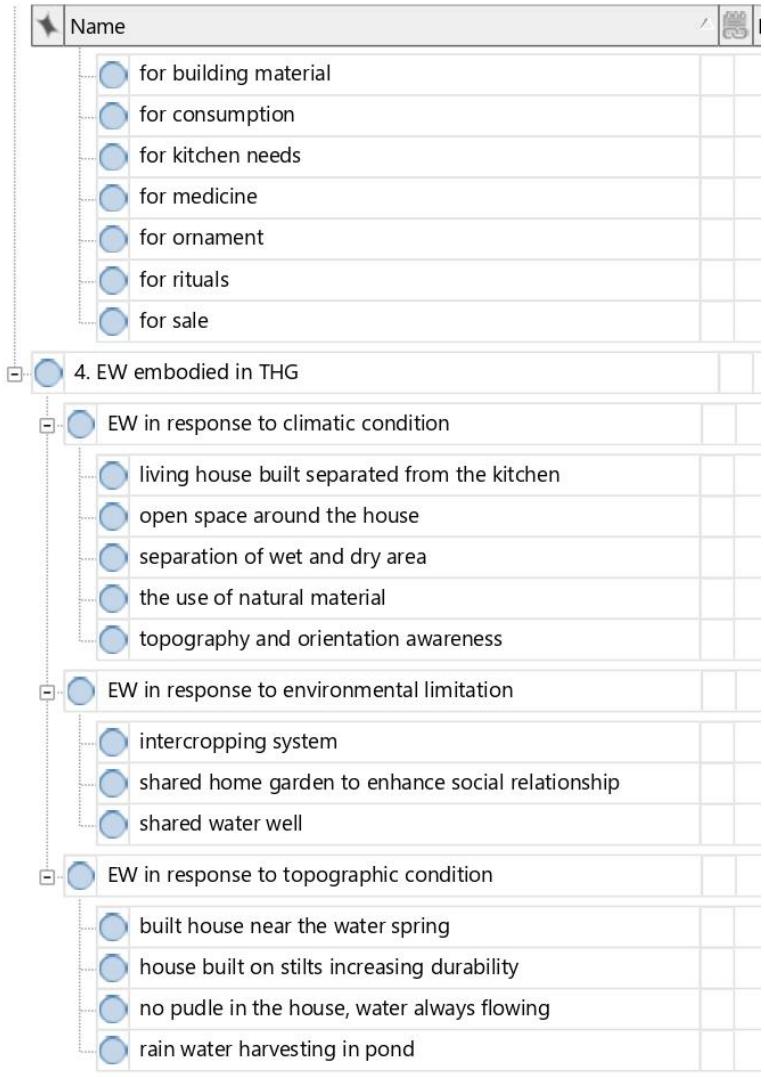
Nodes


Name
trees
Albizia chinensis
Anacardium officinale
Annona squamosa
Arenga pinnata
Carica papaya L.
Cocos nucifera
Gigantochloa apus
Glochiodon borneense
Lannea coromandelica
Mangifera indica
Manglietia glauca
Manihot utillisima
Morinda citrifolia
moringa oleifera
Musa paradisiaca L.
Paraserianthes falcataria
Parkia speciosa
Pithecelobium jiringa
Psidium guajava
Schleichera oleosa
water well
yard
buruan
in front of or surrounding the house
in the middle area
tanean
3. Space use of THG
by activity
bathing in the bathroom
doing handcraft
drying crops
family meeting and socialization
kitchen as center of activity
kobbhung as center activity in HG
raising the livestock

Nodes


Name
rituals celebration
saving crops in the leuit
sightseeing from the terrace
social gathering
sweeping yard in the morning
by time of use
anytime
doing handcraft
rituals celebration
sightseeing from the terrace
social gathering
evening to night
family meeting and socialization
kobbhung as center activity in HG
rituals celebration
social gathering
morning to afternoon
bathing in the bathroom
doing handcraft
drying crops
raising the livestock
saving crops in the leuit
sweeping yard in the morning
External resources
HG History
Importance of HG
as area for ritual activity
as children playground
as clothlines area
as drying crops area
as planting area for kitchen and ritual needs
as selling area
as socialization area
Plant's use
for animal feed

Nodes


Name
for building material
for consumption
for kitchen needs
for medicine
for ornament
for rituals
for sale
4. EW embodied in THG
EW in response to climatic condition
living house built separated from the kitchen
open space around the house
separation of wet and dry area
the use of natural material
topography and orientation awareness
EW in response to environmental limitation
intercropping system
shared home garden to enhance social relationship
shared water well
EW in response to topographic condition
built house near the water spring
house built on stilts increasing durability
no pudle in the house, water always flowing
rain water harvesting in pond

