A future-proof Infrastructure Connection for Cemare

A Multidisciplinary Approach to Bridge Design and Stakeholder Engagement



TU Delft in collaboration with the Indonesia Biru Foundation

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Final report
November 2026

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We would like to sincerely thank the Delft University Fund, FAST and the Jo Kolk Studiefonds for sponsoring our project in Indonesia. With this financial aid, we were able to visit the project location, attend meetings and provide compensation for interviewees.

Disclaimer

This report is written by students for their master's programme of TU Delft and is not a consultancy report. Therefore, we do not take any responsibility, nor ownership, of any construction that is built as a direct or indirect result of the Final Design and other findings in this report. If anyone does want to implement the recommendations and conclusions in a real-life construction, a more detailed structural analysis and professional advice from a certified engineer should be obtained to verify these findings and determine appropriate, site-specific measures.

Generative AI (ChatGPT (OpenAI), Gemini (Google) and Claude (Anthropic)) was used to improve the clarity, grammar and academic writing style of selected parts of this report. Its use was limited to language editing rather than conducting research or generating findings. In addition, transcripts of the recordings were translated and included in the report. All suggested changes were critically reviewed by the project team, who retain full responsibility for the final content.

Preface

We would like to thank the Indonesia Biru Foundation for the great cooperation during this project. Especially Sabila and Jeffry, the main representatives of IBF for the Jembatan Cemare. We would also like to thank Fitri, who answered a lot of our many questions but more importantly was also a caring neighbour. Furthermore, Ganang was of great help in communicating with the local community, giving them an incentive to provide us with their input. For our field work, Ben, Erwin and Musab from Eco Green helped us by providing valuable information about the area surrounding the bridge. Big thanks to Andre Saputra, the founder of IBF, who gave us the opportunity to even start this project, as well as to the TU Delft and especially Yolanda De Las Heras. We are very grateful that we had the chance to apply our knowledge in such a different environment and we could try to make an impact.

We also would like to thank Bayu, from the University of Mataram, and Honza Tillinger from the Czech Technical University in Prague, in providing us with insights on the design process of a construction in Indonesia. Finally, we would like to thank our TU Delft supervisors: Dr.ir. Davide Wüthrich, Dr.ing. José Antolínez, Dr.ir. Suzanne Hiemstra-van Mastrigt and Dr. Jan Anne Annema, who all provided us with valuable feedback during the project but were most of all really supportive and enthusiastic about the project.

Abstract

The Cemare Bridge is the only car-accessible connection between Cemare Village and mainland Lombok, providing access to essential services such as healthcare. However, its deteriorating condition threatens safe access, and the planned renovation is expected to extend its lifespan by only a few years. This research aimed to enable the Indonesia Biru Foundation (IBF) to support the development of a desirable, feasible and viable infrastructure connection with a long-term functional lifespan. The multidisciplinary research consisted of three phases: Analysis, Design and Communication. The Analysis phase combined actor analysis, a survey (n = 47), interviews, participatory design, traffic counting, structural assessment and a literature study. The actor analysis identified the West Lombok regency as the main decision-making authority, while IBF's role is primarily to facilitate stakeholder involvement. It also revealed the absence of long-term arrangements for bridge inspection, maintenance and funding. In the design phase, three conceptual designs were developed using function analysis, a morphological chart and role-play, and evaluated through multi-criteria analysis (MCA). The R2 Dependency concept received the highest score (0.875), mainly due to its strong performance on accessibility, reliability and structural durability. The proposed concrete bridge separates pedestrians from vehicles and incorporates a Park and Ride facility. The local community would carry out routine maintenance, while the regency would remain responsible for major structural upkeep. During the communication phase, the findings were translated into *Project Jembatan*, a series of visual posters in Bahasa Indonesia explaining the design process, proposed solutions and maintenance arrangements to local stakeholders. The research enables IBF to support infrastructure development by connecting community needs, technical design and institutional responsibilities. The next step is for IBF to further discuss the proposed design with the regency to explore alignment with existing plans. Further technical assessments, cost estimates and formal funding arrangements are required before implementation.

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1. Introduction

This chapter introduces the problem that this project addresses. Section 1.1 describes the context and Section 1.2 introduces the client, the Indonesia Biru Foundation (IBF). Section 1.3 analyses the history, condition and use of the Cemare Bridge and the planned renovation. Based on this analysis, Section 1.4 formulates the problem statement and Section 1.5 the design goal. The chapter ends with the research questions that guide the rest of this report (Section 1.6).

1.1 Context

The Cemare Bridge (in Indonesian: Jembatan Cemare) is located in the south-west of Lombok, Indonesia. The bridge connects mainland Lombok with Cemare Village (Figure 1.1).



Figure 1.1 Jembatan Cemare

Cemare has two crossings to the mainland: the Cemare Bridge and the skybridge (Figure 1.2). Only pedestrians and motorcycles can use the skybridge (Inside Lombok, 2023), which makes the Cemare Bridge the only crossing for cars and trucks. This research therefore focuses on the Cemare Bridge.



Figure 1.2 Satellite view of the Cemare Bridge (top) and the skybridge (bottom) (adapted from Google, 2026; edited with Claude)

The bridge plays an essential role in the daily life of Cemare. Residents cross it several times a day to reach schools, healthcare services, markets and work, and describe it as the village's only evacuation route (see Appendix B9). The bridge is also the entrance for visitors to Cemare's beach, mangrove tours and homestays, which make tourism an important source of income for the village (S. Ramadhani, personal communication, September 7, 2026).

1.2 The client and its motivation

The client of this project is the Indonesia Biru Foundation (IBF), a non-profit organisation in Lombok founded in 2020 by Raditya Andrean Saputra. IBF works on marine and coastal conservation, ecosystem restoration, environmental education and community empowerment. It believes that lasting conservation also involves empowering local communities, raising environmental awareness and addressing the challenges that affect their livelihoods and well-being.

In Cemare, IBF works to connect environmental conservation with education, community participation and sustainable local development. During this work, IBF found that the poor condition of the bridge is a major local concern, affecting the community's safety and access to essential services. Because addressing this challenge requires technical expertise and collaboration beyond its own capacity, IBF asked TU Delft students to explore the existing situation, understand the needs of the local community and investigate possible approaches to improving the bridge.

IBF's aim is to contribute to a safer, more accessible and sustainable future for Cemare, where the well-being of the local community and the protection of its surrounding ecosystems can progress together. The full statement of IBF is given in Appendix I.

1.3 Problem analysis

This section analyses the history and current condition of the bridge (Section 1.3.1), its use (Section 1.3.2) and the planned renovation (Section 1.3.3).

1.3.1 History and current condition

Jembatan Cemare, the 104-metre bridge between Cemare Village and mainland Lombok, is in a troubling state. The main section is 5 metres wide, and its deck consists of 470 wooden planks on 7-metre sleepers (Saputra, 2026). The bridge was built in 2004 as an evacuation route after a tsunami. Since then, the community has only carried out small repairs. Rotten deck planks were replaced, but the deterioration of the underlying structure was neglected. Table 1.1 gives an overview of the main events.

Table 1.1 Timeline of the Cemare Bridge

Year	Event
2004	Bridge built as an evacuation route after the tsunami, as a single section shared by all traffic
2010	Additional section with steel beams built alongside it for pedestrians and motorcycles
2010-present	Local community repeatedly maintains the bridge, for example by replacing wooden deck planks

2026	Bridge in critical condition; the pedestrian and motorcycle section is avoided and almost all traffic uses the main section
November 2026	West Lombok regency starts renovating the main section (car deck) only

The bridge is located in a tropical climate above salt water from the sea, which speeds up corrosion and rot (Figure 1.3). The pedestrian and motorcycle section has deteriorated so badly that almost all traffic now uses the main section (Saputra, 2026). A structural assessment of the current bridge is given in Appendix A.

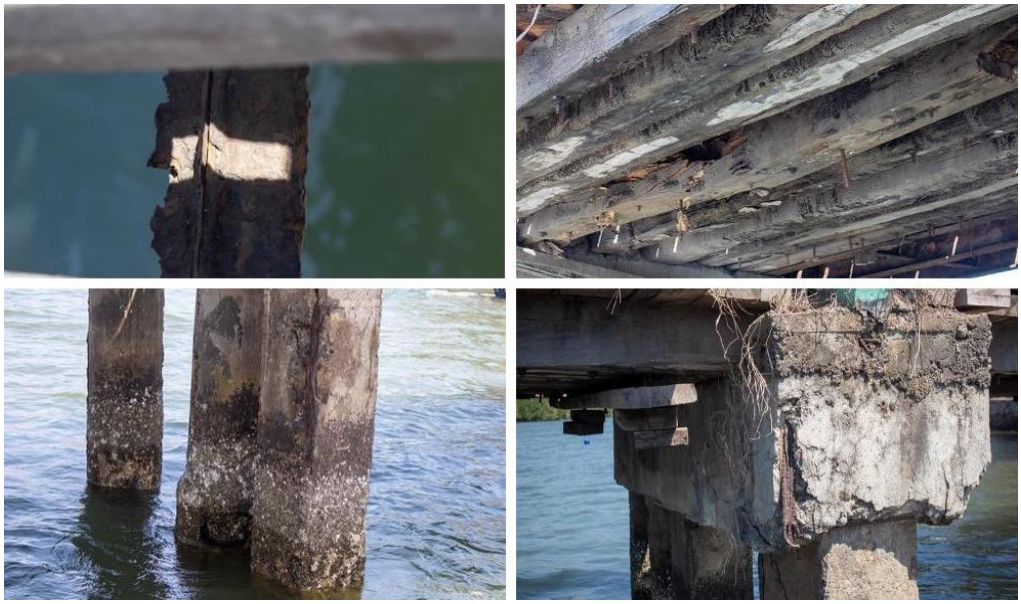

Figure 1.3 Current condition of the bridge: (a) top view of the steel beam, (b) sagged beam due to rot, (c) bottom and (d) top of the concrete pillars

1.3.2 Use of the bridge

To see how intensively the bridge is used, all people and vehicles crossing it were counted during one peak hour. In that hour, 448 vehicles and 1,431 people crossed the bridge (Table 1.2). Vehicle traffic was almost equal in both directions, but more people left Cemare (902) than entered it (529).

Table 1.2 Total counts per direction during one hour

Transport type	To Cemare		To mainland		Total		Persons per vehicle	Share of persons
	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons		
Pedestrians	–	12	–	124	–	136	–	10%
Scooters	204	425	164	325	368	750	2.0	52%
Cars	15	76	32	130	47	206	4.4	14%
Trucks and buses	4	16	29	323	33	339	10.3	24%
Total	**223**	**529**	**225**	**902**	**448**	**1,431**	**2.9**	**100%**

Scooters were the primary mode of transport, accounting for 52% of all people crossing the bridge. Although trucks and buses made up only 33 vehicles, they carried 24% of all commuters, averaging more than ten passengers per vehicle. The majority of the 136 pedestrians were bus passengers forced to disembark and cross on foot. The traffic count shows that the bridge is vital for daily transit, especially for motorcycles, and highlights that crossing fully loaded buses on the structure is already recognised as a safety hazard.

1.3.3 Renovation plan and starting points for a new bridge

In November 2026, the West Lombok regency will start renovating the bridge, but only the main section. The regency aims to keep the bridge in use for a few more years, but the renovation does not offer a long-term solution. Additionally, the regency's Public Works department has submitted a plan for a permanent bridge to the central government, but it has not yet been approved (Haeruzzubaidi, 2026a). This report therefore looks beyond the planned renovation in November and focuses on a new, future-proof connection between Cemare and the mainland.

1.4 Problem statement

Cemare Bridge (Jembatan Cemare) is the only car-accessible connection between Cemare Village and mainland Lombok and is essential for both residents and visitors (Section 1.1). This is shown in the traffic count, where 1,431 people crossed it in one peak hour. However, the salty, tropical coastal environment has corroded the supports and rotted the timber deck, while maintenance has been limited to replacing deck planks. As a result, loaded buses are already too heavy to cross safely, the pedestrian and motorcycle section is avoided, and the main section feels unsafe. This disrupts daily life and harms the local tourism economy (Haeruzzubaidi, 2026a; see Appendix D).

The West Lombok regency government is aware of the severity of the situation. However, a permanent solution does not fit within the current regency budget. The planned renovation therefore covers only the timber deck and wooden beams of the car section and is expected to last just a few years (A. Gunawan, personal communication, September 8, 2026), while the condition of the concrete piers and foundations remains unknown. A long-term plan is still missing, as the design for a permanent bridge has not yet been approved by the central government (Haeruzzubaidi, 2026a). It remains unclear who will inspect, maintain and fund it. Without clear agreements on these tasks, a new bridge risks returning to the current state.

IBF's programmes depend on the bridge, but IBF has no mandate, budget or structural expertise to decide on it. The desired situation is a safe and durable connection between Cemare and the mainland, supported by a long-term plan for inspection, maintenance and funding that is desirable for the stakeholders involved, technically feasible and financially viable.

1.5 Design goal

This section describes what this project aims to deliver (Section 1.5.1) and the three key concepts that the design must meet (Section 1.5.2).

1.5.1 Design statement

We aim to support IBF with a design that helps to develop a future-proof connection between Cemare Village and the mainland. The design includes conceptual proposals to build, use and maintain a bridge in a sustainable way. We present these proposals in a form that is easy for IBF to understand and use, so that IBF can put them into practice with the other stakeholders.

1.5.2 Key concepts: desirable, feasible, viable

To develop a future-proof infrastructure connection for Cemare, the challenge cannot be approached from a single domain. A lasting solution requires balancing human needs and wishes, technical possibilities, and financial realities. Throughout this report, three key concepts are used as a guiding framework to develop and evaluate the bridge proposals:

Desirable: Desirability focuses on the people who use or are affected by the bridge. It addresses the question of whether the users and other stakeholders find the proposed plan acceptable and whether it meets their needs and wishes.

Feasible: Feasibility focuses on the engineering and physical aspects of the connection. It addresses whether a design is technically possible, whether it can be constructed in the local context, and whether it will function safely in practice: sufficient and beneficial.

Viable: Viability focuses on the long-term financial and organisational sustainability of the project. It addresses whether the value of the connection outweighs its costs, and whether the expenses for construction, ongoing maintenance, and eventual renewal can be sustainably funded and managed after the initial work is completed.

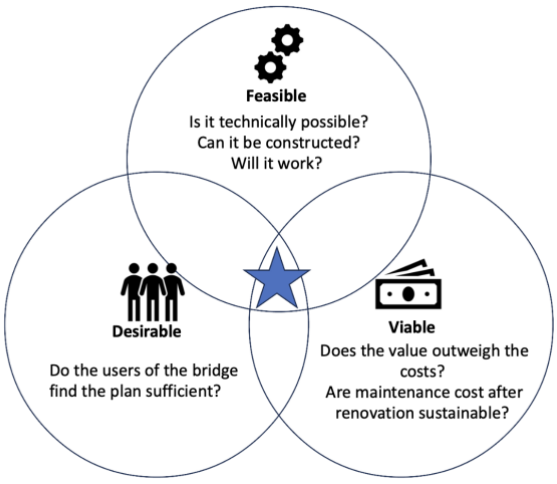

Figure 1.4 Sweet spot of key concepts marked with the blue star

As illustrated in Figure 1.4, addressing only one or two of these domains is insufficient for a long-term solution. For instance, a bridge design that is technically sound and supported by the community but lacks a sustainable plan to fund and organise future maintenance, will eventually deteriorate again. Therefore, this project strives for a design positioned at the intersection of all three circles, represented by the blue star in the centre.

1.6 Research questions

To help IBF deal with the institutional and technical challenges around the bridge, this study explores how a sustainable strategy can be developed together with all stakeholders involved. The following main research question and three sub-questions guide this process:

Main research question:
How can the Indonesia Biru Foundation be enabled to support the design of a desirable, feasible and viable infrastructure connection between mainland Lombok and Cemare Village with a long-term functional lifespan?

Sub-questions:
1. How do the institutional context and the interests, power dynamics and interdependencies of the stakeholders involved shape decision-making on the Cemare infrastructure connection?

2. What are possible conceptual designs for an infrastructure connection between mainland Lombok and Cemare Village that are feasible, viable, and desirable over a functional lifespan?

3. How can the results of this study be communicated to the Indonesia Biru Foundation in a way that supports its role in the Cemare Lombok infrastructure project?

2. Methods

This chapter describes the methods used, why they were chosen and how they were carried out. After the research approach (Section 2.1), Sections 2.2 to 2.4 cover the institutional context, the needs and wishes and the site conditions, and Section 2.5 the translation into design requirements and evaluation criteria. Sections 2.6 and 2.7 cover the design and communication phases. The results follow in Chapters 3 to 5.

2.1 Research approach

The project consisted of three phases, one for each sub-question (Figure 2.1). The analysis phase mapped the institutional context and the actors (SQ1). It also collected the needs and wishes of the stakeholders and assessed the site conditions, which served as input for the design phase. These were translated into design requirements and evaluation criteria for the design phase, which developed functions, concepts and a final design (SQ2). When the design raised new questions, the team went back to the analysis, for example to add functions or check site conditions. Finally, the communication phase handed the results over to IBF and the community through a poster series and a public presentation (SQ3).

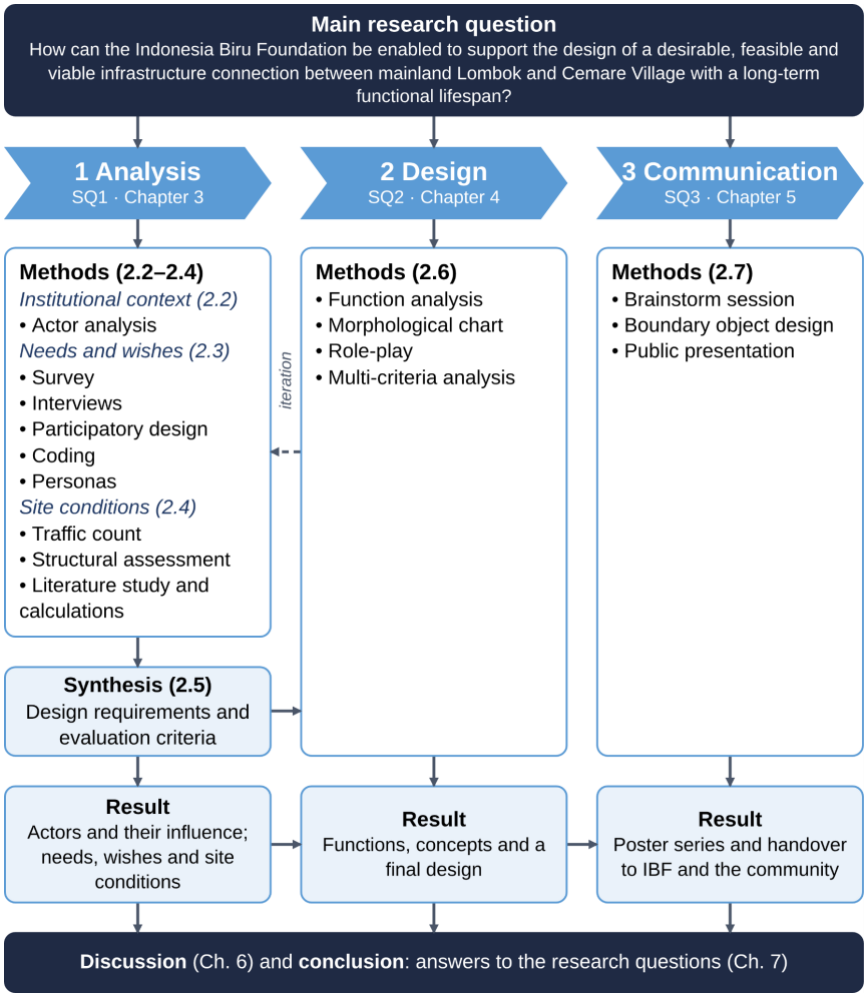

Figure 2.1 Overview of the research approach

2.2 Institutional context: actor analysis

The institutional context was analysed with the six-step actor analysis of Enserink et al. (2022). This approach suits the Cemare Bridge, a multi-actor problem in which decisions on renovation, maintenance and funding are spread across actors with different interests and resources. It shows where decisions are made and where IBF can exert influence. The steps were carried out as follows:

1. **Decision arena:** the scope of the analysis was set by identifying, from the problem statement, which decisions determine the future of the bridge.
2. **Actor identification:** actors were identified in three ways: through their interests, based on the survey and the meetings with IBF; through their formal position, based on an analysis of laws and regulations; and through their participation in the regency's renovation meeting on 8 September 2026.
3. **Formal playing field:** formal positions and relations were derived from Indonesian legislation and drawn in a formal chart. Informal relations were added based on interviews, observations and local news.
4. **Actor characteristics:** interests, perceptions and resources were derived from the interviews, the survey, local news and law and legislation study.
5. **Interdependencies:** the team placed the actors in a power-interest grid based on their formal position, resources and dependence on the bridge, and checked it with IBF.
6. **Implications:** the findings were compared with the problem statement.

The results are presented in Sections 3.1 to 3.3 and Appendices C and D.

2.3 User needs and wishes

2.3.1 Survey

A survey was conducted to collect comparable answers from a large group of users, helping to identify common concerns and priorities. The online questionnaire (Google Forms) was first written in English and then translated into Bahasa Indonesia by IBF. It was distributed in Cemare Village by students of the University of Mataram in collaboration with IBF. The 37 questions covered the use of the bridge, its perceived condition and safety, the impact of a closure, responsibility for the bridge and willingness to contribute. Most were multiple-choice questions, two were rating scales from 1 to 5 and eight were open questions. The survey was completed by 47 respondents, of whom 23 lived in or around Cemare and 24 were visitors, regular bridge users or people working in the area. The responses were analysed using descriptive statistics, including frequencies, percentages and mean scores where applicable. The results are presented in Section 3.4 and Appendix B9.

2.3.2 Semi-structured interviews

Semi-structured interviews were conducted to gain a deeper understanding of the stakeholders' needs, wishes and concerns regarding the current Cemare bridge and its

future design. In a semi-structured interview, the interviewer follows a prepared list of topics and open questions, but can change the order, ask follow-up questions and explore new topics that the interviewee raises (Adams, 2015). This makes the method more flexible than a fixed questionnaire, as it can reveal needs and concerns beyond those the team had prepared questions for.

The interviewees were selected to cover a wide range of stakeholder perspectives. With the help of IBF, four residents of Cemare were interviewed. In addition, two heavy vehicle drivers, a domestic visitor and a foreign visitor were approached in the Cemare Beach area. Scheduled meetings were held with IBF, the Head of Village of Lembar Selatan, the West Lombok Tourism Agency, the regency's consultant and two members of Eco Green. Furthermore, Civil engineering students of the University of Mataram were interviewed for their knowledge of local construction. Figure 2.2 shows several of these interviews and meetings.

The interviews covered the use of the bridge, its condition and safety, expectations for a future connection and responsibilities. They were held in English, with a local interpreter translating into Indonesian where needed. With permission, they were recorded, transcribed verbatim and translated into English with transcription software, and the translations were checked by the interpreter. The transcripts were coded as described in Section 2.3.4. The results are presented in Sections 3.1 to 3.4, and the transcripts are included in Appendix B.



Figure 2.2 Interviews and meetings with stakeholders: (a) Domestic visitor, (b) Heavy vehicle driver, (c) Civil Engineering students of the University of Mataram, (d) West Lombok regency and (e) Head of Village in Lembar Selatan

2.3.3 Participatory design session

A participatory design session was used in addition to interviews for two reasons. First, residents have more local knowledge than the team, and as outsiders the team does not share their cultural context. Co-creation and visual activities let participants express their needs, experiences and abilities more explicitly. Second, local actors will act on the results, so the session also aimed to strengthen the participants' ownership of the insights and their continued involvement in the future of the bridge. The session had two goals: to learn how residents perceive a safe and usable crossing, and how they approach problem-solving.

The session took place on 17 September 2026 at a local beach restaurant in Cemare and lasted about 90 minutes. Seven people who live or work in Cemare took part: two shop owners, a fish transport driver, a fisherman and three residents, aged 30 to 60 (three men and four women). A member of IBF translated. After an introduction, the participants worked on four assignments through drawing and group discussion: identifying problems on photos of the current bridge, sketching their ideal bridge, finding ways to cross the water without a bridge, and suggesting safety features and traffic management. Data were collected through audio and video recordings, drawings and written comments on printed photos. The recordings were transcribed and analysed together with the other materials to identify recurring themes. The results are presented in Section 3.4 and Appendix B3.

2.3.4 Coding into needs and wishes

To make the input traceable in the design, the statements of the stakeholders were coded into needs and wishes. A need was defined as something the connection must offer a stakeholder, and a wish as a preference that adds value but is not essential (van Boeijen et al., 2020). The notes of the meetings with IBF and the transcripts of the interviews and the participatory design session were first colour-coded by theme. Each relevant statement was then recorded as a need or a wish, numbered per type, together with the stakeholder, the source, the underlying problem or motivation and a supporting quote. The survey answers were not coded but used to check the needs and wishes per theme. The results are presented in Sections 3.4.2 and 3.4.3 and Appendix B1.

2.3.5 Personas

Personas were used to represent the different types of users of the connection (van Boeijen et al., 2020). Based on the interviews, the participatory design session and field observations, a persona was made for each main type of user. Each persona describes a fictional user with a short profile, how and why they cross the bridge, and their needs and frustrations. The results are presented in Section 3.4.4.

2.4 Site conditions

2.4.1 Traffic count

A traffic count was used to measure the actual use of the bridge. All people and vehicles crossing the bridge were counted on Sunday 27 September 2026 for one hour in the afternoon, the expected peak according to IBF. Two team members counted at the Cemare end of the bridge, one per direction. For each crossing, they recorded the transport type (pedestrian, motorcycle, car, truck or bus) and the number of persons. The counts were

summed per direction and type, and the average number of persons per vehicle and the share of persons per transport type were calculated. The results are presented in Section 1.3.2.

2.4.2 Structural assessment

A structural assessment was carried out to understand why the current bridge deteriorates, so that a new design can avoid the same problems. Because no documentation of the bridge was available, the visible parts were inspected on site. Visual inspection and simple field tests were chosen because they require no special equipment, do not damage the structure and give a first indication of where the bridge is weakest within a short field visit. The inspection followed the methods of Puspitasari et al. (2023), so that each part was assessed in a consistent way.

The deck planks were inspected visually for cracks, deflection and discoloration, and tested with a sounding test (a hollow sound indicating internal rot) and a penetration test (soft material indicating decay). The wooden beams were assessed for rot and sagging by observing their deflection while pedestrians and vehicles crossed. The steel beams were assessed for sagging and surface corrosion. The bolts and screws were checked for corrosion and struck lightly to see whether they would break. The concrete pillars were inspected for settlement and for deterioration of the concrete and the reinforcement. In addition, the types of loads crossing the bridge were estimated. The different parts were photographed, paying extra attention to weak or broken parts, and the observations were combined with information from desk research. The results are presented in Section 3.5.1 and Appendix A.

2.4.3 Environmental effects: literature study

A new bridge must withstand environmental conditions that develop over decades. These cannot be observed during a short field visit, so they were studied in literature.

First, corrosion of steel and concrete and the decay of timber in tropical coastal environments were studied, to understand how quickly materials deteriorate at Cemare and which countermeasures are available. Next, sea-level rise was taken from NASA (2021) for scenario SSP3-7.0 up to 2070, and tidal levels from five years of records for Mataram (Tides4Fishing, n.d.). With these, the required deck height was calculated as the sum of low tide, sea-level rise up to 2070, the height of a fishing boat (2 m) and a safety margin (1 m), as this height decides whether fishing boats can pass and whether the bridge stays above future water levels. Floods were studied through documented flood events on Lombok and research on the protective role of mangroves. Seismic vulnerability was assessed from the hazard types described by Amirsardari et al. (2019) and from an inspection of bridges damaged in the 2018 earthquake on Lombok (Putra & Adi Riyono, 2020), which led to a study of design for deconstruction as a way to repair bridges after earthquakes.

Finally, scour was studied because it is a common cause of bridge failure in Indonesia and the foundations of the current bridge are unknown. The calculation of the equilibrium scour depth around a cylindrical pier is explained with the method of Schiereck and Verhagen (2019) to obtain an upper limit that shows whether bed protection may be needed. Measurements of soil, flow velocity or water levels on site should still be obtained in further

research to use in these calculations. The results are presented in Section 3.5.2, the formulas and possible input values are given in Appendix E.

2.5 Design requirements and criteria

The needs and wishes from Section 2.3.4 were combined with the results of the actor analysis and the site conditions. The needs and wishes were then grouped into twelve categories under desirability, feasibility and viability (Section 1.5.2), and each category was linked to the analyses that support it.

For each category, the team formulated a design requirement, which describes what the connection must achieve, and an evaluation criterion with a target value, which indicates to what extent a concept achieves it. Where possible, the target values were derived from the site analysis and Indonesian standards, for example the required deck height (Section 2.4.3) and the seismic standard SNI 2833:2016. The other target values were set by the team, based on the needs and wishes. The requirements form the starting point for the design, and the criteria are used in the multi-criteria analysis (Section 2.6.4). The results are presented in Section 3.6 and Appendix G.

2.6 Design phase

The design phase followed the eight steps of the morphological chart method (van Boeijen et al., 2020). Table 2.1 shows how each step was applied in this project, what it contributes to the design phase and in which section it is described.

Table 2.1 Steps of the design phase, their application and contribution (van Boeijen et al., 2020)

Step (Delft Design Guide)	Application in this project	Contribution to the design phase	Section
1. Formulate the main function	Main function of the connection, based on the problem statement	Defines what the connection must do	2.6.1
2. Identify the functions and sub-functions	Function analysis, checked with How-might-we questions	Translates the needs and wishes into functions that the design must fulfil	2.6.1
3. Set up a matrix with a row per sub-function	One row per function	Structures the search for solutions per function	2.6.2
4. List possible solutions per row	Individual brainstorm and prior analysis, merged into one chart	Creates a broad range of solution options	2.6.2
5. Combine one solution per row into principal solutions	Theme concepts, combined through a role-play	Turns separate options into complete and coherent concepts	2.6.3
6. Assess the combinations and select at least three	Multi-criteria analysis	Compares the concepts on the evaluation criteria	2.6.4
7. Visualise each combination as a whole	Visualisation of each combined concept	Makes the concepts understandable for IBF and the other stakeholders	2.6.5
8. Develop a selection into design proposals	Elaboration of the highest-scoring concept, including maintenance and funding	Develops the final concept into a proposal that IBF can use	2.6.5

2.6.1 Function analysis

A function analysis was used to describe what the connection must do, without fixing how it does it (van Boeijen et al., 2020). This keeps the design open to different solutions. The main function of the connection was broken down into sub-functions, mainly based on the needs and wishes and the design requirements. Each function was formulated as a verb and a noun, without referring to a specific solution, material or form. Each function was then rewritten as a How-might-we question, as a check that it did not contain a hidden solution. Functions that contained more than one choice were split. The results are presented in Section 4.1.

2.6.2 Morphological chart

Concepts were generated with a morphological chart (van Boeijen et al., 2020). This is a table with a row for each function, filled with possible solutions, in which a concept is formed by choosing a combination of solutions per row. The method was chosen for three reasons. First, it widens the search for solutions (van Boeijen et al., 2020). Second, each discipline can add solutions in its own field. Third, every choice can be traced back to a function and every function to stakeholder needs. The functions from Section 2.6.1 formed the rows. Each team member first brainstormed solutions per function individually, without judging them. These were then merged into one chart and supplemented with ideas from the participatory design session and measures from the site analysis. The results are presented in Section 4.2 and Appendix F.

2.6.3 Theme concepts and role-play

Because a morphological chart allows many combinations, the options were first combined around themes to create coherent concepts. Each theme gives priority to one goal for the bridge, which follows from the site and actor analysis and different aspects of the stakeholders' needs and wishes. The theme concepts were developed in two steps. First, each team member made a concept for every theme individually, by choosing in each row the option that best served that theme. Then, per theme, the five versions were merged into one theme concept. The option chosen most often was the starting point, and rows with divided votes were discussed until the team agreed.

The theme concepts were then combined through a role-play, which captures both the technical and the social side of decision-making (Mayer, 2009). Each team member defended one theme in three rounds. The rounds differed in the order in which the functions were discussed: starting with shared options (consensus), with use and location (dependency), or with funding and maintenance (budget). Arguments had to refer to the collected data. Each round produced one combined concept. The results are presented in Appendix F and Sections 4.3 and 4.4.

2.6.4 Multi-criteria analysis

The three combined concepts each follow a coherent path through the morphological chart, but they make different trade-offs. To determine which concept offers the most promising basis for the final design, they were compared with a multi-criteria analysis (MCA) on the twelve evaluation criteria from Section 2.5. The team assigned a weight to each criterion, with all weights summing to 1. These estimations were based on using the collective

knowledge gathered during the project and experience of the stakeholders. Each concept was scored per criterion on a five-point scale from ++ to −−, which was converted into values from 2 to −2. Each value was multiplied by the weight of the criterion, and the weighted values were summed into a total score per concept. The results are presented in Section 4.5.

2.6.5 Elaboration of the final design

The highest-scoring concept was elaborated per sub-function of the function tree. In each step, its choices were checked against the needs and wishes and the site conditions, adjusted where they conflicted with other functions, and detailed with literature. This elaboration created a more complete picture of the bridge design, but remained conceptual, without structural calculations. The results are presented in Sections 4.6 and 4.7.

2.7 Communication phase

The communication phase aimed to make the results usable for IBF and the community. It consisted of three methods: a brainstorm session with IBF (Section 2.7.1), the design of a poster series (Section 2.7.2) and a public presentation in Cemare (Section 2.7.3).

2.7.1 Brainstorm session with IBF

To find out how IBF wants to use the results, a brainstorming session was held with four IBF representatives at a local café in October 2026, lasting about one hour. A brainstorm method was chosen so that IBF could generate and discuss ideas together, rather than only answer questions. At the start of the session, the participants formulated the conditions that the final design must meet for IBF to use and communicate it, based on the problem statement, the design statement and IBF's role. The discussion then focused on IBF's role in the project and on how the findings could be presented to different stakeholders, including their practical use. The outcomes were recorded in notes. The results are presented in Section 5.1.

2.7.2 Boundary object design

The results were translated into a poster series that IBF can use to communicate with other stakeholders, based on the wishes from the brainstorm session (Section 2.7.1). Posters were chosen because most stakeholders in Cemare speak Bahasa Indonesia and have no technical background, so the report alone is not accessible to them. Posters can also be understood in one view and invite discussion, which suits IBF's role as a connector rather than a technical expert.

The posters were designed as a boundary object. This is an artefact that is flexible enough to be understood across different social worlds, yet robust enough to maintain its scientific integrity (Star & Griesemer, 1989). Three principles guided the design. First, each poster carries one message and relies on images rather than on text alone. Second, all posters share one name and visual identity, which presents the bridge as a shared project and gives the stakeholders a common language. Such a collective identity gives people a sense of belonging that motivates them to take part (Polletta & Jasper, 2001). Additionally, recognisable visual elements help to spread a message through people's own networks (Bennett & Segerberg, 2012). In this way, the identity encourages IBF and the residents to take ownership of the project. Third, the series follows the structure of the report, so that IBF

can select the posters that fit a conversation. The posters were made in Canva and the texts were translated into Bahasa Indonesia and checked by IBF. The results are presented in Section 5.2, and all posters are included in Appendix J.

2.7.3 Public presentation

To share the results with the people they concern, the final design and the poster series were presented in Cemare. The stakeholders and the local community were invited, so that they could see how their input had been used and ask questions. The presentation also served to hand over the project, it explained that the team's work ends here, and that the community and the other stakeholders can use the results to take the next steps themselves. In addition, it showed whether the posters could be understood without the report. The presentation took place on Saturday 24 October 2026 and was attended by 29 people, including residents and representatives of IBF, Eco Green and the regency. The presentation was done in English and translated into Bahasa Indonesia by a representative of IBF. The questions and reactions were recorded in notes. The results are presented in Section 5.3.

3. Results: Analysis phase

This chapter presents the results of the analysis phase. Sections 3.1 to 3.3 present the institutional context and the actors involved, which form the basis for answering SQ1 in Section 7.1. Sections 3.4 and 3.5 present the needs and wishes of the users and the conditions of the site. Section 3.6 brings these results together in the design requirements that form the starting point of Chapter 4.

3.1 Formal institutional playing field

The decision arena consists of the decisions on the renovation, maintenance, funding and future of the bridge. Through the three identification approaches (Section 2.2), the following actors were selected. The interest-based approach resulted in the residents, visitors, heavy vehicle users and IBF. The institutional approach showed that the village, regency, provincial and national governments hold formal responsibilities for the bridge. The regency's renovation meeting added the consultant who presented the renovation plan, Eco Green, and the contractor that will carry out the works, although it had not yet been appointed.

Indonesian legislation determines which actors hold formal responsibility for the bridge and how they relate to each other. The Cemare Bridge is part of a regency road, which makes the West Lombok regency the road administrator. The regency commissions the consultant and approves the technical plans, commissions and supervises the contractor, and must maintain the bridge and test its fitness at least every ten years. It may also appoint road inspectors and supervises the village government. The national government (Ministry of Public Works, via BPJN NTB) sets national road norms and standards and decides on grants from the Special Allocation Fund (DAK), for which the regency must apply. The West Nusa Tenggara (NTB) provincial government coordinates the regencies and advises on their DAK proposals. Both may take over construction if the regency cannot carry it out. The Lembar Selatan village government has no authority over the bridge, only its village regulations bind residents.

Outside the government, the consultant prepares the technical plans which must be approved by the regency. The contractor, which has yet to be appointed, will carry out the works. IBF and Eco Green have no formal authority, but they have the right to take part in road planning through proposals and to report misuse. As a recognised community group, Eco Green also represents residents towards the government. Residents elect the Head of Village and the Regent, are consulted on village regulations, and may take part in, fund or carry out maintenance. Road users have no formal role in decision-making, but they must comply with the road class and use restrictions set by the regency and village government. Also, visitors have no formal position in decision-making. The full overview, including the legal basis and the administrative levels, is given in Table C.1 in Appendix C.

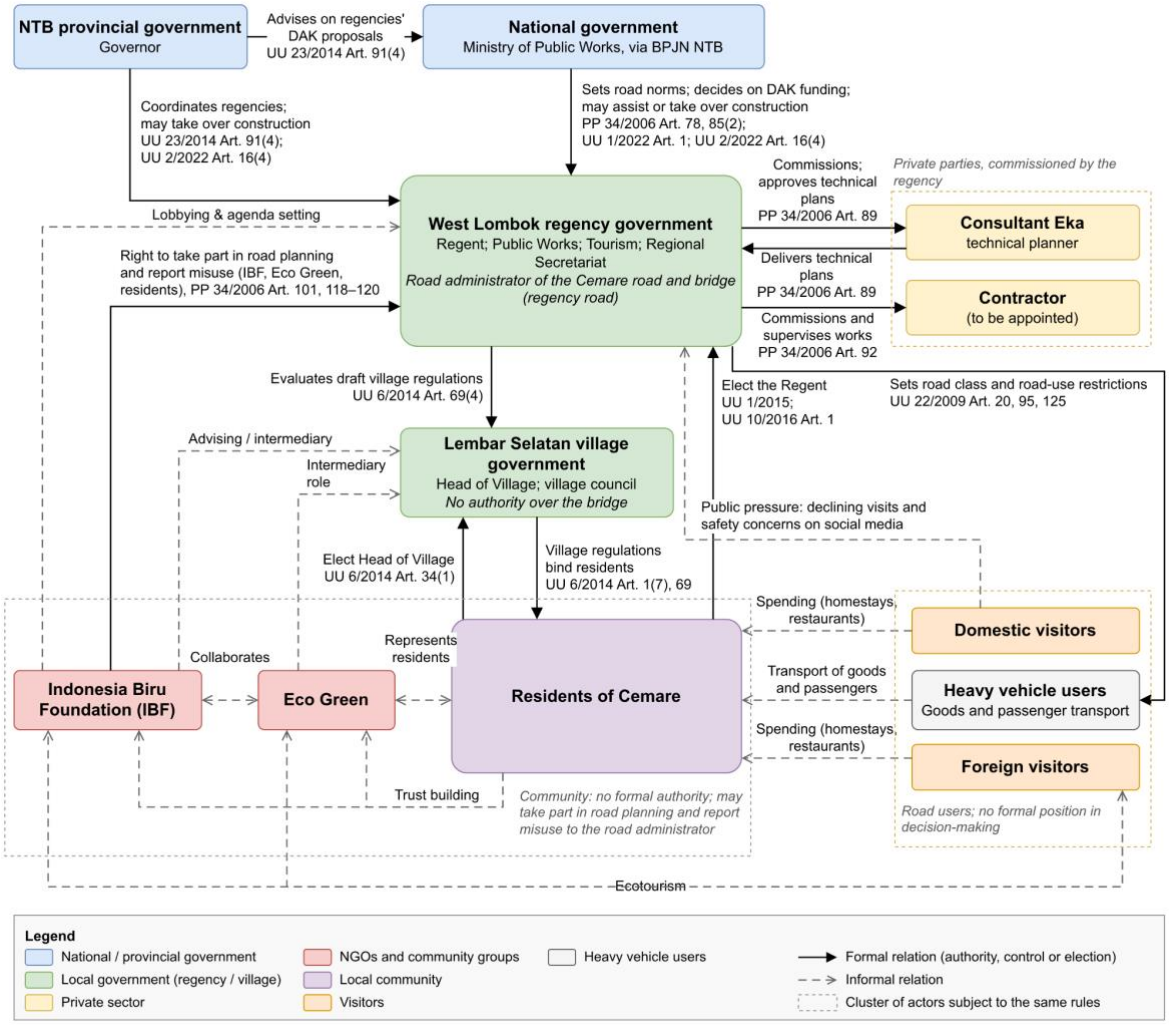

Figure 3.1 Formal chart of the Cemare Bridge decision arena, including informal relations

Figure 3.1 combines these formal relations with the informal relations derived from the interviews, field observations and news sources. Three findings follow from this structure:

- **The regency is the gatekeeper.** As road administrator, it is legally responsible for the bridge, commissions the consultant and contractor, and is the only actor formally linked to the provincial and national governments. All formal routes to a lasting solution, including national funding, pass through the regency.
- **IBF's formal foothold is the right to participate.** IBF is allowed to take part in road planning, make proposals and help supervise. It can put forward ideas on design and maintenance, but it cannot decide on them.
- **Community influence is mostly informal.** Beyond the right to participate, the relations of IBF rest on trust and personal contacts, which makes their influence fragile when people or relations change.

3.2 Actors, interests and interdependencies

Table 3.1 summarises the interests, desired situation and main resources of the actors. The full table, including perceptions and sources, is given in Appendix D.

Table 3.1 Desired situation and main resources of the key actors

Actor	Interests	Desired situation	Main resources
National government	National connectivity and a fair distribution of a limited infrastructure budget across regions	Funding infrastructure that fits national programmes; sees Cemare as one of many requests	Money for rebuilding; decides on funding proposals
NTB provincial government	Coordinated regional development across its regencies	No specific aim for the bridge; supports village development, including tourism	Recommends DAK proposals
West Lombok regency government	Functional public infrastructure, regional economic growth, public trust	Renovate the car deck now (about five years); seek central funding for a permanent bridge	Authority as road administrator; renovation budget; consultant and contractor supervisor
Lembar Selatan village government	Village welfare and development, safe and reliable infrastructure	A wider, stronger bridge; a clear maintenance arrangement and long-term plan	Mobilises residents; link to the regency; limited funds
Consultant Eka	Successfully executing the design project for the government	Deck renovation completed within budget and before December	Technical assessment and bridge-design knowledge
IBF	Ecotourism, long-term safety of the community infrastructure, and the aesthetic value of the bridge	An aesthetic, lasting bridge as entrance to Cemare; acting as advisor	Trust of residents, network, volunteers, social media; lacks authority, budget and structural expertise
Eco Green	Mangrove conservation, environmental awareness, income from ecotourism, and representing residents	A wooden bridge of local materials that fits the mangrove setting; buses and trucks stop before the bridge	Local knowledge; members plus residents; network with IBF, universities and government
Residents of Cemare	Emergency access, safe and reliable daily mobility, access to basic needs, and access for visitors to support the local economy	A permanent fix: a wider bridge where two cars can pass, with a stronger construction	Labour (community self-help); household contributions; user knowledge; votes
Heavy vehicle users	Reliable and efficient transport of goods and passengers, safe access to and from Cemare	A bridge that safely carries heavy vehicles and their loads	Willingness to pay a small user fee; transport knowledge
Domestic and foreign visitors	Recreation, mangrove visits, education, safe access	A bridge they can trust for safe access to the beach, homestays and ecotourism	Spending in the local economy; public pressure via (social) media and reviews

Table 3.1 shows that every actor wants the bridge to be improved, but not every actor wants the same bridge. The differences concern mainly on three points:

- **Lifespan:** the regency plans a deck renovation that lasts about five years and makes a permanent bridge dependent on central funding, which the national government weighs against many other requests. The village government, IBF and residents want a permanent solution with a clear maintenance arrangement.
- **Design:** Eco Green prefers a wooden bridge of local materials that fits the mangrove setting, and IBF stresses its aesthetic value as the entrance to Cemare. Residents and the village government mainly ask for a wider and stronger construction.
- **Traffic:** residents want two cars to be able to pass and heavy vehicle users want a bridge that carries heavy loads, whereas Eco Green prefers buses and trucks to stop before the bridge.

The actors differ in what they want, but they depend on each other to achieve it. No actor can realise a lasting solution alone, because the necessary resources are spread across them. Authority and money lie with the regency and the national government, technical knowledge lies with the consultant, and local knowledge, labour and legitimacy lie with the community. Figure 3.2 shows the relations of the actors in a power-interest grid. The position of an actor follows from its formal position (Section 3.1) and its resources (Table 3.1).

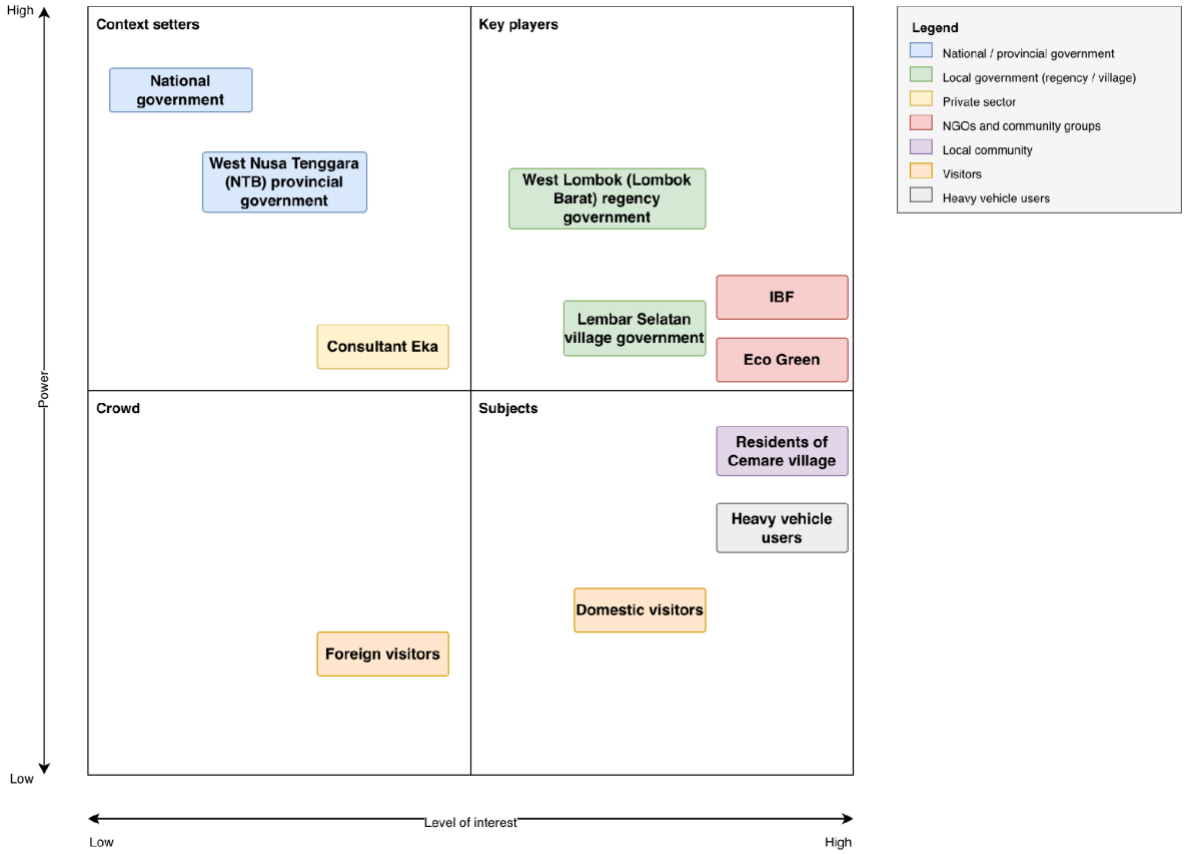

Figure 3.2 Power-interest diagram of the actors involved in the Cemare Bridge

The grid shows a mismatch between power and interest. Residents and heavy vehicle users have a high interest but little power, meaning that they depend on others such as IBF and Eco Green to bring their needs to more influential actors. Although residents can vote, their influence is indirect, as they elect a representative who is responsible for many issues. As a result, the bridge may remain low on the political agenda. The village government has no formal authority over the bridge, but as the level of government closest to the residents it can bring their needs to the regency. IBF and Eco Green have more informal power through their networks and direct contacts with the regency, which allows them to bring the interests of the community into the decision-making process. The national and provincial governments have power but little direct interest in Cemare. The same applies to the consultant, which shapes the technical solution through the plans it prepares for the regency. The regency combines high power and high interest and forms the formal link between the local level and higher levels of government.

