

# Living with Nature

## Water Stories of Kampung Naga, Indonesia

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### Abstract

Rapid urbanisation and sprawling growth have become constant hindrances to nature in most developing countries. West Java is the most populated province in Indonesia under rapid urbanisation. In this rural area of the province, however, there is a traditional Sundanese hamlet called Kampung Naga that has succeeded in cohesively cohabiting with nature. This article discusses how the interaction of water, ecology, and anthropo-systems influences the spatial layout of the village, forms its cultural landscape, and shapes people's social life. In addition to its sustainability, this article also reflects on the challenges of the possible application of this heritage landscape system in wider contexts. Three lessons can be learned from the water heritage system of Kampung Naga: (1) Understanding how the workings of the natural landscape are critical in determining the living space development; (2) The circular water system and its metabolism could only be maintained by integrating it into its cultural, social, and economical values; (3) Community planning and water circularity create a self-sustained living unit in Kampung Naga. Findings from this study can improve our body of knowledge of potential solutions for future spatial development, where the relationship between human and water could be profoundly re-established.

### Keywords

circular water stories, heritage landscape, Indonesia, Kampung Naga, landscape architecture

### DOI

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## Introduction

As one of crucial resources for life, water has always been a major influencing factor on humans when choosing a place to reside. Along with the development of the civilisation, people have manipulated its watercourse, function and form, to fulfil their essential needs (Hein et al., 2019). People and water are inseparable; their relationship influences the formation of living space and people's social and economic activities, as well as establishing an identity for society for hundreds or thousands of years.

In developing countries such as Indonesia, knowledge about the indigenous water systems are still maintained by some traditional societies, but little of that knowledge has been integrated into present-day spatial design and planning. High rates of population growth, rapid urbanisation, and lack of a comprehensive long-term regional planning results in a sprawling settlement. Missing connections between physical development and the existing surrounding nature accelerates environmental degradation. The spatial relationship between humans and water is often lost.

Water in the city is mostly polluted, closed, and disconnected from people's living space (Burkett, 2020). Knowledge of the heritagewater landscape could provide insightful solutions on how this spatial relationship could be redefined.

Kampung Naga shows a well-maintained habitat, where the community lives not only in nature, but with it. It is a traditional Sundanese hamlet in the rural area of Tasikmalaya in West Java, the most populated province in Indonesia (with 43 million people). Surrounded by hills and gifted with fertile soil, inhabitants of Kampung Naga run a living system based on a profound understanding of how the natural system works. The circular system in Kampung Naga has proved to successfully accommodate a self-sufficient community, still living to this day.



FIGURE 1 Kampung Naga from the main access.

Due to its distinctive traditional lifestyle, many articles have discussed Kampung Naga from diverse perspectives: heritage architectural design and traditional building technology (Sudarwani, 2016;

Khairunnisa, 2014; Utami, 2014; Darmayanti, 2018), Ethnography and Local Wisdom (Qodariah & Armiyati, 2013; Iskandar & Iskandar, 2018; Iryana, 2014; Prawiro, 2015), Agriculture and Environment Studies (As'ari & Hendriawan, 2016; Maria, Indrawati, & Astuti, 1995), and water management system (As'ari et al., 2018; Wahadamaputera, Nauw, Sondaka, Ningrum, & Maulana, 2014). However, studies on how the interaction of water, ecology, and social system shapes its spatial structure are given little attention. This shows that the water, space, and cultural heritage, although they are linked inseparably through complex interrelationships, are still approached as siloed perspectives (Hein et al., 2019). Thus, this article aims to fill this gap of knowledge.

Two main methods were adopted to collect and analyse data for this research. First, profound research on the existing literatures about Kampung Naga in water management, ecology, architecture, as well as culture and local wisdom. Second, field observation and interviews were conducted to get more empirical information on how these categories underlay the sustainable living created by inhabitants. Interviewees have various positions in the village, including the head of local organisation, the customary council, local tour guide, and some other male and female inhabitants to gain comprehensive understanding on the local wisdom, social and economic activities in the village. Both data sources then were processed to comprehend the main values held by the community which shape its heritage landscapes. Spatial drawings are presented to show the relation of water, ecology, and the social and economic circular system in spatial constructions.

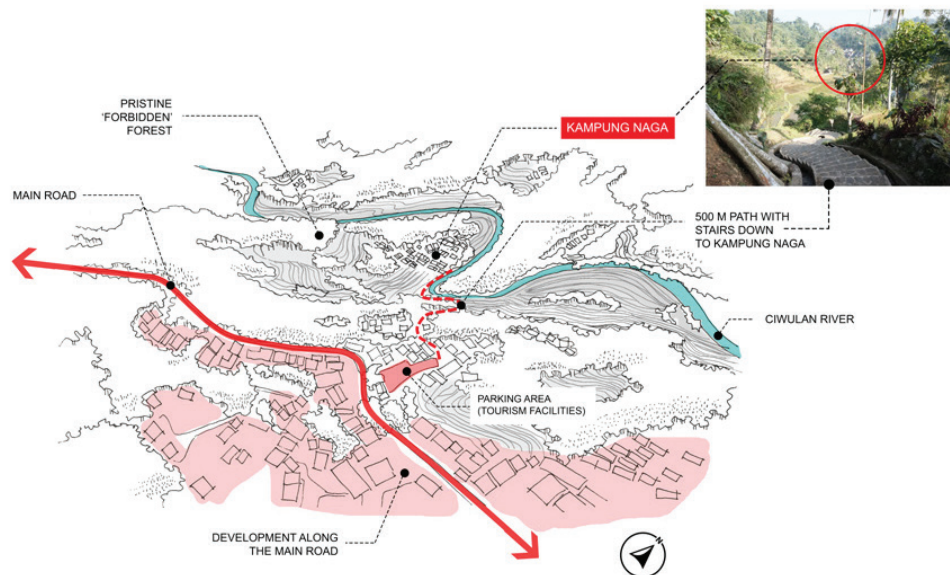


FIGURE 2 Location of Kampung Naga.