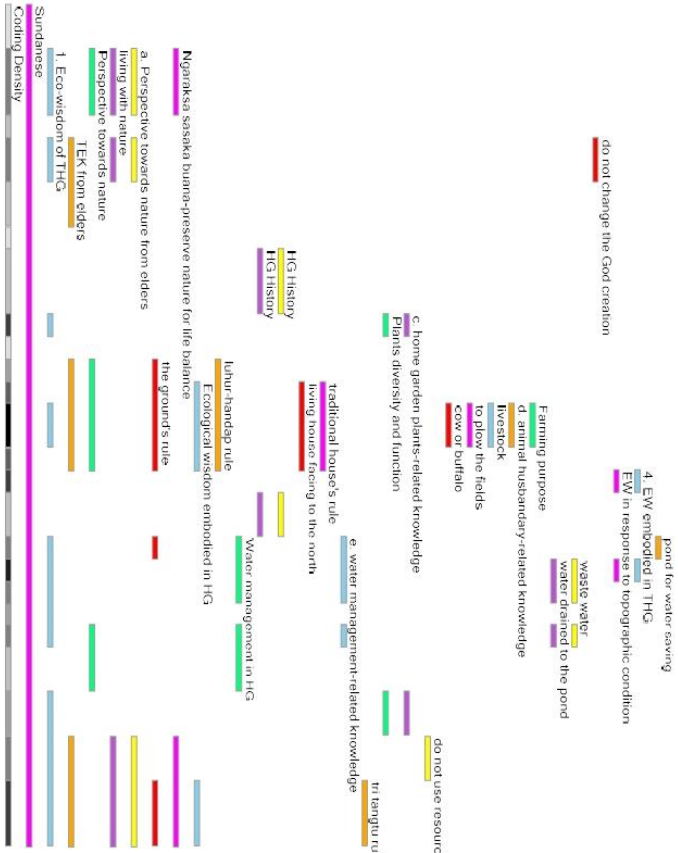
Appendix 4. Coding strip of Interview Transcript (sample)

Transcript Abah Ilin (S03B)

Cara menebang pohon pisang di gunung tilu (hutan adat) tetap meninggalkan tunas sehingga hutan tetap rimbun. Area cikondang dibawah kaki gunung tilu. Dipaling bawah ada area pertanian bawang. Lahan miring ditanami bamboo agar tidak longsor. Hutan adat tidak boleh diganggu.
Rumah-leuit-tampian-kolam-hutan
Pepatah adat : yang Panjang tidak boleh dipotong yang pendek tidak boleh disambung. Pola rumah tidak boleh dikurangi maupun ditambah. Lesung di luar pagar dekat sawah
Padi ditumbuk dg lesung dan dilepaskan dg ani2. Padi local dan padi huma. Serba alami termasuk dari makanan.

History makam leluhur membuka hutan ini uyut dari Cirebon sejak abad 17. Kuncennya sekarang yg ke-9. Rata2 usia kuncen sekitar 100 th. Yg sekarang kelahiran 55. Abah ilin skrg usia 86 kelahiran 1935. Makanan seadanya yang ada di lingkungan sekitar.
Ikan ada padi ada, bawang-bawang dikonsumsi dan dijual.

Pekarangan/Buruan harus ada yang lamping harus diawian, yang datar harus diimahan, nu legok dibalongan.
Dalam membangun rumah di bagian tengah (area datar) mengahdap ke utara (sabilulungan) di bawah ada selokan, sengkedan dan sawah, diatas ada hutan. Mengolah tanah sawah dengan kerbau. Kerbau disimpan di sawah..ada yang mengurus khusus kerbau. Kandangnya dibelakang rumah agak jauh sehingga tidak bau.
Adat tidak akan hilang karena diturunkan kepada generasi selanjutnya.
Rumah Panjang 12 lebar 8
Cikondang kebakaran 1942 saat kemarau Panjang di tahun alif. Tadinya ada 61 rumah adat, tapi terbakar 60 saat itu. Hanya 1 rumah yang tidak terbakar.
Buruan ada kolam, buruan untuk jika ada tamu..ada bangku untuk duduk2.
Air dari kaki gunung Malabar dan air dr gunung tilu. Mengalirkan pakai pipa paralon. Pembuangan ke balong. Pelihara ikan nila. Mas di balong.
Sampah di bakar
Atap dari ijuk aren. Kolam hanya untuk menampung air dr paniisan. Bukan untuk pelihara ikan.
Di cikondang tidak pernah longsor dan banjir karena ketua adat termasuk kelompok pemerhati sumber daya alam dan menginisiasi penghijauan di sekitar cikondang.
Penetahuan tanaman obat didapat dr orang tua. Sehat karena makan-makanan alami dan minum herbal alami.
Hutan larangan tidak boleh mengambil sumberdaya apapun..kalo di gunung tilu masih boleh menebang tapi tidak boleh sampai gundul harus digantikan tanaman baru.
Pagar kendang jaga berbentuk tri tangtu tri buwana. Tatangkalan ma popohonan mahluk cicing, ari sasatuan mahluk nyaring, ari urang mah mahluk eling. Pagar tidak pakai talutuk. Tanaman pagar hanya sebagai penguat