3.3 Implications for the problem formulation

Responsibilities, resources and interests are divided among many actors, which leads to three implications for the problem formulation:

- **The problem is not only technical.** A future connection has to balance different interests, such as durability, access for heavy vehicles, the mangroves and tourism, and needs enough support from the actors to be implemented.
- **Every solution has to pass the regency.** As road administrator and as the route to national funding, the regency must be able to adopt the proposal. The proposal therefore has to fit its procedures and budget, and should strengthen its funding request to the central government.
- **A long-term arrangement is missing.** No actor is currently responsible for inspection, maintenance and funding after the renovation. A proposal therefore needs a clear division of roles.

In conclusion, the challenge is not only to design a durable bridge, but also the arrangements around it that the regency can adopt and the actors will support and help maintain.

3.4 Needs and wishes

This section presents the results of the survey, the interviews, the participatory design session and the personas.

3.4.1 Survey

Figure 3.3 shows the main results of the survey among 47 respondents.

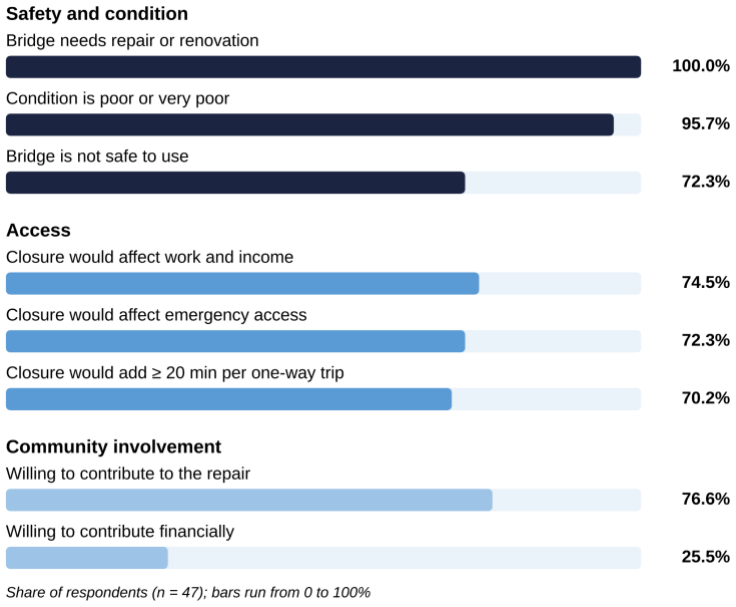

Figure 3.3 Main survey results (n = 47; data from Appendix B9)

All respondents said that the bridge needs repair or renovation. Almost all respondents rated the condition of the bridge as poor or very poor and 72.3% did not consider it safe. The average concern about the bridge was 4.77 on a scale from 1 to 5. The most selected priorities were repair of the structure (83.0%), repair of the deck (63.8%), improved safety (53.2%), improved accessibility (51.1%) and widening the bridge (48.9%). In the open answers, respondents mentioned corroded steel beams, rotten timber, holes in the deck and unstable pillars.

The bridge is used intensively with 34.0% of the respondents crossing it daily and 31.9% several times a week, mostly by motorcycle (74.5%). The majority of the respondents reported the weekend as the busiest period. The impact of a closure was rated at 4.96 out of 5, and 70.2% expected a closure to add at least 20 minutes to a one-way trip. Transport (78.7%), work and income (74.5%), education (74.5%), emergency access (72.3%) and healthcare (70.2%) would be affected most.

Lastly, 76.6% were willing to contribute to the repair, mostly through community-based voluntary work (57.4%). Only 25.5% were willing to contribute money, and 72.3% saw the regency, provincial or central government as responsible. Community participation is therefore seen as complementary to public responsibility, not as a replacement.

3.4.2 Interviews and meetings

Table 3.2 summarises the main needs and wishes per stakeholder group. They are derived from the interviews with the local community, Eco Green, a foreign visitor, and the meetings with IBF, the Head of Village and the regency. The interviewed local community members were residents, heavy vehicle users and domestic visitors. Their needs largely overlapped with those of the residents. But not all needs and wishes always align. For example, IBF and the community need access for heavy vehicles, while Eco Green wishes to keep them off the bridge with a height barrier. The full list, with sources, quotes and the transcriptions of the interviews, is given in Appendix B.

Table 3.2 Needs and wishes derived from interviews and meetings

Stakeholder	Needs	Wishes
IBF *Meetings*	Bridge must support ecotourism (N01); reliable connection to the mainland (N02); strong and safe structure with a long functional lifespan (N03, N04); the bridge must remain accessible to trucks and accommodate heavy vehicles (N05, N06); safe management of high traffic volumes (N07)	Bridge with aesthetic value as an icon/landmark for Cemare (W01, W02); provide information about Cemare and the mangroves (W03); improve access to the mangrove area (W04); support environmental education (W05)
Local community *Interviews*	Reliable connection to the mainland, with access to essential services and fast and reliable emergency access (N08, N10, N11); strong and safe bridge structure (N09); access for heavy vehicles (N12); safe motorcycle accessibility (N13); sufficient width for two-way traffic (N14); maintainable bridge structure (N15)	Permanent long-term solution (W06); comfortable crossing (W07); improved accessibility for tourism (W08)
Head of Village *Meeting*	Strong and durable bridge structure (N16); funding for future bridge maintenance (N17)	Wider bridge (W10); reuse suitable materials from the existing bridge (W11); community involvement in the renovation (W12); explore a user-payment system to fund maintenance (W13)
West Lombok regency *Meeting; N22 from meetings with IBF*	Renovation of the bridge within the available budget (N18, N19); maintain bridge access during renovation (N20); protection of materials against corrosion (N21); ecotourism is the most important thing about the bridge (N22)	Complete renovation of the bridge (W14); use local wood for replacement (W15); complete the current renovation before December (W16)
Eco Green *Interview*	Safe and comfortable bridge (N23); reliable main connection for the community (N24); government-funded bridge maintenance (N25); community involvement in bridge planning (N26)	Complete rebuilding of the bridge (W17); maintain separation between the main bridge and the mangrove trekking area (W18); wooden bridge using local materials (W19); restrict bridge access for large vehicles through a height barrier (W20); community involvement in bridge maintenance (W21)
Foreign visitor *Interview*	–	Safe crossing by car (W09)

3.4.3 Participatory design session

The four assignments led to the following results. Figure 3.4 shows an example of the outcome of each assignment, with (a) to (d) corresponding to assignments 1 to 4.

1. **Problems with the current bridge:** the participants rejected wood as a building material because of holes and frequent collapses. Instead, they asked for a permanent structure with an asphalt deck, concrete pillars and stronger side railings.
2. **The best bridge in Indonesia**: participants described their ideal bridge as an iconic landmark that attracts tourists. It should be wide enough for two cars, able to carry trucks and high enough for fishing boats to pass underneath.
3. **Crossing without a bridge:** during construction, boats and canoes could take over the crossing, as they did before the bridge was built in 2004.
4. **Safety and traffic flow:** participants suggested monitoring cameras, reinforced side barriers and a side deck. If the bridge is not wide enough, traffic officers could regulate alternating one-way traffic at peak hours.

In the evaluation, the participants reacted positively to the session. They said that it gave them more voice and asked to stay involved in planning and execution, specifically through local works, sourcing local materials and transparent funding.

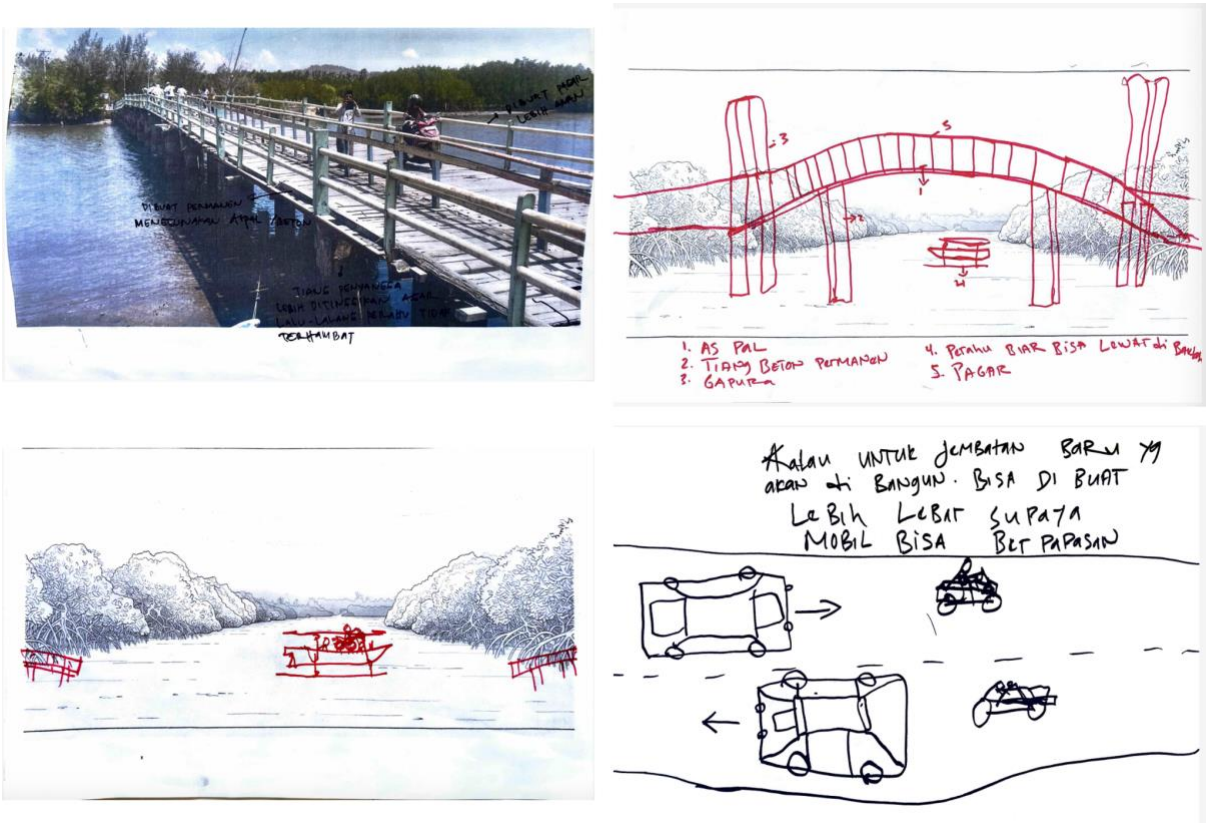

Figure 3.4 Results of the four assignments of the participatory design session: (a) annotated photo of the current bridge (assignment 1), (b) sketch of the best bridge in Indonesia (assignment 2), (c) crossing without a bridge (assignment 3), (d) safety and traffic flow (assignment 4)

The participatory design session largely confirms the needs that the local community expressed in the interviews. Safety, structural durability and accessibility came out as the main priorities, together with the wish for a bridge that supports community involvement, local economic activity and tourism. The session also added new needs and wishes on side barriers, surveillance, clearance for fishing boats and crossing during construction. Table 3.3 shows these additions.

Table 3.3 Needs and wishes derived from the participatory design session

Stakeholder	Needs	Wishes
Local community *Participatory design session*	Traffic should be able to flow simultaneously at both sides (N27); bridge made out of stronger materials, such as asphalt and concrete (N28); higher and stronger side barriers (N29); bridge wide enough for the traffic (N30); active traffic regulation (N31)	Bridge that attracts tourists (W22); big boats need to be able to go under the bridge (W23); use boats if the bridge is not available (W24); active surveillance (W25); no negative impact on the local economy (W26); environmentally friendly landscape (W27)

3.4.4 Personas

Based on the interviews, the participatory design session and field observations, five personas were developed to support the design process. They represent the main users of the connection: the Cemare resident (Ahmad), the fisherman (Hasan), the recreational visitor (Dewi), the heavy vehicle user (Adi) and the local shop owner (Sari) (Figure 3.5). Each persona shows the needs and challenges of one type of user and helps to keep the design user-centred.

Cemare resident – Ahmad

"I am afraid when crossing the bridge because it does not feel safe."



Profile: Resident of Cemare who depends on the connection to the mainland for everyday activities

Typical behaviour: Regularly travels between Cemare and the mainland, mainly by motorcycle or on foot, despite feeling unsafe while crossing

Bridge use: Uses the bridge frequently for work, shopping, services and other daily activities

Goals: To maintain easy and reliable access to work, shops, services and other daily activities on the mainland, without having to worry about crossing the bridge safely

Needs: A safe and reliable connection to the mainland that he feels confident using

Pain points: Feels afraid when crossing because of the poor condition of the bridge and worries that it may not be safe

Fisherman – Hasan

"The bridge should not prevent us from passing with our boats."



Profile: Local fisherman who depends on fishing as a source of income

Typical behaviour: Travels by boat to fishing areas and brings his catch back for sale or further transport

Bridge use: Passes underneath the bridge by boat and uses the connection when moving his catch further by land

Goals: To continue fishing and selling his catch without disruption

Needs: Sufficient horizontal and vertical clearance for fishing boats to pass underneath

Pain points: Insufficient passage underneath the bridge could restrict boat movements and interfere with fishing activities

Recreational visitor – Dewi

"I want to enjoy Cemare without worrying about how to get there."



Profile: Visitor who comes to Cemare to enjoy the beach and mangrove area

Typical behaviour: Visits Cemare with family or friends for a day trip, combining time at the beach with exploring the mangroves

Bridge use: Crosses the bridge as part of her journey to the beach and other attractions in Cemare

Goals: To have an enjoyable and uncomplicated recreational visit

Needs: Convenient and safe access to Cemare's recreational areas

Pain points: The poor condition of the bridge makes Cemare less inviting and can discourage visits

Heavy vehicle user – Adi

"If the load is too heavy, I use the boat to get to the other side."



Profile: Commercial transporter who collects goods from Cemare for further transport

Typical behaviour: Travels to Cemare to collect goods but avoids crossing the bridge when his vehicle is heavily loaded

Bridge use: Uses the bridge to access Cemare and transport collected goods by vehicle to and from Cemare

Goals: To collect and transport goods efficiently without unnecessary transfers or delays

Needs: A safe and reliable connection with sufficient capacity for loaded vehicles

Pain points: Heavy loads make the current bridge feel unsafe, sometimes requiring goods to be transferred separately by motorbike or boat

Local shop owner – Sari

"When fewer people come to Cemare, I have fewer customers."



Profile: Owner of a small warung in Cemare whose income depends on local customers and visitors

Typical behaviour: Runs her business daily, purchases supplies and sells products to residents and visitors

Bridge use: Depends indirectly on the bridge for incoming supplies and customer access

Goals: To maintain a stable business and generate sufficient income

Needs: Continuous access for suppliers and a steady flow of visitors into Cemare

Pain points: Reduced accessibility can make supplying the business more difficult and decrease customer numbers

Figure 3.5 Overview of the five user personas and their profiles: the Cemare resident (Ahmad), the fisherman (Hasan), the recreational visitor (Dewi), the heavy vehicle user (Adi) and the local shop owner (Sari)

3.5 Site conditions

This section presents the results of the site analysis in two parts. Section 3.5.1 describes the condition of the current bridge and what it teaches about the design of a new one. Section 3.5.2 describes the environmental effects that any new bridge at Cemare must withstand, including possible measures to mitigate these impacts. The full structural assessment is given in Appendix A, and the literature, data and calculations behind Section 3.5.2 in Appendix E.

3.5.1 Structural assessment of the current bridge

The structural assessment shows that the current bridge deteriorates through a combination of heavy cyclic loads and the coastal environment (Figure 1.3; Appendix A). The wooden beams (7 m long, 25 cm thick and all of the same age) are the most critical part, especially in the middle and at the outer sides of the bridge. Sagging beams shed load onto adjacent beams, which increases the risk of failure of the whole structure. The planks screwed across the beams are an emergency measure: because they are straight while the beams have sagged, they hardly spread the load (Morales-Conde et al., 2015). The deck planks are made of local wood, which in Indonesian bridges lasts at most about ten years (Doloksaribu & Nababan, 2021), and less under heavy use. Fatigue loading loosens them, and the steel wire used to tie them together cuts into the wood. Bolts have come loose through vibrations, mainly halfway between the pillars, or have rusted through, and both mechanisms reinforce each other. The steel beams of the pedestrian section show significant corrosion after only 16 years, although they sag less than the wooden parts. This indicates brittle failure, which happens more unexpectedly and can therefore be more dangerous. The square concrete pillars cause turbulence and scour (Omara et al., 2022), show exposed reinforcement in the tidal zone and may have settled slightly. Heavy trucks are not allowed on the bridge, but this is not enforced: the traffic count recorded 33 trucks and buses in one hour (Section 1.3.2). Because no original documentation exists and the foundations could not be inspected, their condition remains unknown.

The current bridge therefore offers lessons for a new one: load-bearing parts should not depend on timber, steel and reinforcement need lasting protection against corrosion, connections must resist vibrations, piers should be shaped to limit scour, traffic restrictions need enforcement, and the design and its condition should be documented so that future inspections have a starting point.

3.5.2 Environmental effects

Climate and corrosion. The combination of high humidity, high temperature and airborne salt at Cemare accelerates the corrosion of steel (Corvo et al., 2008). In the pillars, tidal wet-dry cycles drive chloride through the concrete to the reinforcement. There it causes pitting corrosion, which reduces the strain capacity of the bars more than uniform corrosion and can make failure brittle (Ali et al., 2024). The resulting rust expands to two to six times the volume of the steel, which cracks the concrete cover and lets chloride in even faster. This explains the exposed reinforcement found in Section 3.5.1.
Since corrosion cannot be avoided in this environment, a new bridge has to slow it down. This can be done in three ways: by choosing a more resistant steel, by coating the steel, or

by delaying the chloride in the concrete. Stainless steel is the most resistant, but costs about twice as much as weathering steel (Federal Highway Administration [FHWA], 2011), so it is best kept for the most critical parts. For the bridge piers, weathering steel would be an option as reinforcement, as it provides a self-protective oxide layer against wet-dry cycles. Unfortunately, the salinity of the water in the area counters this effect. A different, relatively cheap measure would be to just increase the layer of protective concrete around the pillars. This increases the time necessary for chloride to reach the steel weaponing. For the steel beams, zinc coatings such as hot-dip galvanising are among the most effective practical measures in marine environments (Silaban et al., 2026). Epoxy primer is applicable in Indonesian coastal areas, but has little effect in the tidal zone (Alfaini, 2022). For the pillars, a thicker concrete cover is a cheap way to delay chloride reaching the reinforcement.

Timber decay. Timber is widely used for bridges on Lombok because it is locally available and light, which suits soft coastal soils. In a tropical coastal environment, however, fungal decay is fast. For four Indonesian species in the most hazardous conditions, Prabowo et al. (2022) predict a decay of 1.05 mm per year for Belian (durability class 1), 1.30 for Bangkirai (class 2), 2.39 for Keruing (class 3) and 4.62 for Meranti (class 4). No data exist for the coconut wood that is also used on Lombok. Corroding bolts further accelerate the decay of the surrounding wood (Zelinka & Rammer, 2005).

Sea level and tides. Under scenario SSP3-7.0, the sea level rises by 0.14 m in 2040, 0.37 m in 2070 and 0.46 m in 2080 (NASA, 2021). The tide at Cemare is mixed to diurnal, with extreme high tides of 1.77 to 2.10 m and extreme low tides of 0.08 to 0.20 m above chart datum, a range of about 2 m (Tides4Fishing, n.d.). The tides also drive the wet-dry cycles of salinity that cause corrosion (Alaydrus et al., 2025). In addition, they transport the nutrients and sediments that sustain the mangroves (Sukuryadi et al., 2021), so a new bridge should not obstruct the tidal flow. To keep enough clearance for fishing boats up to 2070, the deck must be at least 3.37 m above low tide (Appendix E).

Floods. Floods occur regularly on Lombok and in West Lombok, but Cemare has not experienced significant flooding in recent years. The replanted mangroves act as a natural buffer against coastal erosion and tidal flooding (Lombokvibes, 2025; Imran & Efendi, 2016). Preserving the mangroves is therefore the main protection against floods. Flood probabilities and levels were not quantified in this study.

Seismic activity. Lombok lies on the Ring of Fire and was struck by an M6.9 earthquake in 2018. An inspection of 38 bridges damaged on Lombok and in Palu showed that the approach roads and abutments are the most vulnerable parts, because the embankments settle (Putra & Adi Riyono, 2020). Retaining walls of stone or brick are especially weak, so reinforced concrete backwalls at the abutments are recommended (Mata et al., 2025). Seismic isolation bearings can further protect the substructure. Recycled rubber bearings are a cheap alternative, but they have mainly been tested on houses and not yet on bridges (Calabrese et al., 2019).

After an earthquake, the base of a conventional monolithic pier is often damaged beyond repair, which makes full replacement necessary. Design for deconstruction uses mechanical instead of monolithic connections, so that damage is concentrated in replaceable parts (Fernandes & Ferrão, 2025). Kopiika et al. (2026) apply this to a self-centring bridge pier

with external rebars that act as sacrificial fuses and can be replaced after an earthquake (Figure E.1 in Appendix E). At the end of its life, such a pier can be unbolted and reused.

Scour. Scour caused 3,193 bridge failures in Indonesia between 2011 and 2021, mainly at older bridges with shallow foundations (Pratama et al., n.d.). The Cemare bridge is 22 years old and its foundations are unknown, so this risk cannot be excluded. A conservative first estimate with the method of Schiereck and Verhagen (2019) can be used for the equilibrium scour depth around a cylindrical pier in relation with the pier diameter. Whether this is safe depends on the foundation depth, which requires an inspection by divers or echo sounding. If the bed consists of silt or clay, as is common in mangrove areas, actual scour will be smaller (Woodroffe et al., 2016). A soil investigation is needed to confirm this. Square piers increase turbulence and scour compared with circular piers (Omara et al., 2022).

It is clear that the environment limits the lifespan of the Cemare bridge. The tropical coastal climate causes fast corrosion to steel parts and timber decay, while sea-level rise, tides and floods affects the required height of the bridge, and seismic activity can cause collapse of bridges on Lombok and scour threatens the stability of the bridge piers. A new bridge must be designed for these conditions.

A more complete assessment, including underlying literature, data and calculations, is given in Appendix E.

3.6 Synthesis: from analysis to design requirements and criteria

Table 3.4 brings the results of this chapter together. The needs and wishes are grouped into twelve categories under desirability, feasibility and viability. Each category is linked to the analysis that supports it and translated into one measurable criterion with a target value. These criteria are used to compare the concepts in the multi-criteria analysis (Section 4.5). The full list of needs and wishes is given in Appendix B1 and the definitions of the criteria in Appendix G.

Table 3.4 Needs, wishes and analyses translated into design requirements and evaluation criteria

Domain	Category	Needs and wishes	Analysis	Design requirement	Criterion
Desirability	Reliability and accessibility	N02, N08, N10, N11, N20, N24	1.3.2, 3.4	The bridge shall safely carry the design loads of all permitted traffic	Heavy trucks (tourist buses or construction trucks) can pass in at least one direction
	Capacity	N05, N06, N12, N13, N14, N27; N30, W10	1.3.2	The bridge shall allow traffic from both directions to cross, either simultaneously or alternately	Width for at least two cars and two pedestrians at the same time
	Safety, management and comfort	N07, N23, N29, N31; W07, W09, W20, W25	3.5	The bridge shall have measures to ensure a safe crossing	Users rate safety and comfort at least 8 on a scale of 1 to 10 in a survey (n ≥ 50)

	Attractiveness and Cemare identity	N01, N22; W01-W05, W08, W15, W18, W19, W22	3.2	The bridge design shall include a distinctive visual feature that makes it recognisable as a landmark for Cemare	Residents and visitors each rate the design at least 8 on a scale of 1 to 10 in a survey
	Local environmental impact	W27	3.2	The design shall minimise disturbance to the surrounding mangrove ecosystem and local fauna	Luminaires with 100% downward cut-off (0% ULR); light spill ≤ 0.5 lux at the habitat boundary; operational noise ≤ 45 dB at 20 m
	Environmental impact	W11	3.2	The construction of the bridge shall minimise environmental impact	Estimated emissions of the materials at most 100 t CO_2e
	Waterway and fishing	W23, W24, W26	3.5	The bridge shall provide sufficient vertical and horizontal clearance for boats to pass underneath safely	Deck higher than low tide + sea-level rise up to 2070 (0.37 m) + fishing boat (2 m) + 1 m margin, i.e. at least 3.37 m above low tide
Feasibility	Structural strength, durability and lifespan	N03, N04, N09, N16, N21, N28; W06	3.5	The bridge shall provide the desired functional lifespan without major reconstruction	Lifespan of at least 30 years
	Maintenance	N15, N18; W14, W16, W17	App. A, 3.2	There shall be a maintenance arrangement with a responsible party	Deck repairs completed within 2 weeks; substructure repairs within 1 month
	Environmental hazards	N32	3.5	The bridge shall provide a reliable connection that withstands environmental hazards and allows residents to cross in case of an evacuation	Withstands floods up to 2 m above sea level; withstands earthquakes according to SNI 2833:2016: no collapse in a heavy earthquake, remains in service after smaller earthquakes
Viability	Financial sustainability	N17, N19, N25; W13	3.2, 3.3	The construction and maintenance costs shall be coverable by identified funding sources	Funding for inspection, maintenance and repairs available within 2 days of application
	Community participation and governance	N26; W12, W21	3.3, 3.4	The bridge shall be inspectable and repairable with locally available skills and materials	Deck and railing issues resolved by locals within 2 weeks

The criteria show that a future connection must do more than carry traffic. It must last in a harsh coastal environment, serve users with different needs, and be maintained and funded after construction.

4. Results: Design phase

This chapter presents the results of the design phase, which form the basis for answering SQ2 in Section 7.1. Section 4.1 presents the functions of the connection and Section 4.2 the morphological chart. Sections 4.3 and 4.4 describe the five theme concepts and the three combined concepts, which are evaluated in Section 4.5. Section 4.6 presents the final design, and Section 4.7 shows to what extent it meets the design requirements of Table 3.4.

The final design is a conceptual proposal. It has not been structurally or technically verified and requires detailed engineering before it can be implemented.

4.1 Functions of the connection

The main function of the connection is to connect Cemare and the mainland for people, goods and services. This function is divided into six sub-functions and 23 sub-sub-functions (Figure 4.1). Together the subfunctions cover the structural, environmental, social and organisational roles of the bridge.

The sub-functions are based on the needs and wishes in Table 3.4 and from the site and actor analyses. F1 and F2 follow from the need for a strong and durable structure and from the structural assessment and environmental effects (Section 3.5). F3 brings together the wishes of IBF, Eco Green and the fishermen to keep the mangroves intact and the waterway open. F4 and F5 follow from the needs of the users and from the wish of IBF, the regency and residents for a landmark that supports ecotourism. F6 was added because the actor analysis showed that no party is responsible for inspection, maintenance and funding after the renovation (Section 3.3).

The function tree was refined in several rounds. Rewriting each function as a How-might-we question showed that some functions still contained a hidden solution. For example, ‘provide an even, gap-free deck surface’ already pointed to a particular type of deck, so it became ‘provide a smooth deck surface’. Other functions turned out to contain more than one design choice. Maintenance, for instance, was split into responsibility (F6.3), funding (F6.4) and execution (F6.5). Preventing scour at the foundations was added later in the design process.

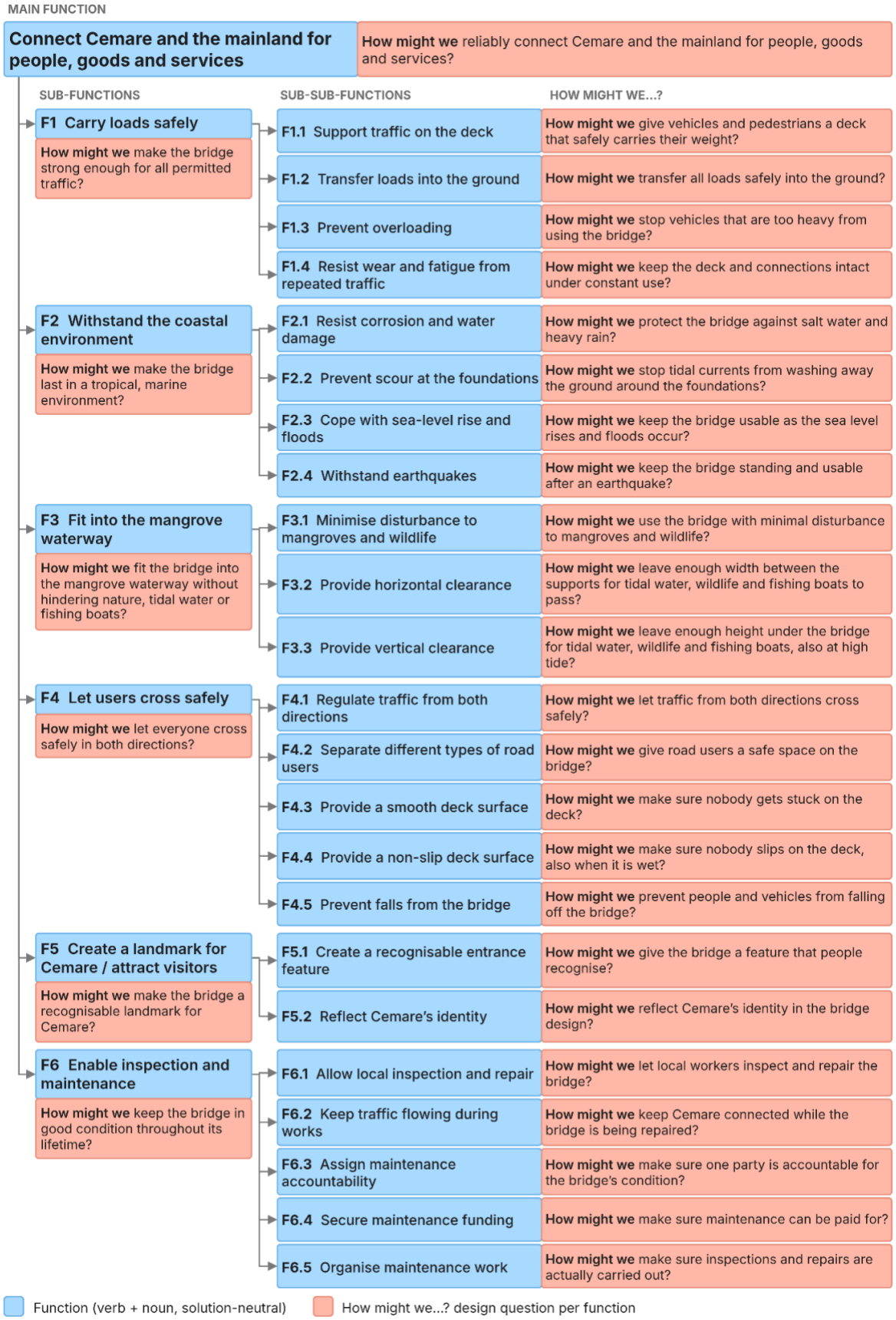

Figure 4.1 Function tree with a How-might-we question for each function

4.2 Morphological chart

The morphological chart contains 194 solution options for the 23 sub-sub-functions (Figure 4.2). The options range from common measures, such as a concrete deck or galvanised steel, to unusual ones, such as a floating bridge or a lift span. Measures from the site analysis, such as demountable rocking joints, and ideas from the participatory design session, such as a boat shuttle, traffic marshals and a welcome sign, were added to the chart. A full description of every option is given in Appendix F, and an overview of common bridge types in Appendix H.

SUB-FUNCTION	SUB-SUB-FUNCTION	SOLUTION OPTIONS										
F1 Carry loads safely	F1.1 Support traffic on the deck	1 Timber deck	2 Concrete deck	3 Steel deck	4 Hybrid steel–concrete	5 Split deck light/heavy	6 Plastic road deck	7 Generative design	8 Arched deck			
	F1.2 Transfer loads into the ground	1 Concrete piles/pillars	2 Strengthen foundations	3 Steel pillars	4 Hardwood piles	5 Spread footings	6 Floating structure	7 Arch structure	8 Cable bridge	9 Soil investigation	10 Screw piles	11 Truss bridge
	F1.3 Prevent overloading	1 Height barrier	2 Load sensors + alarm	3 Fines for overweight	4 Weight-limit signs	5 Police control	6 Staffed gate	7 Vehicle permits	8 Time restrictions	9 Narrow carriageway	10 Goods transfer mechanism	11 Design for heaviest vehicle
	F1.4 Resist wear and fatigue from repeated traffic	1 Strong joints (extra bolts)	2 Steel-on-steel joints only	3 Periodic maintenance								
F2 Withstand the coastal environment	F2.1 Resist corrosion and water damage	1 Protective paint/coating	2 Stainless steel	3 Corrosion-proof materials	4 Galvanised steel	5 Thicker concrete pillars	6 No pillars in tidal water	7 PVC-FRP-confined pillars	8 Water-resistant varnish	9 Weathering steel	10 Sacrificial parts	11 Durable decking
	F2.2 Prevent scour at the foundations	1 Rock armour	2 Seabed mats / blocks	3 Deeper foundations	4 Gabions	5 Waterflow-redirecting walls	6 Mangroves around foundations	7 Sandbags	8 Streamlined pier shape			
	F2.3 Cope with sea-level rise and floods	1 Raise deck (2070 high tide and floods)	2 Adjustable deck height	3 Flood barriers / movable walls	4 Drainage pumps	5 Raise foundations	6 Open structure	7 Floating bridge	8 Watertight bridge	9 10-yr bridge, then higher deck	10 Skybridge evacuation route	11 Mangrove buffer
	F2.4 Withstand earthquakes	1 Isolation bearings	2 Light, strong structure	3 Thick concrete pillars	4 PVC-FRP confinement	5 Shear keys at piers	6 Vertical seismic bars	7 Large mid-span mass	8 Shock dampers	9 Flexible deck sections	10 Extra bracing	11 Deep foundations
		12 Smaller deck radius	13 Easy local rebuild	14 Structural health monitoring	15 Demountable rocking joint							
F3 Fit into the mangrove waterway	F3.1 Minimise disturbance to mangroves and wildlife	1 Keep current location	2 Prefab construction parts	3 No works in wildlife seasons	4 Replant mangroves	5 Speed limit + bumps	6 Quiet hours at night	7 Low-noise surface	8 Sound barriers	9 Education on vehicle noise	10 Damped foundation	11 Red night lighting
		12 Waste nets	13 Bird nesting spots	14 Animal crossings below	15 P+R for tourists	16 Trash bins						
	F3.2 Provide horizontal clearance	1 Long main span	2 Suspension bridge	3 Few, robust pillars	4 Dig away banks							
	F3.3 Provide vertical clearance	1 Raised boat section (arch)	2 Raise foundations	3 Dams limit water flow	4 Swing span	5 Lift span	6 Dredge river					
F4 Let users cross safely	F4.1 Regulate traffic from both directions	1 Traffic lights	2 Two lanes + centre line	3 Two lanes + median barrier	4 Two parallel bridges	5 Traffic marshal	6 Priority signs	7 Single lane + passing bays	8 Renovated side, one-way			
	F4.2 Separate different types of road users	1 Both directions + sidewalks behind kerb	2 Both directions + sidewalks behind barrier	3 Separate pedestrian bridge	4 Both directions: car, motorcycle lane + sidewalk	5 Pedestrians only	6 Pedestrian-only hours	7 Painted lane lines	8 Shared space (slow)			
	F4.3 Provide a smooth deck surface	1 Concrete surface	2 Rubberised layer	3 Interlocking planks	4 Cover plates on gaps	5 Asphalt overlay						
	F4.4 Provide a non-slip deck surface	1 Anti-slip coating	2 Crossfall + drainage	3 Textured surface	4 Rubberised layer	5 Anti-slip strips						
	F4.5 Prevent falls from the bridge	1 Concrete edge walls	2 Timber railing	3 Steel vehicle railing	4 Cable handrail	5 Raised road edge	6 Car speed limit	7 One-way traffic	8 Warning signs			
F5 Create a landmark for Cemare / attract visitors	F5.1 Create a recognisable entrance feature	1 Coloured night lighting + shows	2 Entrance gate / arch	3 Photogenic bridge shape	4 Viewing platform	5 Flags	6 Sculpture	7 Parking + tourist info centre + bicycles	8 Love locks	9 Welcome sign at entrance		
	F5.2 Reflect Cemare's identity	1 Local artwork	2 Mangrove-inspired design	3 Fishing-inspired design	4 Marine-life decorations	5 Local materials	6 Cemare history info	7 Large Cemare name sign				
F6 Enable inspection and maintenance	F6.1 Allow local inspection and repair	1 Simple local materials	2 Training for residents	3 Tool shed at bridge	4 Local inspections + checklist	5 Local team	6 Damage reporting system	7 Standardised, replaceable parts	8 Inspection cable system	9 Detachable cladding		
	F6.2 Keep traffic flowing during works	1 Boat shuttle	2 Phased repair, half open	3 Divert traffic to skybridge	4 Temporary bridge	5 Scooter shuttle to skybridge	6 Cable transport for goods	7 Prefab materials for fast works	8 Evacuation plan			
	F6.3 Assign maintenance accountability	1 Regency (asset register)	2 Formal community group	3 Joint committee with leading party	4 Village government	5 IBF-led partnership	6 Private concession					
	F6.4 Secure maintenance funding	1 Yearly regency budget (APBD)	2 Ad-hoc regency budget	3 Bridge toll	4 Visitor fee	5 Donations	6 Tourism tax share	7 Community contribution	8 Local bridge tax	9 Village fund	10 Parking fees	
	F6.5 Organise maintenance work	1 Regency PUPR crew	2 Contractor per job	3 Long-term private contract	4 Paid caretaker	5 Paid local team	6 Rotating resident teams	7 Community work days				

Figure 4.2 Morphological chart with 194 solution options for the 23 sub-sub-functions

4.3 Theme concepts

A concept is a combination of options per row of the chart. It is a route through the chart that shows how the bridge is built, used and maintained. A concept is not yet a detailed design with exact dimensions and costs, but a first outline of a design.

Five theme concepts were created, each showing what the bridge would look like if one goal were given priority. Each goal reflects a different side of the problem:

- **Natural hazards:** make the bridge resilient to future natural hazards over a long lifespan.
- **Heavy transport:** carry trucks and buses safely, as the bridge is the only connection for heavy vehicles to Cemare.
- **Tourism:** make the bridge a recognisable entrance to Cemare that supports local tourism.
- **Eco-friendly:** limit the environmental impact of the bridge and protect the mangroves, wildlife and waterway.
- **Community-preserved:** let residents inspect and maintain the bridge themselves.

The five theme concepts are described in the same way. The description starts with the structure of the bridge and its use and maintenance, and ends with why the concept is desirable, feasible and viable from the perspective of its theme. Sketches of each concept are shown in Figures 4.3 to 4.7.

4.3.1 Natural hazards

The natural hazards concept is designed to withstand the tropical coastal climate, the sea, earthquakes and scour (Figure 4.3). Experts first analyse the riverbed, so that the foundations carry the loads safely and prevent liquefaction during an earthquake. There are few piers in the deep water, and concrete block mattresses, synthetic mats or large rocks protect them against scour. The steel-concrete composite deck has extra-strong stainless-steel joints and vibration-damping measures, such as demountable rocking joints, and is raised to allow for sea-level rise and floods. Measures such as PVC-FRP-confined concrete pillars and an epoxy coating on the steel beams limit corrosion (Section 3.5.2).

The road has two lanes with a centre line, kerbs for pedestrians, steel railings and a textured surface. A height barrier keeps heavy transport off the bridge. An entrance gate and a sign about the history of Cemare welcome users. Locals prepare a monthly damage report, and the regency pays for repairs from its annual maintenance budget.

Desirable: the bridge is strong and safe, which the local community named as an important need (N09), and it stays usable after natural hazards (N32).

Feasible: the construction techniques needed to withstand hazards such as seismic activity are known and available on Lombok. The bridge may be over-designed for daily use, but it can withstand the expected loads and hazards.

Viable: the large one-off investment by the regency pays off, as the bridge lasts long and needs few renovations.

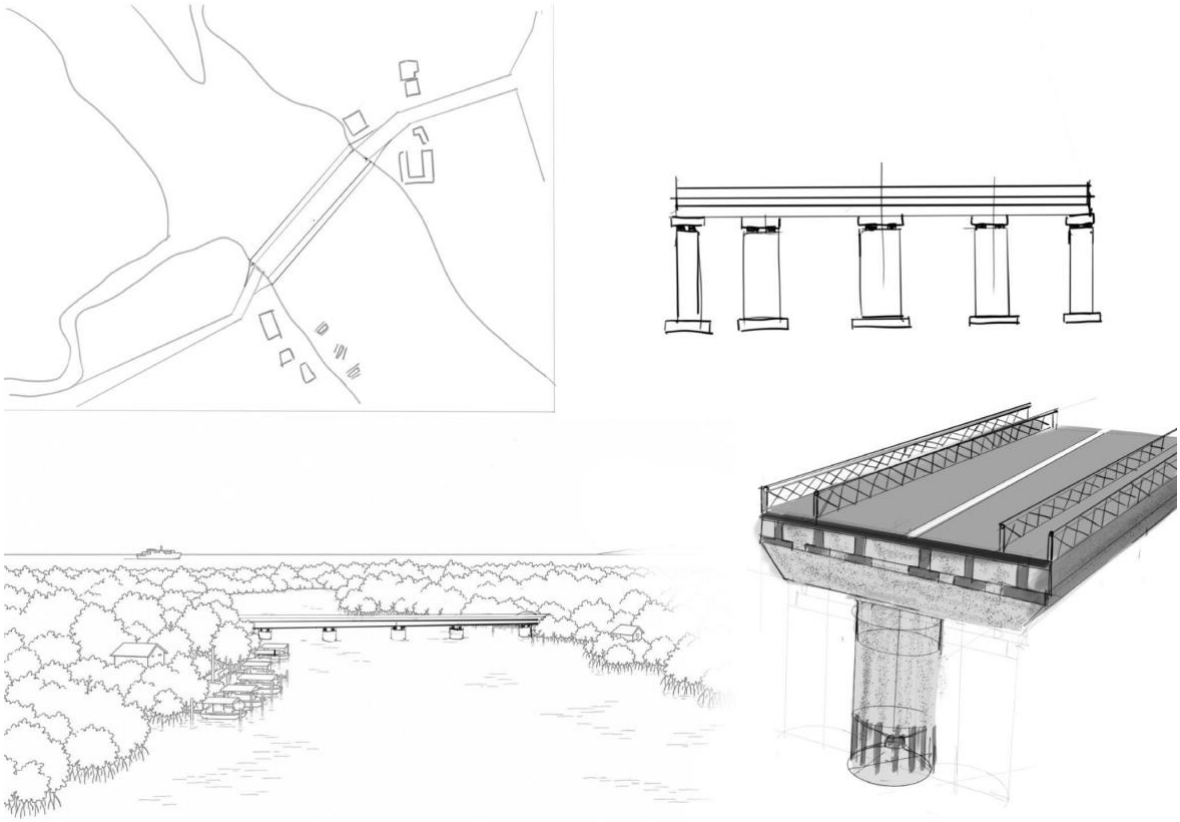

Figure 4.3 Sketches of the theme concept Natural hazards

4.3.2 Heavy transport

The heavy transport concept is built to carry heavy loads and to guide traffic efficiently and safely (Figure 4.4). The bridge rests on reinforced concrete piles and pillars with extra concrete, instead of relying on coatings against corrosion. Extra-strong stainless-steel joints resist wear and fatigue, and an asphalt deck with crossfall and drainage stays non-slip. High side barriers protect the deck against flooding, and seismic isolation bearings absorb both earthquake shocks and the vibrations of trucks.

A permit system based on weight and type of cargo regulates who may cross. Sidewalks on both sides are separated by barriers from a central road with two lanes for cars. This road turns into a one-way priority lane when heavy vehicles cross, to avoid overloading. Maintenance is funded through a bridge toll for its users.

Desirable: it keeps the village accessible for trucks, which IBF and residents need for construction materials, waste collection and the livelihoods of truck drivers (N05, N06, N12).

Feasible: reinforced concrete, asphalt and strong steel joints are common choices for bridges that carry heavy traffic.

Viable: the permit system and the priority lane prevent overloading, which extends the lifespan of the bridge.

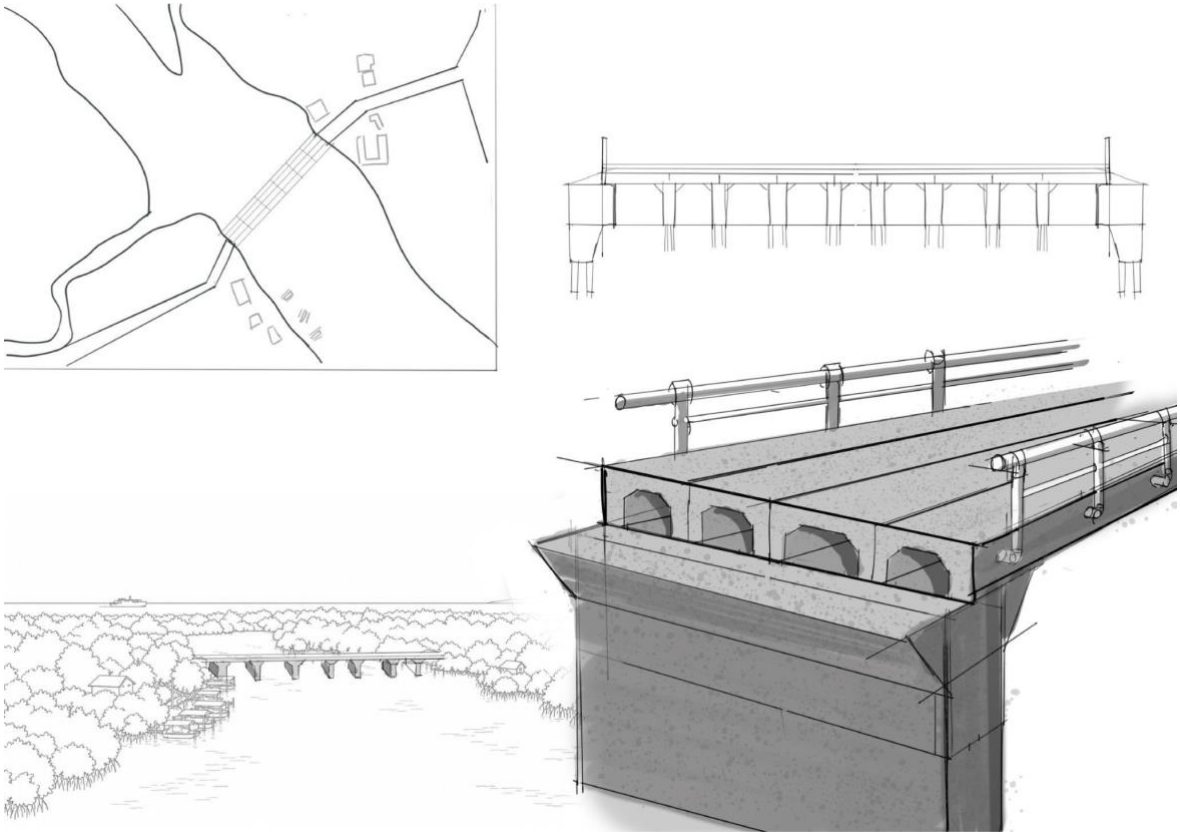

Figure 4.4 Sketches of the theme concept Heavy transport

4.3.3 Tourism

The tourism concept makes the bridge an attraction in itself as a lightweight hanging bridge with an arched structure (Figure 4.5). It needs no pillars in the salt water, which protects the undisturbed nature that ecotourism relies on. The arch gives boats enough clearance to enter the mangroves, and mangroves planted around the foundations on the banks protect against scour. The deck has interlocking planks with an anti-slip coating to provide comfortable crossing.

A staffed gate regulates traffic. The deck has two marked lanes and sidewalks with cable railings behind a physical separation. Visitors park at a park and ride facility on the mainland and cross by foot or bus shuttle, which keeps tourist traffic reduced in the village. A viewing platform with local artwork in the middle of the bridge forms a photogenic landmark. Trained residents do the daily maintenance and renovations are planned in advance, paid from a dedicated share of the regional tourism tax and managed by a joint committee.

Desirable: it delivers the iconic bridge that IBF and the local community wish for (W01, W02, W22). It also protects the mangroves needed for ecotourism (N01, N22) and keeps the village safe and free from tourist congestion (N07).

Feasible: because visitors arrive by shuttle from the mainland, vehicle loads on the bridge stay limited and predictable. The pillar-free span also avoids corrosion and scour in the water.

Viable: the tourism tax gives a structural maintenance budget, and the joint committee makes clear who is responsible.