## Landscape/ Place/ Order

Kampung Naga has inherited its own traditional way of life without intrusion of new culture or technology, although it is only a half kilometre away from the main road which connects two cities, Garut and Tasikmalaya (Sudarwani, 2016). The hamlet is located on the foot of the hill covered by dense forest on one side, which makes it invisible from the main road. A stone staircase at a 45 degree slope along the valley eventually brings visitors to a mesmerising vernacular settlement underneath the forest (Fig. 2).

## **Spatial strategy of Kampung Naga**

The hamlet is located at the most strategic place in the composition of the existing landscape. A total of 1.5 hectares constitutes the living area of Kampung Naga, which comprises 112 traditional buildings (109 houses and 3 public buildings). It has 101 households with a total population of 297 people (Ucu, personal communication, 2019). The forbidden forest is preserved from any human activities on the hilly western side above the settlement. It absorbs rainwater and maintains the groundwater supply, and soothes strong winds and the westerly sun. The houses are located on a slope facing in an easterly direction, which receives more morning sunlight and makes it an ideal place both for residential and agricultural land (Darmayanti, 2018). According to Sudarwani (2016), water from the forest that has a lower temperature flows down into the settlement area, thus cooling and refreshing the warm air within the village.

Another eye-catching landscape is the oxbow of Ciwulan river, which wraps around Kampung Naga from the northern to the eastern side, covering almost half of its edge. As an agricultural community, Kampung Naga is heavily dependent on the water source of the Ciwulan River. These clear roles of the two landscape elements – forest and river – become natural buffer zones to prevent the expansion of the dwelling zone, while at the same time give a pleasant living environment for the native inhabitants (Fig. 3).

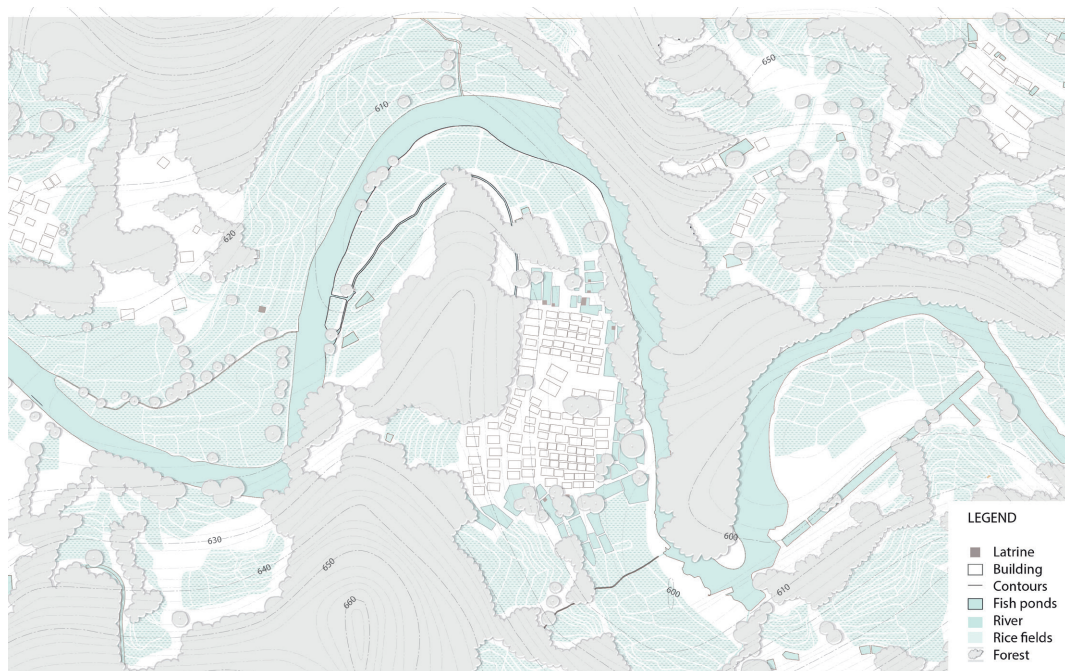


FIGURE 3 Plan of Kampung Naga.

## **Zoning on Topography**

The hilly topography has been a strong influence in defining zones within the village. The village is divided into three zones that correspond to distinctive types of activities, which are integrated with the circular water system as the main support system of the inhabitants' lives. Many literatures describe the zones based on the sanctity of each zone, namely the sacred zone, the clean zone, and the dirty zone (Qodariah & Armiyanti, 2013; As'ari & Hendriawan, 2016; Sudarwani, 2016; Iskandar & Iskandar, 2018). In this paper, we name the zones based on how they relate spatially to the settlement area. The term 'Sacred area', which represents how people perceive the place, is still used to differentiate between the two zones outside the settlement area.

The Sacred area (*Leuweng Karamat*) is located at the highest altitude. It consists of a wildlife forest with strictly restricted accessibility. The roots of the trees play important roles in maintaining the soil structures and purifying the groundwater. Beneath the Sacred area, the Inner area comprises the houses and the main buildings of the village. The lowest part of the village is called the Outer area, positioned between the Inner area and the Ciwulan River. In this zone, all the water-related activities, from utilising to purifying, are carried out before it is discharged back to the river. Bamboo fences are used as the boundary of the settlement area, while simultaneously clearly separating these zones (Fig. 4).