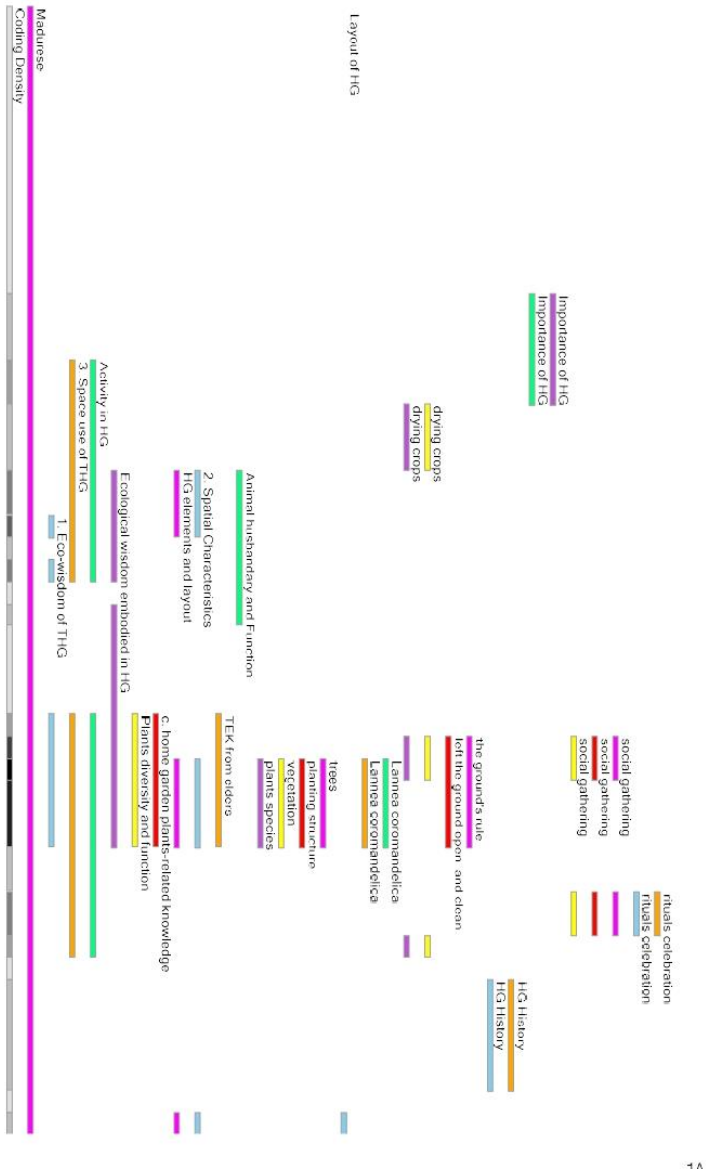
Transkrip Adi Bahri (M01A)

Pekerjaan kepala dusun – perangkat desa
Usia 42
Pendidikan S1
Struktur keluarga
Yang paling tua sekarang nenek, buyut masih ada sampai 20 hari lalu..usia 120 th. Yang tinggal disini ada 5 generasi sampai anak saya.
Saudara ibu dan suadara kakek dr rumah ini ke barat. Timur saudara ibu. Rumah tertua adalah rumah buyut.
Di sebelah barat ada keluarga saudara buyut
Beberapa rumah kosong karena penghuni meninggal dan pindah ke keluarga lain
Sumber pendapatan dari tani