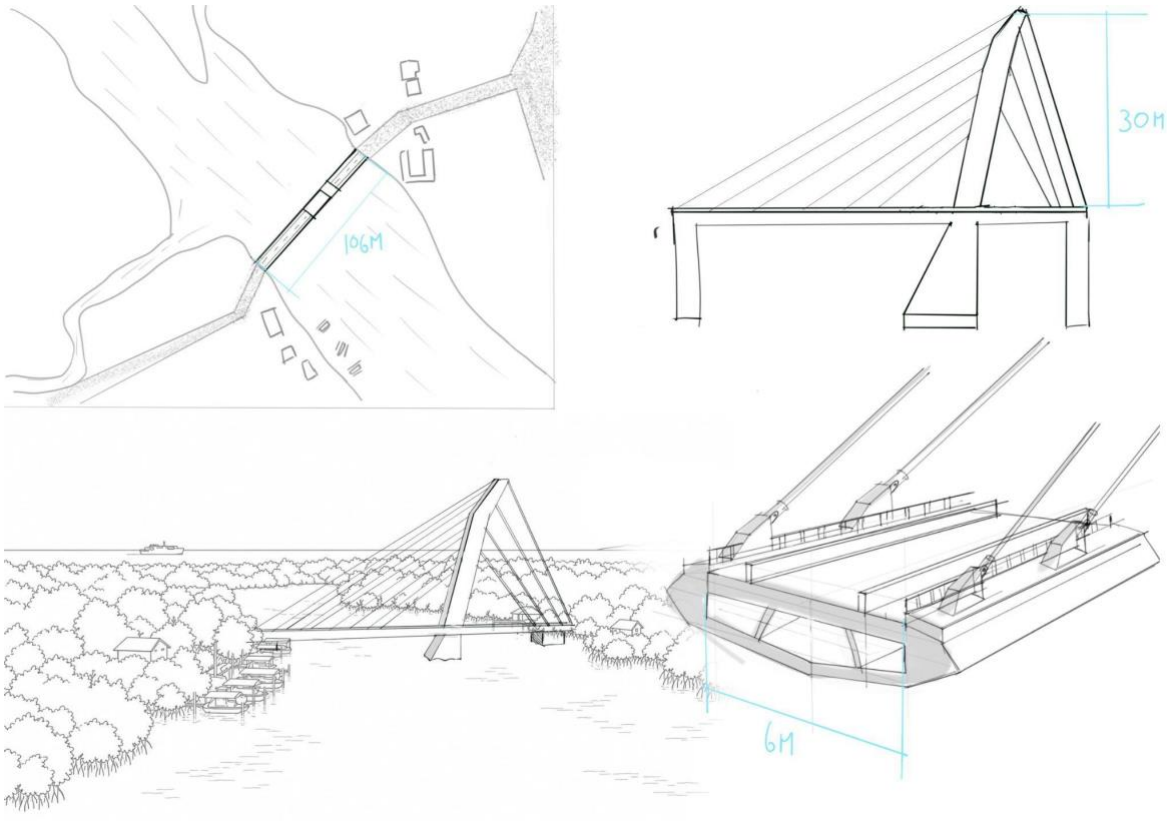

Figure 4.5 Sketches of the theme concept Tourism

4.3.4 Eco-friendly

The eco-friendly concept limits the impact on the environment during construction, use and maintenance (Figure 4.6). A timber deck, for example of ulin hardwood, replaces steel or concrete, and the existing foundations are strengthened rather than replaced. Replaceable sacrificial parts and shock absorbers protect the structure. The bridge stays outside the mangrove area, and new mangroves between the sea and the bridge help against floods and scour. A few robust pillars keep horizontal clearance, and dams limit the water flow to keep vertical clearance.

The bridge is for pedestrians only, with a traffic marshal at peak times to prevent misuse and overcrowding. It has timber railings and a non-slip deck of interlocking planks with drainage. On the mainland, a parking area and a tourist information centre built with local materials form a landmark, and bicycles are available for visitors. A formal community group recognised by the village is responsible for maintenance, and a local team does the work for a small fee, partly paid by a visitor entrance fee. During works, traffic uses the nearby suspension bridge (Inside Lombok, 2023).

Desirable: it stays out of the mangrove area and uses a timber deck, as Eco Green wishes (W18, W19).

Feasible: sacrificial parts and shock absorbers make the timber structure suitable for the coastal environment, and reusing the foundations limits construction work.

Viable: local maintenance keeps recurring costs low, while visitor fees provide continuous funding.

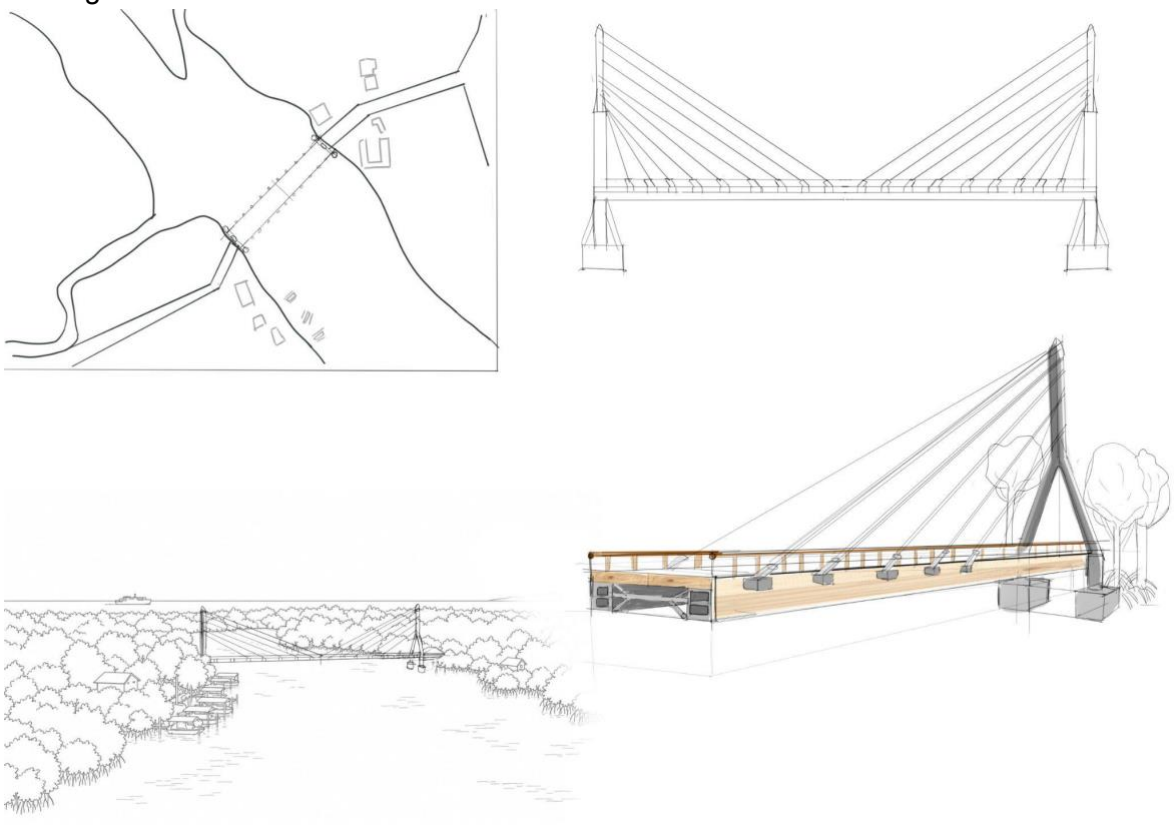

Figure 4.6 Sketches of the theme concept Eco-friendly

4.3.5 Community-preserved

In this concept, the people who use the bridge can also take care of it (Figure 4.7). The base is built to be robust, so it needs little inspection. The ground under the water is checked first, and fewer but stronger concrete pillars stand on deep foundations with rock armour. Rubber bearings absorb earthquakes and the deck is raised above high tide and flood levels. These measures prevent major damage that the community cannot repair itself.

On top are the parts that residents can check and repair with simple tools. The deck is made of interlocking timber planks with anti-slip strips and a timber railing. The road has two lanes with a centre line, shared by all users at low speed with speed bumps. Only vehicles with a permit may cross, which limits damage to the deck. An entrance gate and local artwork show that the bridge belongs to the community. Workshops train residents, and a local team recognised by the village carries out the renovations for a small fee.

Desirable: the survey showed that residents want to help restore the bridge within their own skills, which Eco Green and the Head of Village confirmed (W12, W21).

Feasible: contractors do the heavy work once, and the community does the small repairs.

Viable: local repairs cost less than hiring a contractor each time, and the regency would cover materials and fees from its yearly budget.

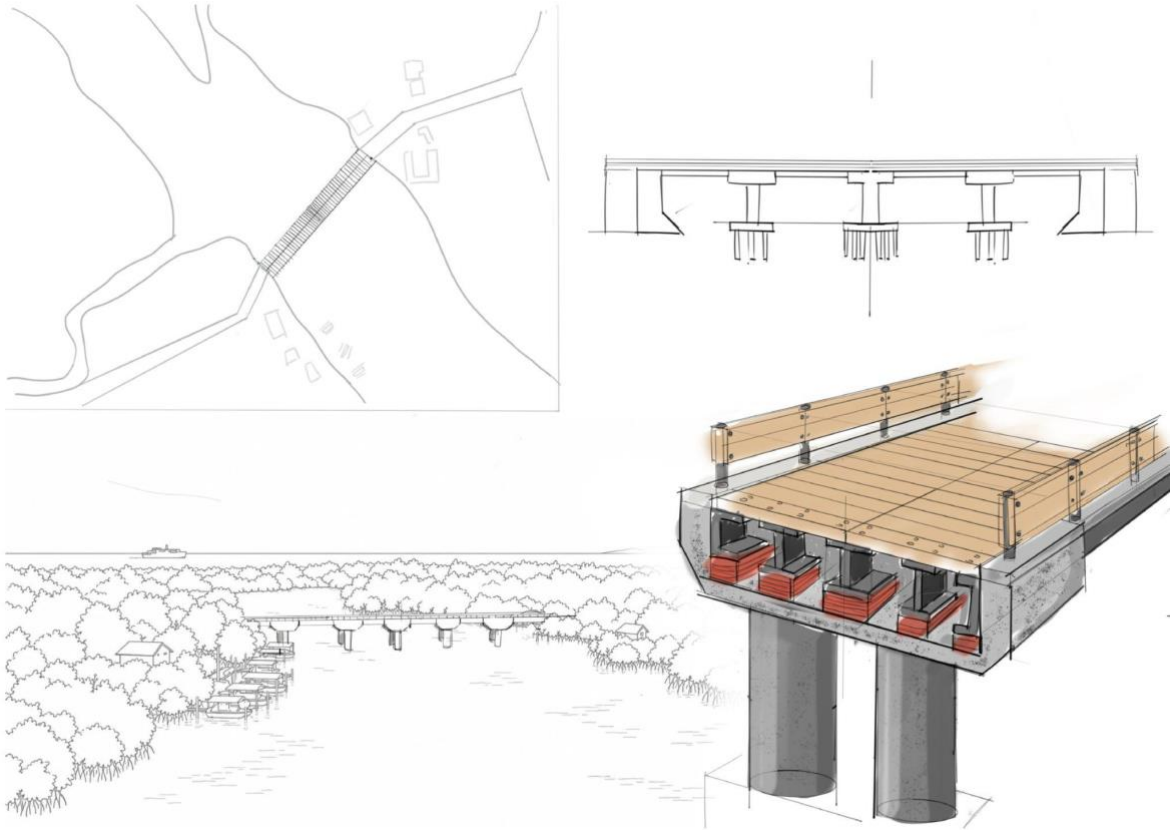

Figure 4.7 Sketches of the theme concept Community-preserved

Taken together, the theme concepts make clear where goals clash. The natural hazards concept is built to last but requires a large one-off investment and keeps trucks off the bridge with a height barrier. The tourism concept avoids pillars in the water and keeps tourist traffic

out of Cemare with a P+R and shuttle. Both choices conflict with the heavy transport concept, which is designed precisely for trucks and buses. The eco-friendly concept protects the mangroves but only allows pedestrians on the only car connection to Cemare. The community-preserved concept can be repaired by residents, but its timber deck decays quickly in the coastal climate (Section 3.5.2). No theme concept therefore meets all needs and wishes at once.

4.4 Combined concepts R1, R2 and R3

To combine the five theme concepts into concepts that address multiple goals, a role-play was used. Role-play can capture both the technical and social complexity of decision-making (Mayer, 2009). This process reflected how different goals can conflict and showed how they can be balanced through negotiation.

Table 4.1 Role-play rounds

Round	Perspective	Discussion starts with	Idea behind the order
1	Consensus	Options that most themes already share	Agree on common ground first, then negotiate the differences
2	Dependency	Who uses the bridge and where it is located	First the choices that determine many others, then the details
3	Budget	Funding and maintenance	First decide what can be paid and maintained

The role-play consisted of three rounds (Table 4.1). The three rounds used different orders for discussing the 23 rows of the options chart. These orders represented three decision-making perspectives: consensus, dependency, and budget. These three rounds resulted in three combined concepts further described in the next sections.

4.4.1 R1 Consensus

Layout, Appearance, and Traffic

The new bridge will have two vehicle lanes, one in each direction, separated by a marked centre line. Cars and motorcycles will share these lanes. On both sides, there will be separate pedestrian sidewalks with timber decking. Steel barriers will separate pedestrians from vehicles, while timber railings along the outer edges will prevent pedestrians from falling into the water. Halfway across the bridge, a viewing platform will extend from one of the sidewalks, allowing visitors to enjoy views of the river and surrounding mangroves without blocking pedestrian traffic. To reflect the local identity, traditional Sasak patterns will be incorporated into decorative panels along the timber railings. A wooden welcome sign, designed together with local artists, will be placed at the bridge entrance.

The pedestrian sidewalks will consist of interlocking timber planks, secured with strong joints and stainless-steel bolts. Anti-slip strips will provide additional grip during wet conditions. The vehicle lanes will have a concrete deck, covered with asphalt, with a slight crossfall, directing rainwater towards drainage outlets along the edges. Speed bumps near the bridge entrances will encourage drivers to slow down, improving road safety and reducing the risk of disturbing wildlife in the mangrove. The bridge deck and supporting structure will be raised to accommodate future sea-level rise, high tides and flooding, considering projected water

levels for 2070. This will also provide additional vertical clearance for local fishing boats passing underneath the bridge.

Finally, a permit system will regulate heavy vehicle access to prevent excessive structural loading. To keep the system practical and easy to maintain, automated weight sensors or simple physical barriers will monitor vehicle weight, reducing the need for complex paperwork. Vehicles exceeding a specified weight threshold will need prior approval from the local government. Permits will mainly be granted for essential transport, such as construction materials and local deliveries, provided the vehicles remain within the bridge's safe load capacity. Weight-limit signs will be installed at both entrances, and approved vehicles may be required to cross at reduced speeds.

Structure, Construction, and Resilience
First, the seabed and existing foundations will be investigated to assess their stability and determine whether they can be reused. If suitable, the foundations will be strengthened and modified to raise the bridge height. Rock armour will be placed around the foundations to prevent erosion and scouring.

The number of supporting pillars will be minimised, and any new pillars will be made of reinforced concrete. Separate deck structures will be used for vehicles and pedestrians. Seismic isolation bearings will be installed between the pillars and bridge deck to allow controlled movement during earthquakes and reduce structural damage.

During construction, a temporary crossing for pedestrians and motorcycles will be installed near the existing bridge, subject to technical and environmental feasibility. Cars and delivery vehicles will use an alternative road route where available, while essential supplies can be transported across the temporary crossing using smaller vehicles. For emergencies, arrangements will be made with local emergency services to provide medical assistance on the Cemare side and transfer patients across the temporary crossing if necessary. Once the new bridge has passed its safety inspections, the temporary crossing will be removed and normal traffic will resume.

Management and Maintenance
Local residents will receive training in basic bridge inspections, damage recognition and minor repairs, allowing them to contribute to routine maintenance. More complex maintenance and structural repairs will be carried out by a private company under a long-term maintenance contract with the Regency. The Regency will fund this contract by allocating part of its annual regional budget (APBD) to bridge maintenance. If applicable, revenue from legally authorised tourism fees will provide an additional source of funding.

A joint maintenance committee, consisting of representatives from the Regency, village government, local community and the private company, will oversee maintenance activities and monitor the bridge's condition. The Regency will retain overall responsibility for ensuring that maintenance is properly funded and carried out.

4.4.2 R2 Dependency

Layout, Appearance, and Traffic

When visitors arrive from the mainland, they are immediately welcomed at a combined parking lot (P+R) and a tourist information centre. This area serves as the central, recognizable entry point. To protect the bridge from overuse, a staffed access gate is positioned here. Tourist buses and other vehicles, such as heavy trucks, are only allowed to pass if they pay a small fee, while tourists travelling on foot or by motorcycle are welcome to cross. Together with funding from the regency (APBD), these fees finance future maintenance.

On the bridge, traffic is guided efficiently and safely. There are two lanes (one for each direction), clearly separated by a centre line, where cars and motorcycles drive. For pedestrians, a safe sidewalk has been created on both sides, shielded from motorized traffic by a robust, physical barrier. The bridge railings combine function and aesthetics: for cars, there is a sturdy steel car section, while pedestrians are protected by a cable railing with a pleasant-to-the-touch wooden top part.

Structure, Construction, and Resilience

The new Cemare bridge retains its original, familiar location but is designed in such a way that both the bridge itself and the construction activities completely spare the surrounding mangrove forests. Between the sea and the bridge, extra mangrove vegetation has even been planted, serving as a robust natural buffer against flooding and sea-level rise.

Above the water, the bridge presents itself as an impressive, elevated structure, decorated with local artwork that reflects the identity of Cemare. The robust, two-meter elevated prestressed concrete girders rest on two reinforced, cylindrical, concrete pillars, one on each side with a 30 or 40 meter horizontal clearance (Black, 2021). The deck itself is finished with a textured concrete featuring a crossfall and integrated deck drainage, ensuring the surface remains non-slip and safe even during heavy rainfall. To guarantee a maximum lifespan, thorough soil investigation is conducted, and if necessary, deep, raised foundations are chosen. Utilizing extra concrete and protective paint (epoxy) against saltwater corrosion are measures to increase the lifespan of the bridge.

Safety and climate resilience have been considered. To withstand the forces of earthquakes, the bridge is equipped with seismic isolators and reinforced concrete shear keys at the abutments and piers. Underwater, the foundations are protected against scour by means of synthetic mats on the seabed, if deemed necessary after scour investigation. The bridge joints are additionally reinforced with stainless steel bolts to counteract wear and fatigue from continuous traffic.

Management and Maintenance

The bridge is maintained through a smart collaboration. The regency, the village council, and the local community form a joint committee. While heavy, long-term maintenance is outsourced via contracts to private specialists, the local population plays an active role in daily management. From the tourist information centre, where repair materials are also stored, a locally trained maintenance team immediately spots minor damage and carries out light repairs. Should large-scale work on the bridge ever be necessary, an emergency and

evacuation plan will take effect, utilizing a shuttle boat to safely transport people and goods to the other side and the beach.

4.4.3 R3 Budget

Layout, Appearance, and Traffic

On the bridge, there is space for two lanes, one per direction, clearly separated by a centre line marking, plus sidewalks behind raised curbs for pedestrians, making the total width 6 meters. The deck features a non-slip, textured concrete surface designed with a crossfall and a highly effective integrated drainage system. On the outer edges, simple cable railings are installed specifically for pedestrians to hold on to safely. To regulate traffic and minimize ecological impact, a speed limit of 20 km/h is enforced using signage and speed bumps. Heavy traffic is allowed and safely accommodated. Furthermore, the bridge foundations are raised to accommodate sea-level rise, high tides, and to allow sufficient vertical clearance for fishing boats during most of the day.

Aesthetically, the bridge integrates local artwork reflecting Cemare's identity and features decorative colored night lighting. To boost tourism, a special light show is held once a week.

Structure, Construction, and Resilience

The bridge is purposefully designed for the heaviest vehicles and trucks. This bridge design is based on a truss bridge model that is highly common on Lombok, ensuring that the required local expertise is readily available. To provide maximum horizontal clearance and protect the waterways, it functions as a hanging bridge with no bridge pillars in the water. However, since the bridge is built in a highly corrosive environment, the use of steel is limited primarily to the middle section, which has a span of 70 meters. For the remainder of the structure, a concrete deck is utilized, incorporating precast prestressed concrete girders. The entire driving surface is made of concrete (Black, 2021). The steel elements are comprehensively protected against the corrosive coastal climate using protective paint, such as epoxy, and will be maintained properly. For critical areas where this is difficult to maintain, such as joints and connections, extra stainless steel bolts are implemented. This will represent a larger initial investment but pays off in the long term by resisting wear and fatigue.

Mangroves are preserved, and additional mangrove vegetation is planted around the foundations and between the sea and the bridge. This acts as a natural buffer to ensure the riverbed soil remains stable against scour, and that floods and sea-level rise are mitigated. To safely withstand earthquakes, shock absorbers and dampers are implemented between the superstructure and the substructure. Additionally, vibration-damping materials are placed between the bridge and the ground to minimize noise and disturbance to local wildlife.

Management and Maintenance

Maintenance relies on a well-organized system. The bridge is inspected through a local damage-reporting system by a resident who uses the bridge frequently. They receive a checklist to inspect the most critical parts and capture visual footage in a certain timeframe. If they experience some trouble or issues with the bridge they can always report this at the local representative. A long-term maintenance contract is established with a private firm, which is informed if any major issues appear and will execute renovations within a month. If major works require temporary closure, traffic will be diverted to the skybridge using clear

signage and an advance notice of at least two weeks. Ultimately, the regency serves as the road administrator; the bridge is registered in the regency's asset register, and all major upkeep is paid for by the Regency's annual maintenance budget (APBD).

4.5 Evaluation of the concepts

Table 4.2 shows the scores per criterion. The criteria are defined in Table 3.4. All concepts score the same on capacity, maintenance and financial sustainability, so the ranking is decided by the other nine criteria. R2 Dependency achieves the highest score of 0.875. It receives the best score on reliability and accessibility, capacity, safety, management and comfort, and waterway and fishing, and a positive score on structural strength, durability and lifespan. As reliability and accessibility and structural strength, durability and lifespan have the highest weight, these scores largely determine its lead. R1 Consensus scores 0.625. It does well on capacity, safety, management and comfort, and waterway and fishing, and is the only concept with a positive score on local environmental impact. However, it scores lower than R2 on the two criteria with the highest weight. R3 Budget also scores 0.625. Although it receives the best score on reliability and accessibility and on capacity, it scores lower on attractiveness and Cemare identity, because locals and visitors are not expected to rate the design 8 or higher. In addition, R3 scores lower on both environmental criteria. Its decorative night lighting and weekly light show disturb the local environment, and the steel in its middle section increases the emissions of the materials. Finally, all concepts score negatively or neutral on financial sustainability and community participation and governance.

Table 4.2 Scores of the combined concepts per criterion (from ++ to −−)

Domain	Criterion	Weight	R1	R2	R3
Desirability	Reliability and accessibility	0.15	+	++	++
	Capacity	0.10	++	++	++
	Safety, management and comfort	0.05	++	++	+
	Attractiveness and Cemare identity	0.05	+	+	0
	Local environmental impact	0.025	+	-	-
	Environmental impact	0.025	0	0	-
	Waterway and fishing	0.10	++	++	+
Feasibility	Structural strength, durability and lifespan	0.15	0	+	+
	Maintenance	0.05	0	0	0
	Environmental hazards	0.10	+	+	0
Viability	Financial sustainability	0.10	-	-	-
	Community participation and governance	0.10	-	-	0

Weighted and summed, these scores give R2 the highest total of 0.875, while R1 and R3 both reach 0.625 (Table 4.3). R2 leads on desirability and feasibility. On viability, all three concepts score negatively, because none of them makes funding for repairs available within two days.

Table 4.3 MCA scores per domain

Domain	Weight	R1	R2	R3
Desirability	0.50	0.725	0.825	0.575
Feasibility	0.30	0.100	0.250	0.150
Viability	0.20	-0.200	-0.200	-0.100
Total	1.00	0.625	0.875	0.625

To check how robust this ranking is, the totals were recalculated with other weights (Table 4.4). R2 also ranks highest when the domains are weighted equally and when each criterion is left out in turn. However, R1 and R2 score the same with equal weights for all criteria. The lead of R2 over R1 therefore rests on the high weights and the scores for heavy traffic and lifespan. If R1 had scored as well as R2 on these two criteria, it would have ranked first.

Table 4.4 Sensitivity of the MCA ranking to the weights

Weighting	R1	R2	R3	Highest
Weights of the team	0.625	0.875	0.625	R2
Equal weights for all criteria	0.667	0.667	0.250	R1 = R2
Equal weights per domain	0.206	0.270	0.087	R2
Each criterion left out in turn (12 runs)	0.472-0.806	0.676-1.083	0.382-0.806	R2 in all runs

The analysis also has limitations that a different weighting cannot correct. First, the required frequency of maintenance was not included as a criterion, although maintenance costs directly affect the available funding. This mainly affects R3, as truss bridges need more frequent inspections, because their many connections and exposed structural members are prone to corrosion and fatigue cracking over time (Chen & Duan, 2014). Second, critical documents such as the Detailed Engineering Design were not accessible, due to jurisdictional overlaps between the Tourism and Public Works departments (Haeruzzubaidi, 2026a). The regency's technical requirements were therefore derived from the interviews and meetings alone, so some of them may not have been captured.

R2 Dependency emerged as the most promising concept in the multi-criteria analysis. Because weights and scores were partly based on qualitative judgement, this ranking indicates a preferred direction rather than a decisive choice. R2 was taken as the basis for the final design (Section 4.6).

4.6 Final design

Disclaimer: There are some aspects mentioned in the R2 concept design that are reevaluated and, in some cases, replaced in order to create more cohesion between the different solutions of each function of the infrastructure connection (see Figure 4.1). These replaced aspects are: one car lane instead of two, greater sidewalks, no high physical barrier between the road and the sidewalks, complete wooden railing instead of steel cable railing, and 19 meters of horizontal clearance between the bridge piers instead of 30 to 40 meters. The specific reason for alteration is argued within this chapter. In addition, all solutions proposed earlier are described in further detail and visually presented. However, this is still not a final technical design and should be reviewed critically by certified engineers. The final design is shown in Figure 4.8.



Figure 4.8A Rendered overview of the final Cemare Bridge design in its surrounding environment.



Figure 4.8B Complete 3D overview of the final Cemare Bridge design, showing the full length, abutments, piers, deck, and railings

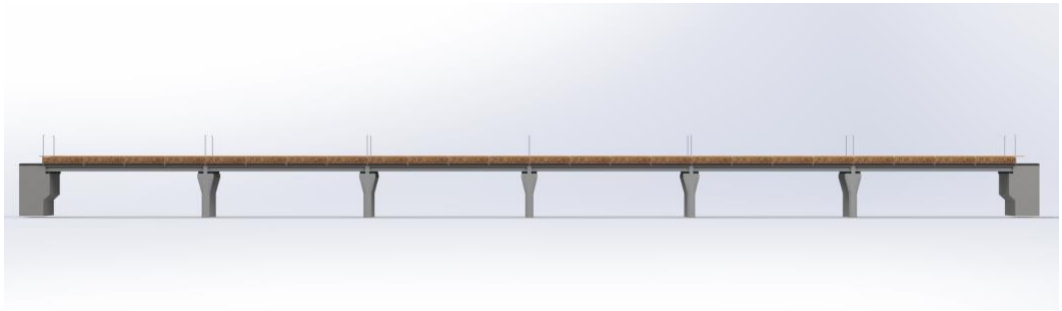

Figure 4.8C Side elevation of the final Cemare Bridge design showing the 19-meter span layout across the 5 pier locations

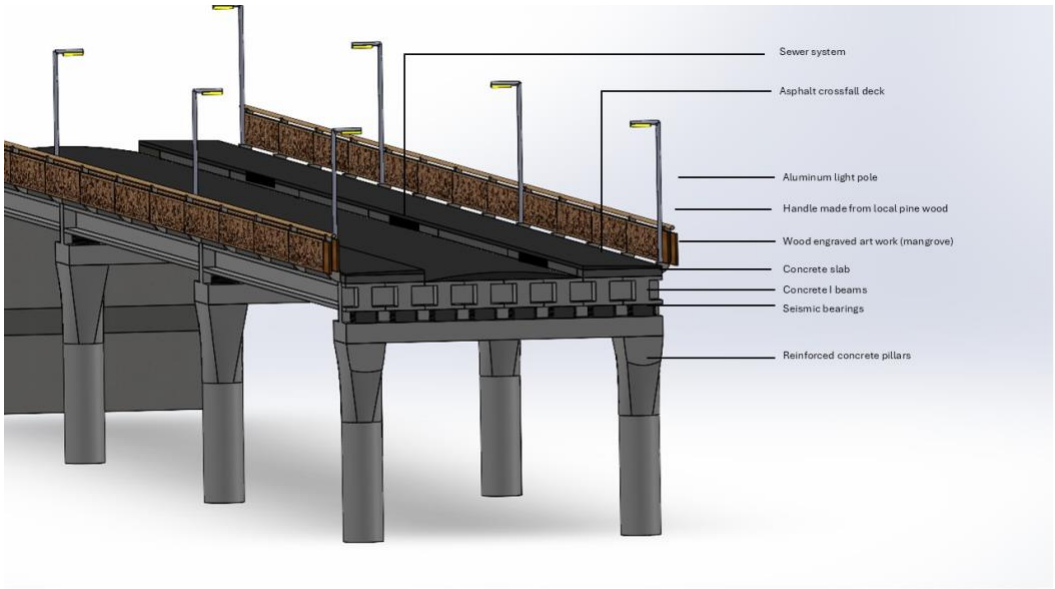

Figure 4.9A Detailed 3D visualisation of the final bridge concept and its key elements

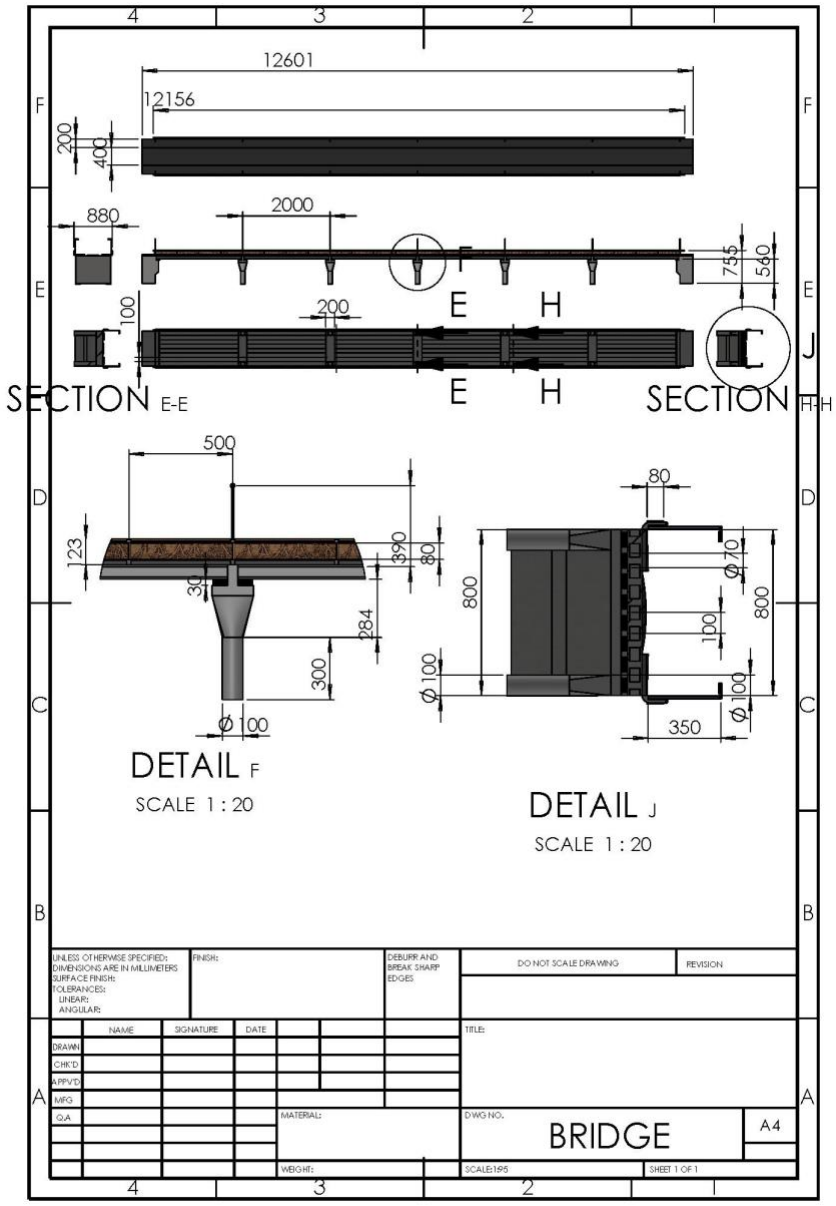

Figure 4.9B Technical engineering drawing of the final Cemare Bridge design, showing top, side, and cross-sectional dimensions in centimeters.

4.6.1 Structure and environmental resilience (F1, F2)

In the structural assessment, it is concluded that the area where the bridge is located, is causing corrosion to steel parts. This is both concluded from literature, as from local inspection of the current bridge. Therefore, no matter the final design from our methodology, high quality steel needs to be used, or no steel at all. The latter option is more economical, except for maybe some connections and reinforcements. From input from inhabitants of Cemare, such as during the Participatory Design (3.4.3), it is clear that people prefer a bridge that lasts long. Besides, the main purpose of this design is to ensure that the new bridge has a longer service life than the current one. Our design mainly uses concrete, which is less vulnerable to corrosion (Figure 4.8). The current wooden girders would be replaced by prestressed concrete I-section (PCI) girders. Although the span with this kind of girders

could be more than 40 meters long to create more horizontal clearance, this can create instability during construction (Dewobroto & Canny, 2024). Since the fisher boats that need to go under the bridge are not that wide, a 19 meter span with 5 locations for the bridge piers is chosen for the final design. The river is also not really deep (see Section 3.5.2), resulting in relatively cheap installation of bridge piers. This could be either increased or decreased by the chosen constructor if necessary. The bridge piers have a cap on top and lead rubber seismic bearings between the girders and the substructure shown in Figure 4.10 (Zakariya et al., 2022). Additionally, reinforced concrete backwalls on each of the bridge abutments are recommended (see 3.5.2).

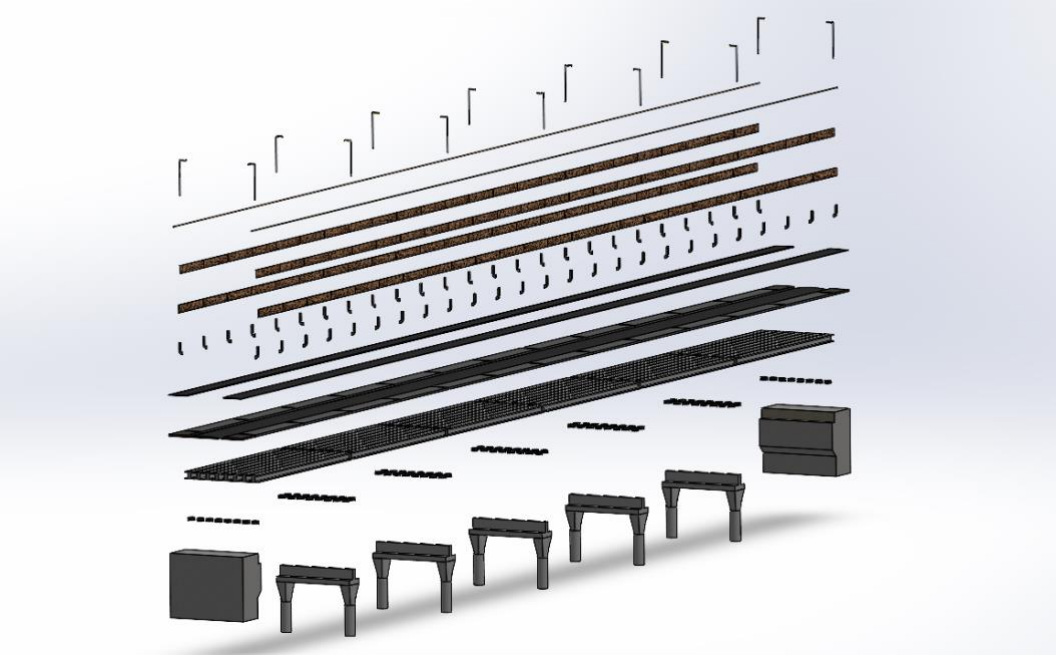

Figure 4.9C Component breakdown of the final bridge design, displaying the individual layers and parts used in the construction

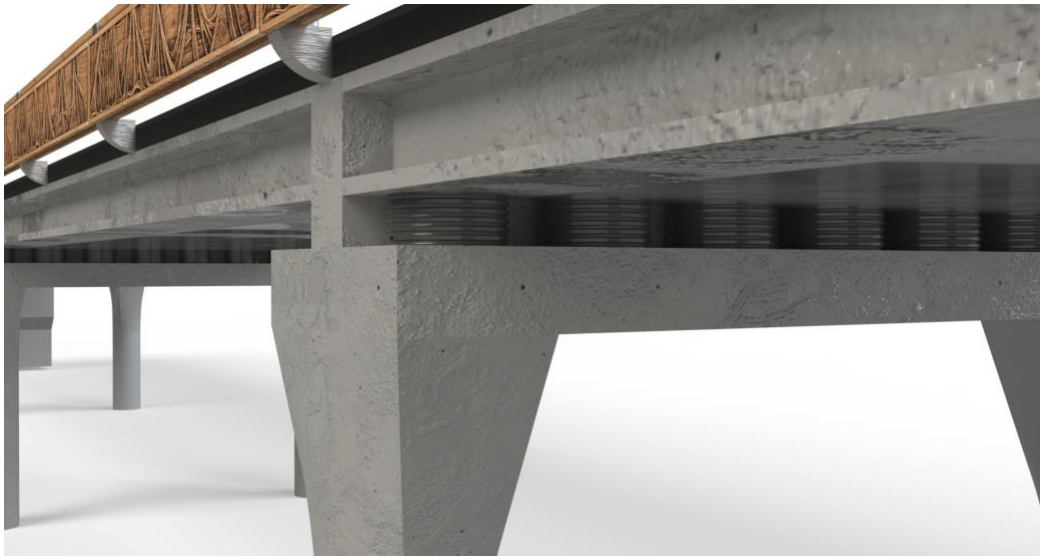

Figure 4.10 Detailed view of the lead rubber seismic bearings placed between the concrete pier cap and the PCI girders

The piers themselves should have enough cover to make sure the reinforcement is safe against corrosion. Especially in the tidal and splash zone this is important. The recommended cover is 85 mm, found in research by Li et al. (2015) about durable concrete bridge piers in the climate of Hong Kong. The research is done in a marine environment, but less tropical. However, since the design is intended for a service life of 120 years, it is assumed to be sufficient for the Cemare bridge design. When the bridge piers are inspected, cracks in concrete larger than 15 mm should be addressed. The total pier diameter will probably be between 1 and 1.5 meters in diameter, but the exact dimensions, including the reinforcement detailing, should be decided by the chosen constructor in accordance with the national guidelines for construction (SNI). A circular shape is recommended to reduce scour compared to a square shape, as the scour factor K_s is 1 instead of 1.1. Scour protection, such as synthetic mats on the seabed, might be put in place if deemed necessary. For more information about scour, the scour section (3.5.2) of this report can be consulted. Furthermore, it is recommended to conduct research on the soil before installation of the bridge piers, to prevent liquefaction and insufficient bearing capacity. The height of the pillars would be 4 metres, to increase the vertical clearance. During low tide, this means that there is a clearance of about 3.5 meters, while during high tide it is 2 meters. This has multiple advantages, such as fisher boats that can pass, more resistant against floods and less corrosion because the bridge superstructure is not in the splash zone anymore (3.5.2).

4.6.2 Mangrove protection and safe crossing (F3, F4)

The width of the bridge is around 8 meters, with a pedestrian path on both sides. The road has a width of 4 meters, has crossfall and sufficient drainage through a gutter system on the sides of the middle street (Figure 4.11). This is different from the original design, where cars could easily pass each other. In this iteration, it is chosen to only let scooters pass simultaneously, since this is the main mode of transport (1.3.2). In contrast, cars are discouraged to cross the bridge by only creating space for one direction at a time. In this way, it is possible for all vehicles to pass, including heavy transport, but it will not create a heavily used, speedy connection. This is done in order to protect both the mangrove area and Cemare from overtourism and heavy traffic. However, the heavy transport is not completely excluded from use, as this is necessary for garbage collectors and traders to reach the area. Some people from this stakeholder group have also mentioned that they do not oppose either paying for usage of the bridge and taking the time to let others pass (3.2).

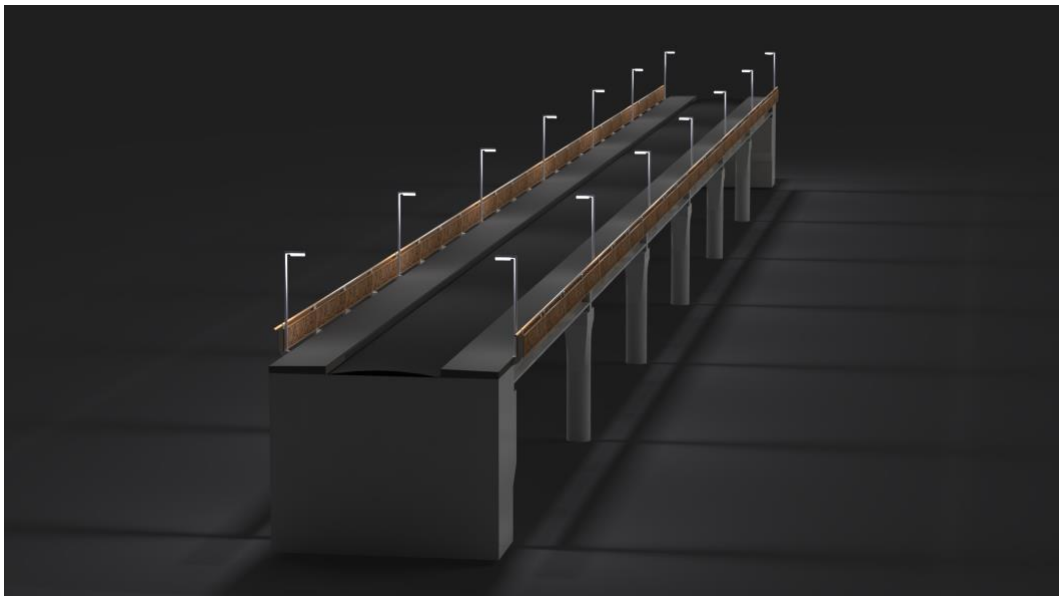

Figure 4.11 Proposed bridge deck layout showing the road, pedestrian paths, crossfall and drainage

Not only should the bridge not be too attractive for heavy vehicles, it should also be attractive to park your truck at the entrance and walk over the bridge. The sidewalks are made as wide as two metres so people can enjoy the mangroves from the bridge as well. Streetlights will provide an additional feeling of safety and sight during the night. Combined with the P+R system, the aim is to encourage more people to walk. This is further explained in 4.6.3 Landmark.

4.6.3 Landmark (F5)

Park and Ride system

The Park and Ride (P+R) system is an expansion of the framework introduced in the draft R2 Dependency concept (See Figure 4.12). Designed to reduce vehicular congestion and structural load on the Cemare Bridge, this transit hub intercepts heavy traffic before the crossing while creating sustainable economic opportunities for the local community. The facility offers free parking for cars, trucks, and tour buses, alongside a separate pick-up and drop-off lane for taxis and public buses to ensure smooth traffic flow. The local community is responsible for operating and monitoring the P+R facility. Residents can capitalize on this system by selling food and beverages and providing motorcycle shuttle services to the beach or the Ecotour. Additionally, canoes and bicycles can be rented as extra income and create a great experience for domestic and foreign tourists. The regional government might help finance the first purchasing of these assets, or a bank or other institutions can provide loans. This is in everyone's benefit, since the bridge will need less maintenance funding if less heavy tourist buses go over it.



Figure 4.12 Park and Ride at the start of the bridge

The steel road railing mentioned in the design is not built, as it does not contribute to the wish of creating a landmark. It will deteriorate quickly in this environment and does not fit in with the mangrove context. The curbs are an additional safety measure to prevent cars from coming close to pedestrians. For the safety of pedestrians, and in case a car loses control, there is a wooden railing on both sides of the bridge. This wooden railing is one of the most important parts of the bridge's aesthetics. Local artwork will be incorporated to reflect the identity of Cemare, Lembar and Lombok, and will be created by paid local workers. The idea is to create an open bridge design with little visual obstruction of the mangroves, while retaining the wooden touch in the form of the railings. Figure 4.13 and Figure 4.14 show a side and top view of the proposed bridge.


Figure 4.13 Contextual rendering of the final Cemare Bridge design integrated into the existing landscape across the water and mangrove banks.



Figure 4.14 Top view of the proposed bridge

4.6.4 Inspection, maintenance and funding (F6)

Regulation of traffic

A staffed gate will be placed at the beginning of the bridge to collect the fees and regulate traffic flow. These funds will be used as a financial contribution for small, routine maintenance tasks conducted by the local team and to pay for the manning of the gate. The primary objective of paid crossing for (heavy) vehicles is to stimulate the use of the free Park and Ride facility on the mainland. By discouraging visitors from driving across, the system decreases the total traffic volume on the bridge and prevents vehicle congestion in the Cemare beach area. Reducing the number of crossing vehicles directly limits structural wear and tear, which extends the lifespan of the bridge and contributes to a future proof bridge.

One manner in which paid crossing can be implemented is by determining the weight and size of the vehicle, which mirrors the logic of the official Indonesian Golongan vehicle classification system established by the Ministry of Public Works and Housing (Departemen Pekerjaan Umum, 2007). Motorcycles can cross the bridge for free because their low weight barely affects the structural condition of the bridge and they require less parking space in the village. Conversely, visitors accessing Cemare by car or truck must pay a fee. Heavy trucks are allowed to cross, but they are charged a relatively higher tariff than passenger cars. Residents of Cemare are exempt from the toll and can cross for free by showing proof of residency.

The decision on implementation of this small toll system lies entirely with the local inhabitants of Cemare, by mutual agreement with the regency. They can decide that, for example, only foreigners or heavy material trucks, or even no one at all has to pay. However, as discussed in this report, it can benefit both the lifespan of the bridge as well as local economic activity.

Community preserved

The final responsibility of the bridge lies at the West Lombok regency, but the local community plays an active role in daily management of the bridge. Maintenance is divided into two categories. First, routine upkeep and minor repairs are managed and executed directly by a local trained team. For example, repainting weathered surfaces and preserving the local wooden artwork integrated into the bridge railings (see Figure 4.15). Residents are responsible for funding these small-scale interventions themselves by establishing a maintenance fund sourced from bridge toll revenues or financial allocations from the Head of the Village. Second, periodic structural inspections and major repairs are conducted by the West Lombok Regency because the local community lacks the specialized technical knowledge and financial capacity for complex engineering work. When major maintenance is required, residents can report the issue to the Regency via an online reporting system, submitting photographic documentation and evidence to trigger a professional assessment and response. Documentation of the construction, state and renovations during its entire lifespan is really important to be able to intervene adequately in case of necessary renovations, as this is momentarily lacking from the old bridge.



Figure 4.15 Proposed wooden bridge railings incorporating local artwork inspired by the mangrove environment

4.7 Verification status of the final design

In this section the final design, described in Section 4.6, is evaluated on the 12 design requirements (Table 3.4). Both improvements compared to the selected design from the MCA are discussed, as well as overall advantages and disadvantages of made choices.

Table 4.5 Scores of the final design compared with R2 Dependency

Domain	Category	Weight	R2	Final design
Desirability	Reliability and accessibility	0.15	++	++
	Capacity	0.10	++	+
	Safety, management and comfort	0.05	++	+
	Attractiveness and Cemare identity	0.05	+	++
	Local environmental impact	0.025	-	+
	Environmental impact	0.025	0	0
	Waterway and fishing	0.10	++	++
Feasibility	Structural strength, durability and lifespan	0.15	+	++
	Maintenance	0.05	0	0
	Environmental hazards	0.10	+	+
Viability	Financial sustainability	0.10	-	-
	Community participation and governance	0.10	-	0
Total		**1.00**	**0.875**	**1.075**

From comparison of the final design with the design outcome from the multi-criteria analysis, it can be concluded that the alterations have had a general positive effect on meeting the criteria. However, there are differences across the different aspects. The narrowing of the car section from two to one lane has a negative effect on the capacity of the bridge. On the other hand, both impact on mangroves and the loading of the bridge structure is reduced, which has a positive effect on the local environment and the bridge's potential lifespan respectively. Simultaneously, the removal of the steel barriers at both sides of the road decreases safety slightly, but it increases attractiveness, as does the implementation of wooden, mangrove inspired railings instead of steel cable railing. It also helps speed up renovation by the local community, as the wooden railings are easier to repair than when steel is used. Overall, the benefits are more spread out over the criteria, which helps in obtaining support from all the stakeholders for this design.

In the end, the feasibility and desirability goals of the final design are mostly met. However, viability is not clearly achieved yet. One of the next steps that should be undertaken is the acquiring of sufficient funding for both the construction and the maintenance of the bridge, possible with the measures described in this report. It is emphasized that technical analysis by experts in the field can help reduce costs, since some aspects of the bridge, such as scour protection, might not be necessary. Additionally, materials can be replaced by cheaper ones, such as using wood instead of concrete, as this requires less initial costs, and is possible to be maintained and renovated by the local community. However, it can create larger costs in the long term since it has to be replaced more often.

These measures are examples of how the final design can become more viable. The choices should be technically verified by a local engineer, as is also the case for the recommendations in this report.

5. Results: Communication phase

This chapter presents the results of the communication phase. Section 5.1 describes the communication needs of IBF, Section 5.2 the poster series and Section 5.3 the presentation in Cemare.

5.1 IBF's communication needs

As discussed previously in Section 2.7.1, a brainstorm session (Appendix L) was used to understand how IBF thinks that the design proposal should be communicated. From the perspective of IBF, they do not own the design proposal, nor do they want to carry full responsibility to finalize the proposed design. Therefore, the way the design proposal is communicated to the public and all relevant parties involved should give the impression that IBF is not the sole owner of the problem. To achieve this, there was a need to establish a communication method that expresses the design as a general subject of interest, not bound to any specific advocate, but understandable, approachable, and interactive to everyone involved. Therefore, IBF thinks that visual communication is important, with Indonesian textual elements to support the visual elements/infographics of the design plans. According to the foundation, these assets would need to have their own unique graphic style, different from their own or that of any other stakeholders.

5.2 Project Jembatan: a poster series for IBF

The design artifacts described in Section 2.7.2 are in the form of posters (all posters are located in Appendix J). All posters are printed on A2-sized paper, and each describes a specific part of the research or final design. The contents presented on the posters are mostly visual, and all textual content is translated into Indonesian. All posters contain a logo that represents the brand image of the project and is meant to give the posters a coherent graphical style.

These posters were presented by hanging them side by side in a logical chronological order. Together, they form an exposition that enables visitors to see multiple posters together and analyze them for themselves after the formal presentation.