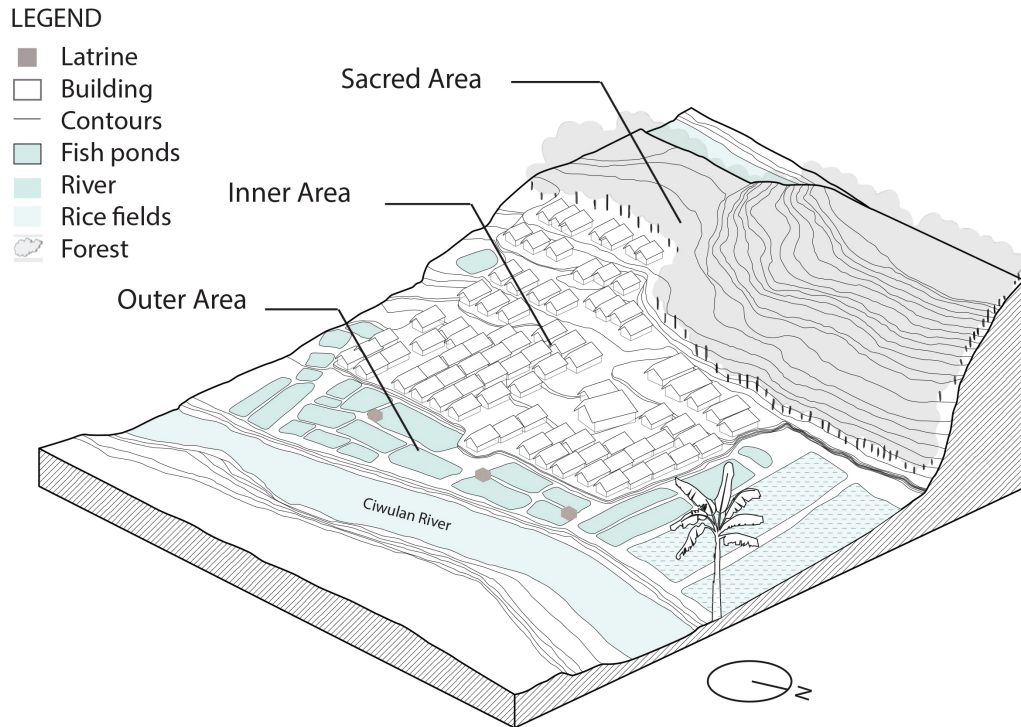


FIGURE 4 Zoning of Kampung Naga.

## Pattern & Space

The neighbourhood in which houses positioned on the foothill creates harmonised linear arrays toward the riverside. When we look closer into the settlement pattern, the houses are arranged in a linear pattern parallel to the contour lines (Fig. 5, left). Sudarwani (2016) mentioned that the house's dimensions are determined based on the specific dimension of the human anatomy and related to the day of birth of the house's occupants. Another factor that determines the length of the house is the width of the flat grounds (approx. 10m) which can be made from the natural topography (Ijad, personal interview, July 11, 2019). The various sizes of the houses do not represent the different social status of the occupants, as they believe all human beings to be fundamentally equal.

Another spatial strategy can be found in the arrangement of the houses, where they form a linear structure in which the houses are facing each other, with the buildings connecting at different ground levels (Fig. 5, middle). This corridor maximises natural ventilation and catches the prevailing breeze, creating a convenient microclimate in the village, especially during the rainy season (Darmayanti, 2018).



**FIGURE 5** Composition of buildings. Left: linear pattern based on same elevation. Middle: linear pattern for wind direction and stormwater management. Right: public buildings located in the middle of the village.

On the other hand, the public square is centralised by location. It is used for any communal activities and social gatherings related to rituals and traditions which maintain the cohesive community atmosphere. The square is located in front of the main buildings, such as the mosque, community hall (*Bale Patemon*), the sacred building (*Bale Ageng*), and the main rice storage (*Leuit*), which form the centre of the village. This spatial composition imposes the importance of social gathering and control within the community.



**FIGURE 6** Centralised and linear space inside the settlement.

## **Endless Flow of Water**

The inhabitants of Kampung Naga believe that there is no such thing as a natural disaster. Rather, they believe that it is human activities that can bring about natural damage, which ultimately results in the losses that befall them. With this belief, water is treated as a major part of their lives. People allow the water space to 'breathe', use it wisely, and purify the wastewater before finally returning it to its original place. Contrasting with the urban water and wastewater infrastructure, which are invisible and inaudible (Burkett, 2020), water can always be seen here, and the sound of its flow can always be heard in almost all parts of the village. Its close connection to their living space affects the inhabitants' consciousness, motivating them to maintain its quality.

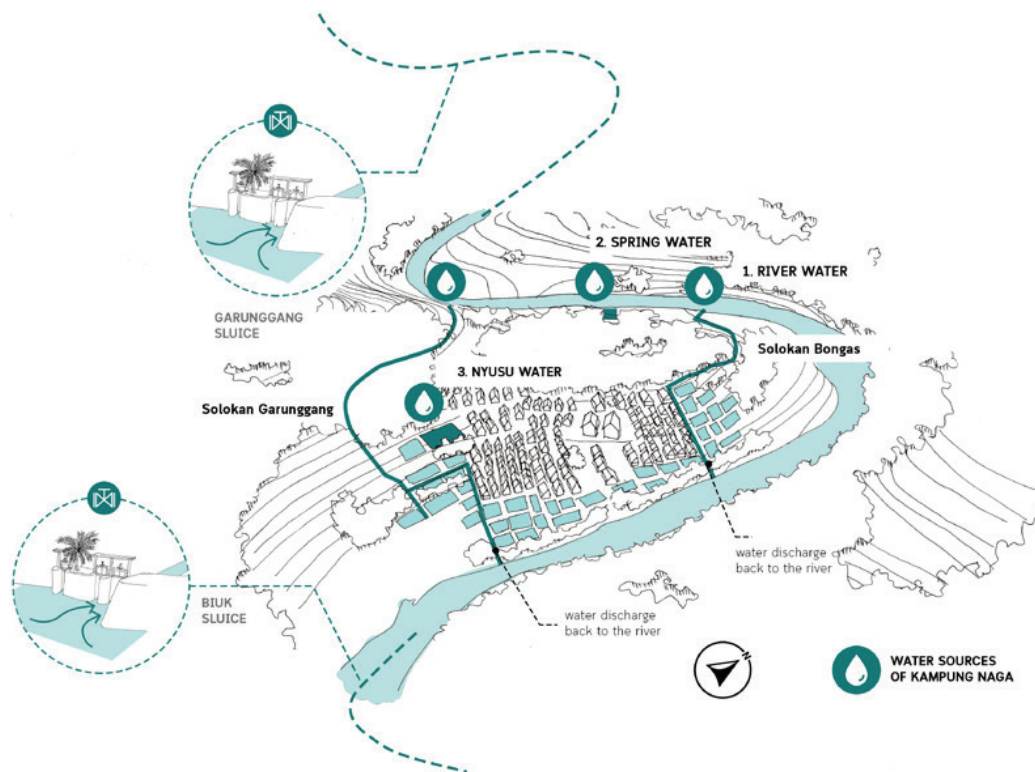


FIGURE 7 Water Sources of Kampung Naga.