Apakah tanean penting bagi keluarga?
Dulu keluarga tidak mau pisah..area ini ditempati oleh keluarga. Sertifikat kepemilikan atas nama kakek (masih 1 nama) namun sudah diwariskan dan dibagi2 tanahnya namun tidak resmi.
Fungsi tanean agar komunikasi antar keluarga tidak pisah. Fungsi kobhung untuk cangkrukan, ngobrol dan berkumpul antar keluarga
Kalo musim panen digunakan untuk menjemur jagung. Kalo beras tetap beli. Diatas dapur ada tempat penyimpanan jagung dan disamping dapur pasti ada sapi. Tempat untuk Sapi Dibangun menyambung dengan dapur.
Konsep taneyan lanjhang dari rumah, langghar, dapur, kendang berdempetan. Saya juga tidak tahu kenapa.
Apa manfaatnya?
Secara perawatan bisa memantau sapi setiap waktu. Saat ini ada dapur lain yang lbh higienis. Dapur lama tetap dipakai untuk membuat bubur pakan sapi dari jagung, singkong, pisang, dicacah kecil2 untuk penggemukan sapi. Sapi disini adalah sapi penggemukan bukan untuk ternak.
Dibelakang sapi ada tempat kotoran sapi, dikumpulkan dan dibuat bokashi di belakang rumah (kebon). Dibelakang rumah ada sekitar 2 meter.
Batasnya berupa dinding penahan. Tidak ada batas khusus, hanya berupa peninggian tanah sekitar 1 meter kemudian dalam tanean rata ke barat.
Di tempat lain ada juga tanean lanjhang tapi tanahnya tidak rata.
Pemilihan tempat tinggal memang mencari tanah yang rata karena tempat rata enak untuk bangunan. Sebenernya saya juga kurang tahu karena sudah daridulu demikian
Jadi fungsi tanean ini selain jemur jagung dan acara sosialisasi, kamrad, mantenan, tanean memang harus kosong. Yang baru sekarang saya beri tanaman namun aslinya kosong. Yang ada didepan rumah ada panggungan – tempat untuk mengikat sapi yang mau dimandikan. Dulu setiap rumah ada panggungan untuk mengikat sapi. Tp sekarang sudah tidak selalu ada..1 panggungan untuk mengikat 2 sapi. Yang digunakan untuk panggungan adalah kayu jaranan.
Aktivitas yang dilakukan di halaman. Saat seperti sekarang tidak ada aktivitas kecuali ada acara atau saat menjemur kacang tanah, jan=gung, kacang hijau, singkong dicacah.
Acara mingguan ada kamrad bahkan hampir tiap malam berpindah-pindah tanean. Setiap minggu hbs maghrib ada tahlilan di makam di sebelah timur tanean. Ada makam keluarga di dalam tanean.
Menjemur di sepanjang taneyan..masing2 rumah menjemur hasil panennya di tanean depan rumahnya.

History tanenan
Dari buyut yang meninggal sudah ada..hampir 120 tahun yang lalu. Tapi area ini sudah pernah direhab. Dapat tanahnya turun temurun. Entah bagaimana sebelumnya. Rata2 berupa tanah sangkolan (waris). Pesennya ortu tanean ini tidak boleh dijual dan dirobah. Harus tetap seperti ini.
Tanean sering dipakai untuk perayaan, mantenan, dan festival tanean lanjhang tiap tahun.

Layout tanean



11 rumah dalam 1 deret. Beberapa dapur dan rumah yang tidak dipakai sudah dirobohkan.
Sumur di timur.
Pembangunan pertama rumah buyut berkembang ke barat lalu ke timur
Tanean memang tidak ada tanaman selain panggungan di depan rumah ke-7 dan rumah ke-10
Kamar mandi dibangun dibelakang (pakeben)
1 sumur untuk semua.