Figure 5.1 Logo representing project style and image

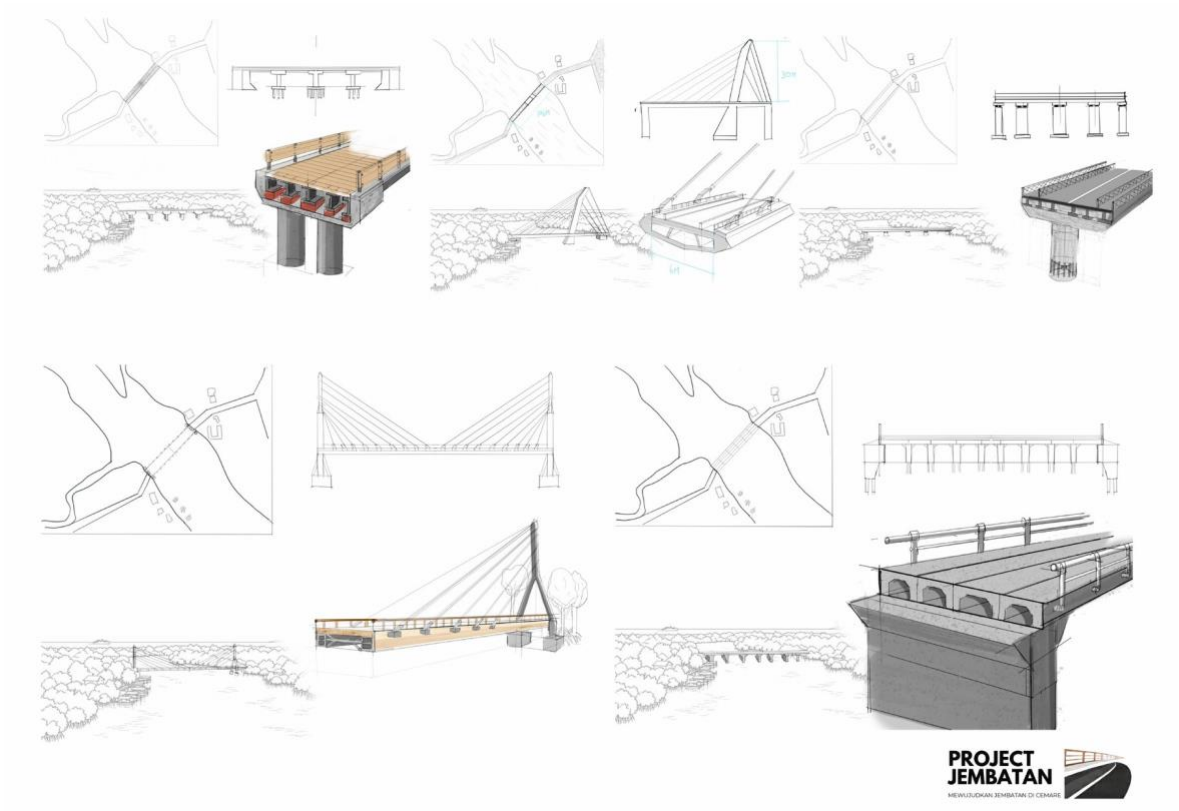

Figure 5.2 Visual elements and showing process

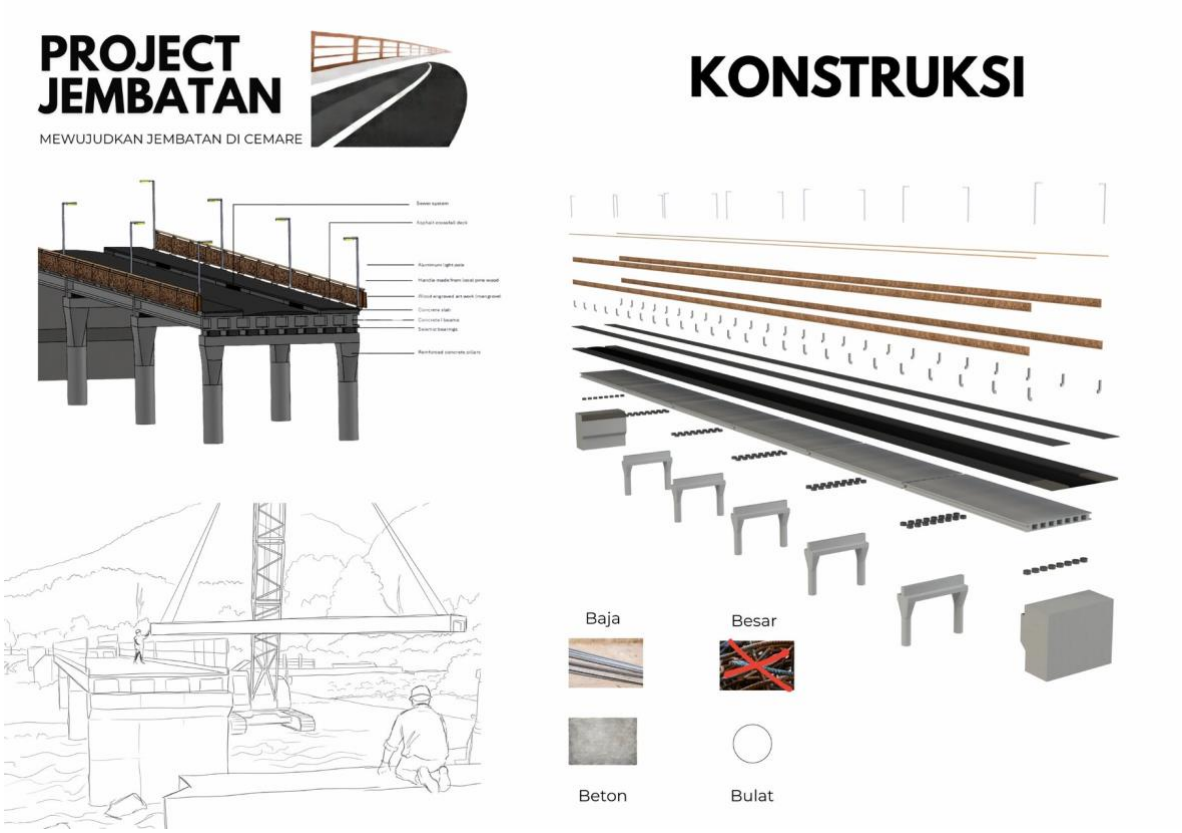

Figure 5.3 Indonesian language included in communication

5.3 Presentation in Cemare

The way of communicating was defined by a poster exhibition where the results of the work were presented (Figure 5.4c). After the presentation, visitors could observe the posters, and the research team was available to receive feedback or opinions. The posters formed an enclosed open space where visitors were able to go into conversation with each other (Figure 5.4a). The visitors (n=29) included local residents, regional government officials, and members of IBF and Eco Green (Figure 5.4d). Based on the notes taken that day, the following results were obtained. All parties were overall satisfied with the end results. The wooden mangrove railing was received positively by Eco Green. The government officials thought that the seismic bearings were a valuable add-on.

Visitors took time to take a closer look at the posters after the presentation. Visitors understood that the design is still conceptual. Therefore, they made an effort by asking questions about information that was not yet fully defined. Common questions revolved around the expected costs and expected delivery time. The research team answered these questions by acknowledging the fact that answers to these questions depend on whether the design is going to be altered by contractors. Furthermore, rough cost estimations were difficult because the decision on where materials and labor will be sourced from is not yet defined.

Representatives of the regional government mentioned that the plans are appreciated and are going to be sent to the consultant (Figure 5.4b and 5.4e). The consultants and government experts will analyze the plans and see which aspects of the design can be

included in the official project proposal for the Audit Board of Indonesia (BPK). Furthermore, the regional government explained to the visitors that it will take a year to go through the administrative process to secure funding within the regional budget (APBD) to build the new bridge. If the funding is secured a public tender process is obligated to select a winning contractor before construction can start. According to the translator this process can take one to three years. In the meantime, there is an available budget to do small repairs, and the West Nusa Tenggara (NTB) Representative Office will do further research on how the parties within this research can be further involved. At the end of the presentation, the regional government spoke with the visitors to ask them if they have connections to the Regional Legislative Council (DPRD) and called on them to help with a lobby so its chances of funding can increase.



Figure 5.4 Exhibition and presentation of the design concepts in Cemare: (a) Exposition build up, (b) West Nusa Tenggara (NTB) Representative Office evaluating the concepts, (c) Presenting the exposition, (d) Visitors attending the presentation and (e) Engineering consultant of the regional government evaluating the design proposal

6. Discussion

This chapter discusses the main contributions and limitations of the research and their implications for future development.

6.1 Main contributions

The main contribution of this research lies in approaching the Cemare Bridge as both a technical and an institutional challenge. Rather than treating these as separate issues, the study demonstrates how decision-making responsibilities, stakeholder interests and engineering considerations influence one another. This is particularly relevant in a context where the organisation initiating the research does not have the authority to implement its outcomes. The research therefore contributes not only a technical proposal, but also an understanding of how such a proposal can be positioned within the existing decision-making structure. For IBF, this distinction is important because the usefulness of the research depends on whether its findings can support decisions made by other actors.

A second contribution is the systematic translation of stakeholder needs into design requirements and conceptual solutions. By connecting the needs and wishes to specific functions and evaluation criteria, the research makes the reasoning behind design choices traceable. This is valuable because infrastructure decisions involve competing priorities that cannot always be satisfied simultaneously. The use of desirability, feasibility and viability provides a structured way to make these trade-offs visible. Rather than presenting the preferred concept as the only possible solution, the design process shows how different priorities lead to different outcomes. This transparency allows stakeholders to question individual assumptions or reconsider priorities without having to reject the entire proposal.

An additional insight concerns the role of maintenance and governance within the design process. Including these considerations as explicit functions challenges the idea that infrastructure design ends with the physical structure. Decisions about materials, accessibility and structural durability also influence who can maintain the bridge, what resources are required and how responsibilities can be distributed. The research therefore illustrates the value of considering the entire functional lifespan during conceptual design, rather than addressing maintenance only after construction.

Finally, the research contributes an approach for translating technical and institutional findings into accessible communication materials. The "*Project Jembatan*" is particularly relevant because the stakeholders involved differ in their technical knowledge, interests and responsibilities. By providing a common visual reference, the materials can support discussions without requiring all participants to interpret the full technical report. Their value therefore lies not only in presenting information, but also in making the reasoning behind the proposal more accessible for discussion and further development.

Together, these contributions demonstrate the value of integrating institutional analysis, stakeholder participation, technical design and communication. The resulting approach provides a transparent foundation for further decision-making, even though the proposed design itself still requires validation.

6.2 Limitations and implications

Several limitations should be considered when interpreting the findings of this study.

First, the institutional analysis relied partly on a limited number of interviews and access to government archives and the Detailed Engineering Design was restricted. Consequently, informal relationships, stakeholder influence and existing government plans may not have been fully captured. However, formal responsibilities were established through Indonesian legislation, while interviews, observations and discussions with IBF provided additional perspectives. Together, these sources provide an initial understanding of the decision-making context. Further consultation with government representatives and access to official documentation would help validate the findings.

Second, the stakeholder research involved fewer than 100 bridge users, compared with 1,431 crossings recorded during one busy hour. The survey sample was also predominantly male, potentially leaving certain perspectives underrepresented. Consequently, the identified needs and priorities cannot be considered representative of all bridge users. Nevertheless, combining surveys, interviews and participatory design activities allowed different perspectives to be considered. This helped identify relevant design requirements, although it remains unclear how important these are to other bridge users. Further consultation with underrepresented groups would help clarify their needs and priorities.

Third, the MCA weights and scores were partly based on qualitative judgements by the research team. Local residents may attach greater importance to accessibility and safety, while the West Lombok regency may prioritise construction and maintenance costs. Such differences in priorities could lead to different criteria weights and potentially change the ranking of the concepts**.** Another limitation is that the MCA did not account for how often maintenance would be needed. This is particularly relevant for R3 Budget, as its steel truss structure requires more frequent inspections. Nevertheless, the MCA provided a structured and transparent comparison, making the selection of the preferred concept traceable*.* Repeating the evaluation with stakeholders and including maintenance frequency would help assess whether the preferred concept remains suitable under different assumptions.

Finally, the proposed bridge design remains conceptual. Detailed structural calculations and geotechnical investigations are still needed to verify its technical feasibility. Construction and maintenance costs have not yet been estimated in detail, and long-term funding has not been secured. Although the local community has expressed its willingness to contribute to maintenance, formal agreements on tasks and responsibilities are still needed. Nevertheless, the design is based on stakeholder requirements, site conditions and relevant literature, providing a starting point for further engineering development.

Overall, the findings provide a basis for further discussion and development of the proposed bridge design. The corresponding recommendations and next steps are presented in Section 7.2.

7. Conclusion and recommendations

This chapter answers the research questions (Section 7.1) and gives the recommendations and next steps for IBF (Section 7.2).

7.1 Conclusion

This study aimed to answer the following main research- and subquestions:

Main research question:
How can the Indonesia Biru Foundation be enabled to support the design of a desirable, feasible and viable infrastructure connection between mainland Lombok and Cemare Village with a long-term functional lifespan?

Sub-questions:
1. How do the institutional context and the interests, power dynamics and interdependencies of the stakeholders involved shape decision-making on the Cemare infrastructure connection?

2. What are possible conceptual designs for an infrastructure connection between mainland Lombok and Cemare Village that are feasible, viable, and desirable over a functional lifespan?

3. How can the results of this study be communicated to the Indonesia Biru Foundation in a way that supports its role in the Cemare Lombok infrastructure project?

The institutional and stakeholder analysis showed that the West Lombok regency plays a central role in decision-making, acting as the formal road administrator and the primary gatekeeper for central government funding. Although stakeholders generally agree that the current bridge needs to be improved, they have different priorities regarding its future design and use. Residents and the local community are directly affected by these decisions and possess significant informal influence and the right to participate in road planning, but lack formal authority over the infrastructure. A critical institutional gap is the current absence of a long-term arrangement for inspection, maintenance, and funding. IBF can therefore play an important role by bringing community needs to the attention of the responsible authorities, ensuring that any viable future solution legally aligns with the regency's procedures while effectively leveraging the local community's capacity for daily management. Its role is primarily to facilitate communication between stakeholders and encourage their involvement in future decisions.

Stakeholder needs and wishes, along with the structural and environmental assessments, informed the development of three conceptual bridge designs. The multi-criteria analysis identified R2 Dependency as the preferred concept, scoring 0.875 against criteria for desirability, feasibility, and viability. Further explanation of this concept can be found in Section 4.4.

In terms of desirability, the conceptual design proposes an 8-meter-wide deck restricted to a single 4-meter car lane alongside two 2-meter pedestrian sidewalks featuring locally crafted wooden railings, addressing accessibility and safety while preventing structural overloading

and protecting the mangrove area. Additionally, the design integrates a mainland Park and Ride facility and a staffed toll gate for heavy vehicles to reduce unnecessary traffic and provide economic opportunities for the local people. The proposed 19-meter spans rest on five reinforced concrete piers of 4 meters high, which create a vertical clearance of about 3.5 meters at low tide and 2 meters at high tide. This allows local fishing boats to pass and keeps the superstructure out of the splash zone. Regarding feasibility, prestressed concrete I-section girders and lead rubber seismic bearings are proposed to provide a durable connection with an intended service life of 120 years. For viability, the proposal establishes a shared maintenance plan: routine maintenance is funded by the toll mechanism and executed by trained local residents, while the regency remains responsible for major structural upkeep. However, further technical investigations, such as soil research to prevent liquefaction and formal funding agreements are required before the design can be implemented.

To make the findings useful to IBF and support its role as mediator without assuming disproportionate ownership of the engineering project, the research results were translated into a boundary object named "Project Jembatan". This communication toolkit presents the research in an accessible format, consisting of a cohesive poster series presented in Bahasa Indonesia that visually outlines the design process, structural choices, and maintenance strategies. The highly visual and interactive nature of these posters allows IBF to share the proposed design, communicate community needs, and facilitate constructive discussions among diverse stakeholders, ranging from local residents to regency officials, with the final goal of securing appropriate funding and creating the urgency to realise a new bridge.

7.2 Recommendations and next steps for IBF

Based on the findings of this report, several recommendations are proposed to support the further development of the Cemare Bridge. First, IBF should use the poster series and findings to facilitate discussions with the West Lombok Regency Government about the proposed design and its relation to their existing design. The poster series can be used as well for IBF to evaluate the final design in discussions with stakeholders to determine its effectiveness. Secondly, the regency and its engineering consultant should conduct structural and geotechnical assessments to verify the proposed final concept design. These assessments should specifically evaluate the design's foundations, its resistance to environmental hazards, and its compliance with applicable standards. Finally, detailed construction and maintenance cost estimates are needed to assess financial viability. The Regency should also establish clear funding and maintenance arrangements, with community participation supporting rather than replacing formal responsibilities.

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Appendices

Appendix A: Structural Assessment

The structural assessment presents a general, not complete assessment of the bridge's structural condition based on visual inspection and simple field tests conducted with limited resources, in combination with desktop research. The observations, interpretations, and recommendations are intended to provide a preliminary overview and general guidance, and should not be directly implemented as a definitive repair or renovation plan. Before undertaking any structural intervention, a more detailed structural analysis and professional advice from a certified engineer or contractor should be obtained to verify these findings and determine appropriate, site-specific measures.

Testing methods

The testing methods below are based on Puspitasari et al. (2023).

Wooden planks

A visual inspection was done on the deck planks to identify cracks, deflection, and discoloration, since these indicate loss of strength and decay, respectively. In addition, a sounding test was performed by striking the wood: a dull, hollow sound was interpreted as an indication of internal rot or voids, whereas a clear, resonant sound was associated with sound timber. A penetration test was carried out by pressing a pointed tool into the wood; sound timber was expected to offer resistance, while yielding or soft material indicated decay. Finally, the wood was examined for damage caused by the steel wire wrapped around it, as corrosion of the wire may cause it to cut into the surrounding timber and locally weaken the cross-section.

Wooden beams

The wooden beams were evaluated mainly for rot and sagging. Deflection under load was assessed qualitatively by observing the movement and displacement of the wooden elements while pedestrians and vehicles crossed the bridge.

Bolts and screws

The bolts and screws were inspected for signs of corrosion and were struck to assess whether they would break or crumble under light impact. Additionally, the surrounding metal components and joints were examined.

Steel beams

The steel beams were visually assessed for sagging and deflection, as well as for surface corrosion, in order to evaluate their structural condition and remaining load-bearing capacity. Pictures were made to document the location and severity of the weakest beams across the structure, including the wooden ones.

Concrete pillars

The concrete pillars were inspected for signs of subsidence or settlement, which may indicate a loss of foundation stability and could compromise the overall structural integrity of the bridge. Additionally, the state of deterioration of the concrete and underlying steel reinforcement was examined.

Loads

The types of loads crossing the bridge were also documented, distinguishing between pedestrians, motorcycles, cars, and trucks, as the magnitude and frequency of these loads directly influence the rate of structural deterioration.

Current Situation

Wooden deck planks

The size of a wooden plank is 10 × 20 × 400 cm. The condition of the planks varies significantly from one to another due to replacements made over the years. According to personal communication with M. Saleh, Head of Village, on September 8, 2026, the wood is resourced from local trees. It is clear that the type of wood used cannot withstand the external effects of the weather and air for an extended period of time. According to Doloksaribu and Nababan (2021), bridges built with local wood in Indonesia, in their case from coconut trees, could last for a maximum of 10 years. With heavy use, which is the case for the Cemare bridge, this is probably a lot shorter. Furthermore, fatigue loading, caused by the constant movement of the planks due to transport over the bridge, seems to be responsible for most of the damage. Some planks are bound together by a type of metal wire to restrict this movement. While this appears to be effective, the wire will have a negative impact on the wood of the deck planks in the long term, since they are cutting into the wood. The metal also corrodes faster in the tropical climate of Indonesia (Corvo et al., 2008). Figures A.1 to A.4 show the condition of the deck planks.



Figure A.1 Partially split deck plank



Figure A.2 Rotten deck planks



Figure A.3 Deck planks held together with a metal wire



Figure A.4 Metal wire with rust

Wooden beams

The thickness of the wooden beams is 25 cm. According to M. Saleh (personal communication, September 8, 2026), the 7-meter long wooden beams are all of the same age. Cyclic loading from cars and trucks accelerates the deterioration of the beams. Consequently, most of them are in poor condition. This is also proven by the way they look (Figure A.7). The beams in the middle and on the outermost sides of the bridge are in the worst condition. The beams are the most concerning part of the bridge structure; currently, the sagging beams are shedding load onto the adjacent beams creating a bigger risk of failure of the entire structure (Figure A.6). This adds up to the already unevenly distributed loads of the wheels of a car or motorcycle. The underlying wooden planks that have been screwed on do not increase the load-bearing capacity of the beams themselves. At maximum effectiveness, they may help distribute loads slightly more evenly across some of the beams. According to Morales-Conde et al. (2015) this does not work, since the applied planks are straight, while the beams are already sagged and therefore not at even height. Therefore it is considered as an emergency measure. Figures A.5 to A.7 show the condition of the wooden beams.



Figure A.5 Plank fastened crosswise to beams



Figure A.6 Sagged beam due to rot



Figure A.7 Rotten wooden beams

Steel beams

The steel beams are not present in the car section. In the pedestrian part, which was built in 2010, they are in poor condition. A lot of rust can be seen on the steel I-profiles and some parts have undergone significant corrosion. Especially in the middle part of the bridge the decay is clearly visible (see Figure A.9). Despite being only 16 years old, 8 years younger than the rest of the structure, the steel beams already show significant deterioration, suggesting an aggressive local corrosion environment. This is confirmed by research by Pongsaksawad et al. (2021), which shows that corrosion peaks in coastal areas in a tropical climate with a high humidity and temperature. Despite this, the pedestrian section appears sturdier in many areas than the car section. There is less sagging and moving of the wood when walking or riding over it. This is unexpected, since this part is not considered a priority and its deck planks are replaced less frequently. The wooden deck is in a bad state, but sections where sound planks are fastened to the steel beams appear structurally strongest. Figures A.8 and A.9 show the condition of the steel beams.



Figure A.8 Severely degraded steel I-beams



Figure A.9 Top view of steel beam

Bolts

The condition of the bolts varies greatly from one individual bolt to another, much like the deck planks. This is likely also due to replacements over the

years, but there are also areas where the structure endures more stress than in other places, such as in the middle between two supports (i.e., the concrete pillars). A larger bending moment is present in these places, and the bolts might have come loose due to the vibrations of the vehicles driving over the bridge. The cyclic loading on the bridge has a significantlybigger impact on connections in wood than monotonic loads (Ataei et al., 2019). In other places, rust has caused the bolts to break off. These two mechanisms have a positive relation with each other: if a bolt is rusty, it becomes smaller, and thus the chance increases that the bolt will sag through the wooden boards due to vibrations. The rusty bolt also damages the wood, creating a bigger hole for the bolt to fall through. Often, extra bolts have been installed in certain spots, likely as an informal repair to offset the loss of a broken bolt. However, it is unclear whether this restores the original connection capacity. Figures A.10 and A.11 show the condition of the bolts.



Figure A.10 Bolt in a deck plank



Figure A.11 Sagging bolts on the underside of a beam

Concrete Pillars

The concrete pillars seem reasonably resistant to the seawater in which they stand. However, their square shape leads to turbulence, which leads to scour, which in turn leads to faster erosion of the pillars (Omara et al., 2022). Currently, the concrete reinforcement is already visible in many places. The tides create a zone of the pillars that is switching between dry and wet. Figure A.12 shows this zone and illustrates the cyclic wetting and drying caused by the tides. This pattern of damage is consistent with chloride-induced reinforcement corrosion, often seen in marine environments. The corrosion adds to the creation of rust, which takes up more space and therefore creates cracks in the concrete. This leads to more visible reinforcement, creating a downward cycle (Ali et al., 2024). The deterioration of the pillars' strength will accelerate as a result, since the exposed steel is less resistant to salt water than the concrete. In some places, the pillars appear to have sunk or settled slightly, but it is difficult to determine what their original position was, since no original documentation is available. Figures A.12 and A.13 show the condition of the concrete pillars.



Figure A.12 Top of reinforced concrete pillars



Figure A.13 Bottom of reinforced concrete pillars

Loads

Figure A.14 shows cars and a motorcycle crossing the bridge at the same time.

Estimation of maximum simultaneous use:

- People: Maximum of 100
- Motorcycles: Maximum of 20
- Cars: Maximum of 5
- (Heavy) Trucks: Are not allowed. In the back of Figure A.14 it can be seen that this is not strictly regulated. The difference between a car, a truck and a heavy truck is not exactly determined by the regional government, who is in charge of putting these kinds of regulations in place.



Figure A.14 Cars and a motorcycle crossing the bridge

Appendix B: Needs and wishes

This appendix contains the overview of all needs and wishes (B1), the transcripts of the interviews and meetings (B2 to B8) and the survey results (B9). The coding of the transcripts into needs and wishes is described in Section 2.3.4.

Appendix B1: Overview

Table B.1 gives an overview of all needs (N) and wishes (W) of the actors, with their source and the underlying problem. Residents are referred to as the local community in the report.

Table B.1 Overview of the wishes and needs of the actors

N/W	Stakeholder	Source	Wish / Need	Underlying problem / motivation	Evidence / quote	Notes
N01	IBF	IBF Meetings	Bridge must support ecotourism	Tourism depends on visitors being able to access Cemare via the bridge	"Being able to access Cemare via the bridge. That is why the bridge is so important."	
W01	IBF	IBF Meetings	Bridge with aesthetic value	The bridge is seen not only as infrastructure but also as an entrance to Cemare	"Make it an icon, monument with great aesthetic"	Aesthetic quality is explicitly identified as a pillar
W02	IBF	IBF Meetings	Bridge as an icon/landmark for Cemare	The bridge has high value for the local population and tourism	"Think about the bridge as an icon (Golden Gate Bridge)"	Closely related to aesthetics; could be combined with the row above
W03	IBF	IBF Meetings	Provide information about Cemare and the mangroves	The bridge is viewed as the entrance to Cemare and an opportunity to communicate its identity and protected mangroves	"Pillars are: solid bridge, aesthetic, information about Cemare and that mangroves are protected in the area"	Could support environmental education
N02	IBF	IBF Meetings	Reliable connection to the mainland	Cemare needs a dependable connection	*"They want a better connection"*	Key priority for IBF
N03	IBF	IBF Meetings	Strong and safe structure	Safety is one of IBF's main priorities	*"Safety, strong structure"*	Key priority for IBF
N04	IBF	IBF Meetings	Long functional lifespan	The bridge should remain functional for at least 10 years	"Long-term (10 years)" "How long should the plan hold → forever"	

N05	IBF	IBF Meetings	The bridge must remain accessible to trucks	Community members depend on truck driving for their livelihood	"It is essential to have trucks there, because some people work as truck drivers"	Important for local livelihoods
N06	IBF	IBF Meetings	Bridge must accommodate heavy vehicles	Large trucks are needed for IBF activities and waste collection	"Big trucks need to pass the bridge for the IBF" / "Dam truck for the waste of Cemare"	Includes trucks for IBF activities and waste collection
N07	IBF	IBF Meetings	Safe management of high traffic volumes	Traffic increases substantially during weekends/ holiday and needs to be managed safely		Particularly relevant during busy weekends
W04	IBF	IBF Meetings	Improve access to the mangrove area	IBF wants more visitors to experience and learn about the mangroves, rather than only visit for sunset	They want many people to go to the mangroves, not only for the sunset	Linked to IBF's ecotourism objectives
W05	IBF	IBF Meetings	Support environmental education	IBF wants visitors and residents to understand the ecological importance of the mangroves	"They want to educate the local population about the local environment"	Focuses on awareness of the ecological importance of mangroves
N08	Residents	Resident Interviews	Reliable connection to the mainland	Residents depend on the bridge for most daily activities	"We just have one bridge for all activity"	
N09	Residents	Resident Interviews	Strong and safe bridge structure	Current bridge is deteriorating and perceived as unsafe	"Now it's danger" / "we need safe conditions"	Safety concerns were mentioned by multiple residents
N10	Residents	Resident Interviews	Access to essential services	Residents depend on the bridge to reach school, hospital, university, work and markets	"Need for going to a hospital, … university, … school, for work, for everything"	Includes healthcare, education, work and markets
N11	Residents	Resident Interviews	Fast and reliable emergency access	Delays and unsafe crossing can hinder healthcare access and evacuation	*"Some people need to go to hospital, five minutes is too bad"*	Bridge also functions as an evacuation route
N12	Residents	Resident	Access for heavy vehicles	Construction materials, goods	"Materials also, all! Materials"	

		Interviews		and supplies need to reach Cemare		
N13	Residents	Resident Interviews	Safe motorcycle accessibility	Motorcycles are the main transport mode for residents	“All people uh go by motorbike”	Motorcycles are the main transport mode among residents
N14	Residents	Resident Interviews	Sufficient width for two-way traffic	Vehicles currently have difficulty passing each other	“Better to widen it, so that if there are cars, they can pass each other”	
N15	Residents	Resident Interviews	Maintainable bridge structure	Current maintenance relies partly on community efforts and repeated repairs	“We need to maintenance, yes, we need to renovation”	Current maintenance is partly organised and funded by the community
W06	Residents	Resident Interviews	Permanent long-term solution	Residents prefer a lasting solution over repeated temporary renovations	“He want like a permanent”	Preference for a permanent solution rather than repeated repairs
W07	Residents	Resident Interviews	Comfortable crossing	Residents want crossing to be easier and more comfortable	“More beautiful and more comfortable again crossing that bridge”	
W08	Residents	Resident Interviews	Improved accessibility for tourism	Better access could attract more visitors to Cemare	“It will increase … visitors … coming into our place at this Cemare Beach”	Linked to local economic opportunities from tourism
W09	Foreign visitor	Foreign visitor Interview	Safe crossing by car	Now scared to cross the bridge by car	"We are afraid to drive our car over the bridge"	Based on the visitor’s perceived safety when crossing by car
W10	Head of Village	Meeting Mohammed	Wider bridge	The current bridge is considered too narrow	“He wants the bridge to be wider”	Specific design preference of the Head of Village
N16	Head of Village	Meeting Mohammed	Strong and durable bridge structure	The bridge requires stronger and more durable construction materials	“The bridge must also be stronger, using better/more durable wood (e.g. Ulin)”	Ulin is mentioned as an example, not as a strict material requirement
N17	Head of Village	Meeting Mohammed	Funding for future bridge maintenance	Current funding is limited and donors are currently not contributing	“In the future, the money should go towards bridge maintenance”	Current donors are not providing funding

W11	Head of Village	Meeting Mohammed	Reuse suitable materials from the existing bridge	Existing materials may still be usable after dismantling	“The old bridge materials will be removed and reused if they are still in good condition”	Reuse depends on the condition of the existing materials
W12	Head of Village	Meeting Mohammed	Community involvement in the renovation	The local community can contribute labour to the renovation	“The local community will help with the renovation”	Head of Village coordinates community participation
W13	Head of Village	Meeting Mohammed	Explore a user-payment system to fund maintenance	A source of revenue is needed to finance future bridge maintenance	“Maybe with a ticket system?”	Possible ticket system; requires discussion with government and community
N18	Regency	Government Visit	Renovation of the bridge	The bridge requires more renovation than currently planned	“It is a priority for them to renovate it” / “They know that more renovation is needed than currently planned”	Current renovation plan only covers the car section
N19	Regency	Government Visit	Renovation within the available budget	The available budget limits the scope of the current renovation	“Why will only the wide section of the bridge be renovated? – Budget”	
N20	Regency	Government Visit	Maintain bridge access during renovation	The bridge needs to remain usable during the works	“The bridge can be used during renovation (the scooter section)”	
N21	Regency	Government Visit	Protection of materials against corrosion	Corrosion is present in the metal structure	“There is corrosion visible on the metal structure” / “Both wood and metal corrosion protector”	
W14	Regency	Government Visit	Complete renovation of the bridge	The current renovation does not cover the complete structure	“They are waiting for the larger budget. The complete construction is already being examined and a plan is being made to renovate the entire bridge”	Depends on future budget/approval
W15	Regency	Government Visit	Use local wood for replacement	The existing wooden section	“The wood will be replaced by the same type of wood”	

				consists of local wood		
W16	Regency	Government Visit	Complete the current renovation before December	The planned renovation is intended to take approximately two months	“It starts in September and they want to finish in two months (before December)”	
N22	Regency	IBF Meetings	Ecotourism is the most important thing about the bridge	This way they can get money	"For the government, the most important thing is that ecotourism can continue"	
N23	Eco Green	Eco Green Interview	Safe and comfortable bridge	The current bridge does not provide sufficient safety and comfort for the community	“The condition of the bridge lacks providing safety, comfort for the community”	The bridge is considered vital for the Cemare community
N24	Eco Green	Eco Green Interview	Reliable main connection for the community	The community depends on the bridge for education, social and economic activities	“This bridge represents a vital object that is very important for the community in Cemare”	Main access for community activities
W17	Eco Green	Eco Green Interview	Complete rebuilding of the bridge	Current budget limitations only allow renovation instead of rebuilding the bridge as a whole	“Due to budget limitations [...] it only can perform renovations only, not rebuild as a whole”	Current renovation is seen as a temporary solution
W18	Eco Green	Eco Green Interview	Maintain separation between the main bridge and the mangrove trekking area	Eco Green wants the mangrove area to remain focused on conservation and education rather than commercial development	“We want the mangrove to stay standing on its own, without being connected with the main bridge”	Maintains the existing separation between the two functions
W19	Eco Green	Eco Green Interview	Wooden bridge using local materials	Eco Green wants the bridge to fit the natural character of the mangrove environment	“Because we are surrounded by mangrove ecosystem [...] we need a wood bridge”	Local materials are explicitly preferred
W20	Eco Green	Eco Green Interview	Restrict bridge access for large vehicles through a height barrier	Eco Green wants large vehicles such as buses and trucks	“So the big vehicles cannot pass [...] like the buses, a truck,	A height barrier of approximately 2–2.5 metres is mentioned

				to stop before the bridge	that stop before the bridge”	
N25	Eco Green	Eco Green Interview	Government-funded bridge maintenance	Eco Green considers bridge maintenance a government responsibility and does not want users to pay directly for crossing	“Must come from the government”	Eco Green explicitly opposes toll collection for bridge use
W21	Eco Green	Eco Green Interview	Community involvement in bridge maintenance	The community has previously contributed labour, materials and equipment to bridge repairs	“We would like to do that”	Community participation is based on voluntary cooperation
N26	Eco Green	Eco Green Interview	Community involvement in bridge planning	Government has the budget, but local community input is needed in the technical planning of the bridge	“There must be a collaboration between government and community”	Community input should be incorporated into government planning
N27	Residents	Participatory Design	Traffic should be able to flow simultaneously at both sides	The current bridge only allows one car at a time		
N28	Residents	Participatory Design	Bridge needs to be made out of stronger materials	The bridge needs to be made out of materials such as asphalt and concrete	" Even on graves asphalt is used" " Asphalt permanent on top, underneath use concrete. " "Replace, change with asphalt" "Frames, like that. On the sides framed, then asphalting, underneath concrete so it's permanent."	
W22	Residents	Participatory Design	Bridge needs to attract tourists	The bridge needs to be iconic and aesthetically pleasing	"As iconic and attractive as possible we design it, in such a way so it's very suitable for tourism around here, right?"	
W23	Residents	Participatory Design	Big boats need to be able to go under the bridge	Fishing boatsneed to be able to go underneath the bridge	*" Make the bridge higher up, because during high tide, fishermen cannot pass underneath with their boat masts."*	

W24	Residents	Participatory Design	Use boats if the bridge is not available	Tourists and locals can be transferred by boat, and ecotourism by canoe	"So if it's for tourism, they want to use canoes so tourists can enjoy the scenery. But for the local people, it's normal boats."	
N29	Residents	Participatory Design	Higher and stronger side barriers	The bridge needs to be safe	"] It's basically the same. The road uses asphalt, with fenced walls, and concrete underneath." " On the edges, we design railings/fences."	
N30	Residents	Participatory Design	Bridge wide enough for the traffic	The bridge needs to be safe	"Also, traffic regulation: at each end, there should be an officer to regulate the flow of traffic so it's orderly."	
W25	Residents	Participatory Design	Active surveillance	The bridge needs to be safe	", install CCTV cameras so if any accident or issue occurs, we can monitor it immediately! "	
W26	Residents	Participatory Design	The bridge should not negativelyimpact the local economy	Fishing boatsneed to be able to pass	" So that this water flowing here produces money around here!"	
N31	Residents	Participatory Design	Active traffic regulation	The bridge needs to be safe	"here must be traffic officers regulating alternately from east to west so there's no jam. "	
W27	Residents	Participatory Design	Landscape needs to be environmentally friendly	The bridge design fits in the environment	"creating an eco-friendly landscape"	
N32	Site analysis	Environmental effects (Section 3.5.2)	Bridge needs to be able to withstand environmental effects	There are many environmental effects that could have a negative impact on the bridge		

Appendix B2: Interviews Residents

Tables B.2 to B.9 give the details and the colour coding of the four interviews with residents.

Interview transcript Cemare citizen 1

Table B.2 Interview details: residents, interview 1

Date & Location:	**Cemare Beach / Cemare Village, Lembar, West Lombok, Indonesia**
Participants:	Interviewer 1 (Male, Dutch researcher, speaking English/Dutch) Interviewer 2 (Female, Dutch researcher, speaking English/Dutch) Translator / Local Guide (Male, Sasak/Indonesian speaker, speaking English & Indonesian) Respondent: Pak Udin (Male, 33-34 yrs, Cemare resident & Head of Parking)
Languages Spoken:	English, Dutch [NL], Indonesian [ID], Sasak [Sasak]
Translation Mode:	Full verbatim transcription translated into English (Sasak transcribed in original phonetics + translated into English)
Transcription Rule:	Verbatim fidelity (fillers, false starts, and hesitations retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak: "..."] = Original Sasak utterance followed by English translation

Table B.3 Colour coding used in residents interview 1

Colour	**Relation**
Yellow	Respondent profile
Dark green	Technical condition & potential design requirements
Green	Values & motivations
Grey	Traffic flow & travel time
Pink	Bridge use
Turqouise	Safety & risk perception

[01:33] Translator: [laughter] So I I's- I just explained to her about this guy. And I explained to her first this guy is uh real from here. And then so you know so the hands before so accident. Like electricity you know, so big electricity. See the almost die. The guy see almost dies. Like uh one week, right? Like [ID] one week. One week in a month. In the hospital. [ID] At that time. This is, we, we tell the story prior to... [ID] Yeah, yeah, yeah. [ID] ...your help. [ID] Yeah, yeah, yeah. Uh three months on the hospital.

[02:10] Interviewer 1: So what what happened again?

[02:13] Translator: Uh this was like uh profession in uh building. For the electricity, like uh like this. Like this on the on the cable, like the big electricity come to...

[02:26] Interviewer 1: A shock?

[02:27] Translator: Yes.

[02:28] Interviewer 1: Electric shock.

[02:29] Translator: Yes. Big burn. So all the bones. The T-shirt, all the bone.

[02:34] Interviewer 1: Oh.

[02:35] Translator: Yeah, the T-shirt so all so burned. And then uh he like this like uh like this now. But he's strong. I mean he's strong. But uh never never give up. Always like uh up up up. And then now to be like this, to be, I mean the the head of the parking area here and then always clean. Every day.

[02:59] Interviewer 1: So he's the head of the parking area.

[03:00] Translator: Yes.

[03:01] Interviewer 1: Th- this parking area and the and the and the other one?

[03:03] Respondent: [ID] Yes, until the beach, until the beach.

[03:05] Translator: All the beach area he clean every day.

[03:08] Interviewer 1: And he also live nearby here, in the village?

[03:10] Translator: Yes.

[03:31] Translator: [ID] Okay, Pak Udin, how old are you now?

[03:33] Respondent: [ID] Almost thirty-four.

[03:35] Translator: So this, the age like uh I mean thirty-four years old. Thirty-four years old.

[03:41] Interviewer 1: Old, okay.

[03:42] Translator: The age. Yeah, the age. And then so like uh male. And then so, [ID] where do you live?

[03:46] Respondent: [ID] In Cemare Hamlet.

[03:48] Translator: Uh he lives in the Cemare. Like a real people from here, born here.

[03:56] Translator: [ID] Daily life and travel, sir: how often do you travel from Cemare to the mainland? [laughter]

[04:08] Translator: [ID] To the main road, this is. Not to buy anything, whatever, meaning... [ID] To Landey? [ID] Ah, to cross this bridge, that's what it means. Not traveling to places that that are luxurious, like that. To cross over, moving from Cemare, this is what it means, to go buy your daily needs, that, that's what it means, the mainland.

[04:26] Respondent: [ID] Yeah, almost five times. Five times.

[04:30] Translator: [ID] Every day?

[04:31] Respondent: [ID] Every day.

[04:59] Interviewer 1: Yeah, now we move on to number one.

[05:00] Translator: So that the daily life and the travel. See like uh he said like a move like on the on the another mainland like uh five times.

[05:08] Respondent: [ID] The point-to-point only, right?

[05:09] Translator: Five times.

[05:10] Interviewer 1: Five times a day?

[05:11] Translator: Yes, a day.

[05:12] Interviewer 1: So he's he's crossing like uh this from this village to the mainland five times a day.

[05:17] Translator: Yes. Five times a day.

[05:19] Interviewer 2: And for what?

[05:20] Interviewer 1: Like why? For what purpose?

[05:22] Translator: [ID] Uh for what needs are those, sir?

[05:25] Respondent: [ID] First, dropping off the children for Quran recitation, then second, schoolchildren. Uh-huh. Then the third is for kitchen needs.

[05:33] Translator: Uh sometimes uh bring the the kid for the school.

[05:36] Interviewer 1: The kids, yeah.

[05:37] Translator: Uh, and then buy some supply for the kitchen. Like that. Like uh vegetables, or something else.

[05:44] Interviewer 1: Do a lot of kids uh who live here go to school on the mainland? Or all the kids?

[05:49] Translator: [ID] How many people whose children who go to school next door? Many, or...?

[05:54] Respondent: [ID] Uh... one person.

[05:57] Translator: Uh, see if you have the one, one daughter...

[05:58] Respondent: [ID] Eh, two, two, two, two, two, sorry, sorry, two.

[06:01] Translator: ...but it's many. Like uh we have here on the village like uh only one elementary school. Just just like that. So when we finish like uh elementary school, we move uh the mainland, like that. Because like uh we don't have school like uh senior, junior school. So only only for in the mainland. So we must uh move to the school. Sometime in the university too, we go there, like that.

[06:33] Interviewer 2: So you live here and then you go there.

[06:34] Translator: Yes, exactly.

[06:35] Interviewer 2: And it's like, how many people? Usually?

[06:38] Translator: Like uh maybe mmm so many people. Like uh half people maybe? Because we have the school only elementary school here. So we but just the move. But sometimes like uh in the elementary school, like uh I mean too many kids here, they're just the move. Yeah, like that, because we have the small one.

[06:58] Interviewer 2: Yeah.

[06:59] Interviewer 1: Yeah. Okay, can you ask him, next to the education of his children, what are other purposes of uh going to the mainland?

[07:07] Translator: Sorry, can you?

[07:08] Interviewer 1: What Like what are other reasons to go to the mainland next to the education of his children?

[07:34] Translator: I think so everything. I think so everything. Everything, I think. Not school, not, but everything we must go to mainland. Because we don't get nothing here, because like uh Cemare Village like uh like an island, you know. Because we we village is like this you know, like a water, so what we must do?

[08:10] Interviewer 1: Uhm, "how do you travel to the mainland?", so the third one. So one, and then the third.

[08:24] Interviewer 1: The third one. So, how do you travel?

[08:25] Translator: The third one. [ID] How far and how long do you have to travel, sir?

[08:31] Respondent: [ID] If we take it from Cemare towards the mainland, at most uh ten minutes. School. [ID] To to his school? [ID] Yeah.

[08:43] Translator: [ID] How many kilometers?

[08:44] Respondent: [ID] About one and a half kilometers. [ID] One kilometer up to two kilometers? [ID] Yeah, approximately, yeah.

[08:48] Translator: Like uh on the road like uh two maybe like almost two kilos in a every day, like a school. Two kilo, two kilometers, and then I mean like uh one and half kilometer like this, in uh ten minutes or fifteen minutes.

[09:03] Interviewer 1: Mhm. And like how does he travel to the mainland? By motorbike or walking, or car?

[09:09] Translator: Uh we have like a three choice.

[09:12] Interviewer 1: Three choices.

[09:12] Translator: Yeah, with the with the car, sorry, we don't have a car, so just a motorcycle, and then some bike. Sometimes uh walking around. Like a walk.

[09:19] Interviewer 1: Bike, like a bicycle?

[09:20] Translator: Yes, a bicycle.

[09:21] Interviewer 1: Okay. And what kind of choice does he use?

[09:24] Translator: Uh motorcycle.

[09:25] Interviewer 1: Motorcycle.

[09:26] Translator: Motorcycle.

[09:27] Interviewer 1: So he bring a car?

[09:28] Translator: Yeah.

[09:30] Translator: The the fourth one?

[09:31] Interviewer 2: [NL] Maybe: which bridge?

[09:33] Interviewer 1: And like uhm how how does he go to the mainland, which do do does he use like any of the bridges? That that connects?

[09:41] Translator: Yes. Yes, the connection.

[09:43] Interviewer 1: Which br- bridge do you use, the skybridge or the...?

[09:46] Translator: I think the this this is one.

[09:48] Interviewer 1: This, the old one?

[09:49] Translator: This the the main bridge connection. Main bridge. Yes.

[10:08] Interviewer 1: Okay. So, how do you experience the current connection between Cemare and the mainland?

[10:14] Translator: [ID] How is your experience with the current access between Cemare and the mainland on the east side?

[10:20] Respondent: [ID] Uh, so I am ready to answer. For, as far as safety and comfort goes, it is still a bit less friendly. Related to the bridge in general. Uh, which we cross every day, it is uh still a bit doubtful. With the reason uh part of the wooden planks have started to become loose, like that.

[10:48] Translator: So, they mean like uh when you walk like uh bridge connection, like uh every time so afraid. You know, afraid, because the wood so always like uh [onomatopoeia: dug-dug-dug] like that, and then the some the connection bridge already like uh so [cough] no good for the using, like that.

[11:13] Interviewer 1: Yeah. So he's afraid when he's crossing the bridge.

[11:15] Translator: Yes.

[11:16] Interviewer 1: Okay. Thanks.

[11:18] Translator: And then?

[11:19] Interviewer 1: And then uh what works well about the current connection? So, does he have any positive points about the current bridge? Like some good things?

[11:29] Translator: Yeah, I think so, good things. So, you can ask him, I will...

[11:34] Interviewer 1: So, uhm what works well about the current condition of the bridge? So do you have any positive things about this bridge, or it's...?

[11:42] Translator: [ID] Uh, what do you think, [cough] for the future regarding this bridge, sir?

[11:48] Respondent: [ID] Uh, our hope uh will immediately have to be repaired in a what, uh... [ID] In a permanent way? [ID] Yes, in a permanent way. Both from the east side up to its west side. It should be dismantled completely. If it is still done by renovation, in my opinion, I am very sorry, that will repeatedly, repeatedly continue to be made a problem later on.

[12:15] Translator: So he said like uh he hope like uh the connection bridge want to fix it, real fix it. Not just the renovation, you know. If we renovation, just the again, again, again. Uh he said like that. When uh renovation is really good or the we fix it is really good because you got like uh I mean like uh he want like a permanent, you know. Like uh when renovation and then again, and renovation again, we don't know about that. He want like uh make or the fix it real real fix it.

[13:09] Translator: Uh sorry, [cough] [ID] would you go to the mainland more often if the access was better, and why? This means... [ID] If it's already good? [ID] Ah, if it's already good.

[13:20] Respondent: [ID] Mmm, big possibility, I will very often cross that bridge. With the reason, I already feel comfortable when it is really, really repaired.

[13:31] Translator: He said like uh he's very happy when the bridge connection is like uh perfect like that. So many many travels come go around, like that. So when the the bridge connection is uh really perfect, like that.

[14:00] Interviewer 1: ...would he go more often to the mainland because the bridge is safer?

[14:04] Translator: [ID] Yes, what do you think if the bridge is good, whether people going back and forth on that bridge will be increasingly more, or how? With visitors...

[14:11] Respondent: [ID] Yes, what is certain is very certain, and it will increase uh the potential capacity of visitors to be more crowded coming into our place at this Cemare Beach.

[14:21] Translator: Uh he said like that, when the the connection the bridge connection is uh better, it's uh many travel or the local people here like uh easy come for the go to mainland. And then so just uh like a magnetic for the many tourists come.

[14:38] Interviewer 1: Yeah. Okay.

[14:40] Interviewer 1: And like uhm... like a lot of trucks are crossing the bridge?

[14:44] Translator: Yes.

[14:45] Interviewer 1: What's what is his opinion on that? Like that a lot of trucks with a lot of tourists crossing the bridge to visit, for example, the beach in the weekend?

[14:53] Translator: Yes, but it's uh we get like a get the many complaints.

[14:57] Interviewer 1: Many complaints?

[14:58] Translator: Many many complaints about the connection bridge, so like uh I mean so so noisy, you know, noisy and danger. So, so many many people come in uh like uh in uh

[cough] I mean like in a week, like uh Sunday, so many people, but some we we listen to many many complaints like that. Because the like when they say go around uh bridge connection, so so many complaints.

[15:30] Interviewer 1: A- and complaints about the safety or about the tourists that coming here by trucks, or?

[15:35] Translator: Yes.

[15:36] Interviewer 1: Both?

[15:37] Translator: I think so many...

[15:38] Interviewer 1: Or maybe it's too busy that a lot of people want to cross it at like the same time?

[15:42] Translator: Yes. Yes.

[15:44] Interviewer 2: Do tourists come with buses?

[15:46] Translator: Uh no with bus. Just the bus we live, just with the car. But the before so when we have the bridge connection is better, so many car come. But now it's uh many like the drivers are afraid.

[15:58] Interviewer 1: Afraid.

[15:58] Interviewer 2: Yeah.

[15:59] Translator: Yeah, so we we look some maybe in uh three months many like a tourists come for the maybe for the beach, or accommodation, for the mangrove uh community, so like so cancel, you know. So when come like uh not like uh...