### Multiple Sources of Water

The inhabitants of Kampung Naga realise that besides the seasonal influences, human activities from the surrounding environment could affect the water quality. Thus, having more than one water source is crucial. Kampung Naga has three main water sources, the Ciwulan River, and two springs on the hills which people distinguish one to another (Spring Water & Nyusu Water) based on the consistency of its water quantity and quality. These three water sources are used for different functions for the inhabitants' daily lives. Ciwulan River flows upstream to Biuk Forest at Cikuray Mountain and downstream towards the Tasikmalaya regency, where it passes through Kampung Naga on its way. It does not pass through dense urban areas, thus avoiding a large amount of harmful pollutants. It flows constantly all year around, which makes it the main source of water for Kampung Naga. Two main sluices are used to regulate the river.

The Garunggang Sluice is located 3 km up from the village and the Biuk Sluice is located beneath, at the edge of the village area, where riverbank structures were also constructed as a long-term preventative measure against erosion. Water from Ciwulan River flows to the village through two channels, namely Solokan Bongas (Bongas channel) which runs on the northern side and Solokan Garunggang (Garunggang channel) which runs on the southern side (Fig. 7). Water discharge from the river to the village is regulated by using piles of rocks. Through these channels, water is filtered naturally by wild grasses and gravels, and is then distributed towards the agriculture area and water tubs at the latrines (Wahadamaputera et al., 2014) (Fig. 8).

### River Water

River stream is diverted by using piles of rock. It flows towards the main channels in Kampung Naga and be used for irrigation and daily activities.

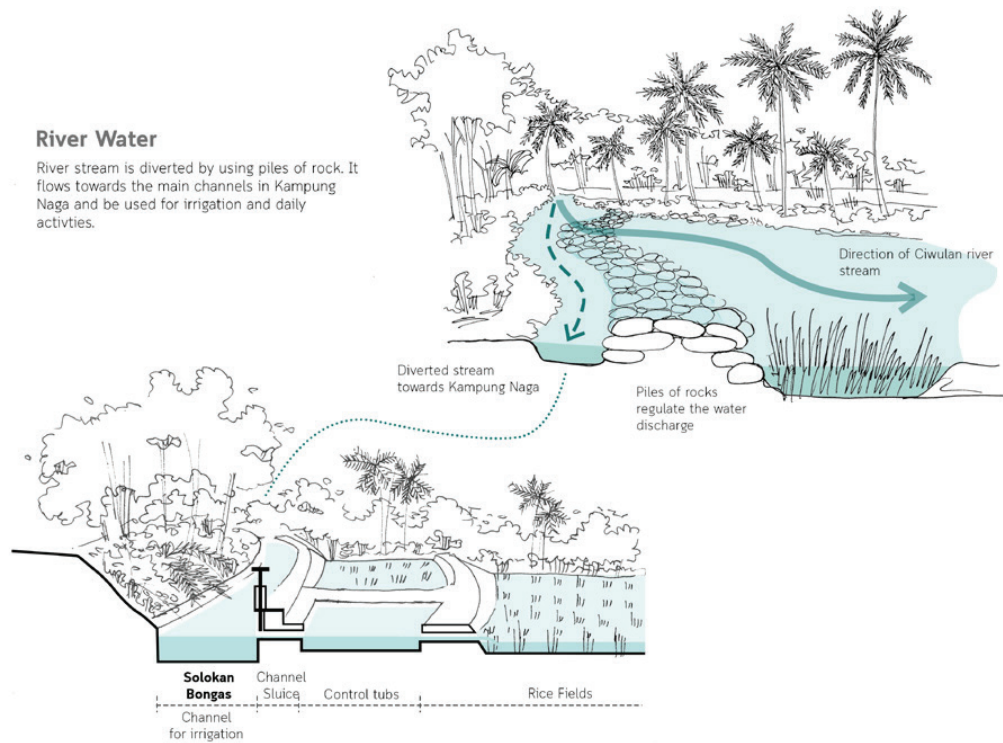


FIGURE 8 Source of Water - River Water.

### Spring Water

Spring water is collected in a cistern and distributed with pipes to the water tanks at the latrines.

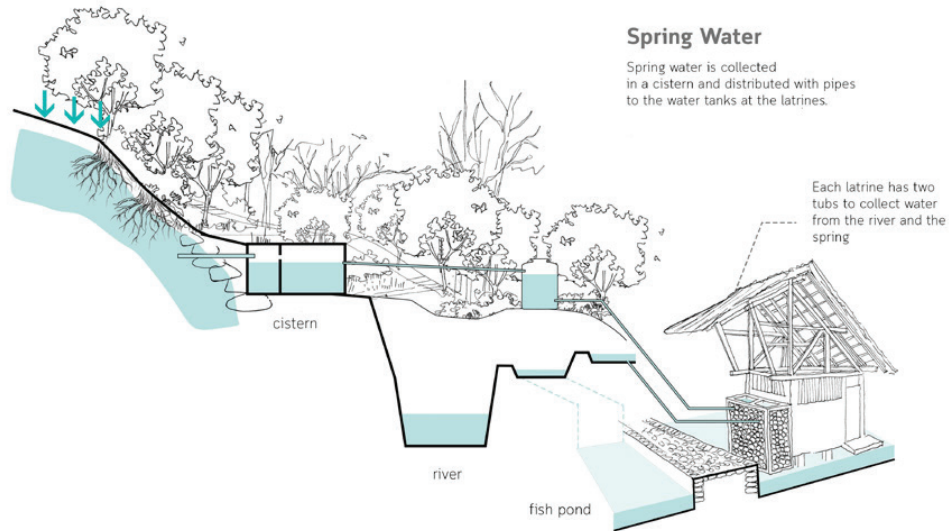


FIGURE 9 Source of Water - Spring Water.

An increase of water discharge during the rainy season influences the water quality of the river. Faster river currents cause mud to rise along the water stream, resulting in a murky river. This muddy water is also exacerbated by the ploughing activities during the rice planting season. During this season, river water is still used for agricultural activities, while water for bathing and washing activities is replaced by the spring water. The spring water is located behind the hill at the back of the village and channelled in two directions, to the mosque located at the centre of the village and to the Outer Area where the latrines are located.