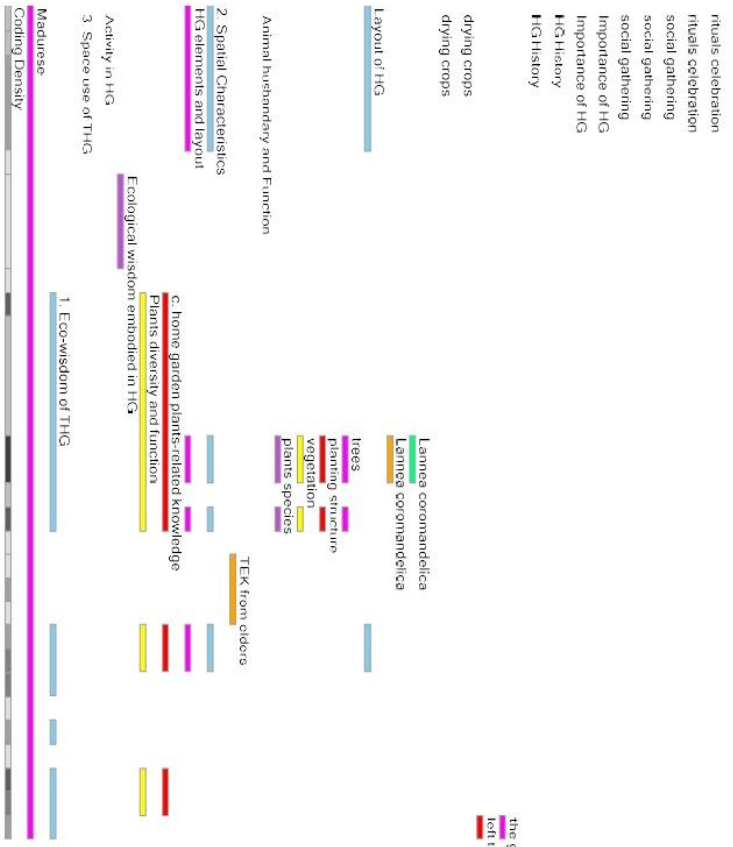
Apakah ada pertimbangan lingkungan.
Rumah selalu menghadap ke selatan. Dapur ke utara. Langghar selalu menghadap timur. Menanam pohon supaya tidak gersang saja.
Ciri khas tanean lanjhnag rumahnya menghadap selatan. Kebiasaan. Ciri khas rumah bangsal pintunya Satu

Pelihara tanaman untuk penyejuk. Menanam bawang dengan polybag di depan rumah. Klo hewan ternak masih dipelihara untuk mata pencaharian. Ketika menanam jagung, daunnya untuk ternak. Dari kotoran ternak dibuat bokashi untuk pupuk
Bibit tanaman dan hewan dari beli di pasar. Jagung pindah dari local ke hibrida.
Perubahan budaya tani harus melalui contoh dari saya sendiri baru klo sudah terlohat hasilnya mengajak petani yang lain.
Cabe jawa dirambatkan ke kayu jaran. Bibitnya dapat dari sumenep dikasih kolega dan diperbanyak sendiri.
Bibit bawang beli. Digunakan sehari2.
Klo orang desa mau makan tidak perlu beli. Jagung sudah ada paling beli beras tapi makannya dicampur jagung atau singkong. Kacang Panjang, kelor, sayuran tidak perlu beli. Lauk dan beras yang perlu beli.

Ilmu dari elders ttg lingkungan.
Klao mau buat rumah harus menghadap ke utara atau selatan. Klo bentuk terserah..sampai sekarang yang muda tidak berani merubah pola tersebut. Sebelum rumah2 disini dibangun diberikan doa2 terlebih dahulu.

Di luar taneyan ini ada kebun dengan berbagai pohon dan tanaman ladang.
Sumber air dari sumur. Air digunakan untuk minum mandi masak. Air dimasak sebelum diminum.
Pembuangan air ke septictank. Dulu BAB ke tegalan.
Air kamar mandi diresapkan ke tanah

Fungsi tanaman supaya tidak panas dan ada hijau-hijau. Untuk masakan sayur. Untuk mengikat sapi dan pakan sapi.
Tanah ditanean dibiarkan sebagai mana adanya.



<Files\\KK interview MADURA> - § 6 references coded [1,30% Coverage]

Reference 1 - 0,18% Coverage

pola tata ruang tanean tidak boleh dirubah.

Reference 2 - 0,19% Coverage

I simply maintened the heritage of my parents

Reference 3 - 0,43% Coverage

Since the tanean has been inherited to generation, the layout of tanean still maintened as its origin

References 4-5 - 0,26% Coverage

the house building that lived by elders still in original form

Reference 6 - 0,23% Coverage

Tanah warisan jangan dijual karena untuk penghidupan.