[16:16] Interviewer 1: They stop, they see the bridge, and they turn around?

[16:18] Translator: Yeah, it's say like I mean like uh, okay, welcome to Cemare business, or no, welcome the connection bridge, but like this see like a wrong way, like that. The wrong way, so no not yet come.

[16:56] Translator: [ID] What is the most important for you in having good access between Cemare and the mainland? [ID] What is the most important, sir?

[17:04] Respondent: [ID] Safety.

[17:07] Translator: It's the point, point. He say like uh safety.

[17:09] Interviewer 1: Safety. Safety is one.

[17:10] Translator: Yeah, safety.

[17:12] Interviewer 1: Because like he's in he's uh dependent of the tourists, because he he works here like at the parking places.

[17:18] Translator: Yes.

[17:19] Interviewer 1: I can imagine when they fix the bridge, more people will come here and he has more work.

[17:23] Translator: Yes.

[17:24] Interviewer 1: Is that true, or?

[17:25] Translator: Yes, it's true.

[17:26] Respondent: [ID] A parking lot attendant.

[17:27] Interviewer 1: And does he also earn more, because more people will come here?

[17:31] Translator: [ID] Uh when the bridge is good, is it good or not for you, will there be very many guests or how, with perhaps your busyness or a lot of work that has more job opportunities, when the bridge is good?

[17:46] Respondent: [ID] Uh maybe uh yes, there will be more. First, uh many visitors who di- uh what, visited by tourist guests as well, and from local residents as well. And a lot also, uh what, maybe later over there, uh what's its name, new entrepreneurs maybe who participate in this beach, maybe the majority like that. We will make it if, for example, what, uh a lot, one of the activities that are beneficial for us here, for example, if this beach is crowded, then we will be ready to accept street vendors, and from that later I will take from a portion of uh what's its name, uh income for waste financing towards uh street vendors who participate in uh or what's its name, the form of dues, like that.

[18:49] Translator: So, he say like uh when the the connection bridge is uh like uh better, so like uh many people come like uh on the like a tourists, the local one, or the for the Europe, it's uh more like a happy because uh many like uh some café or the restaurants, so many people come. And then they he too like a very happy because so many people come on the parking at this area.

[19:15] Interviewer 1: Yeah, so they buy more things and they earn more.

[20:38] Translator: [ID] So, what is the most important for you in having good access between Cemare and the mainland... this is already, right? [ID] And what makes the travel to the mainland become easier for you?

[21:42] Translator: [ID] Okay, besides safety, what else according to you is most important and must be possessed by that bridge? Besides safety. Is it large, is it strong?

[21:56] Respondent: [ID] Yeah, if possible, from the bridge that already exists, that is uh likely this is my personal view. Uh. So, don't, if possible, don't uh have again uh what, that middle wall. That divider, so that it looks wider. Like that. And if we want to talk related to its strength, it is required to be more what, from a portion of the pillars underneath that are renovated to be even bigger.

[22:28] Translator: So like uh when like a safety, you know, the a line on the middle, so like uh when they got nothing, they're going to take out, so more uh the road's more bigger.

[22:38] Interviewer 1: The road.

[22:39] Translator: Yeah, the the road's more bigger when we take out for the... You see before, like on the middle, like uh...

[22:43] Interviewer 1: Yeah, you have like the wider part and the small part.

[22:45] Translator: Yes. He want like uh make like an empty.

[22:48] Interviewer 1: Like one big road.

[22:49] Translator: Yeah, so one, but a big one. So no...

[22:50] Interviewer 1: So no uh thing in the middle that separates.

[22:52] Translator: Yes, exactly. So just uh make the wide. And on the bottom, we he hope like uh renovation, want to fix it like a real real strong, like on the bottom, you know, the...

[23:03] Interviewer 1: Oh, so not a wooden planks construction, you know.

[23:12] Translator: [ID] Why do you want the road to be even bigger, sir?

[23:15] Respondent: [ID] In my opinion, that portion of the small motorbike lane, that that is not important in my opinion, because it's rarely rarely used. Rarely used, it should be functioned in a what, uh normal way only, like that, evenly distributed, lah.

[23:31] Translator: I he hope like a usually the the small one we use for the motorcycle, but now before so in uh every day is already mixed, like uh so car, motorcycle, but he hope like it's uh it's not to use like that, so we must make the bigger. Sometime like uh, okay, we make the separate, but we uh he do like a mix, you know, so just the we like uh one, but mix, like that, so more the bigger.

[23:59] Interviewer 1: So why why do not people use like the smaller part for the to go by motorcycle?

[24:03] Translator: [ID] Why is it not used for small motorbikes?

[24:06] Respondent: [ID] In my opinion, er uh local residents here mostly take the right side in the lane for uh cars. So very rarely passing through or crossing in the lane that has been designated for that. I am also until today amazed. Mostly take the right side. And our reason uh must be flattened out only. Let us together get it. That's all.

[24:32] Translator: Yeah, he said like uh it's a many people so know, but you know already, but like uh don't listen, so just the use the the big one.

[24:41] Interviewer 1: They don't just...

[24:42] Translator: Uh don't listen, so...

[24:43] Interviewer 1: Because the the big one is in better condition?

[24:44] Translator: Yeah, I I mean so the reason is uh like that. So the big the the bigger one is uh is uh [cough] more better than the small one. So the small one is a very noise, so not noisy, I think, but uh dangerous, you know. When we... When we rode like the small one, so very dangerous.

[25:02] Interviewer 2: Yeah.

[25:03] Interviewer 1: [NL] Is actually also good for us, because they are only going to renovate the large part. So then the small part remains bad.

[25:07] Interviewer 2: [NL] Okay, as far as we're concerned...

[25:08] Interviewer 1: Okay, can you uh thank him for his like his uh his answers? We're very happy with that. I think th- this is it for now.

[25:17] Translator: Uh yes. [ID] How, sir, is your hope for the future? Your hope...

[25:23] Respondent: [ID] My hope, regarding the bridge? [ID] That's it, yes. [ID] My hope for the future, don't be too far in the future, if possible, expedite it immediately.

[25:31] Translator: [ID] Yeah, don't wait for the future, soon. [ID] Yes.

[25:58] Interviewer 2: [NL] Oh wait, I can... [in English] Is there is there anything he still wants to say about the bridge? About the connection? Something that he wants to share with us?

[26:12] Respondent: [ID] My hope, we must immediately uh what, uh repair it so that uh our local residents will feel it is more beautiful and more comfortable again crossing that bridge, including mothers who go to the market to sell, especially also our children who are leaving for school, yeah, and the community as well who go back and forth to carry out work activities. Yes, and for, yeah, visitors as well, when entering here so that there are no more complaints, like that.

[27:10] Translator: Yes, we start for the fix it. Because because many you have the kids, many like uh go to school like uh on the mainland, and then some people for the sell something, or or something else, just easy.

[27:35] Interviewer 1: Is is he is he afraid that the that the bridge, the current bridge, will just break?

[27:40] Translator: [ID] Uh, what do you think, sir?

[27:43] Translator: Still want to fix it, but uh like uh broke everything, or...

[27:46] Interviewer 1: No, like is he afraid like maybe because of the water, or the any floodings, or just because like the heavy trucks pass it, the the the bridge will just break down? Because a lot of people use it at the same time.

[27:57] Interviewer 2: He's scared that that will happen.

[28:18] Translator: [ID] Are you, are you afraid that the bridge will collapse in the near future because of its bad condition?

[28:24] Respondent: [ID] Definitely, definitely. Because in the section of the pillar that's uh in its middle position, that's already, already, already started to erode. And uh from a portion of the wooden girder planks, that has already started to come off, both that in the car lane on the left, right? Yeah, focus on the edge, its center. It can no longer be crossed by uh large cars, like dump trucks and other trucks.

[28:51] Translator: Uh he's afraid because the on the bottom for the bridge connection so more like a small one, like that. So easy when uh so many vehicle comes uh around like uh so more more smaller. I mean all the the the wood on the bottom.

[29:07] Interviewer 1: Yeah. Okay. Thank you very much, [ID] thank you [Sasak] [laughter]

[29:13] Respondent: [Sasak: "Pade-pade"] You're welcome [same here].

[29:14] Interviewer 2: [laughter] [ID] Thank you.

[29:16] Respondent: [Sasak: "Pade-pade"] You're welcome [same here].

Interview transcript Cemare citizen 2

Table B.4 Interview details: residents, interview 2

Date & Location:	**Cemare Beach / Cemare Village, Lembar, West Lombok, Indonesia**
Participants:	Interviewer 1 (Male, TU Delft researcher, English/Dutch) Interviewer 2 (Female, TU Delft researcher, English/Dutch) Translator / Local Guide (Male, Sasak/Indonesian speaker, English/Indonesian/Sasak) Respondent: Ibu Winda (Female, 37 yrs, Cemare resident, Midwife & Owner of Warung / Homestay)
Languages Spoken:	English, Indonesian [ID], Dutch [NL], Sasak [Sasak]
Translation Mode:	Full verbatim transcription translated into English (Indonesian & Sasak terms translated alongside original phonetics)
Transcription Rule:	Verbatim fidelity (fillers, false starts, and repetitions retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak] = Originally Sasak

Table B.5 Colour coding used in residents interview 2

Colour	**Relation**
Yellow	Respondent profile
Dark green	Technical condition & potential design requirements
Green	Values & motivations
Grey	Traffic flow & travel time
Pink	Bridge use
Turqouise	Safety & risk perception

[00:08] Respondent: Yeah, my age is uh thirty-seven, and then my name is Winda. I'm stay here maybe fifteen years, and then uh I have a small business here, it's a warung. We have one warung and one small homestay.

[00:23] Interviewer 1: Homestay, oh yeah.

[00:24] Respondent: Yeah, yeah, on uh Cemare Cottage. And uh in my homestay, we have a a little bit education and then a conservation about the turtle.

[00:41] Interviewer 1: Okay, so you're just for daily living you're you're running the homestay and the restaurant.

[00:46] Respondent: Yeah, and then I work in hospital. I'm as a nurse, and for specialist for birth, uh I'm as midwifery uh in a small hospital on the village.

[00:57] Interviewer 1: Oh cool! And then we start with uh the first question uh below the daily life and travel.

[01:13] Interviewer 1: So the the first one.

[01:17] Respondent: Oh yes, uh for coming uh for going to Cemare, uh we need the bridge, you mean?

[01:24] Interviewer 1: Yeah, which which bridge?

[01:26] Respondent: Uh yeah, just the Cemare bridge. We just have uh one bridge for very, very important uh for all activity in this island. This is Cemare is the island, and we just have one bridge for all activity. We just have two bridge, but one bridge just for uh not for uh...

[01:50] Interviewer 1: Just for the having fun, like that?

[01:51] Respondent: Yeah, [laughter] I think just for have fun. If you uh need for look a mangrove, you can go to another bridge. But for all urgent, urgent activity, we need just this bridge.

[02:05] Interviewer 1: Okay.

[02:06] Respondent: Yeah, so every day we go to school uh by the bridge, we go to uh...

[02:12] Interviewer 1: Work.

[02:13] Respondent: ..hospital by the bridge, go to school, work, and everything. Go to market...

[02:18] Interviewer 1: Market, all. And how how often do you cross the bridge yourself? Like a week or how how many times?

[02:26] Respondent: Every day! Every day, maybe uh five moment in one day.

[02:30] Interviewer 1: Five moments, okay.

[02:31] Respondent: Yeah. So the bridge is very, very important for me here. Uh in Cemare we have a seven hundred families. Seven hundred families is uh maybe two thousand and four hundred people live here, stay in Cemare. So every people need for going to a hospital, need for going to university, need for going to school, for uh work, for everything. So, uh the bridge is very, very important for all people in Cemare village.

[03:07] Interviewer 1: And how how do you cross the bridge, like walking, or motorbike, or car?

[03:10] Respondent: Oh, motorbike! Oh, I think all people uh go by motorbike, just maybe three or four people go to uh with car.

[03:22] Interviewer 1: Car, yeah.

[03:24] Interviewer 1: And like a lot of tourists are coming by car as well to visit the beaches, like in the weekend?

[03:28] Respondent: Yeah, yeah, yeah.

[03:30] Interviewer 1: What what's your opinion on that, because it's very heavy to go to cross it by car or like by truck?

[03:35] Respondent: Yeah, because uh for Indonesian people, uh they come uh by scooter and by car, not walking. So I think uh this one is very, very important for come by car, because in here we have a lot of people selling uh seafood, and then uh a lot of uh watersport activity here. So that's a very, very important point for economic here. Yeah.

[04:09] Interviewer 1: Okay, uhm and what's your opinion that there are still big trucks are still passing the bridge, right?

[04:16] Respondent: Yeah, uh I think uh we need a more good bridge, because the bridge uh in uh 2008, [ID] 2008, was it? 2008? [Translator: 2000, 2004.] [ID] 2004? Uh 2004, uh the bridge building in 2004 after tsunami. Because here we have a tsunami effect uh after Aceh, tsunami Aceh, after tsunami Aceh. In here, uh we have a flooding uh because the tsunami Aceh. Now, because the effect of tsunami, uh my government bring me a bridge. Yeah, in 2004, and this bridge just one, only one uh helping me uh if we have a tsunami. Mhm, this one just one evacuation route.

[05:14] Interviewer 1: And and what works well about the current condition? So do you have any positive things about the bridge?

[05:19] Respondent: Yeah, very, very bad now. The bridge condition is very, very bad because the uh, [ID] what is wood, what is wood? Wood, the wood is uh broken, and then the uh, [ID] iron, what is iron? Pillar?

[05:31] Interviewer 2: Construction?

[05:32] Respondent: Yeah, construction is very, very bad, maybe because uh we stay in the ocean, a lot of corrosion, yeah.

[05:43] Interviewer 1: Mhm. Uhm... And so what is most important to you in a good connection between Cemare and the mainland? So what's the mo- if they're gonna fix the bridge, what is for you the most important features of the bridge?

[06:01] Respondent: Yeah, I think it's very, very important, because I think my government uh need uh relation or uh connection [laughter] for repair the bridge, because uh every year we hope for my government, for my uh [ID] village head or my regent... The name leader of uh leader of village, the name is kepala desa.

[06:30] Interviewer 1: Muhammad?

[06:31] Respondent: Yeah, yeah, Muhammad Saleh. Uh now Muhammad Saleh every five years, yeah. Uh and then uh we hope uh some people come to help me, help Cemare, help all people for repair the bridge. Yeah, and uh in last month uh we together in uh all people in this village [ID] worked together cooperatively for repair the bridge. If you come in uh one

month later, one month later, maybe in August, you can look a lot of hole in the bridge. [laughter] Very, very bad.

[07:18] Interviewer 1: Yeah, but if you can just improve three things about the bridge, what would you improve? Like the safety, or the construction, or make it wider, or like what would you what would you say?

[07:29] Respondent: Uh I think we need uh a good construction first, because uh too many people need the bridge. Uh good construction, and then uh we need a more big, because in uh my bridge now uh just one people uh go by car and uh one people stop there. Yeah, uh for crossing the for crossing me from here to the to the there, uh we need maybe five minutes. For emergency, it's not good.

[08:08] Interviewer 2: You want you want two sides to go, yeah.

[08:11] Respondent: Yeah, we need two sides to go, because uh in here we have a seven hundred families. So if some uh tragedy [laughter] in here, uh some people need to go to hospital, five minutes is too bad. Yeah.

[08:33] Interviewer 1: Yeah, okay.

[08:34] Respondent: I think more good construction and more big. Yeah, maybe [ID] asphalt! [laughter]

[08:44] Interviewer 2: And how far is the hospital? The...

[08:47] Respondent: From here, thirty minutes for uh big hospital is uh thirty minutes, and small hospital is uh fifteen minutes.

[08:55] Interviewer 2: Fifteen, okay.

[08:56] Respondent: Yeah, okay.

[08:58] Interviewer 1: Uhm... [NL] Let's see.

[09:04] Interviewer 1: So what what's your opinion, like if they're gonna fix the bridge, the bridge will be closed for the big cars, so o- no tourists can come here by car. So maybe you your company will be affected by the about that?

[09:19] Respondent: Yeah.

[09:20] Interviewer 1: So like maybe they're gonna close it for like a month or something. Like are you afraid for that as well?

[09:24] Respondent: I think uh I think if uh just a scooter come with the bridge, you mean? Uh not so good effect, because in uh Lombok specially, not all people have a scooter. So in the small village, all people just have a public transportation, and for come to here, they need a public transportation, and the public transportation is a car. So they need car for come to here. If uh just scooter, just motorbike come to here, I think uh for if economic effect, not uh too many people come to here for tourism.

[10:09] Interviewer 1: And like the people who are staying at your homestay, the tourists, how do how do they come here, by car?

[10:13] Respondent: Oh, for for the tourists? Oh, my my my guys, all of my guys normally by scooter, or walk![laughter]

[10:23] Interviewer 2: And uh what kind of public transportation is here?

[10:28] Respondent: Uh here, uh Maxim. Grab and Gojek not working here.

[10:33] Interviewer 2: Okay.

[10:34] Respondent: But my homestay, normally the guys uh come to my homestay because they late come from Bali to the port uh in maybe after midnight. So they need uh one homestay not far from the Lembar. Here just two homestays here, so I built my homestay because a lot of people need.

[11:03] Interviewer 2: And they come here by a personal driver then, or by...

[11:05] Respondent: Uh by motorbike.

[11:06] Interviewer 2: Motorbike, their own motorbike.

[11:07] Respondent: Scooter, or walking. Yeah, and uh maybe uh ten percent by uh taxi, taxi port.

[11:14] Interviewer 2: Okay, okay, that's good to know.

[11:17] Interviewer 1: And do they do they If they come with taxi, do do the Does the taxi cross the bridge, or they stop before the bridge and then they...

[11:22] Respondent: Yeah, they stop here. They stop here, yeah. They stop here, because uh the size for the bridge it's okay for the car.

[11:32] Translator: They stop here, but in uh this month. But before, like in August and July, uh cannot, because uh it's uh broke.

[11:42] Respondent: Yeah, cannot, yeah, very, very broke. In August, they stop in the bridge, and they walk to here.

[11:46] Translator: Because the the tires uh go down, the once the tires go down.

[11:50] Interviewer 1: Did did they just fix then the bridge? Because we passed it by car, now it's okay.

[11:54] Translator: Yeah, it's okay for now, but in August...

[11:58] Respondent: In August? [laughter] [ID] If you had passed it back then... No, danger, danger! [laughter]

[12:02] Translator: [laughter] It was like uh...

[12:08] Respondent: A lot of hole, [laughter] and then the wood is broken.

[12:12] Interviewer 2: And by who is it repaired?

[12:15] Respondent: Uh all people here.

[12:17] Interviewer 2: All people.

[12:17] Interviewer 1: Local people.

[12:18] Respondent: No, no government.

[12:19] Interviewer 1: Yeah.

[12:20] Respondent: [ID] Community self-help mutual cooperation.

[12:21] Translator: [ID] Community self-help, community self-help.

[12:22] Translator: Yeah, the community here.

[12:23] Respondent: Yeah.

[12:24] Interviewer 1: [NL] Did they lay that off?

[12:25] Respondent: Yeah.

[12:26] Interviewer 2: Uh who do you think has the most impact to improve the bridge, like a person or...?

[12:35] Respondent: I think if the uh good we have a good if we have a good bridge, uh for economic effect is very nice, uh because all people can coming, uh the tourism can come to here. So all people can selling the seafood and something, and the attractions good, and for uh all people stay here can working, and uh my kid, children, going to school is okay, not dangerous. And a lot of choice. Now we just have one elementary school here, just one. So I think if one kid need a more uh choice for good more good elementary school, they can go to a big city or big village, not just stay here for education.

[13:38] Interviewer 2: Yeah, and uh if there uh will be a new bridge or a better one, who do you think is responsible for that to build it?

[13:48] Respondent: I think all people uh here support it.

[13:52] Interviewer 2: Support it, yeah.

[13:53] Respondent: Yeah.

[13:54] Interviewer 2: And do you think the government's...

[13:55] Respondent: I think the government uh support too, because I think uh my government uh now, [ID] what is 'not capable'? Don't have a lot of money for building a big bridge, because this is a small village. My government uh have a lot of uh city in Lombok Barat, just not just Cemare. So I think uh they don't have a lot of money for building the new bridge. So uh I hope we have a connection and relation for help me, for building the bridge.

[14:38] Interviewer 2: Yeah, so you think to prioritize the problem, you need the connections to the government?

[14:46] Respondent: Yeah, connection and money! [laughter]

[14:48] Interviewer 2: Yeah. [laughter]

[14:52] Interviewer 1: [NL] That that covers the main questions well.

[14:54] Interviewer 2: [NL] Do you still want to ask if she knows the IBF Foundation?

[14:56] Interviewer 1: [NL] Oh yeah.

[14:58] Interviewer 1: Like do you know the the IBF, uh Ibu Foundation?

[15:01] Respondent: Yeah, I know. Yeah, uh IBF uh bring me a lot of uh guys, and then they have a volunteer here. Uh they bring a children education about the trash, about the mangrove, about the turtle, and uh we know IBF maybe uh four years, yeah? [ID] Four years, right, around four years? Four years.

[15:29] Interviewer 1: It's it's founded in 2000, 2020.

[15:33] Respondent: Yeah, yeah, I think IBF IBF is a very, very good partner for me, because here we need a lot of people for bring me education or something, uh because in uh Indonesia, people of Indonesia don't care about the trash. So, uh we need someone for bring me information or education about the trash, about the mangrove, or or something.

[16:07] Interviewer 1: Who who do you think is more has more impact, Muhammad, like the head of the village, or IBF, when it comes to the bridge?

[16:16] Respondent: Uh effect for uh for the village, I think IBF! [laughter]

[16:20] Translator: [laughter] I think yeah, because for example we learn how to use like I mean like the mangrove or the how to...

[16:30] Interviewer 1: How to use, yeah.

[16:31] Translator: Yeah, fix it all about the rubbish and something else, we learn everything.

[16:36] Interviewer 1: Yeah.

[16:37] Respondent: More important is education, because uh we need education and information about the uh how you make a trash, uh and then uh how you plant the mangrove, uh and then how important the mangrove and the trash for cleaning the area. So we just have this education uh from IBF.

[17:05] Interviewer 1: Okay, so you are all very happy that they are here.

[17:07] Respondent: Yeah.

[17:18] Interviewer 1: Do do you have something you just want to tell us about your experiences with the bridge, or just any other things?

[17:26] Respondent: For the bridge? No, uh I'm not specialist for the building! [laughter]

[17:34] Respondent: But I hope uh we have a reparation or uh building new bridge for uh for crossing access uh from Cemare to the city, because very, very important for all people here.

[17:51] Interviewer 1: Do do you think more people are going to use like the other bridge uh compared to this bridge because it's it's in better condition? Like the skybridge, so...?

[18:02] Respondent: Uh the skybridge is not too far, but uh the skybridge is too small. If uh yeah, uh they have a too small bridge and too long. Nah, so if you wait, some people come from the another village to here, you need maybe five minutes, [ID] right, five minutes? You wait five minutes from, yeah, and you stop for the scooter, for the scooter, yeah.

[18:31] Interviewer 1: So you can't cross each other with scooter?

[18:33] Respondent: No, not possible!

[18:34] Translator: No, cannot, we must return, must return. Yeah, must return.

[18:38] Interviewer 1: Oh so maybe have you ever thought of a traffic light for that?

[18:42] Respondent: Uh yeah, maybe uh if uh we have a traffic traffic here, no, no, because traffic light, yeah, uh not possible for...

[18:50] Translator: For a small one, just enough for the one motorcycle.

[18:53] Respondent: Yeah, just one for motorcycle.

[18:55] Interviewer 2: Yeah.

[18:56] Interviewer 1: [NL] Yes, that is a whole other problem indeed.

[18:58] Respondent: So for urgence, not possible.

[19:02] Translator: I say in the beginning just for fun.

[19:05] Respondent: Yeah, just for fun! Just for fun, selfie! [laughter]

[19:09] Translator: [laughter] But uh the people maybe like uh brings emergency like uh for the hospital, cannot.

[19:15] Respondent: If you need if you bring...

[19:17] Translator: Like uh die on on on on the road.

[19:20] Respondent: Die on the road, and birth on the road! [laughter]

[19:22] Translator: Yeah, exactly! [laughter]

[19:23] Interviewer 2: Yeah, oh no! [laughter]

[19:27] Respondent: Long bridge, and uh after bridge, you go to the village, not go to street.

[19:33] Interviewer 2: Yeah.

[19:34] Respondent: Yeah, same like here. In uh Cemare, uh Cemare go to village, not to road. [Sasak: "Ndek naks langsung jok lorong?"] Doesn't it lead straight into an alley/path?

[19:40] Translator: Uh no, just come like a garden, on the garden. And then uh come down, and then we come to garden, not to the main road.

[19:51] Translator: So different for the have the the bridge connection is uh here, so like the connection to the the main road.

[19:58] Respondent: Yeah.

[20:39] Interviewer 1: [NL] I just have one question, apart from... Oh, I can also ask it. So like what kind of fit- visitors come do uh visit like Cemare? Because you have like more the tourists like us, from Europe, and you have maybe like visit people from Mataram that want to go to the beach in the weekend?

[21:01] Respondent: Oh, in weekend, just local people. Local people just uh go to homestay, Europe. All is Europe.

[21:10] Interviewer 2: Okay, homestay, yeah, to stay here, and to the beach is from the local people.

[21:13] Respondent: Yeah.

[21:14] Interviewer 1: Okay, and eco-tour is more like uh Europe as well?

[21:18] Respondent: Yeah, [laughter] for going to mangrove is uh Europe, uh and to the beach maybe uh guys from uh Europe, but local people just for going to the beach, not for uh eco-tour, not for going to mangrove. For going to mangrove, yes, maybe just for selfie, not for uh have information, yeah, or vacation.

[21:51] Interviewer 1: Okay, thank you very much!

[21:52] Respondent: Thank you, yeah, thank you. Maybe you can help me for building the bridge, good bridge, and uh good construction for the bridge.

[22:05] Interviewer 2: Yeah, we hope so.

[22:06] Respondent: Yeah, because I know your your uh... [Translator: All community hopes like that.] Yeah, your university is very, very big in Holland, yeah? TU Delft is very, very big. Famous and big, because uh I have a lot of guys from the [ID] Netherlands, and they say uh they look uh... uh write writing on the boat is 'TU Delft'. 'Oi, TU Delft is very, very good university and big!'

[22:36] Interviewer 1: Oh, TU Delft, yeah, they sponsored like some of the kayaks, right, for the eco-tour. Yeah, yeah.

[22:40] Respondent: Yeah, TU Delft University. You come from TU Delft? Yeah, TU Delft very, very big university for the technical, yeah? [laughter] I think uh good for build the bridge and construction. You have a [ID] knowledge! [laughter] Specialist for it, I think, in TU Delft, uh for construction and then for technical.

[23:28] Interviewer 1: [ID] Thank you.

[23:29] Respondent: [ID] Thank you! [laughter]

Interview transcript Cemare citizen 3

Table B.6 Interview details: residents, interview 3

Date & Location:	**Cemare Beach / Cemare Village, Lembar, West Lombok, Indonesia**
Participants:	Interviewer 1 (Male, TU Delft researcher, English/Dutch) Interviewer 2 (Female, TU Delft researcher, English/Dutch) Translator / Guide (Male, Sasak/Indonesian speaker, English/Indonesian/Sasak) Respondent 1: Female resident / shop owner (approx. 31 yrs, Cemare resident) Respondent 2: Male resident / shopkeeper (speaking for the shop & household)
Languages Spoken:	English, Indonesian [ID], Dutch [NL], Sasak [Sasak]
Translation Mode:	Full verbatim transcription translated into English (Sasak and Indonesian transcribed with phonetics and translated into English)
Transcription Rule:	Verbatim fidelity (fillers, false starts, and repetitions retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak: "..."] = Original Sasak utterance followed by English translation

Table B.7 Colour coding used in residents interview 3

Colour	**Relation**
Yellow	Respondent profile
Dark green	Technical condition & potential design requirements
Green	Values & motivations
Grey	Traffic flow & travel time
Pink	Bridge use
Turqouise	Safety & risk perception

[00:00] Interviewer 1: So uh what is your age, and where do you live?

[00:04] Translator: [Sasak: "Mbe taokna?"] Where is the place?

[00:06] Respondent 1: Cemare.

[00:07] Translator: Cemare. [ID] Yes, in Pantai Cemare. You live here.

[00:08] Respondent 1: I live here.

[00:09] Interviewer 1: And what is your age? How old are you?

[00:11] Respondent 1: Uhm, kira-kira...

[00:13] Respondent 2: I think thirty-one now. Thirty-one.

[00:15] Respondent 1: Yeah, thirty-one years old now.

[00:18] Interviewer 1: And uh how often uhm do you travel from Cemare to the mainland?

[00:23] Respondent 2: Yes, of course, yes.

[00:26] Interviewer 1: How often, like uh how how many times uh a day or a week?

[00:30] Respondent 2: I think it's every day.

[00:31] Interviewer 1: Every day.

[00:32] Respondent 2: Yes, every day. Every every... I think it's until yeah until night, maybe every day, yeah.

[00:41] Interviewer 1: Do you know how how many how many times a day, like uh three, four, five?

[00:46] Respondent 2: Uhm, maybe five, five times, yes. Every day.

[00:53] Interviewer 1: And what's the reason she travels to the mainland? For what kind of things does she go there?

[00:58] Respondent 2: Uh, sorry, one more? Sorry, I...

[01:02] Respondent 1: [Sasak: "Api ye tekene?"] What is he saying?

[01:03] Translator: [ID] Can you ask her like, for what purposes...

[01:04] Interviewer 1: Why does she go to the mainland, like for what?

[01:05] Respondent 2: Oh yeah, uh for activity, for uh buy some...

[01:13] Interviewer 2: [NL] Can you hear it?

[01:14] Respondent 2: ...yeah, like the...

[01:15] Interviewer 1: Groceries?

[01:16] Respondent 2: Yeah, of course! Like the buy some for the uh food, yes, food, and for buy sell also like...

[01:29] Translator: [ID] Like for materials, like iron and stuff?

[01:30] Respondent 2: Yeah, materials also, all! Materials.

[01:33] Translator: When building something like that, yeah.

[01:34] Interviewer 1: Okay. And like how how does she travel there, by walking, motorcycle, or car?

[01:40] Respondent 1: [Sasak: "Mbe saq?"] Which one?

[01:41] Interviewer 1: How how does she go to the to the mainland?

[01:43] Respondent 2: [ID] Tell him. For... [Sasak: "Ape rane?"] What is it called?

[01:46] Respondent 1: [Sasak: "Mobil"] Car.

[01:47] Respondent 2: [ID] Uh, for that thing, right?

[01:48] Translator: [ID] No. Motorbike or car?

[01:50] Respondent 2: Oh yeah, we use the motor- motorbike.

[01:53] Interviewer 1: Motorbike.

[01:54] Respondent 2: Yeah.

[01:54] Interviewer 1: Always the motorbike?

[01:56] Translator: [ID] Always?

[01:57] Respondent 2: Yeah, always. Sometime we use the car.

[02:00] Translator: The motorbike is always, but with the car sometime.

[02:02] Respondent 2: Yeah, sometime we...

[02:03] Interviewer 1: Do you have do you have your own car?

[02:04] Respondent 2: We don't have. Yeah, we have only motorbike.

[02:08] Interviewer 1: And when do you use the car, uh for what kind of things?

[02:11] Respondent 2: Yes, if we buy some material, and then buy like the some... [Sasak: "Ape arane? Galon gas, ape..."] What is it called? Gas gallons, or... Yeah, all, like the some water, the big, the big size, maybe we use the car.

[02:26] Interviewer 1: Okay. Is it also for the shop, is is this your shop?

[02:29] Respondent 2: Yes, this the shop.

[02:30] Interviewer 1: So if you want to buy a lot of, like for example, big water tanks...

[02:34] Respondent 2: Yeah, like the bottle, you know, yeah, like the gallon also, sometime we use the car.

[02:39] Interviewer 1: Okay, and like do you do you rent a car, or do you book a taxi, or...?

[02:44] Respondent 2: Uh...

[02:44] Respondent 1: Friend.

[02:45] Respondent 2: Yeah, we rent. Sometime the car is come, yeah. [Sasak: "Adeng-adeng nte"] Slow down.

[02:48] Respondent 1: [Sasak: "Arak ndek nani selesi?"] Is there anything not finished now?

[02:50] Translator: [Sasak: "Wah, ndek wah mumpung sak nani rurung mayan sepi"] Done, it's fine while the road is quite quiet now.

[02:54] Interviewer 1: Uhm, okay. And how how do you how do you experience the current connection between Cemare and the mainland? So how do you experience uh, for example, the bridge?

[03:07] Respondent 2: The yeah, before the broken, [ID] tell him, [Sasak: "Badaq bende, badaq. Jamaq awas..."] Tell him, tell him. Just watch out...

[03:10] Translator: [ID] Yeah, like what is the experience? How is the experience when crossing the bridge whose condition is like this currently?

[03:16] Respondent 1: [Sasak: "Takut"] Afraid.

[03:18] Respondent 2: Before now, yeah, the... Now it's very difficult for if you uh if we we use the car, yeah, because...

[03:31] Respondent 1: [Sasak: "Mbe sak begugur"] Where it fell through...

[03:32] Respondent 2: Yeah, all is broken, maybe, yeah.

[03:36] Interviewer 1: And like when it's when uh you can't use uh the bridge for car anymore, what how how are you going to transport like the big things to the supermarket?

[03:46] Respondent 2: Yeah, like uh... [ID] Tell him, what is it, that thing? [Sasak: "Ape arane? Untuk jembatan ke..."] What is it called? For that bridge... [Sasak: "Ape arane?"] What is it called?

[03:57] Respondent 1: [ID] He is asking for that thing, right?

[04:00] Respondent 2: [Sasak: "Untuk ape arane beruq ne?"] For what did he say just now? Sorry, one more, Sir?

[04:03] Interviewer 1: Like uh [cough] like now sometimes you get like you stock the shop with like the car, when it the the bridge is in like its condition is too bad, so a lot of planks are broken, you can't cross it with the car anymore, so how do you transport then your your uh things you want to want to sell? Like do you uh go walking with that, or do you just go by bicycle?

[04:26] Respondent 2: Yeah, for now we walking. For now we walking from behind the... [Sasak: "Ape arane?"] What is it called?

[04:31] Translator: So the I mean the supply, it's like uh when the cars cannot like uh route, like uh more the reach, like more money come out. Like uh we must uh take again with the with the motorbike. When the cars can't come.

[04:47] Respondent 2: With the motorbike, yeah.

[04:49] Interviewer 1: Okay. Thank you.

[04:52] Interviewer 1: Uhm... Like what what problems do you experience uh at the current bridge? Like what are the problems you experience when you're driving there by car or by motor bicycle?

[05:04] Respondent 2: Oh, a little bit... Now it's danger.

[05:07] Interviewer 1: Danger.

[05:08] Respondent 2: Yeah, it's danger. The before we we used the uh car, I think... Eh sorry, before we used the motorbike, now the car is normal, yeah, we we can go. And then we can the take also for the all uh material, and then about the for buy some uh...

[05:32] Interviewer 1: Yeah.

[05:33] Respondent 2: Yeah, but now little bit danger for me, because uh we must uh we need the only one access, yeah, with for the... Sorry, we use if we use the car, yeah, we have only one access.

[05:49] Interviewer 1: Yeah.

[05:50] Respondent 2: Yeah, we really need maybe, yeah, for the uh activity every day.

[05:58] Interviewer 2: Mhm, because it because it is dangerous, do you still use your car there or no car?

[06:02] Respondent 2: No, we cannot use the car! We use only motorbike.

[06:06] Interviewer 2: It's only motorbike.

[06:07] Respondent 2: Yeah.

[06:08] Interviewer 2: Because it's too dangerous.

[06:09] Respondent 2: Yes, too dangerous. [cough]

[06:16] Interviewer 1: And would you would you travel more often to the mainland if if the bridge was better in better condition?

[06:23] Respondent 2: [Sasak: "Ape arane untuk kondisi ape ne?"] What is it called, for what condition is this?

[06:25] Translator: [ID] Yes, for the condition of the bridge, yeah...

[06:28] Respondent 2: Yeah?

[06:28] Translator: [ID] Yeah, according to you, the solution from you, yeah, currently...

[06:33] Respondent 2: We need the to maintenance, yes, we need to renovation, yeah.

[06:40] Respondent 2: Yeah, because if not to renovation or the maintenance, I think we cannot go to buy some for the activity also, yeah.

[06:55] Respondent 1: [Sasak: "Iye gen ketendang"] He will get thrown off/bumped around.

[06:58] Interviewer 1: He like he mentioned that he he is not using his car anymore anymore because it's too dangerous, yeah.

[07:07] Interviewer 1: Like but it's the bridge is still used by heavy trucks in the weekend for the the the locals who visit the beach.

[07:13] Respondent 2: Yes.

[07:14] Translator: Uh example like uh now you see he building, right? Like uh buy some sand on the another village, so usually you is like uh more big truck, you know, like uh more big vehicle. But now it's the condition is the uh bridge connection is uh like that, so like uh not really use, so we must uh put the some sand over there.

[07:37] Respondent 2: Yes, we must... yeah.

[07:39] Translator: Like in the small one. Like uh you know like uh like a vehicle more smaller. So we must uh like uh the usually we use the one, one chance, so so like uh two options, so we must uh put the material there, and then uh take again with uh motorbike, or uh with a small vehicle, like that.

[08:04] Interviewer 1: Okay. Who who has the most influence in like uh changing the bridge? Who do you think, like who can be most uh impactful?

[08:18] Respondent 2: [Sasak: "Untuk ape arane?"] For what is it called?

[08:21] Translator: [ID] Yes, how... What's its name...

[08:24] Translator: [ID] What is the solution? What is the impact if it continues like this continuously, this bridge? Meaning, the negative impact if it continuously stays like this, the bridge whose condition is like this currently.

[08:38] Respondent 2: [ID] Uh, for its what? Its impact?

[08:39] Translator: [ID] Its impact, yeah.

[08:41] Respondent 2: Yeah, maybe for we we we cannot go to a market, buy something, yeah, maybe we we don't have uh activity maybe for the out the another village, so the next or buy some... Yeah.

[09:10] Interviewer 2: Who who need to repair it if it's broken? Who do you think?

[09:14] Respondent 1: [ID] Who should repair it?

[09:16] Respondent 2: Uh...

[09:17] Translator: [ID] Government or the community, the public?

[09:19] Respondent 2: Yeah, sometime the community from this the village.

[09:22] Interviewer 1: [NL] That woman said 'no' to the question if they can hear it.

[09:24] Respondent 2: Yeah, for the yeah, when the broken.

[09:25] Interviewer 1: [NL] So we have to talk louder.

[09:26] Interviewer 2: And do you think the government has to do it?

[09:28] Respondent 1: [ID] Government, who...

[09:29] Respondent 2: Yeah, sometime. Sometime when the government have the like the... [Sasak: "Ape arane? Anu, bae kepeng, anu ne"] What is it called? That, money, that thing...

[09:37] Translator: Money.

[09:37] Respondent 2: [ID] Budget. What is budget?

[09:39] Translator: Money.

[09:40] Respondent 2: Yeah, sometime when they have the money, yes, government also.

[09:44] Translator: [ID] Handouts, yeah? If there is no budget, no budget...

[09:47] Respondent 2: Yeah.

[09:48] Translator: He said like uh when uh government have the enough money so fix it, but until now it's uh lose the way, he said like that.

[09:56] Interviewer 2: [NL] So, they don't know who has the most influence. Perhaps they don't know who...

[10:01] Respondent 2: [ID] Oh, the influence of the bridge, who has... Yeah, that's it, who influences it, yeah.

[10:06] Translator: [ID] Yes, let them know.

[10:08] Respondent 2: Yeah, I think it's we have community and from here, sometime we maintenance with the... [Sasak: "Ite kance epe ne? Sak dalem nggih?"] Us with who? Those inside, yes? Sometime we have the maintenance with the community from here, yeah, with the all here, yeah, we like the we call the swadaya, yeah? And then, yes, swadaya, we call the swadaya. And then when the we take only sometime take one home uh give one uh five thousand, maybe sometime one home give the twenty thousand, and then we buy something like the tree, yeah.

[10:50] Interviewer 1: So everyone can donate something and you can use that to fix the bridge?

[10:52] Respondent 2: Yeah, yeah. Sometime, sometime the government also.

[10:55] Interviewer 1: Is it Muhammad, the head of the village?

[10:58] Respondent 2: Pardon?

[10:59] Interviewer 1: You know uh...

[11:00] Respondent 2: About the village in this the in this island, you mean? Uh I don't know, maybe it's many. Yeah, sometime we get uh until ten million, sometime, sometime we get the until five million, and then we buy some tree, and then we... yeah.

[11:20] Interviewer 2: And who who collects it? Who organizes this?

[11:25] Respondent 2: The organize, you mean?

[11:27] Interviewer 2: Yeah, who does it? Which person?

[11:29] Respondent 2: Uh like the community from the Eco Green, sometime uh like the... [ID] What is kadus? We call the government, yeah, sometime the solution from the government, and then we uh yeah, like this, like the community from Eco Eco Green.

[11:51] Interviewer 2: And then the Cemare government?

[11:53] Respondent 2: Yeah. Yeah.

[11:54] Interviewer 2: Okay.

[11:57] Interviewer 1: Like uhm yeah, what what would you improve uh for the current bridge, what would you improve?

[12:05] Respondent 2: Pardon, you mean? Improve, like uh...

[12:09] Respondent 1: [Sasak: "Anek doro-dorusan garis ne. Endeng-endengan ye, pade seket-seket saos ne. Iye ne anu-anu"] Look directly at the line here. Hand in hand, it's fifty-fifty only. That is what...

[12:35] Respondent 2: [ID] Yeah, maybe... what, uh... for improvement in the future.

[12:43] Respondent 2: Okay, maybe uh if we repair the bridge, three things what are to be repaired... We want to change like the tree maybe, and then yeah, yes, the wood, the yes, the the big wood, and then uh maybe we need only wood and then, [ID] what is iron? Construction?

[13:09] Translator: The construction.

[13:10] Respondent 2: Yeah, the construction. Yes, the big one. Yes, we change for the solution only one, because it's very old, very old now until now. So we difficult access if we not change the wood.

[13:37] Interviewer 2: What's for you the most important thing about the bridge?

[13:41] Respondent 2: [ID] What is it? About that bridge, what?

[13:44] Translator: [ID] Huh? How important according to you?

[13:46] Respondent 2: Oh, it's we we uh really need, we really need because we we don't uh activity if we don't have the the bridge.

[13:54] Respondent 1: [Sasak: "Mayan, bayar-bayar dulu"] It's alright, pay up first.

[13:56] Respondent 2: Yeah, because...

[13:58] Interviewer 1: You need you need it every day.

[13:59] Respondent 2: Yeah, we need every day for me, yeah, because we buy something in the market every day, yeah.

[14:06] Interviewer 1: So you buy in the market and you sell it here.

[14:08] Respondent 2: Yes, yes.

[14:09] Interviewer 1: Maybe we will continue the list.

[14:18] Interviewer 1: You know do you know the IBF Foundation?

[14:21] Translator: IBF, IBF.

[14:22] Respondent 2: Yes, yes, I know. Yes.

[14:25] Interviewer 1: Like do you like them, or do you often see them here?

[14:28] Respondent 2: Uh...

[14:29] Translator: [ID] In your opinion, what is IBF like? Like what? Those who came recently, who have waste programs, or whatever, how is it in your opinion, is it important or not?

[14:38] Respondent 2: IBF I think it's really good, because all the activity is very good for for the for the for this village, yeah, for the yeah.

[14:52] Respondent 2: Uh, [Sasak: "Ape ndah anu ne?"] What else was that? [Sasak: "Tetuk?"] Right?

[14:54] Translator: [ID] Planted mangroves, right?

[14:55] Respondent 2: Yeah, the planting the mangrove, and then all, maybe the activity is very good for the my child also, yes. We study, we study about the English also with him.

[15:13] Translator: [Sasak: "Aok, kan nani wah"] Yes, exactly so now.

[15:15] Interviewer 1: English also, yeah.

[15:16] Respondent 2: Yes.

[15:17] Interviewer 2: [NL] I think that covers it pretty much.

[15:21] Interviewer 1: [NL] Done, right?

[15:22] Interviewer 2: [NL] Spi-? No, no.

[15:24] Interviewer 1: Okay, thank you.

[15:25] Respondent 2: Thank you so much, Sir. [ID] You are welcome.

[15:28] Interviewer 2: [NL] Uh, do we still need to ask? Did they already say everything?

Interview transcript Cemare citizen 4

Table B.8 Interview details: residents, interview 4

Date & Location:	**Cemare Beach / Cemare Village, Lembar, West Lombok, Indonesia (at Quran Study House / Madrash)**
Participants:	Interviewer 1 (Male, TU Delft researcher, English/Dutch) Interviewer 2 (Female, TU Delft researcher, English/Dutch) Translator / Local Guide (Male, Sasak/Indonesian speaker, English/Indonesian/Sasak) Respondent: Pak Haji (Male, 41 yrs, Cemare resident, Head of Local Community & Quran Teacher)
Languages Spoken:	English, Indonesian [ID], Dutch [NL], Sasak [Sasak]
Translation Mode:	Full verbatim transcription translated into English (Indonesian and Sasak speech transcribed with phonetics and translated into English)
Transcription Rule:	Verbatim fidelity (fillers, false starts, and repetitions retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak: "..."] = Original Sasak utterance followed by English translation

Table B.9 Colour coding used in residents interview 4

Colour	**Relation**
Yellow	Respondent profile
Dark green	Technical condition & potential design requirements
Green	Values & motivations
Grey	Traffic flow & travel time
Pink	Bridge use
Turqouise	Safety & risk perception

[00:15] Interviewer 1: You live here, okay. And what is your age? Like how how old are you?

[00:19] Translator: [ID] What is your age, Pak? [Sasak: "Ara tebaq-tebaqan..."] Is it around thirty-eight?

[00:22] Respondent: [ID] Forty-one. Forty-five... forty-one.

[00:31] Interviewer 1: And like how how often are you going to the to the mainland? How often, like once a once a day or more often a week? So like how often do you use, or you go to the mainland?

[00:46] Translator: [Sasak: "Pire kali side joq lewati jembatan tiq sehari?"] How many times do you go across that bridge in a day? [ID] Four, five...

[00:53] Respondent: Maybe uh [ID] three times, four times, yeah? [Translator: Until five?] Up to lima kali.

[01:00] Translator: So like around five times.

[01:02] Interviewer 1: Five times a day.

[01:03] Translator: A day.

[01:04] Interviewer 1: And why does he go to the mainland? For what kind of things?

[01:08] Translator: [Sasak: "Ape doang kegiatande jok ketok-ketok tiq?"] What are your activities going back and forth over there?

[01:10] Respondent: Uh, [ID] first, to go to the market.

[01:13] Translator: Uh once market.

[01:14] Interviewer 1: For the market, yeah.

[01:15] Respondent: [ID] And second, for community matters at the village office.

[01:19] Translator: Uh the second one for the office for the head village, because like uh he's the second one for the uh head of village. So the office is uh in uh in a mainland.

[01:34] Interviewer 1: Yeah. Is is he going to the to the like you know Muhammad? His department, or?

[01:40] Translator: Ah, yeah, yeah! Exactly, yeah. Department, yes.

[01:43] Interviewer 1: Like does he work there or why does he go there?

[01:45] Translator: He works there. Yeah, works there for the we have here like I mean like uh in uh so one community, this is number one, like uh the head.

[01:54] Interviewer 1: Oh, so you're the head of the of the local community?

[01:57] Respondent: Yes, yes.

[01:58] Translator: Yes.

[01:58] Interviewer 1: Ah, okay. And can you tell, can he tell us a bit more of what he's what he's doing with this community?

[02:04] Translator: [ID] What activities are there, Pak?

[02:06] Respondent: [ID] For community activities, uh for the needs of the community, to make family cards (KK) or for other community needs.

[02:14] Translator: So all needed uh community, I mean like uh like a card or like I mean like uh IC... like identity card, like IC. Yeah. You see like uh from from from him to bring to the the Mr. Saleh, on the office on the mainland.

[02:35] Interviewer 1: Okay. Thank you.

[02:38] Interviewer 1: And and how do you go to the to the mainland, by motorbike or walking or car?

[02:44] Translator: [Sasak: "Ape kadunde joq ketok? Motor, mobil?"] What do you use going there? Motorbike, car?

[02:46] Respondent: [ID] Motorbike.

[02:47] Translator: Motorbike. Motorbike.

[02:48] Respondent: Motorbike.

[02:49] Interviewer 1: Okay. No car?

[02:50] Respondent: No car.

[02:53] Interviewer 1: And uh how do you experience the current condition of the uh Jembatan Cemare?

[03:00] Translator: [Sasak: "Berembbe menurut side pengalaman side saat lalu lalang ketika kondisi jembatan marak niki?"] How in your opinion, your experience when going back and forth when the condition of the bridge is like this?

[03:06] Respondent: [ID] Yeah, somewhat disrupted. [Translator: Disrupted, yeah?] Disrupted. So, we need repair, lah. So that... [Translator: Takut, ya?] ...afraid.

[03:16] Translator: So he said like afraid, like uh around the connection bridge, like that.

[03:26] Translator: Say like uh not happy, because uh too broke, I mean like uh always dangerous, afraid when he like uh...

[03:36] Interviewer 1: He's afraid.

[03:37] Translator: Yes. Okay, afraid.

[03:40] Interviewer 1: Does does he uh has any points he like about the current bridge? Some good points?

[03:46] Translator: So so which one?

[03:47] Interviewer 1: Uhm, the second one of the current connection. Two, and then uh point two, so 'apa yang...'

[03:58] Translator: Okay.

[04:02] Translator: [ID] Now, what is good or running smoothly from the current access, with the condition of the bridge currently?

[04:10] Respondent: [ID] Yeah, what is needed...

[04:11] Translator: [ID] What condition right now, that we know how the condition is like this... In your opinion, Pak, what is it like?