With two kinds of water sources, each latrine has two separated cisterns to maintain the quality of the water (Fig. 9). Closer to the village, another spring (Nyusu Water) is utilised as a source of potable water. Nyusu water always has constant capacity and quality regardless of seasonal change. It is the result of water infiltration through the tree roots of the forbidden forest on the hill bordering the village on the western side. The community made an opening in the walls against the hill to allow the water to flow to the faucets located at a large pond underneath in order to ease the water uptake for daily consumption (Fig. 10).

In the Inner area, water can only be accessed through a station close to the mosque. It is used for cleaning rituals before praying activities, and occasionally used when the community washes their food materials. Almost all water-related activities take place in the Outer area, consisting of the latrines, fish ponds, and washing area, all of which are located at the lowest elevation. A system of ditches, pipes, and control tubs are used to distribute the water following its natural topography.

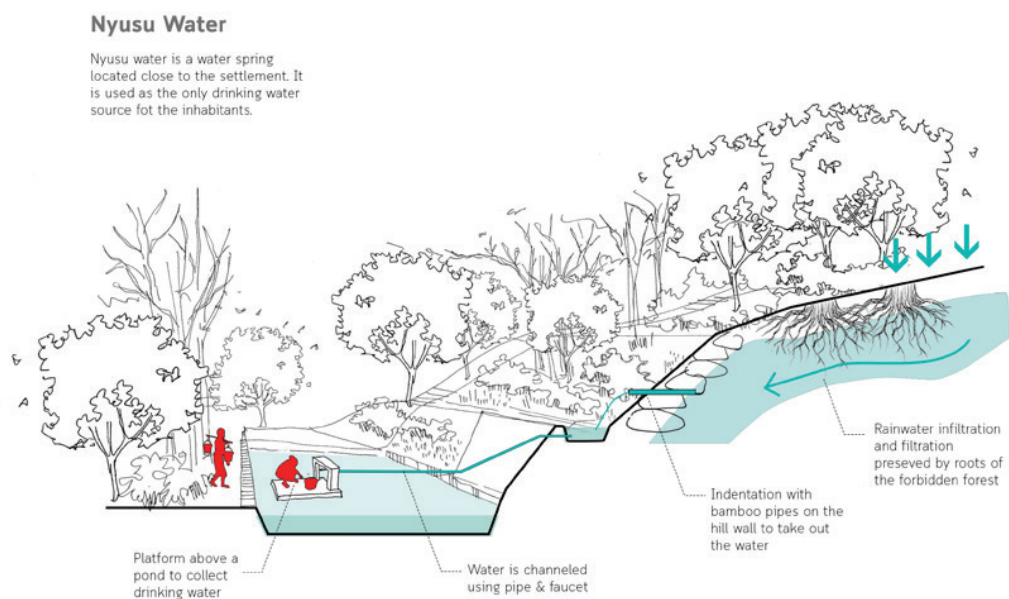


FIGURE 10 Source of Water - Spring Water (Nyusu Water).

At the agricultural area, each plot of the rice fields is bordered with small embankments and ordered as a terracing system following its natural contours. The water is distributed by gravitational force from the top to the lowest plot of the rice fields (Fig.11). While all privately-owned fields are connected to each other, there is no formal organisation applied in the management of water for irrigation. Hence, the inhabitants apply designated rules about the maximum pipe size to irrigate the rice field only to share the water resource equally by maintaining their customs. A manual system to open and close the bamboo-made water conduits, allowing control of water to flow to each parcel even with diverse planting times.

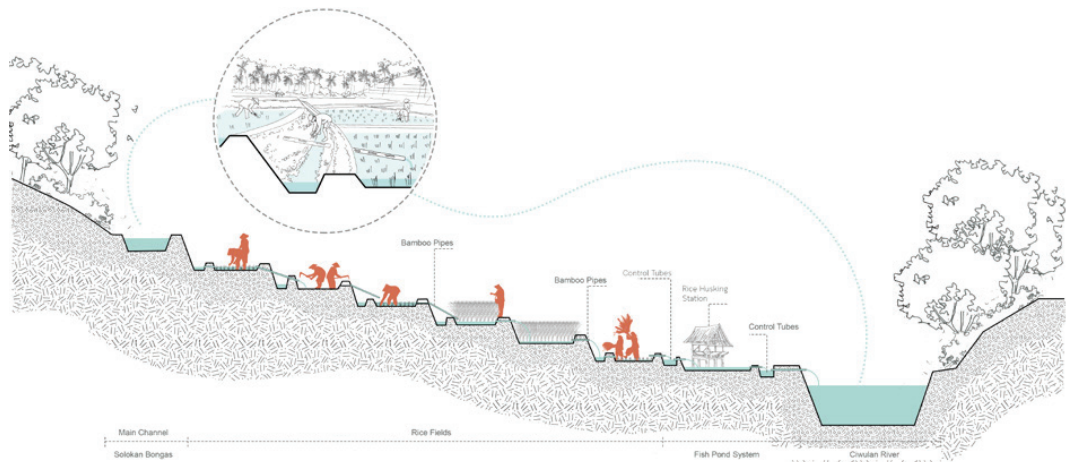


FIGURE 11 Water System in the Terraced Rice Fields.

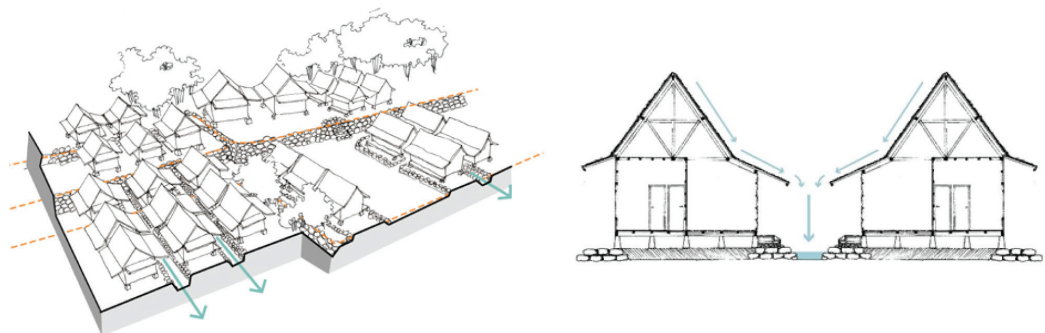


FIGURE 12 Left: Linear pattern of the houses forming storm water drainage system. Right: Stone podium of the two houses create space to collect and to drain the stormwater. Original image by NanneKnijff (redrawn).