<Files\\KK interview SUNDA> - § 1 reference coded [1,53% Coverage]

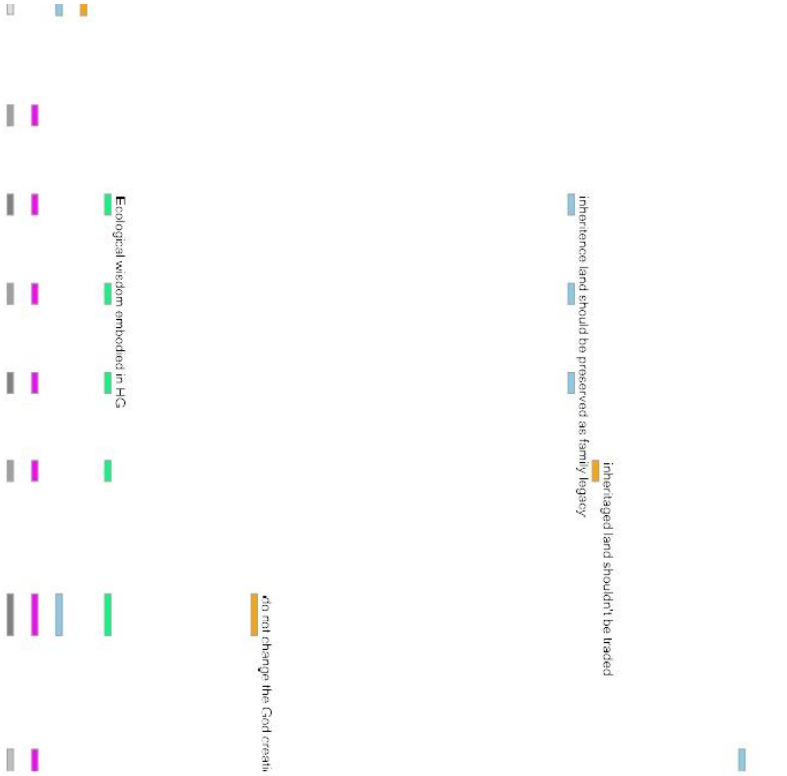
Reference 1 - 1,53% Coverage

Panjang tidak boleh dipotong yang pendek tidak boleh disambung. Maknanya tidak boleh merubah apa yang sudah diciptakan Tuhan.

<Files\\Madura Site> - § 1 reference coded [0,83% Coverage]

Reference 1 - 0,83% Coverage

Madura home garden laid out according to the concept bappa, babbhu, guru, rato which is the



Cara menebang pohon pisang di gunung tilu (hutan adat) tetap meninggalkan tunas sehingga hutan tetap rimbun. Area cikondang dibawah kaki gunung tilu. Dipaling bawah ada area pertanian bawang. Lahan miring ditanami bamboo agar tidak longsor. Hutan adat tidak boleh diganggu.

Reference 2 - 4,67% Coverage

yang Panjang tidak boleh dipotong yang pendek tidak boleh disambung. Pola rumah tidak boleh dikurangi maupun ditambah.

References 3-4 - 6,20% Coverage

Hutan larangan tidak boleh mengambil sumberdaya apapun..kalo di gunung tilu masih boleh menebang tapi tidak boleh sampai gundul harus digantikan tanaman baru.

Reference 5 - 8,31% Coverage

Pagar kendang jaga berbentuk tri tangtu tri buwana. Tatangkalan ma popohonan mahluk cicing, ari sasatuan mahluk nyaring, ari urang mah mahluk eling. Pagar tidak pakai talutuk. Tanaman pagar hanya sebagai penguat

<Files\\Transcript Abah Maki SB> - § 1 reference coded [17,10% Coverage]

Reference 1 - 17,10% Coverage

Layout bangunan diatur berdasarkan falsafah sunda : warugan lemah : tata letak tanah menurut kosmologi sunda
Yang disini baheng aler : (tumpah) memanjang ke utara, rumah dibangun dr timur ke barat menghadap lapangan/alun-alun. Dan memang memilih tanah berundak untuk permukiman karena area paling tinggi untuk ketua adat.

<Files\\Transcript Sahawi> - § 1 reference coded [6,23% Coverage]

Reference 1 - 6,23% Coverage

Tanah warisan klo bisa jangan dijual supaya dapat terus ditanami untuk anak cucu

<Files\\Transkrip abah Anom> - § 1 reference coded [4,94% Coverage]

Reference 1 - 4,94% Coverage

Kalo Panjang tidak boleh dipotong kalo pendek tidak boleh disambung : tidak boleh merubah apa pun.

<Files\\Transkrip Baduy> - § 2 references coded [10,47% Coverage]

References 1-2 - 10,47% Coverage

Gunung tidak boleh dilebur, lebak (dataran) tidak boleh dirusak. Sasaka (tempat keramat) tidak boleh dirubah.

<Files\\Transkrip Pak Luut Suganda Kampung Naga> - § 5 references coded [18,64% Coverage]

References 1-2 - 15,94% Coverage