[04:22] Respondent: [ID] For right now, yeah, we need safe conditions. Uh so we need repair, that is if possible made what is it called... better than this one. Better than this bridge.

[04:41] Translator: Say like uh now in condition right now it's uh really not not good, so he hope like uh more fix it like that. More fix it and more built up for the...

[04:54] Interviewer 1: Does he have any good points, or only bad? It's it's like too dangerous, no uh good points?

[04:58] Translator: Yes, too dangerous, it's uh bad bad point for right now.

[05:01] Interviewer 1: Okay. And if he can improve some things, what would he improve? Like if he if he can uh choose three three things to improve about the current bridge, what would he choose?

[05:13] Translator: [ID] What is your input about this bridge, or what is the solution for the future? We don't know what might happen, right?

[05:19] Respondent: [ID] We hope from the government, yeah, so that they can see the condition of this bridge, and so we hope this bridge needs to be repaired, so that our community who are here becomes safer to go back and forth, to be crossed, like that.

[05:37] Translator: So he hope the government like uh come to see how do we have the connection bridge, uh the condition. And then he hope like to government like uh wanted more quickly to fix it.

[05:54] Interviewer 1: Quicker?

[05:55] Translator: Yeah.

[05:55] Interviewer 1: It takes too long now.

[05:56] Translator: Yes, for the fix it we have the connection bridge, for easy for the all the community come or the use the bridge connection, like that.

[06:08] Interviewer 1: Okay, so what if he can just fix three things about the bridge, what would he improve? Like what what are his his wishes for a new bridge? Like safer or or wider, or like better traffic?

[06:21] Translator: [Sasak: "Menurut side ne berembbe jembatan tiq sak tekumbek? Mau diperlebarkah, atau kayunya dibongkarkah? Tiga poin ya."] According to you, how should that bridge be treated? Widened, or the wood dismantled? Three points, yes.

[06:30] Respondent: [ID] We hope this bridge is dismantled completely, then we widen it. Widen it so that later if anyone passes to to the east, to the west, it will be easier than the current one.

[06:48] Translator: Say like uh like uh he hope like a more bigger. Like uh and then hope like uh the old, the the the woods now is already old, they wanted to take out. Take out and they change with a new one more and then stronger, and then the roads more bigger, like that. So easy for the car or some motorbikes uh come in the east and the west, like that.

[07:14] Interviewer 1: So if you have the bridge, you have the the wider part for the cars, smaller part. But does he want to remove like uh the wall that separates the wider part and the smaller part?

[07:25] Translator: [Sasak: "Menurut side berembbe, sak nani niki jari sekali bele' apa jepit marak niki? Untuk seke' motor kode' atau seke' bele'?"] According to you, should it be made entirely large/wide, or kept separated like this? One for small motorbikes or one big one?

[07:33] Respondent: [ID] Better to widen it, so that if there are cars, they can pass each other, enlarged, widened.

[07:39] Translator: Say it's like a better for the bigger, because when uh car like uh can... [Interviewer 2: Two cars?] Yeah, can two cars, not not wait only in the in the west one or the east one, like that.

[07:51] Interviewer 1: Okay, good. Thank you.

[10:38] Interviewer 2: Uhm, if there will be a built a new bridge, who has to pay for it?

[10:44] Translator: [Sasak: "Lamun te pinaq te kire jembatan te saq bayar maksudne kepengne saq jelangan?"] If we build, who do you think pays for this bridge, meaning who provides the money?

[10:50] Respondent: [Sasak: "Sai jelangan? Sai te?"] Who provides it? Who are we? [ID] The other one isn't the government? The government.

[10:55] Translator: [ID] Yes, the government. The government, the government.

[10:58] Translator: See if all the money from the government, he said from the government.

[11:02] Interviewer 2: And which government? The Lembar government or the central...

[11:06] Respondent: [ID] Central.

[11:07] Interviewer 2: The central Republic Indonesia.

[11:09] Translator: Come from the Republic Indonesia on Jakarta, and it comes in uh on the city in Mataram. So like the connection is like that. So come like down there like here the village, and then the small government again, and then it comes in again. So when I have the reached of the government. Yes.

[11:27] Interviewer 2: Okay, this final step?

[11:29] Interviewer 1: Yeah, what's that this question?

[11:32] Translator: [ID] We heard that at one time, a ticketing system was also used for that bridge, and people had to pay to cross it. What was your experience with this system? And with the entrance pass?

[11:46] Respondent: [Sasak: "Ndeq te kenaq hal-hal marak tiq, jari fitnah"] We don't want things like that, it becomes slander/gossip.

[11:48] Translator: [Sasak: "Nah laguq ye teketuanan, teberangan mauq"] Yes, but that's what was asked, to get opinions...

[11:51] Respondent: [ID] To speak honestly, that name is not...

[11:54] Respondent: [Sasak: "Ndeq taon jek"] I don't know, [in English] I don't know.

[11:56] Translator: And usually, we use like uh I mean for the one people, like when they get like uh the before, so one thousand only, but before. The the main just for save, I mean like for the mosque, from the beginning, the plain on the beginning. Yeah, but until like uh one years, but the government ticket, so just the sell it just to walk your money.

[12:35] Interviewer 1: Corruption.

[12:36] Translator: Yeah, for the government and then we share like the all the village like that with the ticket ticket, it gave it gave it like that. The rule, I know the rule is like that. So not for the government too. Send the supply for maybe for the mosque, for some schools, like that.

[12:54] Interviewer 1: [NL] That's good, so they actually say the money all went to other things.

[12:57] Interviewer 2: [NL] Yeah.

[12:58] Translator: But now it's uh nothing, because we like uh a little bit like uh because the condition is the connection bridge like that, so so no no again like the make the piece, like that.

[13:13] Interviewer 1: [NL] Ask the question of: suppose there is a new ticket system and you know for sure the money goes to the bridge, would you agree with it then?

[13:17] Interviewer 2: [NL] Yeah.

[13:17] Translator: So when we take the money, so many people complain like that. So even we don't uh take the money, so many people complain, so we like uh so we can...

[13:26] Interviewer 2: Do you think it can work in the future with another organization or ticketing?

[13:32] Translator: I think it's uh no ticketing, I think for better. Yes, for no ticketing, it's better.

[13:38] Interviewer 1: No ticketing.

[13:39] Translator: No ticketing.

[13:39] Interviewer 2: Also for tourists?

[13:40] Translator: Yes. Yes, they come and they come. Just come to enjoy or come to eat, or the beach or something else, I think just come, no ticketing anymore, I think so.

[13:51] Interviewer 1: But if you if all the most all the money goes directly to the bridge, for sure, would it help to do some ticketing to raise money for the bridge?

[14:02] Translator: I think so before, people say like that, but so say nothing, still nothing. Not believe it. So just uh no ticketing anymore, I mean.

[14:12] Interviewer 1: So people people don't believe that it will be used for the bridge, so they don't pay.

[14:16] Translator: Yeah, no, don't believe. Because already like uh so many years.

[14:20] Interviewer 1: Okay.

[14:21] Translator: Because you you see like when you come like a small house, on the the bus... uh you see like a small glasses and then some, they should buy ticket there.

[14:32] Interviewer 1: Yeah, yeah.

[14:34] Interviewer 1: Okay. And uh does he know the IBF Foundation?

[14:39] Translator: Uh yes, he did. In community too.

[14:41] Interviewer 1: Does he also uh collaborate with the IBF to explore some to search for solutions or something?

[14:48] Translator: [Sasak: "Side milu IBF kan? Taok IBF?"] You participate in IBF, right? You know IBF?

[14:52] Translator: Uh he's like uh he's a community too. We always make the project together, like uh the mangrove or something else, we always come join with us.

[15:06] Interviewer 1: [NL] Do you have anything to add?

[15:08] Interviewer 1: Like can you ask him, does he want to say anything for us, or about the bridge, just we didn't ask him? Does he want to say something himself?

[15:16] Translator: [ID] What about, Pak? Your hope regarding the continuation of this bridge?

[15:22] Respondent: [ID] Yeah, our hope for the future so that that bridge is better, and later for our community so that it is safe and comfortable, and also we hope all of this so that Cemare will increasingly develop. That's all.

[15:43] Translator: Yeah, he hope like uh the bridge connection more more bigger, stronger, and safety.

[15:50] Interviewer 1: Okay. So bigger, stronger, and safety, yeah.

[15:53] Translator: And then easy for the all the community here, or the another place too, for the easy for come out. Yeah, like that.

[16:00] Interviewer 1: And last question: like this is his house, right? There are a lot of children here. Is it also like a place where people come together, or?

[16:07] Translator: Yeah, come together for the learn, we call learn.

[16:11] Interviewer 1: For what?

[16:11] Translator: For the learn, we learn, like a mosque.

[16:13] Interviewer 1: Like a school, or?

[16:14] Translator: Yeah, school, but no no no bigger like a local school. For read the Al-Quran, we call Al-Quran. But only for the children.

[16:24] Interviewer 1: So they can play here.

[16:25] Translator: Yeah, play, and read, like that. Learning and playing. He the teacher too, like so.

[16:32] Interviewer 2: That's so nice!

[16:34] Interviewer 1: Great work.

Appendix B3: Participatory design session

Tables B.10 and B.11 give the details and the colour coding of the participatory design session. Figures B.1 to B.6 show the drawings and annotations of the participants.

Planning participatory design session:

1. Short introduction | 5 minutes
2. Terms of agreement signage | 10 min
3. Footage of the bridge: show pictures | 5 minutes
4. ***Assignment 1****: Try to draw how you think the bridge can be improved or what needs attention*
    1. Use the pen to try to draw pictures reflecting your opinion on the current state of the bridge | 10 minutes
    2. Presentation/discussion on how the bridge can be improved in groups of three | 5 minutes
5. ***Assignment 2:*** *What would the best bridge in Indonesia look like?* | 7 min
6. Presentation | 5 min
7. Break | 10 min
8. ***Assignment 3:*** *How would you cross the river without using the bridge?* | 7 min
9. Presentation results | 5 min
10. ***Assignment 4****: How would you make (crossing of) a bridge feel* ***SAFE*** *and* ***EASY*** | 7 minutes
11. Presentation results | 5 minutes
12. **Evaluation**: What did you think about this exercise? Was it useful? | 5 min
13. End

Participant requirement:

5-7 participants:

1. Time: 1 hour and 30 minutes
2. Free lunch
3. Requirements:
    1. Local people that use the bridge frequently
    2. Different methods of transport (walking included)
    3. Can write and speak Indonesian **OR** English

Results participatory design session

Assignment 1:



Figure B.1 Participants indicating the need to replace the wooden bridge components



Figure B.2 Participants' annotations highlighting the need to improve the bridge's side railings

Assignment 3:



Figure B.3 Participants' illustration of mooring docks to facilitate alternative water crossings

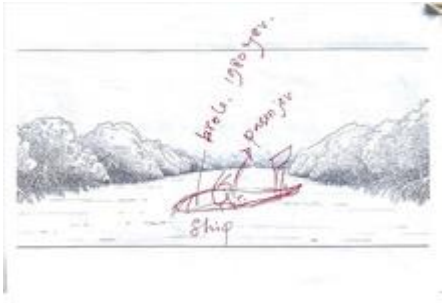

Figure B.4 Participants' illustration of larger passenger boats as an alternative means of crossing the water

Assignment 4

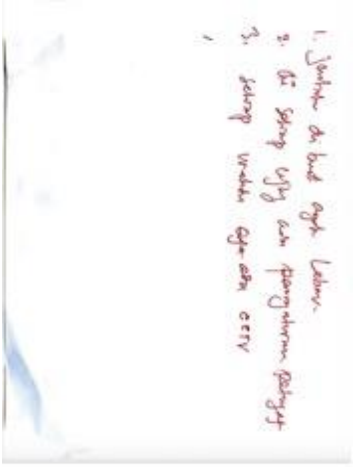

Figure B.5 Participant's suggestion to install CCTV cameras to improve bridge safety and monitoring

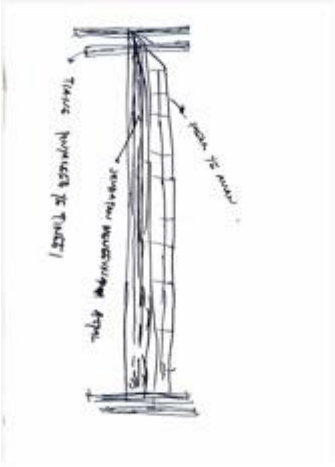

Figure B.6 Participants' illustration highlighting the need for a separate side deck to improve pedestrian safety

Transcript participatory design session

Table B.10 Details of the participatory design session

Date & Location:	**Cemare Beach / Lembar Selatan, West Lombok, Indonesia (17-09-2026)**
Participants:	TU Delft researchers (English / Dutch) Local interpreter / facilitator (Indonesian / Sasak / English) Participants 7, 8, 9, 10, 11, 12 and 13 (local residents of Cemare)
Languages Spoken:	English, Indonesian [ID], Sasak [Sasak], Dutch [NL]
Translation Mode:	Full verbatim transcription translated into English (Indonesian & Sasak passages with original text and translation)
Transcription Rule:	Verbatim fidelity (fillers, repetitions and hesitations retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak: "..."] = Original Sasak utterance followed by English translation

Table B.11 Colour coding used in the participatory design transcript

Colour	**Theme**
Green	Aesthetics of the bridge
Yellow	Materials
Blue	Bridge needs to be strong
Red	Repair
Pink	Future
Dark blue	Finance

[00:00] Participant: [ID] Good afternoon.

[00:01] Facilitator: [ID] Good afternoon.

[00:02] Interviewer 1 (Dutch): [NL] Participants 7, 8, 9, 10, 11, and 12. And 13.

[00:07] Interviewer 2: Thank you for being here. We are students from the uh Technical University of Delft, that's in the Netherlands.

[00:18] Facilitator: [ID] Okay, university of uh engineering their major is, in the Netherlands.

[00:24] Interviewer 2: And we're here to help with the renovation and improvement of the bridge.

[00:32] Facilitator: [ID] They are coming here related to repairing the bridge in front.

[00:38] Interviewer 2: And uh maybe you guys know the government is trying to uh repair the bridge or replace the bridge in the future.

[00:48] Facilitator: [ID] Mothers and fathers probably already know, if from the government itself there is already a plan to repair or build the bridge in front.

[00:58] Interviewer 2: However, we are here to know what you guys think of the bridge situation and how you would solve it. So, how would you design a new bridge, and how would you improve the current?

[01:14] Facilitator: [ID] So, we are here to know, from the community's perspective, how is it? What would be good? If, for example, the community... for instance, mothers are given a picture, then on the picture, how would you repair it, from the mothers' and fathers' own view, what is the best way? So that is what they want to see.

[01:34] Interviewer 2: Are there any questions?

[01:36] Facilitator: [ID] Are there any questions?

[01:38] Participant: [ID] None.

[01:40] Participant (Elder): [ID] Ah, later I will ask about where the funds come from, then how the frame shape is, the structure, how the execution method is, where the funds come from, who is working on it, like that.

[01:54] Facilitator: [ID] For what we're doing here, it's from the community itself: how do you want to build it? For example, later we show a blank picture: from the community's view, what would be good? We just want to see the community's thoughts regarding the bridge.

[02:08] Participant (Female): [ID] Use asphalt, lah!

[02:10] Facilitator: [ID] Yes, can do.

[02:11] Participant (Elder): [ID] The point is a permanent one, so that it's... so that it's a one-time project, lah, like that. Break-resistant, like that, so there is no burden on future generations, like that.

[02:24] Facilitator: [ID] Ready. After this, there will be a sheet where you can draw or write, and then we will collect it.

[02:30] Facilitator (to Interviewer): So he was saying that, uh, 'I was thinking that we might just do a big one, so we don't need to maintain or repair it ever again.' So that's it.

[02:39] Interviewer 2: Does he want to participate?

[02:41] Facilitator: Yeah. [ID] You want to join? Please.v

[02:43] Participant (Elder): Yes, uh...

[02:44] Interviewer 2: Yeah, yeah, take a seat!

[02:47] Interviewer 2: Okay! Uh, so, uh, great. Uh, we'll start with the first assignment.

[02:54] Facilitator: [ID] Okay, we start with the first one.

[02:55] Interviewer 2: We have uh pencils or pens, and we want to ask you to first take a look at all these pictures. They're from the bridge, and they're and the surrounding.

[03:07] Facilitator: Okay.

[03:08] Interviewer 2: We want to ask you to mark out important things that you think need to be improved. And if you know how to improve it, then try to draw on the picture. Uh, you can use words, you can use uh drawings.

[03:27] Facilitator: Okay, so they could just choose whatever pictures they want?

[03:29] Interviewer 2: Yeah!

[03:30] Facilitator: [ID] Okay. So you can take... these pictures are taken from the bridge, around the bridge, under the bridge. You can choose one, and from that picture, according to you all, what can roughly be improved? What can we convey to be improved? For example, the frame, from picture... yeah, this picture for example! This picture. Then you want to draw: 'This is cracked,' then draw: 'This needs to be replaced,' for example replaced with wood or replaced with concrete. That depends on your thoughts. So there is no right or wrong, it totally depends on your thoughts. So you can take one picture per person, whichever picture you want.

[04:12] Interviewer 2: Yeah. So uh give everyone...

[04:15] Facilitator: [ID] With markers, Bu? Yes.

[04:18] Interviewer 2: And take your time to look at the pictures.

[04:21] Facilitator: [ID] No need to draw, you can write directly: can use Indonesian, can use Sasak language, it's fine!

[04:29] Interviewer 2: Go go around the table, take a good look.

[04:32] Facilitator: [Sasak: "Orek-orekan, mbe-mbe a... langsung orek gambar niki, nggih. Baitan wis niki, nggih."] Scribble, whatever... directly draw on this picture, yes. Take this one, yes.

[04:40] Participant: [ID] On the back, or on...?

[04:41] Facilitator: [ID] In the front! For example, what picture is that, Pak? Ah, for example that one, you want to draw... [Participant: Yes, yes.] ...the underside, for example. Then give notes: 'This needs to be replaced with what,' according to your thoughts, how is it?

[04:54] Participant: [ID] Yes, what is it...

[04:56] Facilitator: [ID] Yes, according to your thoughts, how is it?

[05:00] Participant: [ID] This one... use asphalt.

[05:02] Facilitator: [ID] Yes, draw it!

[05:05] Participant (Female): [Sasak: "Lek kubur bae seon aspal"] Even on graves asphalt is used!

[05:07] Facilitator: [ID] If you don't know how to draw, just writing is still okay!

[05:19] Participant (Female): [ID] Can we write here?

[05:21] Facilitator: [ID] Ah, write! You can draw and mark it: where is it damaged, where needs repair, where needs replacement, which one must be replaced.

[05:31] Participant: [ID] What if everything?

[05:32] Facilitator: [ID] If everything, you can do that too!

[05:33] Participant: [ID] Everything, like that?

[05:35] Facilitator: [ID] Everything! You can do that too.

[05:37] Facilitator (to Interviewer): So he was asking if they can draw on all of it?

[05:40] Interviewer 2: Yeah, they can draw on everything they want!

[06:05] Participant (Female): [ID] Of course. Asphalt permanent on top, underneath use concrete.

[06:10] Facilitator: [Sasak: "Ndek narak malik keris ide?"] Any other idea?

[06:13] Participant: [Sasak: "Ada ne anu..."] There is that...

[06:17] Interviewer 2: Can can you explain to them that they can use multiple pictures? They don't have to use one, they can write on as many as they like.

[06:23] Facilitator: Okay. [Sasak: "Jadi bisa kanggok nganggo belah-belah keloek gambar. Gambar sak bida-bida, sekek gambar, due gambar, lime gambar, bau doang. Misalkan nani cuma gambar anun doang, bawaan jembatan doang. Lamun kita atas jembatan mungkin ada yang dipikirkan perlu diubah, bisa juga ambil gambar atas jembatannya."] So you can use various numbers of pictures: different pictures, one, two, five pictures, all are fine. For example, if you now only have the underside of the bridge, but for the top of the bridge you think something needs changing, you can also take the picture of the top.

[06:47] Facilitator: [ID] So from these pictures, you can take as many as you want, mark which ones need repair or replacement. So as many pictures as possible is fine, not just one picture that we work on.

[07:08] Participant: [ID] Like this?

[07:09] Facilitator: [ID] Ah, great!

[07:14] Participant: [ID] Replace, change with asphalt.

[07:18] Facilitator: [laughter] [ID] Cross it out, if it's full of holes, cross it out!

[07:22] Participant (Sasak): [Sasak: "Taon te suruk doang, bubar suruk ye buru endek n mele"] We were only ordered, but when ordered they immediately didn't want to! [laughter]

[07:44] Interviewer 2: Someone drew on this one?

[07:47] Facilitator: [ID] Look at the map too, maybe there's something wrong on the map, not accurate, or anything...

[08:08] Facilitator: [ID] Maybe there's an error on the map, needs correction.

[08:20] Participant: [ID] Replace...

[08:42] Participant: [ID] When people are going home to the village, they go back and forth...

[09:07] Participant: [ID] Draw it, replace it all.

[09:16] Interviewer 1 (Dutch): [NL] Yes, it is good that we see what they indicate as a problem area.

[09:47] Facilitator: [ID] That's why he asks for input.

[09:59] Participant: [ID] Where is the camera?

[10:04] Facilitator: [ID] He is telling stories to his friend! 'Actually that was...' [laughter] Why are you telling stories?

[10:24] Facilitator: [ID] Are you done?

[10:26] Participant: [ID] Done!

[10:28] Interviewer 2: Want a new one?

[10:29] Facilitator: [ID] Want more or is that enough? Enough? Okay, you already answered that one.

[10:33] Participant: Ready!

[11:00] Interviewer 2: So for the next part, we want to do a quick evaluation. We're going to split the groups in two, and we would like to hear them present their ideas to each other. Okay?

[11:15] Facilitator: Okay, cool.

[11:17] Interviewer 2: Okay, thanks! This one? Yeah, this one too. Uh...

[11:23] Participant (Elder): [ID] Do I need to write my name too, or no need?

[11:25] Facilitator: [ID] If you want to write your name, it's fine; if not, that's also fine. We guarantee the anonymity of the participants' identities.

[11:34] Interviewer 2: So, uhm, what we want to do now is to split the group in two groups, and we want to ask you to explain to each other what you came up with, what is your idea. And we will do that for three minutes. So explain short, and react on each other.

[11:58] Facilitator: [ID] So, earlier everyone has drawn and written how the bridge should be, what materials, what needs replacement. Now we divide into two groups. Later, one group agrees on what is best for the bridge, then shows it to this group, and this group also shows theirs to that group. So mutually sharing ideas and plans, what it's like. Let's split directly!

[12:28] Interviewer 2: Use the drawings to show...

[12:30] Facilitator: [ID] You can show the drawings: what needs replacement, why it should be replaced with this, what makes it better. For example, one group says: 'Better to use wood,' and this one says: 'Better to use concrete.' You can discuss it with each other!

[12:47] Participant (Female): [ID] We just discussed, permanent is best! On top with asphalt, underneath with concrete, then walls.

[12:54] Interviewer 2: Wow! Walls?

[12:56] Participant (Female): [ID] Walls, retaining structures on the side.

[12:59] Participant: [ID] Frames.

[13:00] Facilitator: [ID] How so?

[13:01] Participant (Female): [ID] Frames, like that. On the sides framed, then asphalting, underneath concrete so it's permanent.

[13:10] Participant (Elder): [ID] Then at least the bridge here is made as an icon for the surrounding area.

[13:19] Interviewer 2: Icon, right?

[13:20] Participant (Elder): [ID] As iconic and attractive as possible we design it, in such a way so it's very suitable for tourism around here, right?

[13:32] Participant (Elder): [Sasak: "Ndek arak masukan malik?"] [laughter] No other inputs?

[13:35] Participant (Female): [Sasak: "Engkaq, jagan deh"] No, that's enough. [ID] No, that's all. The important thing is proper!

[13:39] Facilitator: [ID] Okay, the important thing is proper, the important thing is strong.

[13:42] Participant (Female): [ID] Strong, definitely strong. Durable.

[13:44] Facilitator: [ID] Durable, okay.

[13:47] Participant (Female): [ID] The important thing is durable for years and years, doesn't collapse!

[13:51] Translator / Facilitator: Okay. This group, they want to make it long-lasting.

[13:56] Interviewer 2: Oh!

[13:58] Translator / Facilitator: They want asphalt, concrete pillars, they want to make a wall...

[14:03] Participant (Female): [ID] Asphalt!

[14:04] Interviewer 2: Does everyone agree on that?

[14:06] Translator / Facilitator: Yeah, they agree for it to be long-lasting, but some want it to be more iconic, with art... to make it iconic.

[14:14] Participant (Female): [ID] If we use wood, it will still collapse. Every year it collapses!

[14:19] Participant (Elder): [ID] So that it can be a selfie spot also later there, so it becomes the icon of Cemare.

[14:24] Interviewer 2: Selfie place. So, tourism?

[14:26] Translator / Facilitator: Tourism, yeah.

[14:28] Interviewer 2: Okay. And so they made an attraction?

[14:33] Translator / Facilitator: Yeah.

[14:34] Interviewer 2: Okay, they want to be an *iconic place.*

[14:36] Participant (Female): [ID] Using wood? No!

[14:38] Interviewer 2: No wood! [laughter] Why why no wood?

[14:41] Facilitator: [ID] Why, why?

[14:42] Participant (Elder): Because it's a very... [ID] easily damaged, lah!

[14:45] Facilitator: Okay.

[14:46] Participant (Female): [ID] Full of holes! Full of holes!

[14:50] Interviewer 2: But it's it's easier to repair.

[14:52] Participant (Elder): Easy to...

[14:53] Facilitator: [ID] Yeah, but he said if it's wood, it's easier to repair.

[14:55] Participant (Female): [ID] But it breaks quickly! Cars, brook! [crashes through]

[14:59] Interviewer 2: Ah, it just collapses if there's cars.

[15:01] Participant (Female): [ID] How many times already cars have fallen in! [laughter] It causes anxiety! Visitors feel anxious!

[15:10] Interviewer 2: What what did you draw?

[15:12] Facilitator: [ID] What did you draw just now?

[15:13] Participant (Female): [ID] What was drawn just now was asphalt with concrete underneath, with retaining walls.

[15:21] Interviewer 2: Yeah. And can I ask you, what did you write, draw?

[15:25] Facilitator: [ID] What did you draw just now, the girl?

[15:28] Participant (Female): [ID] The same! Concrete also, asphalt!

[15:32] Facilitator: [ID] Can you show the drawing from earlier, which one was it?

[15:36] Participant (Elder): [laughter] [Sasak: "Mbe e nani tamunan?"] Where did we put it now?

[15:43] Facilitator: Okay, this is asphalt.

[15:46] Participant (Female): [ID] Explain it, explain it to them so they understand.

[15:50] Participant (Elder): This change for permanent bridge.

[15:55] Participant (Female): [ID] Replace this with concrete.

[15:57] Participant (Elder): Replace... replace this...

[15:59] Interviewer 2: Replace with the metal, yeah? Concrete?

[16:02] Participant (Elder): Yeah, the concrete, yes! Concrete, yes.

[16:05] Facilitator: [ID] What else, Bu?

[16:07] Participant (Elder): Also make for impress uh for this icon area, this.

[16:13] Interviewer 2: Beautiful, yeah.

[16:15] Participant (Elder): Yeah, beautiful, beautiful!

[16:17] Interviewer 2: Okay, we can move to the next assignment?

[16:19] Facilitator: [ID] Okay, we move to the next one...

[16:21] Interviewer 2: Yeah, the drawing one, right?

[16:26] Interviewer 2: So for the next assignment, we're going to ask you a question to design or draw, write, how the best bridge in Indonesia would look like to be placed here. How would you imagine the most ideal situation of this bridge?

[16:47] Facilitator: [ID] So, this is a picture of Cemare without the bridge. If you are given the opportunity to design the most suitable, best bridge, how would it look? You can draw or write: materials, barriers so tall trucks cannot enter, completely free!

[17:21] Participant (Elder): [Sasak: "Nggih, niki pinaq jembatan bebas desain apean, sak paling ideal nggih?"] Alright, here we design a bridge freely, whatever design, the most ideal one, right?

[17:51] Interviewer 1 (Dutch): [NL] They're doing great, aren't they? Yeah, we're amazed.

[17:57] Interviewer 1 (Dutch): [NL] I hope they don't think that we're going to build it, creating great expectations! But it's important that they know it has an impact.

[18:24] Participant (Female): [ID] A suspension bridge! A hanging bridge! [laughter]

[18:32] Interviewer 2: Oh, that's beautiful! Do you guys have those in the Netherlands?

[18:37] Interviewer 1 (Dutch): Yeah, definitely, but not as much. We mainly have ones with one big pillar, like a cable-stayed bridge.

[18:50] Participant (Female): [ID] Asphalt!

[18:52] Interviewer 2: But I don't feel really comfortable going to a hanging bridge. It just feels shaky...

[18:59] Interviewer 1 (Dutch): Yeah, it feels scary because there isn't anything that supports it from below. But you can make it sturdy, support it on both sides.

[19:12] Interviewer 2: You study at Mataram University? You know any civil engineering students? What kind of projects do they work on?

[19:22] Local Guide / Student: Mostly how to make buildings withstand natural disasters, like earthquakes.

[19:28] Interviewer 2: Yeah, we would like to visit the university!

[20:17] Interviewer 2: Two minutes left!

[20:19] Facilitator: [ID] Two minutes more!

[20:22] Participant (Elder): [ID] Make it good, Bang Enal! [laughter] A hanging bridge, Bang Enal, that's good!

[20:30] Interviewer 2: Oh, they can keep it for now.

[20:32] Facilitator: [ID] Oh, for now, keep it first, they say.

[20:51] Interviewer 1 (Dutch): You guys come here often, right? That would be a long bike ride. 30 minutes?

[20:57] Local Guide / Student: Oh, it's like 50 minutes. We use Gojek, but it's too far for scooters, the highway is crazy busy.

[21:40] Interviewer 2: Finish your drawing, and then you can keep it for now.

[21:44] Facilitator: [ID] Hold on to it first, Pak. He wants...

[21:50] Interviewer 2: Okay, thanks! We would like to hear your thoughts on what you drew.

[21:55] Facilitator: [ID] So, for those who have drawn, please explain what the drawing looks like, why it's good, what materials are used, and so on.

[22:02] Interviewer 2: And please react on each other's ideas!

[22:05] Facilitator: [ID] Later, the others can also comment! For example: 'Oh, that material isn't suitable here.' We're interested in that!

[22:15] Facilitator: [ID] Come on, Bang Enal, show it to your friends! Let's go!

[22:23] Participant (Bang Enal): [ID] First, number one, this should use asphalt on the road.

[22:29] Facilitator: Asphalt, okay.

[22:30] Participant (Bang Enal): [ID] Second, this one uses concrete pillars.

[22:36] Participant (Bang Enal): [ID] Third, so there is a gateway / arch.

[22:40] Interviewer 2: An arch, okay.

[22:42] Participant (Bang Enal): [ID] Fourth, underneath, boats can pass back and forth beneath it.

[22:47] Participant (Bang Enal): [ID] And fifth, a fence / railing on every side.

[22:52] Interviewer 2: Walls. What does the rest think?

[22:54] Facilitator: [ID] What do the others think about Bang Enal's design?

[22:57] Participant: [ID] Good! The demand is roughly the same!

[23:01] Participant (Elder): [ID] Can I add something too?

[23:04] Interviewer 2: Please say something!

[23:05] Participant (Elder): [ID] For me, around here, later we can build houses or a park, the best view we can design. We invite whoever can make this area beautiful, an attractive park, right? What can we do to help so this water can produce money from here? From this bridge, from below it, so it generates money, besides bringing visitors, so they can see what is best that we made around here. Like I said, the bridge should be made permanent, the road asphalted, and the sides made of concrete as attractively as possible. The point is, we create an environmentally friendly landscape. So that this water flowing here produces money around here!

[24:05] Facilitator: So he wants to make something beautiful from below the bridge that people can see from above, like a park, something that makes people come and generates profit.

[24:21] Participant (Elder): Our idea: how to make money from this water!

[24:25] Interviewer 2: Does everyone agree?

[24:28] Participants: [ID] Agree! Setuju!

[24:32] Interviewer 2: Do you have something different?

[24:35] Participants: [ID] Same, same! Sama-sama!

[24:38] Interviewer 2: Could you maybe explain a bit?

[24:40] Participant (Female): [ID] It's basically the same. The road uses asphalt, with fenced walls, and concrete underneath. And the gateway / arch should be tall so that trucks

can enter underneath it, right at the entrance, so it is clearly visible: 'Welcome to the Tourism Village!'

[25:11] Interviewer 2: Okay, thank you! We'll go to the almost last question.

[25:16] Facilitator: [ID] Okay, this can be collected, two more questions and then finished.

[25:31] Interviewer 2: So now we're going to ask you almost the same question again. But now, come up with a solution to cross the water WITHOUT a bridge!

[25:52] Facilitator: [ID] Now, given the same picture, how do you cross the water, but WITHOUT using a bridge? It can be anything! Free!

[26:04] Participants: [ID] Using a boat! Can do! Raft! Bamboo raft! Swimming! Life jacket! Like in the old days!

[26:21] Participant (Female): [ID] Most feasible is a boat. If manual, it's exhausting! [laughter]

[26:35] Interviewer 1 (Dutch): Swimming? I'm very interested in what they come up with. In case there is maintenance on the bridge, you need an alternative.

[27:18] Interviewer 1 (Dutch): This is normally how we start a design project. Somebody once talked about dolphins to cross! Very interesting to see the different ways people come up with.

[28:40] Interviewer 2: Three minutes left!

[28:57] Participant (Female): [ID] A boat is good, right?

[29:07] Participant (Elder): [Sasak: "Pinaq kandoq, bateq te keliling"] Make a canoe, let's go around.

[29:19] Facilitator: [ID] Time's up! Who wants to explain how they cross without a bridge?

[29:24] Participant (Elder): [ID] Like this, we use a ship or a boat, lah! Even a helicopter could work! [laughter]

[29:38] Participant (Female): [ID] Like the old days! In 2001, we used boats before there was a bridge.

[29:47] Facilitator: Before the bridge, in 2001, they used boats.

[29:50] Participant (Female): [ID] We could even bring motorbikes on the boat!

[29:52] Facilitator: [ID] How did that work?

[29:53] Participant (Female): [ID] There was a small wooden platform across, so the motorbike just crossed over temporarily.

[29:57] Facilitator: Oh, so they put their motorbike on it and used the motorbike as a motor!

[30:06] Interviewer 2: And what did you guys come up with?

[30:09] Participant (Elder): [ID] Year 2001 era! Boat!

[30:18] Interviewer 2: And you, the same?

[30:20] Participant (Youth): [ID] If for tourism, maybe we can use canoes, that is more attractive. But for the general public, the most possible is a passenger boat, like the old days. We build a boat mooring dock to get on.

[30:37] Facilitator: So if it's for tourism, they want to use canoes so tourists can enjoy the scenery. But for the local people, it's normal boats.

[30:51] Interviewer 2: Very smart! Okay, thank you. Now we do the final question. Of course, in the end we have lunch for everyone!

[31:11] Facilitator: [ID] After this, we have lunch! Nasi or Mie?

[31:21] Participants: [ID] Nasi! Nasi goreng! Mie goreng!

[31:43] Interviewer 2: Keep up with me, we're almost done. For the next question, we give you a blank paper. How would you make a bridge or crossing feel SAFE? You can draw, write, whatever you want, in 3 minutes!

[32:09] Facilitator: [ID] The last one: on blank paper, how to make a bridge that feels SAFE? As safe as possible! How to make it safe for those who cross?

[32:25] Interviewer 2: Come up with as many ideas as possible. Nothing is considered wrong. This is your way of bringing your voice into the bridge design.

[32:37] Facilitator: [ID] As safe as possible! Does the bridge need to be reinforced, or people wear life vests, or what?

[32:49] Facilitator: [ID] 3 minutes! You can write or draw.

[33:04] Interviewer 1 (Dutch): [NL] Wat is dit nu dan? Hoe maak je hem veilig?

[33:16] Facilitator: [ID] For example, a bridge with patrol boats underneath, or whatever...

[33:43] Interviewer 1 (Dutch): [NL] Je moet weten hoeveel van die foto's die we nu maken van TU Delft, die zijn goud waard!

[34:02] Interviewer 1 (Dutch): [NL] Dit is de Holy Grail.

[34:13] Interviewer 1 (Dutch / Vlog): [NL] Hallo, we zijn bij de co-creatiesessie op dit moment, in het mangrovegebied. We vragen de lokale mensen wat zij vinden van de huidige situatie van de brug en hoe zij dit zouden oplossen. Het doel is om te zien welke oplossingen zij zelf bedenken en hoe zij zich uiten. Ze zijn nu druk aan het tekenen en schrijven. We hebben gevraagd: hoe maak je een brug veilig? En hoe zorg je voor een goed alternatief? Uiteindelijk gebruiken we deze inzichten voor ons onderzoek bij TU Delft.

[36:20] Interviewer 2: Okay, that's time! Could you tell me a bit?

[36:24] Facilitator: [ID] Please explain, Pak!

[36:27] Participant (Elder): [ID] These are the concrete pillars we made as attractively as possible to support the new bridge. On the edges, we design railings/fences. And underneath, the water must be utilized to generate income, creating an eco-friendly

landscape. Also, traffic regulation: at each end, there should be an officer to regulate the flow of traffic so it's orderly. In addition, install CCTV cameras so if any accident or issue occurs, we can monitor it immediately! And make the bridge wider!

[37:22] Facilitator: First is to make it wider. Second, people to manage traffic on each side. Third, install CCTV to monitor accidents or problems 24/7.

[37:41] Interviewer 2: To make sure people follow rules or other purposes?

[37:44] Facilitator: Follow rules, and see if there's damage in the night when no one is watching.

[38:00] Participant (Female): [ID] For the new bridge, make it wide so two cars can pass each other smoothly.

[38:10] Facilitator: Main point: make the new one way bigger so two cars can pass at the same time.

[38:20] Participant (Bang Enal): [ID] Same as Lalu Agus: wider, and the clearance underneath must be higher so fishing boats with masts can pass through without having to remove their masts during high tide!

[38:43] Facilitator: Make the bridge higher up, because during high tide, fishermen cannot pass underneath with their boat masts.

[39:04] Interviewer 2: You know that in the weekends it's very busy with tourists, right? How would you make a solution so that everyone can cross fast and easy?

[39:27] Facilitator: [ID] If it's very crowded on weekends, how do you make crossing fast and safe?

[39:37] Participant (Bang Enal): [ID] There must be traffic officers regulating alternately from east to west so there's no jam. And the bridge must be wider!

[39:58] Facilitator: Have officers manage the traffic alternately, and make the bridge wider.

[40:17] Interviewer 2: Very interesting. We really appreciate your help, it's nice to collaborate!

[41:05] Interviewer 2: Have you guys talked to the government? What did they say?

[41:10] Interviewer 1 (Dutch): A lot! The government really wants to collaborate, but there are so many parties that sometimes the voices of these local people get put in the background. That's why we are researching their needs.

[41:41] Participant (Elder): [ID] Traffic management with officers at both ends, CCTV, and a wider bridge.

[42:13] Facilitator: Wider bridge, traffic management officers, and CCTV cameras.

[42:46] Participant (Female): [ID] And wide enough for two cars to pass!

[43:00] Interviewer 2: Do you think this participatory session was good?

[43:06] Participant (Elder): [ID] Very good! Like I said earlier, we must be involved in the execution, in knowing where the funds come from, project clarity, and utilizing local materials and workers so that the community benefits!

[43:44] Facilitator: They said it was very enjoyable. They hope local people are involved when planning and building the bridge, and that the government hears them.

[44:00] Interviewer 2: Thank you! To use this information for our educational research at TU Delft, we just need your signature on the consent form. It's completely anonymous.

[44:21] Facilitator: [ID] Explaining the informed consent form for TU Delft research...

[45:00] Participants: [Signing consent forms, ordering lunch, and wrapping up the session].

[46:00] Interviewer 2: Thank you very much! Enjoy your lunch!

Appendix B4: Interview Truck Drivers

Tables B.12 and B.13 give the details of the two interviews with truck drivers.

Interview Transcript Truck Driver 1

Table B.12 Interview details: truck driver 1

Date & Location:	Pantai Cemara / Cemare, Lembar Selatan, West Lombok, Indonesia
Participants:	Interviewer 1 (Male TU Delft researcher, English/Dutch) Interviewer 2 (Female TU Delft researcher, English) Facilitator / Interpreter (Student/guide, Indonesian & English) Respondent: Commercial octopus collector/transporter (non-local buyer, male, supplier to a factory/export in Surabaya)
Languages Spoken:	English, Indonesian [ID], Dutch [NL]
Translation Mode:	Full verbatim transcription translated into English (Indonesian passages with original text and translation)
Transcription Rule:	Verbatim fidelity (fillers, repetitions and hesitations retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian

[00:00] Interviewer 1: ...use the bridge for transport, like what does he transport, and if if they're going to renovate the bridge, is he like independent of the bridge and for his for his like his uh his income as well? Like that kind of questions.

[00:15] Facilitator: Okay. [ID] So if, for example, the bridge is currently being repaired, right, if Abang wants to transport, through where would it be then?

[00:23] Respondent: [ID] Uh, so so the model is like this. I am actually not a local person from here, right? Uh-huh. So, when that is disrupted, [Facilitator: Uh-huh.] usually I am delivered... if if cars cannot pass, using a motorbike he goes over there, crosses using a motorbike. If a motorbike cannot pass, that means... [Facilitator: Wait for a while, like that?] Uh-huh. Uh, what's its name? No, sampan [small boat], right?

[00:46] Facilitator: [ID] Oh, using a sampan! Okay, boat. Okay. So, if it was under renovations, or cars couldn't go, he could uh use boat to transport the thingy, yeah, to transport the octopus and everything.

[01:00] Interviewer 1: Oh, and then they how do they pick up like uh the the like what what is...?

[01:06] Facilitator: Octopus.

[01:07] Interviewer 1: Octopus, yeah. And then they pick up it like at the other side of the river?

[01:10] Facilitator: Oh yeah, so they're bringing it to the boat and will pick up at the other side of the river. [Interviewer 1: Okay.]

[01:15] Interviewer 2: How often do they go here with the octopus?

[01:17] Facilitator: Every day.

[01:18] Interviewer 2: Every day? Ooh!

[01:19] Interviewer 1: Every day, so it's every... it's for one restaurant or for all the restaurants?

[01:23] Facilitator: Uh they were taking the octopus here and send it to somewhere else. So this is the the place where they supply the octopus, yeah.

[01:31] Interviewer 2: So they give the octopus to the restaurants?

[01:34] Facilitator: They take the octopus from the fishermen here, and then they sell it somewhere else.

[01:38] Interviewer 2: Okay, where?

[01:40] Facilitator: [ID] Where is it brought to, usually?

[01:42] Respondent: [ID] Uh, global market, right.

[01:44] Facilitator: Okay, so it was like an open market thingy, [Interviewer 2: Mhm.] here and there, here and there.

[01:49] Respondent: [ID] Europe...

[01:50] Facilitator: Ah, to Europe!

[01:51] Respondent: [ID] America...

[01:52] Facilitator: America!

[01:53] Interviewer 2: Woah!

[01:54] Interviewer 1: Crazy!

[01:55] Respondent: [ID] But I am still at the lower level, though. [laughter]

[01:57] Facilitator: [laughter] [ID] Soon you will go up, right! [laughter]

[02:00] Respondent: [ID] Sent to Surabaya first, right. In Surabaya it is processed in the factory, [Facilitator: Yes.] after that the Surabaya factory exports.

[02:07] Facilitator: Oh, okay. So this one are going to be sent to Surabaya, to the factory, and then they're going to do inspections, uh box it, and then they'll go export it outside of the country after that.

[02:19] Interviewer 2: And they only pick it up here? There's no other points?

[02:22] Facilitator: [ID] Besides here, where else? Or only here?

[02:24] Respondent: [ID] Uh, all beaches in Lombok, it seems.

[02:27] Facilitator: Okay, uh mostly uh most beach in Lombok.

[02:30] Interviewer 2: Oh.

[02:30] Facilitator: So this is just one part of the logistics.

[02:33] Interviewer 2: Yeah.

[02:34] Interviewer 1: And how how does he feel like crossing this bridge? Does he have any doubts or when is the when it comes the point that he decides to take the boat? Because he has a lot of valuable... [Facilitator: Yeah.] stuff with him.

[02:46] Facilitator: [ID] When crossing the bridge carrying these goods, how does it feel, Bang? Apprehensive, or how?

[02:51] Respondent: [ID] If there is a lot, I don't dare to cross! [Facilitator: Don't dare to cross, right?] Don't dare. Yeah, so it is delivered over there. If here it's just a little, for example there's uh 100 kilos for example, right, uh he brings it over there to... Once, what day was that, uh around approximately two weeks ago, [Facilitator: Uh-huh.] a load of 1 ton, right, wanted to add 100 kilos here... [Facilitator: Okay, didn't dare?] He delivered it over there, outside.

[03:17] Facilitator: [laughter] [ID] Yes, carrying a lot of goods, after all, it's terrifying too, yeah yeah yeah!

[03:22] Facilitator: So, uh, when the octopus is too much, or he already have so much things, he can't he can't cross the bridge, he'll ask them to bring the octopus with boat, and then he'll wait from the other side of the bridge. So, two weeks ago he did that, because he was already has like a 1 ton's worth of weight of thingy, yeah, and then they're going to take 100 kg here, and he couldn't cross the bridge, so he tell them to...

[03:51] Interviewer 2: Deliver with boats. Wow.

[03:53] Interviewer 1: Can you ask him, would he uh is he willing to pay like a small fee, like for the maintenance of the bridge if he if like if if they improve the condition?

[04:02] Facilitator: [ID] So if the bridge is repaired, right, it's good. Now, but when crossing, there is a parking fee of Rp 2,000 to cross, for the bridge maintenance costs.

[04:11] Respondent: [ID] Ah, I would be more interested in that!

[04:13] Facilitator: [laughter] Okay! [laughter]

[04:15] Interviewer 1: Huh?

[04:16] Facilitator: Okay, yeah, he said, 'I was very interested with that, because that's better, that's good.' Yeah, that's what he said.

[04:22] Interviewer 1: He would like to pay like a small amount, and then...

[04:24] Facilitator: Yeah, it's better than waiting for the boat, I think! [laughter] [ID] Rather than waiting for the boat, right? [Respondent: Mhm.]

[04:28] Respondent: [ID] I say, actually why isn't that done, right, with this, make over there, [Facilitator: Yeah, a ticket counter.] a counter, people from here have jobs... [Facilitator: Yeah, earn money.] earn money, repair the bridge. When there is excess, it can be made into... what's its name?

[04:42] Facilitator: [ID] Made artistic or whatever, right. Because earlier I also asked the bus that brought the odong-odong, right, they always come here every day. They said now because the bridge is like that, visitors have decreased drastically, they said.

[04:54] Respondent: [ID] Yes, because yesterday they repaired this sidewalk, right? Passed by trucks, [Facilitator: Ah.] that's what made... loaded with stones, [Facilitator: Heavy materials, yeah.] heavy materials.

[05:04] Respondent: [ID] That was the cause yesterday.

[05:06] Facilitator: Okay, so yeah, he was very interested. It's it's better that way because all the the people, the local community, could also have a way to actually manage the bridge and also grow. So maybe the spare money could they could make something, a building, they could make some artistic design, or something that could attract more people. And uh the reason why the bridge is like that, because a couple of days ago, I think a weeks ago, uh a truck with uh rocks and stuff, because there there's some constructions here, bringing them through the bridge, and then it collapsed.

[05:42] Interviewer 2: Yeah.

[05:43] Facilitator: Yeah.

[05:43] Interviewer 1: Like how do you know, like...?

[05:45] Facilitator: Uh he was, yeah, he was here yesterday.

[05:48] Interviewer 1: It was two weeks two weeks ago?

[05:49] Facilitator: Yeah, he was I think a week ago, he was just explaining it to me.

[05:53] Interviewer 1: After the rain, I think, Sunday, because then...

[05:55] Interviewer 2: After the rain, I think, yeah.

[05:58] Interviewer 1: Okay, thank you very much.

Interview Transcript Truck driver 2

Table B.13 Interview details: truck driver 2 (tourist bus and odong-odong driver)

Date & Location:	**Cemare Beach, Lembar Selatan, West Lombok, NTB, Indonesia**
Participants:	Facilitator / Interpreter (Translating for the Odong-Odong/Bus Driver) Interviewer 1 (Male TU Delft Researcher, English) Interviewer 2 (Female TU Delft Researcher, English)
Languages Spoken:	English
Total Duration:	2 minutes 27 seconds
Subject / Focus:	Driver route flexibility, vehicle passenger offloading before crossing, bridge deterioration awareness, impact of bridge condition on tourist numbers, and weight/size regulations
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian

[00:00] Facilitator: Okay, so the first one: how important is this route to them, to the driver? So, she was explaining to me that this is not their only route, so they go to other places with uh the tourists. So sometimes it was in Senggigi, sometimes it was in other parts of Lombok. So they have a lot of thingy: going to the beach, to the a lot of stuff. And then if this place was uh, let's say they cannot cross here, then they'll just go to another place.

[00:30] Facilitator: And then uh the next one is: how... what was the questions again? The...

[00:34] Interviewer 1: Uh like that how does he feel like crossing the bridge with so many people, like...?

[00:37] Facilitator: Okay, how he feel. With so many people. So he said he are afraid if uh all of the people are still on the car, so he told them to get off the car, and then he goes and then they'll walk...

[00:51] Interviewer 1: All people?

[00:52] Facilitator: Yeah, all of the people.

[00:53] Interviewer 1: That's quite interesting to know.

[00:54] Facilitator: That's quite interesting to know, yeah.

[00:55] Interviewer 2: Yeah, and it happens multiple times.

[00:57] Facilitator: Yeah, and it happened multiple time a day. And and she said that now it was uh a little bit more less people come because of the bridge.

[01:05] Interviewer 2: Yeah? Oh!