## Stormwater and Wastewater Management

Rainwater is well infiltrated in Kampung Naga by maintaining minimum use of pavements inside the village. Only the main access pavement is made of stone, while the other access routes between the houses and the open spaces are made of compacted soils. The stone structures, which have no adhesive materials, are also used as retaining walls which are aligned with the hilly topography. This allows water to penetrate through the thin gaps between the stones. Houses are organised in rows to form corridors where the tips of the roofs meet on lines (Fig. 12 - Left).

Within this arrangement, rainwater is collected in the ordered gravel ditch lanes. To anticipate long standing water when rainwater discharge increases, rows of gutters traverse the contours from the higher to the lower area to the main drainage system that connects to the river. In support of this solution, each house is designed to stand above a stone podium which also functions as the border of the gutter (Fig. 12 - Right). Moreover, the system that reduces the formation of standing water controls the growth of mosquitoes.

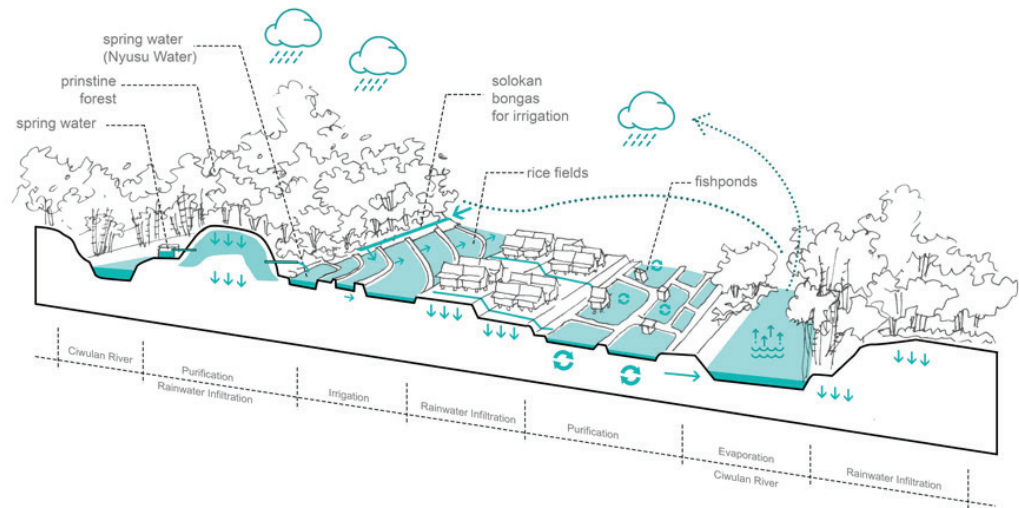


FIGURE 13 Water Circularity in Kampung Naga.

The management of household wastewater has been regulated, starting from the utilisation of the topographical zoning system (Fig. 13). Located at the lowest zone, the wastewater from the public bathrooms will not contaminate the living space. Wastewater flows directly from the latrine to the fishponds underneath. These fishponds have multiple functions: they are a place to raise fish as one of the food resources for the community, while at the same time naturally filtering the water from human waste. Purified water flows through a drainage system with control tubs between the fishponds towards the river.

Compacted clay was originally used to construct the pond walls. It was formed using bamboo slats as shuttering until the clay structures are dry enough to be stable. The main gutter, pond walls, and control tubs are currently stone and concrete structures. The centralised position for the public interest is also applied in the fishpond system. The largest pond, located in the centre, is owned by the village, and is used for raising fish which can only be harvested for public consumption during special events, while the surrounding fishponds are mostly owned privately by the inhabitants.

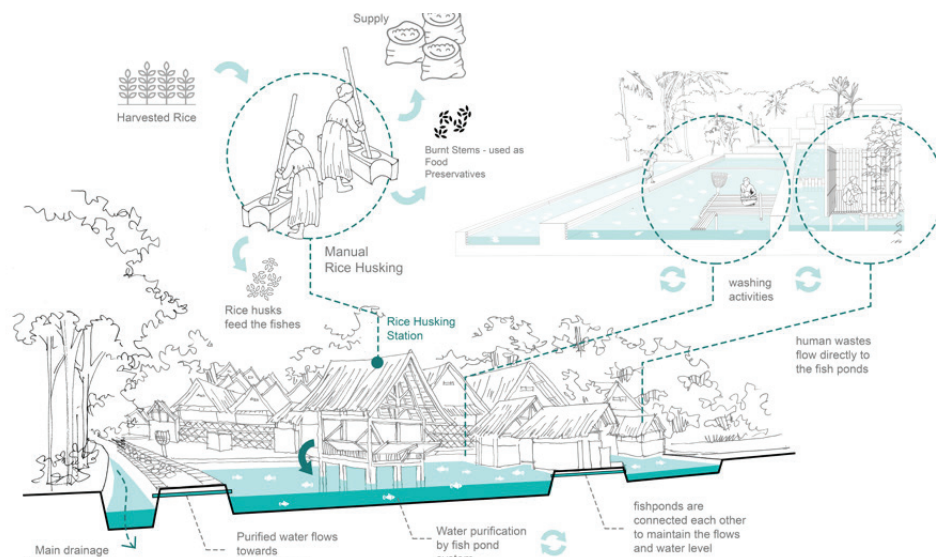


FIGURE 14 Ecological Circularity in Kampung Naga.

## Ecological Circularity: No Wasted Resources

Kampung Naga successfully maintains the cycles of their multiple natural resources. These efforts are reflected in the spaces that have been created as a part of their environment, for example, the optimal use of rice crops. Rice husking stations are built above the fishponds. In these stations, rice is manually pounded to separate the grain from the outer husk. The husks are thrown into the pond to feed the fish, which eventually become a source of food for the community. In addition, the stems are collected and burned to be used as natural shampoo, cure some skin diseases, and are also used as a natural preservative for certain foods (Fig. 14).

Another example of the circularity can be seen in the architectural design of the house. The house is raised on stone pedestals to protect the wood structures from termites, which come from the humid ground. The space under the house is used to store firewood and raise chickens, which also act as a natural control against the termites. A floor made of bamboo slats floor is used in the kitchen area to allow the ash from the traditional stove to fall down through its fine gaps. This then mixes naturally with the chicken feces underneath. Within 3-6 months, this mixture will form natural fertilizer for the community's crop. Wood from the fields is collected for cooking and building materials (Fig. 15). With these circular processes, people can fulfil their basic needs within the village from nature.

## Kampung Life: Faith And Social Bond

The inhabitants of Kampung Naga preserve the traditional way of living. There is no new technology such as electricity, modern agricultural equipment, and any form of foreign intervention, which does not conform with the values of their culture, is disallowed in the hamlet. This conservative mindset is strictly taught through social regulation, social involvement, and belief, which are deeply rooted in their myth and philosophy.

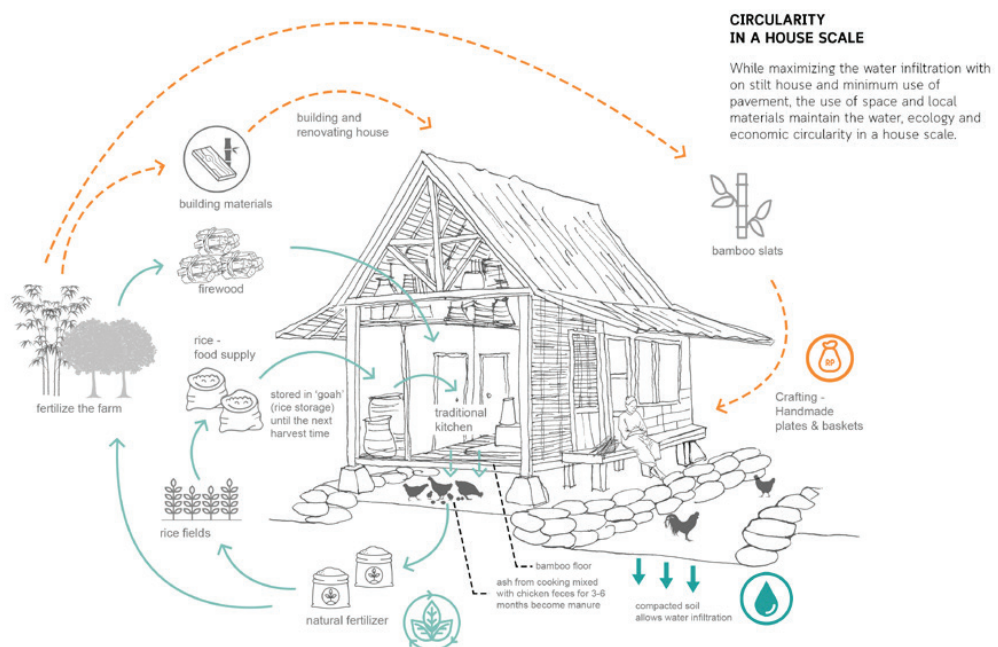


FIGURE 15 Ecological Circularity on a house scale.

## **Rules and Restrictions for Environmental Management**

A circular ecology and water system might be difficult to maintain if inhabitants do not retain their tradition regarding their sustainable way of living. Besides the logical thinking of using the natural topography, the three zones in Kampung Naga represent their view as a Sundanese traditional community of the cosmological concept called Tritangtu, a trinity that they believe is required to be balanced in order to live harmoniously (Darmayanti, 2018). This concept may be applied into the vertical spatial hierarchy of the traditional house, as well as the zoning system in Kampung Naga (Darmayanti, 2018). The three vertical spaces represent the world in Sundanese culture, comprising Upper world (*BuanaNyungcung*):

- a sacred place for the ancestor and holy spirits; Middle world (*BuanaPanca Tengah*)
- a living place for all the houses and the main public buildings such as the mosque, community hall (*Bale Peteman*), a public granary (*leuit*) and the sacred house (*Bale Ageng*);
- and Underworld (*BuanaLarang*) where the fishponds, fields, rice fields, and rice husking station (*SaungLisung*) are located (Darmayanti, 2018).

Based on this cosmological world frame, circular living is controlled and passed down for centuries by spatial boundary, social education, and communal events.

There are lots of verbally stipulated customary restrictions and rules which are inherited and preserved to maintain the structure of the community (As'ari & Hendriawan, 2016). This is also elaborated into single details on how community members should live with nature, including space orientations, the wisdom in using the water, building construction techniques, and the utilisation of local materials. Through myth, ritual ceremonies, and direct visualisation of the concept in spatial constructions, three educators - a customary leader (*kuncen*), family, and community - strengthen each other in passing down the values of the tradition. This becomes the pattern of thought and is transformed into an integral part of daily life at Kampung Naga (Iryana, 2014).

The biophilic mindset to conserve their environment are taught along the faith that violation of this tradition would bring negative impacts for the community's life. One of the examples is that the forbidden forest can only be visited by men during the ritual ceremony because this forest is home to the spirits (Iryana, 2014). With this restriction, the forbidden forest is preserved with no human disturbance. These well-observed provisions end up enriching the ecosystem's services. Its rich ecosystem provides local people with literally everything to live, such as food, medicine, and plant-based building materials - bamboo, palms leaves, etc. People create tools they need and build the house from scratch. They weave handmade plates, baskets, and other items from bamboo. As complemented by the resources that could be gained from agricultural activities, people are entirely self-sufficient.

## **Craftsmanship as a Tool for Social Bond**

While the community expands beyond the traditional village, craftsmanship in functional elements persists and is utilised as a tool to keep a strong social bond between the community members who live both inside and outside the village. For instance, the village border is marked by bamboo fences which must be changed every year. The job of replacing the fences is not a hassle for the community, but a good chance to invite their relatives to join in. Another example is the decision to keep using piles of rocks to regulate the river water discharge instead of changing it to concrete structures; the activity of maintaining the rocks requires that people work together so that they build up the community spirit. It is another reason for using manpower, craftsmanship, and choosing natural materials over modern technology to maintain Kampung Naga.