[01:06] Facilitator: Yeah! Because usually du- during weekends, they will be packed with people, but now because of the bridge, less people are willing to come.

[01:14] Interviewer 2: Oh, yeah.

[01:15] Facilitator: So, yeah.

[01:16] Interviewer 1: Thank you very much, bro. And like, [cough] do you think he... does he know like he's damaging the bridge with his car? Do you think he's aware of that?

[01:25] Facilitator: Yes. He's he's very aware of it, but um I don't know how to uh explain it. He was like uh, um, 'Yeah, it is damaging the bridge, but like what can I do?', things like that.

[01:38] Interviewer 1: And so his income is dependent on the bus as well, right?

[01:42] Facilitator: Yeah.

[01:43] Interviewer 1: Like his job is just uh being the driver of this bus.

[01:45] Facilitator: Yeah. Yeah, exactly.

[01:47] Interviewer 1: Okay. Um, and do you do you have... are they like if they close the bridge, or for the renovation, then they just go to another beach?

[01:54] Facilitator: Yeah, then they will go to another beach.

[01:55] Interviewer 1: Then they just change the route.

[01:56] Facilitator: Yeah, then just change the route.

[01:58] Interviewer 1: Okay. And do you know maybe yourself: are there any rules, like crossing the bridge for like such such vehicles, or...

[02:04] Facilitator: Like law?

[02:05] Interviewer 2: Yeah.

[02:05] Interviewer 1: Are there rules, or...? For big trucks?

[02:07] Facilitator: Yeah, I thi- I think there's supposed to be a law in how heavy, how big, how wide they are, but...

[02:14] Interviewer 2: Nobody's nobody's checking.

[02:15] Interviewer 1: Yeah, like we are visiting Tuesday the the government, so we'll we will be ask uh them as well.

[02:20] Facilitator: Oh! Oh yeah, you should you should ask them.

[02:22] Interviewer 1: He didn't uh say something about that?

[02:24] Facilitator: Yeah. Definitely ask them. [laughter]

[02:26] Interviewer 2: Yeah! [laughter] We will.

[02:28] Interviewer 1: I think these were the most important questions. Thank you for so much for this. That went so quick, brother. Thanks. [laughter]

[02:33] Facilitator: Ah, all that.

Appendix B5: Interview Domestic Visitor

Table B.14 gives the details of the interview with domestic visitors.

Interview Transcript Domestic Visitor

Table B.14 Interview details: domestic visitors

Date & Location:	**Cemare Beach, Lembar Selatan, West Lombok, Indonesia**
Participants:	Interviewer 1 (Male TU Delft researcher, English/Dutch) Interviewer 2 (Female TU Delft researcher, English) Facilitator / Interpreter (Student/guide, Indonesian & English) Respondent: Male domestic tourist (38 years, from Sweta, Mataram; travelling by odong-odong/scooter with family)
Languages Spoken:	English, Indonesian [ID], Sasak [Sasak], Dutch [NL]
Translation Mode:	Full verbatim transcription translated into English (Indonesian & Sasak passages with original text and translation)
Transcription Rule:	Verbatim fidelity (fillers, repetitions and hesitations retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak: "..."] = Original Sasak utterance followed by English translation

[00:56] Facilitator: Okay. [ID] Alright, Pak. How old are you, Pak?

[01:00] Respondent: [ID] Thirty-eight years old.

[01:03] Facilitator: Thirty-eight.

[01:04] Facilitator: [ID] Gender?

[01:06] Respondent: [ID] Male. [laughter]

[01:07] Facilitator: Male! [laughter]

[01:09] Interviewer 1: Male. Strong!

[01:13] Facilitator: [ID] Where are you originally from, Pak?

[01:15] Respondent: [ID] From Sweta.

[01:17] Facilitator: Okay, he was from Mataram. Mataram.

[01:21] Interviewer 1: Mataram, oh yeah.

[01:23] Facilitator: [ID] Oh, uh what is your occupation, Pak?

[01:25] Respondent: [ID] Uh, labourer. Daily casual labourer.

[01:29] Facilitator: Uh, he was a... I don't know how to explain it accurately, but it was uh... how do you say... I I don't really find the words. Uh, he was like a... you work when there's work, but you don't work when there's no work. Stuff like that. [NL] You understand, right? [Interviewer 1: Yeah, yeah.]

[01:47] Interviewer 1: Like what kind of work?

[01:48] Facilitator: Everything. [Interviewer 1: Everything.] Yeah.

[01:50] Interviewer 1: Okay.

[01:52] Interviewer 1: And this one?

[02:14] Facilitator: [ID] Earlier, how did you travel coming here, Pak?

[02:16] Respondent: [ID] Using a motorbike. While the family used an odong-odong.

[02:20] Facilitator: Oh, so... [ID] Oh, the one that was crowded earlier, oh yeah! Okay, so he was using a scooter, [Interviewer 1: Yeah.] but his other family members were using, you know, the big-ass cars that we saw? [Interviewer 1: Big-ass car.] Yeah, the one that has a lot of colours. The one that we thought wouldn't cross the bridge, that one! [Interviewer 1: Okay.] Yeah, that one.

[02:37] Interviewer 1: And like another question: uh do they need to book that big car uh in advance, or how do they collect that much of people to to go to Cemare?

[02:46] Facilitator: [ID] Okay. Uh so before traveling, was that odong-odong booked first, or how?

[02:50] Respondent: [ID] Yes, it was booked first.

[02:52] Facilitator: [ID] Okay. Then you made plans to gather together, like that?

[02:54] Respondent: [ID] The plan to gather was already planned from a week before, [Facilitator: Okay.] to come here. Traveling here, after all, it's very pleasant here! [laughter]

[03:04] Facilitator: Yeah. Okay, so they were already making plan like a week prior. Yeah, because this this place is quite famous, so they were already planning a week prior and they already ordered the...

[03:17] Interviewer 1: The truck, yeah.

[03:18] Facilitator: Yeah, the the truck thingy.

[03:19] Interviewer 1: Is is there like one big organisation who is in charge for all the trucks, or like are they just individual big uh truck drivers?

[03:26] Facilitator: [ID] Those odong-odongs, do they have a company, or are they privately owned by individuals?

[03:31] Respondent: [ID] Looks like private property. Some are privately owned, some are owned by... yeah, companies.

[03:40] Facilitator: Okay, so there's a company-owned one and there's also a private-owned one, so it just depends.

[03:46] Interviewer 1: Do you do you know the the name of the company?

[03:48] Facilitator: No. [laughter]

[03:51] Interviewer 1: So then the the next one.

[03:53] Facilitator: Oh, it's this one?

[03:54] Interviewer 1: Yeah, I think uh the second one.

[03:56] Facilitator: Oh, this one. [ID] Do you often come here, Pak?

[03:58] Respondent: [ID] Coming here, it's newly... the first time. But going over there, we have. Over there, we have. To other places.

[04:05] Facilitator: [ID] Oh, so one by one...

[04:06] Respondent: [ID] One, one place, yes, but they have different names, right, yes. Different names.

[04:11] Facilitator: Okay, so Cemare, this is their first time, but they've been going to other beaches around the area. So so they go to a different one each each time they go to holiday.

[04:22] Interviewer 1: Okay. Pretty nice, yeah?

[04:27] Interviewer 1: Uh yeah, we just follow the...

[04:30] Facilitator: Okay. [ID] Uh then next, when crossing the bridge earlier, how did that feel? [laughter]

[04:35] Respondent: [ID] Terrifying! Scared! All got off! Everyone riding the odong-odong got off. [Interviewer 1: Yeah.] They got off, only got back on after crossing, only then did they climb back up.

[04:47] Facilitator: [laughter] Okay, so he said it was... [laughter] Yeah, so it was very scary, they didn't dare to wait in the car when they were crossing, so so all of them get out and then wait for the truck to cross, and then they with uh walking, and then they go back to the car after they cross the bridge.

[05:07] Interviewer 1: And why did they cross with the with the truck? They could also just park the truck there and just walk all the way up to here.

[05:15] Facilitator: Oh, because it was part of the... the trucks, it's true, part of the whole thing. I don't know the sense, it was like that. They need to park there in front of the thingy, and then they will go back again, the truck, to take more people.

[05:33] Interviewer 1: Okay.

[05:37] Facilitator: [ID] Oh, [laughter] when you saw the bridge, did you hesitate at all, like 'Better turn back, better go somewhere else'? [laughter]

[05:41] Respondent: [ID] Somewhat hesitated, because it was like this, [Facilitator: Yeah, yeah.] then it was broken, tilted like this, the road looked slanted, felt like falling! [Facilitator: Yeah.] Even when I rode a motorbike earlier... [Facilitator: Yeah, it slanted, right? tilted...]

[05:54] Interviewer 1: And can you ask him, does he prefer to go to other places or other beaches because uh there is a better accessibility?

[06:05] Facilitator: [ID] So next time, would you want to come here again given that bridge, or rather go somewhere else that has a better road?

[06:11] Respondent: [ID] Would think twice also, like that. [laughter] Maybe if there is another road, yes, we could come here, like that.

[06:17] Facilitator: Okay, so he was saying, yeah, he he was really like second-guessing, should we just go home and go to another place because of the thingy, but they ended up going here. And I was asking, 'Would you like to go uh again here with this kind of [laughter] this kind of road?' And they said, 'Maybe no. But if there's other roads, then yeah, we could go again.'

[06:37] Interviewer 1: I think that's the only way.

[06:38] Facilitator: Yeah, that's the only way actually, yeah, probably no. [laughter]

[06:42] Interviewer 1: Okay, thanks thanks for asking.

[06:48] Facilitator: And then uh... this one, right?

[06:51] Interviewer 1: Yeah, I think so.

[06:53] Facilitator: [ID] Okay. Uh have you ever before seen the condition of the bridge on, for example, on a phone or anywhere before coming here?

[06:58] Respondent: [ID] Uh, never, this was the very first time. Never seen on a phone, never. The first time was just passing by, 'Oh, the road is like this!' [laughter]

[07:07] Facilitator: He said this is the first time they saw the bridge conditions. No internet, nothing. So they just like saw it and fairly surprised.

[07:16] Interviewer 1: Okay. Understandable, I guess.

[07:22] Respondent: [ID] Very concerning! Very concerning! Indeed. Extremely concerning, yes.

[07:28] Interviewer 2: [NL] Is this 7? Shall we check if it's 7?

[07:31] Interviewer 1: [NL] I just need to turn on data, then I can just do two screens: this one here and that one there, then we can read along precisely.

[07:37] Facilitator: [ID] They come here, uh engineering is their major, so they want to research the bridge, its design...

[07:43] Respondent: [ID] Hopefully it can be helped!

[07:44] Facilitator: [ID] Amen, yes, right!

[07:46] Respondent: [ID] Yes, hopefully it can be helped.

[07:48] Interviewer 2: [NL] Yes, check, yeah.

[07:50] Participant (Local Resident): [Sasak: "Adek t bimbing adek t perbaiki, anuk niki, ya jaq membatu adek sebie perbaiki, bapak."] So that they guide and repair this thing, yes, they will help so it gets repaired, Pak.

[07:54] Respondent: [Sasak: "Gelis bae jembatan niki..."] As soon as possible, this bridge...

[07:56] Interviewer 1: [NL] This is twelve, right?

[07:57] Interviewer 2: [NL] Yes.

[07:58] Interviewer 1: [NL] Maybe six, that he asked it earlier?

[08:00] Participant (Local Resident): [Sasak: "Perbaikin jalan..."] Repair the road...

[08:02] Interviewer 2: [NL] No, he did say that.

[08:03] Interviewer 1: [NL] That's the accessibility. Yeah.

[08:04] Facilitator: [ID] Researching...

[08:06] Participant (Local Resident): [Sasak: "Dong kela de jok..."] [laughter]

[08:14] Facilitator: [ID] Even us who often come here still get scared too! [laughter]

[08:18] Participant (Local Resident): [ID] Especially when there are lots of big cars! [laughter]

[08:21] Respondent: [ID] Terrifying! Better off not broken.

[08:23] Interviewer 1: Number eight?

[08:24] Facilitator: Okay, uh. [ID] So, what if, for example, the bridge... it's already wobbly, right? Then suddenly it is closed first for large vehicles, in your opinion, Pak, how is that?

[08:34] Respondent: [ID] Much better! Because for the sake of safety also. Why? Because later, if anything goes wrong, it will take victims, like that. It's much better like that, closed first temporarily.

[08:47] Facilitator: He was saying, 'Even better! They they should close it for safety, because we don't want any accident to happens, any casualties, or whatever. So it's better to be closed for safety, for general safety.' So he very agreed with that.

[09:03] Interviewer 1: Okay. Number nine?

[09:05] Facilitator: Okay. Oh wait, this shuttles, do you mean it to be like a car, or is it boat?

[09:12] Interviewer 2: Uh, I think the shutt- it means like uh they stop the bus before the bridge, [Facilitator: Uh-huh.] and then there's like a car or something after the bridge, so the people don't have to cross...

[09:20] Facilitator: Oh! So they just walk the bridge and then go back to the car? [Interviewer 2: Yeah.] Okay, to the other car waiting for them, okay. So, [ID] the question is: what if... wait, which is it? Is it this one? Okay. Uh what if, for example, you park before the bridge, then get off, then walk all the way here, would that roughly be okay, or... [Respondent: Too far!] Too far, right?

[09:42] Respondent: [ID] Far, very far, yes! Extremely far.

[09:44] Facilitator: [ID] Nah, but what if the car stops, you walk across the bridge, then after the bridge someone picks you up, how is that?

[09:50] Respondent: [ID] Well, that would be pleasant! [Facilitator: That's pleasant, right?] Pleasant! Okay, if like that, it's possible.

[09:55] Facilitator: So, if they were going to walk all the way from the bridge to here, it would be too far, right? But if there were a shuttle then... [Interviewer 1: That's fine.] Yeah, that's fine.

[10:07] Interviewer 1: Okay, thank you. And we go move on to ten?

[10:10] Facilitator: Okay, [ID] in your opinion, Pak: if the bridge is rebuilt or repaired, what would its ideal shape be like? Should we make it a hanging bridge, for example, or should we make it concrete?

[10:20] Respondent: [ID] Oh, for me, yes, it's much better, Gus, permanent. Much better permanent, to be crossed... long-lasting, right? [Facilitator: Yes, right? 10 years, 20 years, right?] Yes! For as long as possible, strong, sturdy, like that! [Facilitator: If it's wood, one or two years...] If it's wood, one or two years. If here, if using a hanging bridge, maybe someone might steal the bolts later, right? [laughter] That's risky later, terrifying! Much better like that, right?

[10:48] Facilitator: Okay, so he was saying if they were going to design a new one, make a new one or repair it, they would like to make it a permanent one from like steel, uh because that way it will last decades, right? If they were going to make it from wood, year or two and it's just going to be break again. [Interviewer 1: Destroyed, yeah.] Yeah. Uh, and and he was saying if you're going to make a... what is it called? What is it called?

[11:11] Interviewer 2: Um, yeah, like a hanging bridge?

[11:13] Facilitator: Hanging bridge, yeah. There's maybe people would like steal the thingy, and it'll just... [laughter] very dangerous thing, right? So so better just make it like that, but steel. [Interviewer 1: Yeah.] Strong steel pillars and everything, yeah.

[11:27] Interviewer 1: Okay. Thanks. Uh, eleven?

[11:31] Facilitator: [ID] Oh, uh on the other side over there, there is a mangrove forest. [Respondent: Yes, yes.] Uh roughly, would you be interested to see, take a stroll around there?

[11:40] Respondent: [ID] Very interested, even more so if it's... what's its name, well-maintained, renewed, like that, lah. The point is, better managed, lah. [Facilitator: Managed, yeah.] Yes, much better! It would feel cool to look at, feel refreshed, like that.

[11:58] Facilitator: [ID] There is a beach, there is a mangrove! [Respondent: Yes!] Okay, so he was saying, yeah, that's very great! Even better, they really want to go there, and they would like for it to be uh the management to be good, to be... what is it called? Everlasting? Is that the correct words? Yeah, that sounds... okay. Yeah, so they'd like to see it, they'd like to go and walk around it. Here is the beach, and then we could go see the mangrove, so... [Interviewer 1: Okay.] Yeah.

[12:31] Interviewer 1: Thank you. And then twelve?

[12:35] Facilitator: Hmm. [ID] How about here, from what you see, how is the crowd? Is it fun, exciting, then...?

[12:41] Respondent: [ID] Exciting, exciting! Crowded, enjoyable here! The view is good, up to we see mountains are there, then ships, ships are there, good! [Facilitator: Everything is here, yeah? Relaxing, refreshing.] Yes, sunsets are there, like that. Then food prices are also affordable, lah. [Facilitator: Affordable, not excessive.] Not too excessive, yeah. Then like what's its name, like riding what's its name, banana boats, [Facilitator: The rides, yeah.] yeah, not too expensive, like that. [Facilitator: Affordable, everything is affordable.] Affordable. The mothers here are also very friendly! [laughter] Yes! [laughter]

[13:21] Facilitator: [laughter] Ready, okay. So he was saying like the people are so friendly, and then it was affordable, like the food, the banana boats, and everything was affordable, it wasn't overpriced, so everything is good. The sunset is beautiful, the sea is beautiful, the people is very kind, yeah, absolutely thrilling!

[13:45] Interviewer 1: Good to hear. So the last question?

[13:51] Facilitator: Oh, okay. [ID] So later, what if, for example, the bridge is already repaired, right? Then they need, for example, a parking fee of Rp 2,000, for example, every time we cross for the bridge maintenance costs. Roughly, would that be okay or not?

[14:04] Respondent: [ID] Okay, really! [Facilitator: Okay.] That's okay! [Facilitator: [laughter] That's natural, right?] That's natural for maintenance, right? [Facilitator: If it's used for maintenance, it's okay.] Okay! No problem, no problem, yeah!

[14:20] Interviewer 1: So we we have two last questions uh to end with.

[14:24] Facilitator: Okay. [ID] Okay, we have the last two questions left. The first one is: in your opinion, Pak, who should actually maintain and manage the bridge over there? Is it from...

[14:36] Respondent: [ID] The community must step in, the government too must step in, all circles, all! [Facilitator: All levels, right?] Yes, all levels must step in! [Facilitator: Okay.] That is our shared property, after all! [Facilitator: All are responsible too, right?] Not private property, right, we all... [Facilitator: The only access road here too.] Yes! Outsiders too, that is theirs as well! [laughter] The place where we take strolls, right? [laughter] Yes!

[15:02] Facilitator: Yeah, so he was saying it was uh our thingy, so everyone should take parts in manage it. So the government should take parts, so the local people, and even the tourists, whether it was a local tourist or international tourist, everyone should take parts in managing the bridge because everyone would use it. So everyone needs the bridge, so everyone should also manage the bridge.

[15:27] Facilitator: [ID] Last one, Pak: if you could change one thing about that bridge, what would roughly be changed? Is it the design, made taller for example, or the materials, or what?

[15:37] Respondent: [ID] Everything! [laughter] The design must be good, [Facilitator: Okay.] then the materials must be good, basically everything changed, lah! So that it

becomes a tourist destination, like that. [Facilitator: Yes, so the bridge itself also becomes a tourist attraction.] Becomes a tourist destination, like that.

[15:52] Facilitator: Okay, so he was saying if he could like uh one things that could be changed, he want he want to change like everything! From the materials, make it more beautiful, so he want to make the bridge is an icon of Cemare. Things that people could see, beautiful!

[16:11] Facilitator: Yeah, we heard that a lot, yeah. [laughter]

[16:14] Interviewer 1: Can you can you thank him for all his uh valuable answers?

[16:19] Facilitator: Yeah. [ID] Okay, they say thank you for your answers, very valuable, yes! [Respondent: Thank you! Same-same.]

Appendix B6: Interview foreign visitor

Table B.15 gives the details of the interview with a foreign visitor.

Interview Transcript Foreign visitor

Table B.15 Interview details: foreign visitor

Date & Location:	**Cemare Bridge, Lembar Selatan, West Lombok, NTB, Indonesia**
Participants:	Interviewer (TU Delft researcher) Tourist (Dutch female tourist, rental car driver) Partner / companion (present in background)
Original Language:	Dutch [NL] (translated verbatim into English)
Total Duration:	1 minute 25 seconds
Subject / Focus:	Bridge safety perception, decision to park the rental car before the bridge and cross on foot with luggage, risk aversion, and bridge renovation urgency
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian

[00:00] Interviewer (TU Delft): [NL] We were just standing uh by the bridge to observe everything here, and then we ran into this Dutch couple who uh decided to leave their car over there and go to the island with their suitcases. May I ask you uh what made you make this choice?

[00:15] Tourist: [NL] Yes, I looked at that bridge like that and I think uh it does look as if uh some of the planks might not be completely secure. And after all, we rented a fairly large car, brand new too.

[00:26] Interviewer (TU Delft): [NL] Yes.

[00:27] Tourist: [NL] So we figured that it might be safer to first check how it all holds up, and whether cars cross it frequently. And we heard that the bridge is quite due for renovation anyway, so we decided to just walk across instead.

[00:39] Interviewer (TU Delft): [NL] Yes, it definitely looks like that too. Yes.

[00:41] Tourist: [NL] [laughs] Yes.

[00:42] Interviewer (TU Delft): [NL] And suppose you had received a tip for a restaurant on the island, for instance, and you were going there, that was the plan. Would you turn around then instead of driving across?

[00:52] Tourist: [NL] No, then I would still park the car on the other side and walk across, most likely. I just consider that safer, yes.

[00:58] Interviewer (TU Delft): [NL] Yes, but it is quite a bit further to walk then.

[01:00] Tourist: [NL] Yes, it's walkable. So we choose safety. We've managed to keep this rental car in one piece all the way to this point, and we'd really like to keep it that way! [laughter]

Appendix B7: Government visit

Table B.16 gives the details of the meeting with the West Lombok government.

Table B.16 Meeting details: government visit

Date & Location:	**West Lombok Tourism Office / Cemare, West Nusa Tenggara (NTB), Indonesia**
Participants:	TU Delft Research Team Head of West Lombok Tourism Agency Technical Advisor / Engineering Consultant Facilitator (English-Indonesian), Sabila (IBF), Nedi
Languages Spoken:	English, Indonesian [ID], Dutch [NL]
Total Duration:	1 hour 13 minutes 34 seconds (Audio parts 1 & 2)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak: "..."] = Originally Sasak

[10:15] Facilitator: [ID] So they are asking: in an emergency situation like floods or evacuation, how would heavy vehicles pass if there is a portal?

[10:35] (Consultant): [ID] The portal is designed to open and close. In emergencies, the portal can be unlocked and opened by designated village officers so emergency vehicles can pass.

[11:15] Facilitator: So only in emergency situations or special occasions would it be opened. Otherwise it remains locked to private cars and light vehicles under 2 meters.

[11:45] Interviewer (TU Delft): That's great. What about the long-term vision for the new bridge? Are there restrictions or environmental criteria for the mangrove area?

[12:20] (Consultant): [ID] For the permanent new bridge, a comprehensive AMDAL [environmental impact analysis] will be conducted. The piers must be spaced widely so fishermen's boats can navigate freely underneath without collision risk.

[13:10] TU Delft Student: We have a list of around 60 requirements from local residents, Eco Green, and the government that we are integrating into our proposal.

[14:00] (Tourism Agency): [ID] What are some of those requirements?

[14:15] Facilitator: [ID] They gathered input from villagers, local tourists, and drivers: making the bridge iconic, wide enough for boats underneath, and pedestrian-friendly.

[15:00] (Consultant): [ID] We also hope the bridge becomes Instagrammable and attractive for tourists, while functioning reliably.

[15:45] Interviewer (TU Delft): Could you provide any official documentation or requirements from West Lombok regency so we can align our proposals with your vision?

[16:20] (Consultant): [ID] Yes, we already drafted initial design concepts and calculations at Public Works (PU). I will share the architectural drawings via WhatsApp so you can compare and modify them.

[17:10] TU Delft Presenter: That would be perfect. We can review your existing plans and incorporate local requirements.

[18:00] Interviewer (TU Delft): We also saw an online article mentioning an existing bridge budget and plan from the government. Is that plan still active?

[18:40] (Consultant): [ID] Yes, that is the submission to the central government (PUPR). PU estimated 50 billion IDR for a total rebuild. That's why your study serves as vital justification for the proposal.

[19:30] (Tourism Agency): [ID] Exactly, your study provides the essential academic and field background for Pak Sekda and the Ministry.

[20:15] Sabila (IBF): [ID] So the technical design will be shared, and we can coordinate the MOU formalization.

[21:00] (Tourism Agency): [ID] Very good. Nedi will assist in liaising between TU Delft, Sabila, and our agency.

[22:30] TU Delft Student: And how do you view the timeline for construction?

[23:15] (Consultant): [ID] The temporary renovation will take approximately 1 to 2 months once started. The permanent bridge would be targeted for next fiscal year.

[24:45] Facilitator: [ID] The students will finalize their design proposals and report before departing in late October.

[26:00] (Tourism Agency): Thank you so much. We really appreciate your collaboration and dedication to Cemare!

[27:30] (Consultant): [ID] I will send the CAD/SketchUp drawings and budget breakdown right after this meeting.

[29:00] TU Delft Presenter: Thank you, Mr. Eka. That will help us tremendously in refining the model.

[31:15] Interviewer (TU Delft): We will include all these points in our final presentation and hand over the report.

[33:30] (Tourism Agency): [ID] Let us make sure this bridge benefits the local economy and preserves the beautiful nature.

[36:00] Facilitator: [ID] Alright, everything is clear and agreed upon.

[38:00] (Tourism Agency): Thank you very much, safe travels around Lombok!

[40:11] Facilitator: [ID] ...special vehicles picking them up from local residents. So that creates new local jobs, and because locals manage it, even when the new bridge is completed, it becomes an established habit and livelihood that they won't want to lose.

[40:35] (Tourism Agency): School, bro! [laughter] School! Yeah, Nedi.

[40:40] (Tourism Agency): [ID] Meaning like this: I agree maybe, yeah. But thank you for your presentations, and yeah, I think it's a productive discussion. Only I want to convey what Mr. Erwin's idea is. Maybe note this down, , as meeting minutes for today, even though it's not finished.

[41:20] (Tourism Agency): [ID] To ensure whether we proceed or not with this project, Mas: I need backup support, official letters from the Hamlet (Dusun), Village Head (Kades), and Sub-district Head (Camat), stating that besides the letter, there is a declaration that they urgently need this for economy and logistics to cross.

[42:00] (Tourism Agency): [ID] But with the note that the most emphasized point is: emergency. Specifically for emergencies. So that hopefully if anything happens, it prepares everyone, including Pak Erwin. 'Look Pak, we did this because of community demand, here is their declaration letter.'

[42:35] (Tourism Agency): [ID] Including the SOP created by Bapak: when this is prepared, we will install a portal barrier and execute the advice given earlier: only side-bridge access, starting from the finish point, maybe walking, or small cars, or picking up using cidomo [horse cart] for community empowerment.

[43:10] (Tourism Agency): You know cidomo? Horse carriage, traditional transportation in Cemare. So that empowers the locals.

[43:40] (Tourism Agency): [ID] What is strictly forbidden under any circumstances is passing by trucks. Buses and trucks cannot pass; odong-odong cannot pass. And please draft that in writing this afternoon, so it can be signed by Camat, Kades, and Bapak.

[44:20] (Tourism Agency): [ID] That is the second point. The third: this bridge has a maximum lifespan of 6 months, so we must budget in next year's fiscal plan to completely rebuild the new bridge in PUPR. We will submit that agreement to Pak Sekda and .

[45:10] (Tourism Agency): Why? Because existing, you know, it's so... it's so danger for the people. Danger for me and for us! [laughter]

[45:30] TU Delft Student: Yeah, but the new bridge will not be built tomorrow, right? So you need something in between the time. Of course. We understand you need more information about the current situation.

[46:15] TU Delft Student: I want to say something about the portal, right? About limiting heavy vehicles. The bridge is also an evacuation method when things go bad on the mangrove, right? So when people really need to pass, they still need to do so. How would you physically restrict heavy vehicles?

[47:00] Facilitator: [ID] They ask: if suddenly there is an emergency like floods or tsunami and people need to evacuate with vehicles, can they still pass through the portal?

[47:30] (Consultant): [ID] The portal is planned with an open-and-close system, not only for emergencies but also for village events in Cemare. The width is set to private car dimensions, and the height is restricted. In emergencies, the portal lock is opened so vehicles can pass freely.

[48:30] Facilitator: So in an emergency situation, it can still be opened, but during normal hours it will remain locked. It will be restricted to private car width and 2 meters height.

[49:15] TU Delft Student: Okay, thanks. Can you clarify their vision for the new bridge? Are there restrictions or regulations for the new bridge design?

[50:00] Facilitator: [ID] For the new bridge, are there specific requirements, concept restrictions, or design guidelines needed by the community?

[50:30] (Consultant): [ID] Because Cemare is a tourism destination, help us design a bridge with artistic value—aesthetic, not just functional. Also, fishermen pass back and forth underneath, so the concrete structure must have sufficient clearance and not obstruct boats.

[51:30] Facilitator: The requirements: Cemare is a holiday destination, so the local community wants an iconic, beautiful bridge landmark. And for the piers, they want them spaced so fishermen's boats can navigate freely underneath without obstruction at high tide.

[52:30] TU Delft Student: We talked with local residents and Eco Green, and we have a list of around 60 requirements that we are combining into our design proposals.

[53:30] (Tourism Agency): Lot of opinions! [laughter] That makes it more interesting.

[54:20] Facilitator: [ID] They gathered 60 inputs from local residents, drivers, and tourists to create an iconic bridge with wide clearance underneath for boat traffic.

[55:30] (Consultant): [ID] We hope this bridge becomes Instagrammable, a collaborative landmark between TU Delft and our local government.

[56:45] TU Delft Student: Could you provide any list of official requirements or previous plans from the regency so we can compare and integrate them into our final proposal?

[57:45] (Tourism Agency): [ID] They need inputs for the proposal, , technical requirements and community needs.

[58:30] TU Delft Student: Like carrying capacity, load requirements, or specific environmental factors, so we can align everything.

[59:30] (Tourism Agency): [ID] will provide all technical answers, criteria, materials, and guidelines for your proposal.

[60:45] (Consultant): [ID] I will send the list and technical drawings via WhatsApp right after this.

[61:30] TU Delft Student: Perfect. When can we expect the model or drawing?

[62:00] (Consultant): [ID] Maybe tomorrow, by Friday.

[63:00] TU Delft Student: One final question: to what extent have environmental factors been considered, such as corrosion from saltwater, tides, earthquakes, and sea level rise?

[64:00] Facilitator: [ID] They ask: for renovation and future construction, how are natural disasters, tidal fluctuations, and marine corrosion being accounted for?

[64:45] (Consultant): [ID] For natural disasters, the suspension bridge serves as temporary evacuation access. During renovation, the bridge will be closed for approximately 2 months for deck repairs. For the new bridge, an AMDAL [environmental impact assessment] will be conducted beforehand.

[66:30] Facilitator: [ID] They also ask about corrosion from saltwater on the steel elements.

[67:00] (Consultant): [ID] For steel, we plan to replace rusted components and apply protective paint coatings to delay corrosion.

[68:00] (Tourism Agency): [ID] Now this is urgent for tourism and economy under our agency, but later it must transition to PUPR for technical engineering.

[70:00] (Tourism Agency): [ID] We are thankful for TU Delft's presence. When I saw the bottom condition of the bridge, I realized how dangerous it is!

[71:30] Facilitator: For corrosion, they plan to paint and treat it. For emergencies, the skybridge and portal provide backup access. Notifications will be given a week before construction so vehicles park outside.

[72:45] TU Delft Student: Thank you so much for this very helpful meeting!

[73:20] (Tourism Agency): Thank you very much. All the best for your project!

Second recording

[00:00] Government Official 1: [ID] It can be seen like that, someone built and then stopped, built and then stopped. We also want to resolve that issue so it doesn't repeat: build then stop, build then stop.

[00:10] Sabila (IBF): [ID] Yeah, like looking at the impact. If there is construction for fishermen's facilities, that should be integrated...

[00:15] (Consultant): [ID] Yes, we also received information about that. It's just that it is currently under the Marine and Fisheries Agency (Dinas Perikanan). That is why local government agencies (OPD) sometimes lack coordination in their activities; suddenly an agency appears on its own...

[00:28] Sabila (IBF): [ID] That's what I don't want. It ends up being fragmented.

[00:33] Government Official 2: [laughter] [ID] Yes, like that.

[00:40] (Consultant): [ID] Many activities are like that. What always becomes a dilemma for regional governments is: when a program comes from the central government, placed in the region, the one contacted is not the Regent (Bupati) or Governor, but directly the Village Head (Kepala Desa). The question to the Village Head is: 'Is there village land? We want to

build a fishermen's cooperative.' 'Oh, there is!' 'Where?' 'There.' Okay, plotted directly without studying its position, how its access is, whether it's feasible or not to build there...

[01:14] Sabila (IBF): [ID] That answers my questions all this time! [laughter] So it's about individual interests.

[01:25] (Consultant): [ID] Exactly... A simple example is this bridge. This bridge, back in 2021 if I'm not mistaken, we drafted a Master Plan for Cemare tourism. Our first identification was indeed the bridge. In that master plan, we designed that at the front area, visitors leave their vehicles. Parking is in front, so a kind of Tourist Information Centre is in front. Visitors decide where to go in Cemare, then they are directed. They walk across the bridge, and on the opposite side they are greeted: they can ride horses, ride cidomo [horse cart], or take sampan [boats] according to their tour. Made similar to Gili. That was the concept.

[02:15] (Consultant): [ID] But again, our master plan was only read, not implemented. During implementation, budgets appeared from the regency, from the province, without looking at the master plan. They constructed concrete pavement on the road yesterday. Our recommendation was paving blocks so rainwater could absorb into the soil. In Cemare, if you enter and turn right, it's concrete pavement, right? But the width is awkward: not wide enough for two cars, but too wide for one. When cars pass each other, one has to drop down into the ditch. That's what happens when master plans aren't followed.

[03:00] Government Official 1: [ID] That's why we shouldn't get tired. Especially when we have friends like these students. Earlier I also invited Pak Sekda [Regional Secretary], so Pak Sekda can see this from the start. We want to show: this is how proper planning is done, not just suddenly repairing something when the community reports damage. Actually how much budget is needed? Even I as a consultant was asked: 'Mas, there is 400 million, plan it for the bridge.' If I don't plan it, I'm wrong; if I plan it, well, this is what happens...

[04:06] Sabila (IBF): [ID] So people often look at scientific studies and think, 'What is this for?'

[04:12] (Consultant): [ID] They only see: 'Why is just a book costing 50 million or 25 million?' They look down upon studies, whereas before physical activity, this study comes first!

[04:25] Government Official 1: [ID] We are talking about West Lombok, but overall Indonesia is often like that.

[04:30] Sabila (IBF): [ID] Even people ask me: 'Why are you studying that? Is it important?' That's the mindset.

[05:00] (Consultant): [ID] Technically, [Head of Tourism Agency] was worried. But because the budget was placed in this agency, if not executed, he is faulted. So minimally, we find strong technical reasons to keep working without violating regulations. That's why we want to communicate to Bappeda: we will do this now, but please cover the bridge again next year or two years later. Don't say 'it's already repaired by Tourism, why bother again.' This is only temporary!

[05:50] Government Official 1: [ID] Yesterday's incident with the truck caused the Public Works agency (PUPR) to inspect internally. They don't take outside jobs right now, focusing on their own internal audits. So the target shifted to Tourism for tourism purposes. But like I said: if the purpose is tourism, it cannot handle heavy engineering. Technically, Tourism can only make an aesthetically pleasing bridge, beautiful, attractive, but temporary!

[06:30] Government Official 1: [ID] With these students coming, it supports tourism even more. Later I will share the photos with Pak Sekda. We need their assessment material to present to the village and Bappeda. Public Works (PU) already has detailed data; PU even mentioned 50 billion for a totally new bridge. That's why the background justification from the students is essential.

[07:15] Sabila (IBF): [ID] Yes, clarifying the organizational structure, who takes responsibility, so there is no confusion.

[07:30] (Consultant): [ID] Exactly, it takes time to explain all of this thoroughly.

Appendix B8: Eco Green

Table B.17 gives the details of the interview with Eco Green.

Table B.17 Interview details: Eco Green

Date & Location:	**Cemare Beach, Lembar Selatan, West Lombok, Indonesia (17-09-2026)**
Participants:	TU Delft researchers (English / Dutch) Respondent 1: Chair of Eco Green Cemare (Indonesian) Respondent 2: Interpreter / board member of Eco Green (English / Sasak)
Languages Spoken:	English, Indonesian [ID], Sasak [Sasak], Dutch [NL]
Translation Mode:	Full verbatim transcription translated into English (Indonesian and Sasak passages with original text and translation)
Transcription Rule:	Verbatim fidelity (fillers, repetitions and hesitations retained; no summarisation; [inaudible] for unclear words)
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian | [Sasak: "..."] = Original Sasak utterance followed by English translation

[00:00] Interviewer 1 (Dutch): [NL] Interview 5 and 6..

[02:03] Respondent 1: [ID] How could you be- I become an Eco Green member? Uh, initially we were a local community that wanted to uh provide a concrete step for the surrounding environment, especially our natural resources, uh and also for how to uh build a generation that is better in the future uh for us to make this village into a village that is conscious of uh natural resources. So that they later in the future manage the natural resources of this living place well and do not perform uh destruction, whether to the ecosystem, from environmental pollution, and others.

[03:10] Respondent 1: Okay, number three?

[03:11] Interviewer 2: Yeah.

[03:12] Respondent 1: [ID] Uh, I in Eco Green have the opportunity uh to become the leader in uh the structure of Cemare Eco Green, so that I am responsible to manage uh friends, members of Eco Green, uh how we conduct activities, starting from daily activities, conservation, and collaboration with uh universities and other environmental activists, other

organisations in Indonesia, especially local, to together uh give us uh inputs, good knowledge on how we should step and move to uh keep this activity alive.

[04:44] Respondent 2: [ID] Number four: how is your organisation structure?

[04:47] Respondent 1: [ID] Yes, uh if for the organisation structure of Eco Green, uh that is already available completely with uh divisions with duties and functions that uh we have agreed upon in our own organisation structure, namely Eco Green.

[05:07] Respondent 1: [ID] Annual budget? Oh, number of members? Yes, number of members... [Sasak: "Gelis aring ngitung nani?"] Quickly counting now? [Sasak: "Adek dua telu, opat, lima..."] Let's see: two, three, four, five... Fifteen, right? Fifteen. Number of members: fifteen uh people.

[05:32] Respondent 1: [ID] Annual budget: uh we do not possess a budget. Uh, the budget that we receive is uh from several collaborative activities, from several uh environmental activists, activities that uh require assistance from us, so that uh maintenance for uh budget financing from there we receive it, from collaboration and several program packages that we propose to partners.

[06:17] Respondent 1: [ID] Network? Uh...

[06:19] Respondent 2: [Sasak: "Tanggal pende- ya, jaringan."] What date did- yeah, network.

[06:21] Respondent 1: [ID] Network? Network: uh we open widely uh related to network, uh uh what, communication with all across sectors, especially friends who care about the environment, uh natural resources that exist in uh Lembar Selatan here. We were established almost... year what? 2001? 2001.

[07:01] Interviewer 2: Long time.

[07:02] Respondent 2: Yeah, long time. Long time.

[07:05] Respondent 1: [ID] Uh, please... how to participate? Participation: uh we want uh what, the generation in Cemare, all elements of society as a whole to participate in all activities that we conduct, organise, so that uh it makes it easier for us in uh conducting education. Because our target is how society takes part participating in all activities, whether it is education, social, uh conservation, so that uh our role and duty are slightly lighter when society already possesses uh takes part participating in an activity that we run.

[08:26] Respondent 1: [ID] So, our pur- purpose in Eco Green: how we create a generation that uh possesses knowledge about natural resources, especially with uh a level of awareness that is better than before us, so that in the future when we are no longer around, the next generation already possesses uh knowledge, understanding that is good to continue uh activities that we currently conduct.

[09:17] Respondent 2: [ID] Performance. Organisation performance. How is the organisation performance currently in achieving goals?

[09:21] Respondent 1: [ID] Yes, we share tasks with members uh for performance. So, there are uh divisions that are indeed filled by uh members too, who sometimes when there

is no time uh to participate because of the busyness of college lectures, so they, we uh divide tasks to run uh our duties so that goals keep running.

[09:59] Respondent 2: [ID] Are there obstacles hindering... slowing down the process?

[10:04] Respondent 1: [ID] Uh, obstacles and barriers always exist in every activity that indeed uh possesses positive value. Uh, not only from external, from internal too sometimes those challenges uh always exist, and that becomes dynamics that what, how we resolve uh every challenge and problem.

[10:43] Respondent 2: [Sasak: "Apa makna Eco Green?"] What is the meaning of Eco Green?

[10:44] Interviewer 2: Could you give an example, like, of such obstacles?

[10:49] Respondent 2: [Sasak: "Ya, basa ape sinek jari contoh misal tantangan."] Yes, what language can be an example, like a challenge?

[10:52] Respondent 1: [ID] Yes, uh... for example when an issue occurs that, in terms of, uh between government policy and the community. Then we have to, how to resolve that issue. Sometimes uh government policy does not align with our plan in Cemare here in building an area that is friendly, that is eco-friendly, friendly for tourists.

[11:39] Respondent 1: [ID] What is the meaning of Eco Green? Yes, we want uh the meaning of Eco Green is: how to build these natural resources eco-friendly, by putting forward uh the sustainability of natural resources, making uh these natural resources as the soul uh of us to conduct activities.

[12:12] Respondent 2: [ID] Does the community view Eco Green like that?

[12:14] Respondent 1: [ID] Huh? Oh, yes! So, uh, the community sees us as a mobiliser, the community sees us as a mobiliser that, a mobilising community that exists in uh this hamlet, in this village, to uh motivate all lines, from children, teenagers, up to parents, for how we uh have a sense of pride towards this dwelling place of ours, although we have not been optimal to uh manage, provide a usefulness for the community, but in principle they highly uh appreciate our existence.

[13:28] Respondent 2: [ID] Can you explain further regarding the relationship between Eco Green and Yayasan Biru Foundation and the government?

[13:34] Respondent 1: [ID] Yes, uh our relationship with Yayasan Biru Foundation, uh Alhamdulillah is very good, uh because uh Yayasan Biru Foundation so far takes part uh assisting us in activities that exist in uh Cemare here, especially in assistance uh and other education. And how is our relationship with the government? We very much maintain the relationship, so that how collaboration, communication can run. Because when uh our relationship is not good with the government, not right with the government, then the space for communication will close, dialogue will uh close, be shut. Well, we open that up, so that at any moment the government, when we need something, the government opens itself for us to dialogue, to discuss related to all plans of uh activities and policies that the government makes. That is why we must build an elegant communication, that is good with uh the government.

[15:10] Interviewer 2: Is the, um... If I understood right, it was about the communication with the government [Respondent 2: Yeah.] and that that needs to be open so they can have a dialogue if necessary? [Respondent 2: Yes, it's necessary.] Do you think that relation is the best it ever was, or in the past, was it better before?

[15:37] Respondent 2: Yeah, so the next, now, between the government, community here, so hand each other how to solve the the community problem everywhere right now. [Interviewer 2: Yeah.] And now we got uh many uh attention from uh especially for me, from uh West Lombok Regency. So our our regent post all his uh stakeholder to come to community. Everything they need, that's why.

[16:21] Interviewer 2: So it's better?

[16:22] Respondent 2: It's better right now.

[16:26] Interviewer 1: And is Eco Green now dependent on IBF, or if the IBF is gone, they will be independent?

[16:33] Respondent 2: Independent. Eco Green is independent. I mean, so, uh, Eco Green do a collaboration with anybody. [Interviewer 1: Yeah.] With, uh, Biru Foundation or with TU Delft, anybody. [Interviewer 1: Anybody that wants to.] So we we always open.

[16:53] Interviewer 2: Okay. Next?

[16:56] Respondent 2: Okay, next. [ID] What factors are most relied upon by the organisation to complete its mission?

[17:02] Respondent 1: [ID] Factors that are most relied upon by this organisation to complete its mission are: uh the strength and solidarity of uh the organisation members themselves, so that they stay uh solid and one goal to achieve that objective.

[17:34] Respondent 1: [ID] Next: opinion of the organisation regarding current situation around the bridge, right? Okay. Uh, opinion uh related to the bridge: this bridge uh represents a vital object that is very important for the community in Cemare, uh which is nearly seven hundred uh households that reside here uh to be active, starting from education, school children, social, economy, relying on this bridge as uh the main strength to conduct a uh development in the future. That is why uh it is very concerning indeed at this moment when the condition of the bridge uh lacks uh providing safety, comfort for the community, especially us who are in Cemare here, when being active. And this is very concerning indeed when uh it receives less of a positive response to uh be able to be renewed uh maximally by the government, but unfortunately due to budget limitations so that it only can perform renovations only, not rebuild uh as a whole.

[19:28] Respondent 1: Next?

[19:30] Interviewer 2: Yeah, okay. Um, so you need to convince the government, right? [Respondent 2: Yeah.] So you need a lot of movement behind your plans. [Respondent 2: Movement, yeah.] Um, but uh you are responsible for um nature restoration, right?

[19:50] Respondent 2: Yes.

[19:51] Interviewer 2: Do you think that the traffic that comes to the mangrove because of a better bridge condition, [Respondent 2: Yeah.] would that not impact the nature and the environment? Because more activity on the mangrove means maybe more waste, [Respondent 2: Yeah.] for example. So, we would like to know a bit more about your opinion on that.

[20:17] Respondent 2: Yes, thanks uh. So, during our activities here, that's what we do, because we cannot cover everything right now, because the we have not so many uh I mean, uh, team, but we we try to, together with all the community here, to cover that that's problem, especially about waste, everything here. [Interviewer 2: Yeah.] So we try to to asking anybody here, 'Okay, let's do, let's do,' like that.

[20:57] Interviewer 2: So you you trust that you could like receive more people here [Respondent 2: More people, yeah.] and uh lower the impact of more people, right?

[21:07] Respondent 2: Yeah.

[21:08] Interviewer 2: Okay. Okay, yeah, next question.

[21:10] Respondent 1: [ID] Important things need to be considered when renovating the bridge in general, building infrastructure connections between mainland and mangrove forest?

[21:18] Respondent 1: [ID] Yes. Uh, important consideration that needs to be taken when building this bridge is: uh for the bridge uh to the mangrove trekking area, uh we want that mangrove forest exclusive. Uh so it is not connected with the main bridge, public bridge as a whole. Uh this public bridge is only as mobilisation, uh main necessity of the community, main access of tourists to enter this place. So we do not want there is this public bridge, this big one, connected directly with uh mangrove, mangrove area. Because uh we do not sell that mangrove as uh what, a place to gain profit. Because... yes, uh we want the mangrove to stay standing on its own, without being connected with uh the main bridge. So that sustainability for the mangrove continues to run, because we want this mangrove to remain existing until we are gone, so that our generation finds this mangrove still good uh and still intact as a fortress of our dwelling place.

[23:19] Interviewer 2: How would you how would you realise that, how would you imagine that in terms of design? Um, so we understood that um the mangrove, that the new bridge should not be something to profit on. Uh, it needs to be... let's see... you don't want to sell the mangrove [Respondent 2: Yeah.] as a place to make profit, [Respondent 2: Yeah.] right? People need to come here to see the mangrove, [Respondent 2: That's right.] not for like for other businesses. [Respondent 2: Yeah, so...] So how could you...

[23:54] Respondent 2: So, yeah. So, perhaps I can uh explain a little bit, so why we have to separate between uh the main bridge and then mangrove? [Interviewer 2: Yeah.] So, from our community, from Eco Green itself, so we use that the the mangrove trekking for education and we do a restoration there, not for uh I mean, so, uh to do to do something for commercial. No, not like that.

[24:41] Interviewer 1: No restaurant, no shops.

[24:44] Respondent 2: No shop, yeah. So, we want to make it more more natural. [Interviewer 2: Yeah.] Yeah. So, difference. So if if we talk about uh the main bridge, that's the connectivity [Interviewer 2: Yeah.] between the community. I mean, for uh main access. That that that that's the the difference.

[25:12] Interviewer 2: Because a lot of tourism come during the weekend, [Respondent 2: Yeah.] but they don't all come for the mangrove. [Respondent 2: Yeah.] But they use the bridge, right? [Respondent 2: Yeah.] They are the biggest group that use the bridge. [Respondent 2: Yeah.] So when the new bridge gets built, it's probably going to be more for them [Respondent 2: Yeah.] than for people that come for the mangrove. [Respondent 2: Yeah, that's right.] How would you... and you want to separate that? [Respondent 2: Yeah, we want to separate.] Do you imagine two bridges, or...?

[25:40] Respondent 2: So, according to, I mean, so uh I mean, so to our community itself about the main bridge, we only need one bridge, that that's it. [Interviewer 2: Yeah, one bridge.] One bridge, that's it, not to build another one. If only the the central government want to build, I mean, so a little bit bigger or something taller, or I don't know exactly. But for sure, for these years, so the government want to to only to renovate first. After we have a a good uh I mean, so support from uh government, we already apply to the central government for new bridge, the new bridge, yeah.

[26:45] Interviewer 2: Then it's important to know what kind of bridge you want, [Respondent 2: Yeah.] right? If the new bridge gets built.

[26:50] Respondent 2: Yeah, so for because we are uh surrounded by mangrove ecosystem, [Interviewer 2: Yeah.] so we need uh a wood bridge, so will be, I mean, so not like a concrete one or the the direct one, no, we are not like that. It's more natural.

[27:14] Interviewer 1: Wood is more natural, it's more in the picture of...

[27:16] Respondent 2: Yeah, in the picture.

[27:18] Interviewer 2: Local materials.

[27:19] Respondent 2: Yeah, local material we do, we want to get that.

[27:22] Interviewer 1: And and uh would it be like if you would because, for example, trucks are are really damaging the bridge right now. [Respondent 2: Yeah.] Uh would you say like only, for example, local people can cross the the the bridge with the cars, and then uh there there won't be that many tourists with cars? [Respondent 2: Yeah.] Is that like an option, that they can only walk to the mangroves and the beach?