## Limits & Challenges: When We Think About Applying To The Urban Context

Kampung Naga is one of the idealistic examples on how a community lives in balance with nature. It is formed as an independent self-sustained community with sets of rules and restrictions preserved by the community both in developing their living space and maintaining the ecological circularity of its environments. However, Indonesia as a developing country with rising issues such as a high rate of population growth, rapid urbanisation, and lack of comprehensive long-term regional planning, could challenge the sustainability of this balanced life, as well as the possibility for the application of the values and local wisdom to other places in the future.

### The Strict Settlement Boundaries

For hundreds of years, Kampung Naga has preserved the boundaries of its settlement area. The inhabitants can make new families and increase the number of their family members, but it is strictly forbidden to expand the living space inside the village. In this situation, Kampung Naga could maintain around 297 inhabitants (with a maximum of 320 inhabitants) living inside the village (Ijad, personal interview, July 11, 2019), while the rest of the family members could live outside the traditional village (Iryana, 2014). By adhering to these rules, it is possible for Kampung Naga to maintain the correct balance between the community size, agricultural area as a main source of food supply, as well as its capacity to regulate the water cycle. However, with a highway - one of the determinants of urban sprawl (Firman, 2008; Mulyana, 2014) - located close to the village and its current state as a cultural tourism site, Kampung Naga is facing the challenge that natural boundaries might shrink due to the overwhelming growth of the surrounding population. It would be difficult to argue their right to maintain the strict boundary and consequently they may be forced to open the gate, contrary to their custom of population control within the village. On the other hand, applying a similar system in the urban realm is not seemingly logical population management, as people can move freely. When urbanisation increases, problems follow: limited space and high demand on resources for an increased number of dwellers might occur.



FIGURE 16 Left: Bamboo fences separate each zone in Kampung Naga. Right: Handcraft using bamboo slats.

## **The Refusal of New Technology and Development**

Kampung Naga's community believes that conservatism toward new technology is necessary to maintain the purity of their culture and tradition. Once technology is utilised, almighty nature can fade under the shade of technology (Prawiro, 2015). Unlike Kampung Naga, where fishponds take up more space than residential areas, due to the large capacity of water needed for self-purification, crowded urban areas need a more advanced system for higher density, although its side effects could also degrade nature. A city is highly controlled, preventing nature from working fully within its limitless power. The co-existence of nature and applied science is one of the biggest challenges that inspires people to have a biophilic attitude.

## **Closed Community and Customs**

Despite following Indonesia's administrative leadership structure, Kampung Naga also has a customary council leader (kuncen) who takes charge of the rules of tradition under Islamic culture (Maria, Indrawati, & Astuti, 1995). Any inhabitants who violate rules will get an appropriate punishment, the worst of which is to be exiled from the community. To apply a similar system in an urban setting could be problematic. Many cities consist of mixed cultures, religions, and customs, allowing people to live more freely by individual choice. Thus, a tight-knit community sharing the same values could lead to segregation within a broader multi-cultural society.

## **Governing Coalition for Sustainability**

A regional development plan could be a potential plausible actuality. Kampung Naga is considered to be a self-sufficient unit, but it cannot hinder its connection to other surrounding areas, even beyond the natural boundaries. The government's decision on a new regional development plan is capable of changing land use directly and indirectly. This could be easily understood by referring to the water issue, a crucial resource for living. It is the continuous resource that flows from the Mountain Cikuray through other upstream villages along the contours and reaches Kampung Naga. Once water infrastructures (dams and irrigation systems) are developed, both inhabitants' agricultural activity and the ecosystem can be badly affected. In other words, change of land use in the adjacent area will greatly influence the water quality and ecosystem in Kampung Naga. Thus, domestic water treatment for the river will be indispensable in the future.

In the agricultural system, the use of fertilizers is slowly affecting the quality of the river water that comes out of the village. On the scale of the village, this challenge can be controlled by the restriction of fertilizer use for the crops. However, the threats regarding the river water quality could still come from neighbouring villages located upstream along the river. It is crucial to come to a mutual understanding on keeping the river free from any industrial activities which could pollute the water. Without such an agreement on managing the river at a larger scale, this would always be a potential threat that could greatly impact the lives in Kampung Naga.

Furthermore, governance cooperation is not confined to the national scale. On a global scale, climate change means that nature might not be able to function as effectively as it is currently. Since the life of Kampung Naga depends entirely on ecosystem services, the community would be threatened by any damage to its living support system. This assumption applies equally to complex urban areas, if we adopt this self-supporting system. It would be appealing to create a more compact circular ecosystem through the intervention of technology to maintain a balance of supply and demand chains.

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## Conclusions

From the research, three lessons can be learned from the water heritage system of Kampung Naga:

- Understanding how the natural landscape works is crucial in determining spatial development. The integration offers people benefits of living with nature and maintaining it over a long-term period. Kampung Naga utilises existing topography to designate the orientation of the houses, the clear zoning plan of the settlement, water related amenities, agriculture, and wildlife.
- A circular water system is elaborated based on the natural landscape and ecosystem service. Local people explicitly understand the natural characteristics needed to utilise multiple water resources, as well as their responsibilities to purify the wastewater before discarding it back to the river. However, this circular metabolism could only be maintained by integrating it into its cultural, social, and economical values for the local inhabitants.
- Community planning and water circularity create Kampung Naga as a self-sustained living unit. Strong cultural identity drives inhabitants to maintain self-sufficient food production and ecological cycle by limiting the development area. This control is held by faith and traditions which are preserved by the inhabitants in their daily lives.

All in all, we could understand the heritage water landscape through learning how the interactions between landform, water, ecology, and anthropology create the entire system. It influences how people create spaces to live and establish some restrictions to maintain its sustainability. Understanding the heritage landscape might not offer immediate solutions to current water problems on a global scale. However, it could improve our body of knowledge of possible solutions of future spatial development, where the relation between humans and water could be profoundly re-established.



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