[27:46] Respondent 2: Yeah, I think for now this, we we we we cannot uh be like that until the government repair totally [Interviewer 1: Yeah.] the bridge first. But now, so we I mean, so we give a a chance for anybody to cross the bridge first. But whenever it's will be fixed by the government or under construction, we have to, I mean, stop everythings, [Interviewer 2: Yeah.] like a cars. [Interviewer 2: Yeah.] Yeah.

[28:30] Interviewer 2: Because those buses that carry tourists, [Respondent 2: Yeah.] you don't want them to cross the bridge, right? [Respondent 2: No, we don't, yeah.] Also they're not the new bridge, [Respondent 2: Just just stop, yeah, that place, yeah.] Yeah, okay, yeah.

Even though it's a new bridge, right? [Respondent 2: Yeah.] You still don't want the buses to cross. Okay.

[28:51] Respondent 2: So we already uh plan, we have a plan already how uh uh the bridge looks like after. [Interviewer 2: Really? Can you show it?] Yeah, so not all the vehicle can uh pass the the bridge, no. [Interviewer 2: No, okay.]

[29:08] Interviewer 1: Can you uh send it, like the plan? Do you already have it, like on...?

[29:11] Respondent 2: [Sasak: "Arak model contohne?"] Is there a model example of it? So we have a in this year we are going to uh to build like uh uh a gate. It's it's like a like a gate later. [Interviewer 1: Yeah, yeah.] You know that the the height of uh vehicles around two and a half or two meters, maybe not till three meters. [Interviewer 1: Yeah.] So the big vehicles cannot pass [Interviewer 2: Yeah.] like that. So we have to stop like that. [Interviewer 2: Yeah.] So it's it's like uh like the buses, a truck, [Interviewer 1: Yeah.] that stop before the bridge.

[29:56] Interviewer 1: And and if local people want to build a house here and they need the material, and you need big trucks, would you like open the gate then, or no? Or they just have to bring it in scooters? Because you don't want construction here.

[30:09] Respondent 2: No, no. No, not really. Yeah. So that that that they have to uh carry twice. I mean, uh they using uh a small car, [Interviewer 1: Yeah.] small pick-up like that.

[30:21] Interviewer 2: Yeah, but for example, if they want to build something big, like a like the mosque, [Respondent 1: The mosque.] then they probably need trucks. You don't want the trucks?

[30:33] Respondent 2: The next, uh, we have uh already informed to all the villagers, to the community here about uh the situation about the bridge. And then after, when the government want to uh repairs, so that's it's already informed by the the government.

[31:02] Interviewer 1: And they agree?

[31:03] Respondent 2: They agree. Because this not only for one or two persons, all of us here. Not only from here, from other side. [Interviewer 2: Are these tourists?] Yeah, [laughter] [Sasak: "Sai niki, Pak Kadus? Sai?"] Who are these, Pak Kadus? Who? Oh, the tourists! [laughter] Local tourists.

[31:26] Interviewer 2: So these are these are local tourists. [Respondent 2: Yeah, local tourists.] They don't live here, but they come. [Respondent 2: No, no, they come. Local tourists.] Okay. They come by bus?

[31:34] Respondent 2: Yeah. [laughter]

[31:36] Interviewer 2: Did they arrive with the bus or with...?

[31:37] Respondent 2: Yeah, that that that the one.

[31:39] Interviewer 1: Oh, in the back of a truck, yeah. Small truck.

[31:43] Interviewer 2: Okay, so I think we can skip question eleven, because uh... [Interviewer 1: Yeah, yeah.] Yeah. So could we um move over to question twelve?

[31:56] Interviewer 1: No, I think twelve we also... You are aware of the bridge condition, of course. Uh, yeah, we were... uh the skybridge, right?

[32:09] Respondent 2: Skybridge, yeah.

[32:10] Interviewer 2: Was Eco Green involved with the design of the skybridge?

[32:13] Respondent 2: No, no, we are not involved.

[32:15] Interviewer 2: Did you try to get involved?

[32:17] Respondent 2: So, we we are not concerned on the bridge, but we are before from uh like I told you told me before that from uh a state electricity company already built a mangrove trekking down the the skybridge. But now it's broken.

[32:46] Interviewer 1: It's broken again. They don't care about it, they just put it there and then leave. [Respondent 2: Yeah.] Nobody handled it.

[32:53] Interviewer 2: Could we uh move to question fourteen?

[32:57] Respondent 2: Fourteen. [ID] Fourteen. [Respondent 1: Fourteen, what is this?] Fourteen, regarding the renovation plan? Number fourteen: 14, yeah.

[33:09] Respondent 1: [ID] In your opinion, who has a greater influence in formulating bridge renovation plans: the government or the local community?

[33:17] Respondent 1: [ID] Yes. Uh related to the greater influence in formulating the bridge renovation plan is uh the government, because the government possesses the budget that later will be synchronised with uh the community uh for uh its technical aspects, uh so that there is what, input from the local community for in in the formulation of uh that bridge plan. Uh indeed there must be a collaboration between government and community, so that planning uh with a minimal budget can be maximally implemented.

[34:21] Respondent 1: [ID] Next: In your opinion, how long should the bridge that has been renovated be able to last in terms of years?

[34:28] Interviewer 2: So it's about the bridge that [Respondent 2: Yeah.] they think it will last five years. [Respondent 2: Around five years.] Do you think it will last five years? [Respondent 2: Five years, yeah.] You agree?

[34:39] Respondent 2: Maybe more, maybe six or seven years, I think so. If they renovate it now, yeah.

[34:46] Interviewer 2: Based on the budget they have right now to renovate?

[34:49] Respondent 2: Because according to the national economic situation right now, we we cannot predict about that. I mean, we can uh get uh more money to to build a new one. [Interviewer 1: Yeah, yeah.] Yeah, that's the problem.

[35:08] Interviewer 2: So you trust it will be it will last long enough?

[35:12] Respondent 2: Uh but I'm sure from the government, they will always uh I mean, uh take attention for that bridge.

[35:21] Interviewer 1: They care about it, department of tourism.

[35:23] Interviewer 2: Even even though it breaks down, there will be another renovation, you think, [Respondent 2: Yeah.] before they build a new bridge. [Respondent 2: Yeah.] So it's trust. [Respondent 2: Yeah.] Okay. Uh next question?

[35:36] Respondent 2: [ID] Okay, next: 15, right? Number 15? Oh, 16. Uh 16, 16. Who crosses the bridge most often every week?

[35:54] Respondent 1: [ID] Yes. Uh this bridge, if we look at it, it uh quickly incurs damage because of the very high activity uh of the community that uh uses this bridge. Uh not only uh local people who cross, but almost uh all uh visitors, activities that are in uh Cemare here. If we look from uh based on what, grouping, uh tourists are the ones who are more active in Cemare here. And the community at most uh if local community at most between three to four times uh back and forth out uh to buy necessities uh from this bridge.

[37:11] Respondent 1: [ID] What is the impact of tourism on the Eco Green mission, please explain?

[37:16] Respondent 1: [ID] Yes. Uh our challenge is when the impact of this tourism uh incurs an instability towards uh our mission in Eco Green to protect the environment, protect the mangrove ecosystem, natural resources that are here in uh a very large level of visits, which certainly not all visitors are educated to provide a positive impact. There are times uh some visitors who indeed still do not possess uh positive educated mindset when coming to this place. Uh for example when they bring food with a lot of trash, then leave it behind, this is uh a challenge that is not good for us, so that we must conduct education also to visitors.

[38:39] Respondent 1: [ID] The positive impact, uh the economy runs. So the community gains uh benefits uh from the high level of visits from tourists, both local and outside, so that uh when economic movement runs, the community is faster for us to educate.

[39:09] Respondent 1: [ID] What else? Next: In the past they collected fees for crossing the bridge on weekends, in your opinion why was this system... Yes! We were the ones who requested for them to be stopped! Because it did not provide feedback to good infrastructure. [Interviewer 2: You guys?] Yes! So we requested them to stop because they were not uh capable of providing feedback from that revenue. [Respondent 2: Yeah.] Not good the management. [Interviewer 2: Yeah.] So we stopped that because we saw it did not provide a positive impact for infrastructure, for repair of uh the bridge, road, lighting for the surrounding community.

[40:17] Interviewer 1: Would it be possible for Eco Green or BUMDes [Respondent 2: BUMDes, from BUMDes.] to uh reimplement this system and to use it for the bridge, or is that not a option?

[40:27] Respondent 2: From BUMDes. [Interviewer 1: BUMDes.] Yeah, but not from Eco Green, not Eco Green. [Interviewer 1: BUMDes did it already? Yeah.] Okay, but is there a way that it could work, this toll system?

[40:37] Respondent 1: [ID] Eco Green was not involved! Eco Green is not involved in government management. We remain standing outside to control the running of government

policies that are in Lembar Selatan. From the utilisation of areas, natural resources, we are outside. Because we do not want to be touched directly by activities that possess the potential to damage our image in the community.

[41:14] Interviewer 2: Yeah. But, for example, if if the money was used [Respondent 2: Yeah.] to restore the bridge, to maintain the bridge, [Respondent 2: Yeah.] would then such a system be welcomed by you, by Eco Green?

[41:30] Respondent 2: Means, uh...

[41:32] Interviewer 2: Okay, could you translate?

[41:34] Respondent 2: So, I mean, so Eco Green will, I mean, so will take a part to to handle the money and then to I mean to collaboration about the bridge, like that? So I think it's it's impossible, because we are not a part of the the government. We are in outsider.

[42:04] Interviewer 2: So you can never know where where the money is going, right?

[42:07] Respondent 2: So we we know. We we know that, because about uh amount of the people crossing... [Interviewer 2: Yeah.] I mean, and then we can calculate from uh, for example, Saturday and then Sunday, I mean, it's look like a high season, a lot of visitors coming. So per car around Rp 10,000, and then a motorbike around Rp 5,000 for one motorbike. And then if we calculate...

[42:50] Interviewer 2: It's a lot of money.

[42:51] Respondent 2: A lot of money! [Interviewer 2: Yeah.] A lot of money! More than, uh, I mean, so in average around uh four hundred of till five hundred uh people cross [Interviewer 1: Each day.] each day.

[43:10] Interviewer 2: Could you uh could you I want to ask him something, could you translate? Uh, you're not a fan of the uh toll system, right? [Respondent 2: Yeah.] Because you don't know where the money is going, and you don't want the government to profit off people that are coming here, [Respondent 2: Yeah, right?] right? However, the bridge needs to be maintained, [Respondent 2: Yeah.] so there needs to be money at all times to do so. Would you then think uh a toll system would still not be a solution for that, or would you then agree if the money is going for renovation?

[44:03] Respondent 2: [Sasak: "Ndek cuma kan anuk tol no mbe saq lebih anuk separan side tiq? Untuk mbe te?"] So regarding that toll, which one do you think is more appropriate? For what?

[44:13] Respondent 2: [ID] Well, this is the question: whether for renovation, is it better for renovation, or how regarding that toll system?

[44:21] Respondent 1: [ID] Yes, uh we still will uh head towards that, because for the repair of this bridge it requires costs, uh before the government budgets a bridge that is permanent. That is permanent to uh be built, so that there is no in the future there is no maintenance that we cost that we uh allocate for bridge repair. If currently, we indeed need, Pak, the bridge for uh temporary repair.

[45:10] Interviewer 2: Where does the money where where will the money come from for the new bridge, to maintain the new bridge?

[45:19] Respondent 2: To maintain the new bridge, now?

[45:21] Interviewer 2: If you build a new bridge, [Respondent 2: A new bridge.] and after ten years it needs maintenance, [Respondent 2: Maintenance.] where does that money come from?

[45:28] Respondent 2: Must come from the government. From...

[45:30] Interviewer 2: Not from people that pay to use the bridge?

[45:34] Respondent 2: No, no. [Respondent 1: For the bridge in the future, its maintenance?]

[45:41] Respondent 1: [ID] As long as the community... the government manages well, the community will give support, mutual cooperation (gotong royong) to repair the bridge voluntarily when damage occurs.

[45:56] Respondent 2: Yeah, so gotong royong, collaboration.

[46:01] Respondent 1: [ID] Before this bridge damage occurred, previously it had already occurred, damage that was worse. And that we performed repair with gotong royong together with the community to repair, without any interference from the government [Interviewer 2: Okay.] even a bit. So that currently damage occurs again, only now we communicate with the local government of West Lombok [Interviewer 2: So the people do it.] to perform repairs.

[46:44] Interviewer 2: Okay. Uh so you don't want the tourists to pay for maintenance?

[46:49] Respondent 2: No, no, we don't want.

[46:50] Interviewer 1: Because you're afraid they won't come?

[46:52] Respondent 2: I mean, so, because if we are now we're in a a tourist area, [Interviewer 2: Yeah.] tourist area, and then the bridge, it's just like a highway. [Interviewer 2: Yeah.] It's just like a highway, so anybody can cross. So I mean if you want to to get some money, only in the parking area like this. Or if if only the government want to uh give attention to build of any facility, okay, no problem. But before we we trust that the the government from uh BUMDes, like you said before, I disagree they collect a money from the the bridge. I disagree! [Interviewer 2: Because that's a disagreement with the government...] Yeah. Before they did it, I already talked, I already told them that that is suicide. I said that is suicide. You kill yourself.

[48:07] Interviewer 2: Okay.

[48:07] Respondent 2: Because, you know, not only talking about the the bridge, but any infrastructure in everywhere in this area, [Interviewer 2: You don't pay.] not good maintenance. [Interviewer 2: Like roads.] Yeah. That that that's uh we we got so many complaints from all the visitors here, and also from local people here.

[48:31] Interviewer 2: So you say that like uh getting money from the usage of the bridge by toll doesn't solve [Respondent 2: The problems here.] the problems, because a lot of other bridges and roads are also not maintained [Respondent 2: Yeah.] and they also don't collect toll. [Respondent 2: Yeah.] Okay, that makes sense.

[48:51] Respondent 2: Yeah. That that that's why, I mean, so we are from the Eco Green, we we forced the government to stop it. That that that's the problem here. So this is not only one or two years...

[49:10] Interviewer 1: Many years.

[49:11] Respondent 2: Many years. Yeah, if we calculate, well, we can build a good house. [laughter] [Interviewer 1: Yeah, build a new mosque.] Really!

[49:22] Interviewer 2: So the money needs to come from somewhere else than people that when they use the bridge, they pay. [Respondent 2: Yeah.] You don't want that. [Respondent 2: Yeah.] You want that the money from directly from the government.

[49:34] Respondent 2: Government. And then we already give advice to the government from Lembar Selatan government [Interviewer 2: Yeah.] that if you want to create your place, like this, we are in Cemare, we have so many potential. We are so potential, you can build anything here, but we... because we're in a tourism area right now, tourism area, so you can uh give any services to the visitor, or you can buy some banana boat or something to I mean, so how to to make a people come here, and then yeah, this can spend money here.

[50:28] Interviewer 2: They spend the money, and the tax and the tax can go to the bridge.

[50:31] Respondent 2: Yeah, to the bridge.

[50:32] Interviewer 2: Yeah, okay. No direct money from using the bridge, [Respondent 2: No.] but indirect.

[50:37] Respondent 2: No, yeah. [Interviewer 2: Okay.]

[50:39] Interviewer 2: Okay, that's it's pretty clear. Um, it's good to know your opinion on on that. Um, so do we have two two more questions left?

[50:52] Interviewer 1: Yeah.

[50:53] Interviewer 2: So, um, it's question nineteen.

[50:57] Respondent 2: Nineteen, nineteen.

[51:00] Respondent 1: [ID] Number 19?

[51:14] Respondent 1: [ID] Can this bridge still be relied upon when a natural disaster occurs, such as a flood or tsunami? Well, can this bridge be relied upon?

[51:30] Respondent 2: Complicated question.

[51:33] Respondent 1: [ID] Uh, for tsunami and flood disasters, it is not good. [laughter] [Interviewer 2: Okay.] Yeah, it cannot be relied upon uh if the condition is in current damage.

[51:49] Interviewer 1: Yeah, unreliable.

[51:51] Interviewer 2: Uh the new bridge needs to be reliable. [Respondent 2: Yeah.] And if the bridge gets renovated, do you think that bridge is then reliable?

[52:03] Respondent 2: Yeah, I think so.

[52:04] Interviewer 2: So we're talking not about the new bridge, but the renovated bridge.

[52:07] Respondent 2: Renovated bridge, I think so.

[52:09] Interviewer 2: So the renovated bridge would be suitable to withstand a tsunami?

[52:13] Respondent 2: Yeah, I think so.

[52:15] Interviewer 2: Because the pillars underneath the bridge are not going to be replaced. [laughter] I don't know if you saw them, but they're not in a good condition.

[52:27] Respondent 2: Yeah, not good. But a few days ago, I already talked with the consultant, Mr. Eka. [Interviewer 1: Yeah, Mr. Eka.] What do you think about the bridge? Which spot would you like to to repair this year? But I don't know exactly which spot.

[52:51] Interviewer 2: They talk about the upper layer, [Respondent 2: Upper layer.] not the structure underneath. [Respondent 2: Structure.] But the structure underneath is important if [Respondent 2: Yeah, that's...] in a tsunami, right? [Respondent 2: That's...]

[53:02] Interviewer 1: Who who who did What did Who is Mr. Eka? Is he from the government, or from an external...?

[53:07] Respondent 2: He's not not external, he's not the government, but consultant. [Interviewer 2: He works for the government, but he's external.] Yeah, external. [Interviewer 2: Not part of the government. No, not part of the government.]

[53:18] Interviewer 2: You don't uh, are you not worried that in the coming six years, something can happen, and even though the bridge is renovated, [Respondent 2: Yeah.] the bridge can still collapse? [laughter] [Respondent 2: Yeah.]

[53:32] Respondent 2: I mean, so, for example, six years, I think you come here and then you can do, I mean, so after the the bridge renovate, you think that uh you can collapse or...?

[53:50] Interviewer 2: No, I I mean that um the if the bridge gets renovated today, [Respondent 2: Yeah.] then we have a temporary solution, right? But when a tsunami comes, [laughter] then it's still not good enough. [Respondent 2: Not good enough.] So in the next six years, you take a risk [Respondent 2: Yeah.] that when a flood happens or a tsunami, it's still too dangerous. It's still not safe for the next coming six years, even though the the planks get replaced, right? So it's a bit better, but still not safe.

[54:41] Respondent 2: Still not safe.

[54:43] Interviewer 1: Don't you have skybridge?

[54:45] Respondent 2: Skybridge? Yeah, that's the skybridge, uh I mean, so the the planning of it used only for evacuation. [Interviewer 1: Yeah.] That one, the skybridge.

[55:03] Interviewer 1: Do people have enough time to go there? Is that reliable?

[55:10] Respondent 2: Uh, because you know that Cemare Beach, this is like a long uh coastal beaches here. So the not uh the population is not only lives in one place, it's spread like that. [Interviewer 1: Yeah.] Yeah, about two or three or four kilometres. [Interviewer 1: Yeah.]

[55:40] Respondent 2: So there are another option in the northern. We we have a a small bridge, but not so big like that one, was only for a motorbike or just cross. [Interviewer 1: No cars for either, yeah.] Yeah.

[56:06] Interviewer 1: Uh, so then uh twenty, about the tide?

[56:09] Respondent 1: [ID] Impact of high/low tide on this bridge?

[56:12] Respondent 2: Not, no, no impact about the tide.

[56:15] Respondent 1: [ID] There is no impact.

[56:19] Interviewer 1: Okay. Uh, then we will check one more time if we have any last questions.

[56:31] Interviewer 1: Well, if you have any more photos of the past, of the bridge?

[56:37] Respondent 2: [Sasak: "Ara foto saq laeq?"] Are there photos from the past? Already sent to Sabila, you can try to check. [Interviewer 1: Oh yeah, okay, with the people visiting, yeah.] Yeah. Okay.

[57:04] Interviewer 1: And how many people are depending on tourism in Cemare?

[57:12] Respondent 2: Tourism? [ID] How many, huh? How many residents are depending on tourism? [Respondent 1: Depending on tourism?] I think, you know that's uh the majority population here are fishermen. But now, not only fishermen, this is like a a combination: uh fisheries and tourism right now. [Interviewer 1: Tourism, yeah.] Yeah, [laughter] yeah, right?

[57:43] Respondent 1: [ID] Fisheries and tourism, this is a combination.

[57:48] Interviewer 1: Would be if there would be no tourists now, it would be a problem for a small part, or for a lot of people?

[57:56] Respondent 2: Uh tourists is every day. Tourists is every day coming here.

[58:04] Interviewer 1: So if there are no tourists, that's bad.

[58:06] Respondent 2: No, no, no, tourists, yeah.

[58:08] Interviewer 2: Okay.

[58:14] Interviewer 1: Yeah, I think I think that is uh that is answer.

[58:20] Interviewer 1: So sometimes you go around the village and ask for money for repairs, right? For a quick renovation of the wooden planks? [Respondent 2: Yeah.] Uh, is that something that is still okay for the people? Do they still contribute, or is it being less every time?

[58:40] Respondent 2: If we take money direct to to the community, to the people here, we we won't do that, we won't do that.

[58:53] Interviewer 2: Where do you get money to repair something?

[58:56] Respondent 2: Uh yeah, like like a few months ago, [Interviewer 1: Yeah.] that's uh I mean, so we are not taking uh a fresh money, [Interviewer 1: Yeah.] but we we just like, what is it? So we invite them [Interviewer 2: To help.] to help, yeah. So what would you give? You have a wood, we can cut it, [Interviewer 1: Yeah.] like that. And then after, 'Oh, I have a machine for cutting uh the wood,' like that. [Interviewer 1: So everyone gets involved.] And then someone gets the bolts, like the screws. [Interviewer 1: The screw.]

[59:43] Respondent 1: [ID] Exactly, yesterday it was like that, right?

[59:46] Interviewer 1: Just working together, no one getting paid because they just want to help, everyone coming together as community to do it.

[59:52] Interviewer 2: Do you think that system would apply for the new bridge too?

[59:55] Respondent 2: Yeah, it would. I think so, we would like to do that. But...

[60:00] Interviewer 2: But maybe the new bridge has materials that are like harder to replace, like the skybridge is made from metal [Respondent 2: Yeah, that's right.] and this bridge is made from wood. So how would you replace something that's like metal, that would involve a lot more, you need welding, you need like rarer materials?

[60:26] Respondent 2: Yeah, that that's for professional, like a...

[60:29] Interviewer 2: So that that's why it's important that the new bridge can be like if the new bridge gets broken, it needs to be able to be repaired with by the local community, if I understand?

[60:44] Respondent 2: So we we we already uh talk with the government, with all the community here, that if only the government want to to fix or to build the the bridge, we we we ask them to to use I mean, like a local material, but not not uh from like like the concrete or something like that, like in skybridge, no, no, we are not like that.

[61:25] Interviewer 1: And you want the wooden bridge for the picture as well?

[61:27] Interviewer 2: A wooden bridge, yeah.

[61:28] Respondent 2: Wooden bridge, yeah.

[61:31] Interviewer 2: Would that maybe not last as long, right?

[61:34] Respondent 2: Yeah, so... So we have another material from a kind of wood that still get longer, you can use it till ten or fifteen or twenty years.

[61:52] Interviewer 1: Ulin wood.

[61:53] Respondent 2: Yeah, ulin, that's right.

[61:55] Interviewer 1: I know, but it's really expensive, right?

[61:57] Respondent 2: Yeah, expensive. Really.

[61:59] Interviewer 1: Where is it coming from, Lombok or no?

[62:00] Respondent 2: No, no, it's uh from Kalimantan, Borneo, yeah, Kalimantan. But it's hard to find it right now. [Interviewer 1: Yeah, it's hard. Not sustainable also. Not good for nature.] Yeah.

[62:21] Interviewer 1: Yeah, I think that's it. Thank you so much! Do you have any questions for us left, or...?

[62:28] Respondent 2: Uh, all right. I think so that's that's enough. Thank you.

[62:34] Interviewer 2: This is really helpful for us, yeah.

[62:37] Respondent 2: So, we are from on behalf of the community here, would like to say thank you for your coming here, and then you have a a great support, especially for the bridge. So we have to sounding this good idea to the government, especially to my government.

[63:05] Interviewer 2: Yeah, we we understand. We are amazed by your contribution, your drive to make a better impact. You're central in this.

[63:18] Respondent 2: So even I'm working as a government official, but I'm not talking uh about that I'm from the government. I'm a part of the community here. That that's what I do here.

[63:35] Interviewer 2: That's why you're here. You're talking on behalf of the people, not of...

[63:38] Respondent 2: Yeah, yeah. So I see the real one here, what we should do here.

[63:44] Interviewer 1: Yeah, I think you know the best, and you've also got the ideas, and uh yeah, some things that we are thinking of, you already you knew already! [laughter] I'm curious what they think about it.

[64:06] Interviewer 2: Yeah, thank you. We need to go to the other people, but...

[64:09] Respondent 2: Okay, thank you very much.

[64:10] Interviewer 2: Appreciate it very much!

[64:12] Interviewer 1: Thank you so much.

[64:14] Respondent 1 & 2: Thank you.

[64:17] Respondent 1: [ID] Want to go over there?

[64:18] Facilitator: [ID] Yes.

[64:19] Respondent 1: [ID] Okay then. Finished with this, amazing! Tomorrow join running, tomorrow! [laughter]

[64:30] Facilitator: [ID] From Eco Green, who is joining?

[64:32] Respondent 1: [ID] Us! With that person later.

Appendix B9: Survey Results

This appendix presents the results of a community survey about the condition, use and importance of the Cemare Bridge (Jembatan Cemare). A total of 47 respondents completed the questionnaire. The results provide an indication of how the bridge is used, how its current condition is perceived, and what the community considers important for its future.

1. Statistical Analysis

1.1 Respondent profile

The average age of respondents was 34.15 years (standard deviation = 8.45 years; median = 34 years; range = 16–50 years). Of the 47 respondents, 36 were men (76.6%) and 11 were women (23.4%).

Employment status was reported as follows:

- Full-time employed: 18 respondents (38.3%)
- Self-employed or business owner: 16 (34.0%)
- Part-time employed: 4 (8.5%)
- Pupil or student: 4 (8.5%)
- Unemployed or seeking work: 2 (4.3%)
- Other occupations, including honorary work or TNI: 3 (6.4%)

Twenty-three respondents (48.9%) lived in or directly around Cemare. The other 24 (51.1%) were frequent visitors, commuters or people working in the area.

1.2 Bridge use and travel patterns

Reported frequency of bridge use:

- Daily: 16 respondents (34.0%)
- Several times a week: 15 (31.9%)
- Several times a month: 7 (14.9%)
- Rarely: 6 (12.8%)
- Once a week: 2 (4.3%)
- Never: 1 (2.1%)

The main means of transport used were motorcycles (35 respondents; 74.5%), cars (11; 23.4%) and bicycles (1; 2.1%).

Bridge use was reported to be highest during weekends by 41 respondents (87.2%). This is likely related to the bridge’s role not only in everyday travel, but also as an access route for tourism and recreation at Cemare Beach. Regarding time of day, 29 respondents (61.7%) reported no major difference throughout the day, while 12 (25.5%) identified the morning as

the busiest period. In addition, 39 respondents (83.0%) estimated that more than 100 people cross the bridge each day.

1.3 Perceived condition and safety

Respondents assessed the physical condition of the bridge as follows:

- Very poor: 30 respondents (63.8%)
- Poor: 15 (31.9%)
- Reasonably good: 2 (4.3%)

In total, 45 respondents (95.7%) rated the bridge condition as poor or very poor. Concern about the bridge was also high: on a scale from 1 (not concerned) to 5 (extremely concerned), the average score was 4.77 (standard deviation = 0.70). Forty respondents (85.1%) selected the maximum score of 5.

When asked whether they considered the bridge safe to use, respondents answered:

- No: 34 respondents (72.3%)
- Maybe: 11 (23.4%)
- Yes: 1 (2.1%)
- Unknown or no answer: 1 (2.1%)

All 47 respondents (100%) indicated that the bridge needs repair or renovation. The most frequently selected priorities were repair of the bridge structure (39 respondents; 83.0%), repair of the deck or road surface (30; 63.8%), improved safety (25; 53.2%), improved accessibility (24; 51.1%) and widening the bridge (23; 48.9%). Respondents could select more than one priority.

1.4 Impact of a possible bridge closure

The perceived impact of closing the bridge was very high. On a scale from 1 to 5, the average impact score was 4.96 (standard deviation = 0.29), and 46 respondents (97.9%) gave the maximum score of 5.

Respondents estimated the additional one-way travel time caused by a closure as follows:

- 5–10 minutes: 4 respondents (8.5%)
- 10–20 minutes: 8 (17.0%)
- 20–30 minutes: 13 (27.7%)
- 30–60 minutes: 9 (19.1%)
- More than 60 minutes: 11 (23.4%)
- No additional travel time: 2 (4.3%)

Based on these estimates, 70.2% of respondents expected a delay of at least 20 minutes for a one-way trip if the bridge were closed. The areas of daily life most likely to be affected

were transport (37 respondents; 78.7%), work and income (35; 74.5%), education (35; 74.5%), access during emergencies (34; 72.3%), access to healthcare (33; 70.2%) and access to shops and other facilities (30; 63.8%). Multiple answers were allowed.

1.5 Responsibility, community support and renovation expectations

When asked which institutions should hold responsibility for the bridge, 34 respondents (72.3%) selected the regency, provincial or central government; 28 (59.6%) selected the village administration or local government; and 17 (36.2%) supported cooperation between multiple parties. Respondents could select more than one institution.

Thirty-six respondents (76.6%) said they were willing to contribute to the repair or renovation, while 9 (19.1%) answered “maybe” and 2 (4.3%) did not know. The most frequently selected forms of voluntary support were gotong royong (community-based voluntary work; 27 respondents, 57.4%), sharing knowledge or contacts (15; 31.9%), and helping with coordination or organisation (14; 29.8%). Eight respondents (17.0%) selected a financial contribution.

When asked specifically about financial contributions, 12 respondents (25.5%) said they were willing to contribute, 24 (51.1%) said they might contribute, and 10 (21.3%) said they would not. One respondent is not accounted for in these three categories in the supplied results.

Cost estimates varied. The most frequently selected ranges were IDR 2.5–10 billion (15 respondents; 31.9%) and IDR 200–500 million (10; 21.3%). Regarding the expected implementation period, 18 respondents (38.3%) selected 1–3 months and 12 (25.5%) selected 3–6 months. For the expected service life after renovation, 19 respondents (40.4%) selected more than 10–20 years and 12 (25.5%) selected 10–20 years.

2. Key Findings

2.1 Serious concerns about safety and the bridge condition

The survey indicates serious concern about the current condition of the Cemare Bridge. Almost all respondents (95.7%) rated its condition as poor or very poor, and 72.3% did not consider it safe to use. Open comments referred to corroded steel beams, rotten timber, holes in the deck and unstable support pillars. Some respondents considered collapse a realistic risk. All respondents agreed that repair or renovation is necessary. These are perceptions reported by respondents and should not be treated as a substitute for a professional structural inspection.

2.2 Importance for access and the local economy

The bridge is an important connection for residents and other users of the area. Respondents expect a closure to affect transport, work and income, education, emergency access and healthcare. More than 70% estimated that closure would add at least 20 minutes to a one-way journey. The bridge also provides access for visitors to Cemare Beach, linking its function to local tourism and recreation.

2.3 Strong willingness to contribute, alongside public responsibility

The survey suggests substantial community willingness to support the project: 76.6% said they were willing to contribute. Voluntary labour through gotong royong was the most frequently selected form of support, followed by sharing knowledge and contacts and helping with organisation. At the same time, respondents most often identified higher levels of government and the village administration as the institutions that should take responsibility. Community participation therefore appears to be viewed as complementary to public-sector responsibility, rather than a replacement for it.

3. Conclusion

The survey results indicate that the Cemare Bridge is considered to be in a critical condition and that its safety and accessibility are major concerns for its users. The bridge serves an important social and economic function for Cemare and the surrounding area. A closure could substantially disrupt everyday travel and access to employment, education, healthcare and emergency services, while also affecting access to local tourism.

There was unanimous agreement among the respondents that action is needed. Respondents expect the relevant government authorities and the village administration to take a leading role, particularly in relation to technical responsibility and funding. At the same time, many respondents expressed a willingness to contribute through gotong royong, knowledge-sharing and organisational support.

4. Discussion and Implications

4.1 Governance and management

Because respondents identified both the village administration and higher levels of government as responsible parties, cooperation between these institutions is important. The village administration could help coordinate community participation and local support, while the regency or provincial government could take the lead on the technical design and the main funding, subject to the responsibilities and resources of the relevant authorities.

4.2 Rules and maintenance

Responses suggest that clear rules for bridge use, such as vehicle or weight restrictions, may be lacking. Any renovated or replacement bridge should therefore have clearly communicated rules for permitted vehicles and loads, together with a defined inspection and maintenance schedule. These measures would support safe use and help achieve the intended service life.

4.3 Transparency

Some respondents emphasised transparency in the management of the project budget. Clear communication about costs, funding sources and how contributions are used may help maintain public trust and encourage community participation.

5. Limitations

The survey included 47 respondents. Although the results provide a clear indication of concerns among the people who participated, a larger sample would help strengthen the reliability of estimates, particularly those relating to costs and the effects of a possible

closure. The sample was also predominantly male (76.6%). Future research could seek more balanced representation, including women's experiences and needs relating to family travel and access to healthcare. The results reflect respondents' reported experiences and opinions; they do not independently establish the bridge's structural condition, actual traffic volume, project cost or the feasibility of a particular renovation option.

Appendix C: Formal positions of actors

Table C.1 gives the formal position of each actor and its rights and responsibilities regarding the Cemare Bridge.

Table C.1 Formal positions of actors and their rights and responsibilities regarding the Cemare Bridge

Actor	Formal position	Rights and responsibilities regarding the bridge	Content and location of the legal basis
National / provincial government			
National government (Ministry of Public Works, via BPJN NTB[a])	Central government; the Ministry of Public Works is responsible for national roads and general road policy, and operates in the region through BPJN NTB	Sets national road norms and standards; decides on regencies' funding proposals, such as DAK[b]; may financially assist regions that cannot fund their roads; takes over construction of regency roads if the regency is unable to; BPJN verifies regional road proposals and is the channel for central involvement in a permanent bridge	**PP 34/2006** (Republik Indonesia, 2006) Art. 78 (p. 33): the Minister sets road norms, standards and guidelines. Art. 85(2) (p. 37): central government may assist regions that cannot fully fund their roads. **UU 1/2022** (Republik Indonesia, 2022a) Art. 1: DAK is a central government transfer for national priorities, whose use the central government determines. **UU 2/2022** (Republik Indonesia, 2022b) Art. 16(4) (p. 16): central government takes over regency road construction if the regency cannot. **Permen PU 1/2025** (Kementerian Pekerjaan Umum, 2025) Organisation and tasks of BPJN as a technical unit of the Ministry.
West Nusa Tenggara (NTB) provincial government	Regional government above the regency	Administers provincial roads (the Cemare road and bridge are not among them); the governor coordinates regencies and advises on their DAK proposals; may take over construction of regency roads	**UU 2/2022** (Republik Indonesia, 2022b) Art. 16(4) (p. 16): the province may take over construction of regency roads. **UU 23/2014** (Republik Indonesia, 2014a) Art. 91(4): the governor coordinates regencies and advises central government on their DAK proposals. **Kepgub NTB 620-351/2016** (Gubernur Nusa Tenggara Barat, 2016) Annex: list of provincial roads, which does not include the Cemare road.
Local government			
West Lombok regency government (Regent; Public Works	Regional government responsible for regency roads, including the Cemare road and bridge; the	Administers the Cemare road and bridge as a regency road; the Regent sets its status by decree; commissions the	**UU 2/2022** (Republik Indonesia, 2022b) Art. 16 (pp. 15–16): the regency administers regency roads

department; Tourism department; Regional Secretariat)	district is part of its apparatus	consultant and approves the technical plans; commissions and supervises the contractor; must maintain the road, test its functional fitness at least every ten years and may appoint road inspectors; guides and supervises the village government and evaluates draft village regulations	(regulation, guidance, construction, supervision). **PP 34/2006** (Republik Indonesia, 2006) Art. 21 (p. 10) and elucidation to Art. 86(3): bridges are part of the road, so road rules apply to the bridge. Art. 62(3) (p. 27): the Regent sets the status of regency roads by decree. Art. 89 and 92 (pp. 39–40): the road administrator approves technical plans and supervises construction. Art. 97 (p. 41): the road administrator must maintain its roads through routine maintenance, periodic maintenance and rehabilitation. Art. 102 (pp. 42–43): roads must meet technical and administrative requirements, including for bridge structures, before they are opened, and must be tested again at least every ten years; the road administrator forms the test team and declares the road fit. Art. 103–105 (pp. 43–44): road inspectors observe daily and report monthly. **UU 23/2014** (Republik Indonesia, 2014a) Art. 209: the district is part of the regency apparatus. **UU 6/2014** (Republik Indonesia, 2014b) Art. 69(4): the Regent evaluates draft village regulations on the budget, levies and spatial planning.
Lembar Selatan village government (Head of Village; village council)	Lowest level of government; the Head of Village is elected	Has no authority over the bridge, which is a regency road; sets village regulations with the village council, which bind residents	**UU 6/2014** (Republik Indonesia, 2014b) Art. 1(7) (p. 3): village regulations are set by the Head of Village together with the village council. Art. 69: village regulations bind residents; draft regulations must be consulted with the community.
Private sector			
Consultant Eka	Private technical planner commissioned by the regency	Prepares the technical plan documents for the renovation and is responsible for them; must meet the expertise requirements; the documents are approved	**PP 34/2006** (Republik Indonesia, 2006) Art. 89 (p. 39): technical plan documents are prepared by a technical planner and approved by the road administrator; the planner is fully responsible for them and must

		by the regency as road administrator	meet the expertise requirements for construction services.
Contractor (to be appointed)	Private construction company	Carries out the works on the basis of the technical plans; must meet the expertise requirements; is supervised by the regency as road administrator	**PP 34/2006** (Republik Indonesia, 2006) Art. 92(2)–(4) (p. 40): construction follows the technical plans, is supervised by the road administrator or a supervision consultant, and contractors must meet the expertise requirements.
NGOs and community groups			
Indonesia Biru Foundation (IBF)	Non-governmental foundation	Has no formal authority over the bridge; can take part in road planning, development and supervision through proposals, suggestions and information, and may report misuse of the road to the regency	**PP 34/2006** (Republik Indonesia, 2006) Art. 118–120 (pp. 49–50): the community may take part in the regulation, guidance, development and supervision of roads, through proposals, suggestions, information, funds or carrying out work itself, and may report misuse of the road.
Eco Green	Recognised community group leading mangrove conservation at Cemare beach	Has no formal authority over the bridge; can take part in the same way as IBF, and represents residents towards government actors	**PP 34/2006** (Republik Indonesia, 2006) Art. 118–120 (pp. 49–50): see IBF.
Local community			
Residents of Cemare	Citizens and daily road users	Elect the Head of Village and the Regent; are bound by village regulations and must be consulted on draft regulations; may take part in road planning, contribute funds and carry out maintenance themselves; may report misuse of the road to the regency as road administrator	**UU 6/2014, as amended by UU 3/2024** (Republik Indonesia, 2014b, 2024) Art. 34(1): residents directly elect the Head of Village. Art. 69: village regulations bind residents; draft regulations must be consulted with the community. **UU 1/2015, as amended by UU 10/2016** (Republik Indonesia, 2015, 2016) Art. 1: the Regent is directly elected by the people. **PP 34/2006** (Republik Indonesia, 2006) Art. 101 (p. 42): persons or agencies may carry out or fund road maintenance. Art. 118–120 (pp. 49–50): the community may take part in road planning and supervision, and may report misuse of road space to the road administrator.
Road users			

Heavy vehicle users (goods and passenger transport)	Road users operating heavy vehicles such as trucks and buses	Have no formal position in decision-making on the bridge; must comply with the rules of the regency as road administrator, including road class and road-use restrictions. Users who live in Cemare are also bound by village regulations as members of the community, may take part in road planning and may report misuse of the road	**UU 22/2009** (Republik Indonesia, 2009) Art. 19 (pp. 16–17): roads are classified by the heaviest axle load and vehicle dimensions they can carry. Art. 20 (p. 17): the regency sets the road class of regency roads, indicated by traffic signs. Art. 28(1) (p. 20): everyone is prohibited from actions that damage or disrupt the function of the road. Art. 95 (p. 54): prohibitions on the use of regency roads are set by regency regulation and indicated by traffic signs. Art. 125 (p. 67): drivers of goods vehicles must use roads according to their road class. **UU 6/2014** (Republik Indonesia, 2014b) Art. 69: village regulations bind residents; draft regulations must be consulted with the community. **PP 34/2006** (Republik Indonesia, 2006) Art. 118–120 (pp. 49–50): see IBF.
Domestic visitors	Road users	Have no formal position in decision-making on the bridge	–
Foreign visitors	Road users	Have no formal position in decision-making on the bridge	–

Note. UU = Law (Undang-Undang); PP = Government Regulation (Peraturan Pemerintah); Permen = Ministerial Regulation (Peraturan Menteri); Kepgub = Governor's Decree (Keputusan Gubernur). Page numbers refer to the official documents; links are given in the reference list.

[a] BPJN NTB (Balai Pelaksanaan Jalan Nasional Nusa Tenggara Barat) is the regional office of the Directorate General of Highways of the Ministry of Public Works. It plans, builds and maintains national roads and bridges in West Nusa Tenggara, and verifies road data and road programming proposals from regional governments (Direktorat Jenderal Bina Marga, n.d.; Kementerian Pekerjaan Umum, 2025). In Cemare, BPJN NTB built the nearby suspension bridge and has surveyed the site for a permanent bridge (Haeruzzubaidi, 2026; Radar Lombok, 2023).

[b] The Special Allocation Fund (Dana Alokasi Khusus, DAK) is a transfer from the central government to regional governments to fund specific programmes and activities that are national priorities. Unlike general transfers, its use is determined by the central government (Republik Indonesia, 2022a, Art. 1). Regencies apply for DAK through proposals, on which the governor advises the central government (Republik Indonesia, 2014a, Art. 91(4)).

Appendix D: Actor characteristics

Table D.1 gives the interests, desired situation, perceptions and resources of each actor.

Table D.1 Interests, desired situation, perceptions and resources per actor

Actor	Interests	Desired situation / objectives	Perceptions	Resources	Source
National government	National connectivity and a fair distribution of a limited infrastructure budget across regions.	Funding infrastructure that fits national programmes.	According to the regency, the national government sees Cemare as one of many similar funding requests.	**Money:** the main source of funding for rebuilding the bridge. **Knowledge:**engineers of the regional Public Works office (BPJN NTB). **Authority:** decides whether the regency's proposal is funded. **Position in network:** national MPs can channel aspiration funds to local projects, as happened with the nearby sky bridge.	A. Gunawan, personal communication, September 8, 2026; Haeruzzubaidi, 2026a; Radar Lombok, 2023; Suara NTB, 2026
West Nusa Tenggara (NTB) provincial government	Coordinated regional development across its regencies, and the provincial tasks assigned by law, such as managing marine resources and forestry.	No specific desired situation for the bridge; supports villages in developing their own potential, including tourism.	No direct involvement in the bridge found.	**Authority:** can take over construction of a regency road if the regency is unable to carry it out. **Position in network:** the governor coordinates development between regencies and recommends regencies' special allocation fund (DAK) proposals to the central government.	Republik Indonesia, 2014a, 2022b
West Lombok (Lombok Barat) regency government	Functional public infrastructure, regional economic growth, public trust.	Renovating the car deck now, with a lifespan of about five years, while seeking central government funding for a full renovation or a new bridge.	Acknowledges the critical condition, but considers a permanent bridge beyond its budget. Sees central funding as necessary but uncertain, because many regions compete for it, and expects attention from NGOs and students to	**Authority:** as road administrator of this regency road, decides on, commissions and supervises the renovation. **Money:** allocating the renovation budget. **Information:** the consultant's assessment. **Manpower:** hires the consultant and contractor who carry out the works. **Position in network:** formal channel to central ministries for funding a permanent bridge.	A. Gunawan, personal communication, September 8, 2026; Eka, personal communication, September 22, 2026; Haeruzzubaidi, 2026a; Suara NTB, 2026

			improve the chances.		
Lembar Selatan village government	Village welfare and development, safe and reliable infrastructure.	A wider and stronger bridge built with more durable wood. After the renovation, a clear arrangement for maintaining the bridge, including who carries it out and how it is funded, and a long-term plan for rebuilding it.	Sees village infrastructure, and the bridge in particular, as a priority on his agenda. The Head of Village sees himself as the link between residents and the regency. Believes the renovation alone is not enough: without regular maintenance afterwards, the bridge will fall back into its current state.	**Authority:** sets village regulations, but has no authority over the bridge, which is a regency road. **Money:** limited; village funds are meant for matters under village authority. **Organisation:**mobilises residents to help with the renovation. **Position in network:** connection to the regency to request maintenance and a permanent solution.	Inside Lombok, 2023; M. Saleh, personal communication, September 8, 2026; Suara NTB, 2026
Consultant Eka	Successfully executing the design project for the government.	Deck renovation completed within budget and before December.	The foundations are still strong. The steel only needs replacing where corroded, and the top timber layer of the car section needs to be replaced.	**Information:**technical assessment of the bridge's current state and inspection of the structure during the renovation. **Knowledge:**technical knowledge of bridge design.	Eka, personal communication, September 8, 2026
Indonesia Biru Foundation (IBF)	Sustainable ecotourism, long-term safety of the community infrastructure, and the aesthetic value of the bridge giving a good impression of the village.	An aesthetic bridge intended to last indefinitely, marking the entrance to Cemare. IBF aims to act as an advisor to co-supervise the works and develop a usage system with the village and the regency.	Past short-term fixes addressed neither the long-term structural function nor the aesthetic value. Sees the lack of a long-term design, maintenance and funding plan as the core problem. Sees its own influence as	**Organisation:** can help mobilise residents for repairing the bridge. **Knowledge:**sustainability and ecotourism expertise. **Manpower:**volunteers who can help develop a long-term design concept and maintenance plan. **Position in network:** direct contact with residents, the Head of Village, the regency and the consultant. **Legitimacy:** trusted by residents.	S. Ramadhani, personal communication, September 7, 2026; A. Saputra, personal communication, September 14, 2026

			building a case and putting the bridge on the agenda.	**(Social) media:** can show the bridge's condition and support fundraising.	
Eco Green	Mangrove conservation and education, environmental awareness, income from ecotourism, and representing residents.	One wooden main bridge built with local materials that fits the mangrove setting, funded by the government. Buses and trucks are stopped before the bridge. No toll on the bridge; revenue comes indirectly from tourism services and parking.	The bridge is vital for the households living at Cemare. The government can only renovate because of budget limits. The government has the most influence because it controls the budget, but plans should be made together with the community. Tourism brings income but also waste.	**Knowledge:** local environment and visitor education. **Manpower:** 15 members, plus residents it mobilises. **Money:** no fixed budget; funding comes from collaborations and programme proposals to partners. **Position in network:**collaborates with IBF, universities and environmental organisations, and keeps an open channel to the village and regency. **Legitimacy:** a recognised community group. **(Social) media:** can show the bridge's condition and support fundraising.	Musap, personal communication, September 7, 2026; Surabaya Post, 2026
Residents of Cemare	Emergency access, safe and reliable daily mobility, access to basic needs such as school, healthcare and markets, and access for visitors to support the local economy.	A permanent fix instead of repeated repairs, a wider bridge where two cars can pass, and a stronger construction.	Feel unsafe because of loose planks and eroding construction. Residents rate the condition as poor or very poor, and say it needs repair. Believe the government lacks the money or priority, leaving repairs to the community.	**Manpower:** repair the bridge themselves through community self-help. **Money:** household contributions. **Knowledge:** as daily users, they know where the bridge is weakest and how it is used, which is input for inspection and design. **Political influence:**as voters, residents can hold the Head of Village and regency politicians accountable for the bridge.	Haeruzzubaidi, 2026b; resident interviews and survey (see Appendix B)
Domestic visitors	Recreation, such as relaxing on the beach and watching	A bridge they can trust for safe access to the beach.	Perceive the crossing as unsafe.	**Money:** visitor spending supports the local tourism economy that depends on the bridge.	EkbisNTB, 2026; Haeruzzubaidi, 2026a

	sunsets, and safe access to activities.			**(Social) media:**photos of vehicles stuck in the bridge's holes, shared online, put public pressure on the regency to act.	
Foreign visitors	Mangrove visits, education, recreation and safe transport to the village.	A bridge they can trust for safe access to the beach, homestays and ecotourism activities.	Depend on the bridge for arrival and access to activities.	**Money:** pay for eco-tours and homestays that depend on the bridge. **(Social) media:**Google Maps reviews and posts make the bridge's condition visible internationally.	Haeruzzubaidi, 2026a; S. Ramadhani, personal communication, September 7, 2026
Heavy vehicle users	Reliable and efficient transport of goods and passengers, safe access to and from Cemare.	A bridge that can safely and reliably accommodate heavy vehicles and their loads.	Sees the current bridge as unsafe for heavy loads. When carrying large loads, people need to step out of the vehicle and walk, and goods may have to be transferred by boat instead. Believes a small user fee for maintenance would be acceptable if it improves the bridge. Also recognises that heavily loaded trucks can damage the bridge.	**Money:** can contribute to maintenance through a small user fee. **Knowledge:**practical knowledge of transport needs and bridge conditions. **Vehicles:** trucks and other vehicles needed for transport.	Octopus transporter, personal communication, September 2026; heavy vehicle driver, personal communication, 2026

Appendix E: Environmental effects

The environmental conditions in Indonesia have a significant effect on the bridges in the country, and should therefore be taken into account. In this section, the environmental effects on bridge design for the Jembatan Cemare are explained.

Climate

Jembatan Cemare is constructed near a coast with a tropical climate. This has several effects on the different materials that might be used for this bridge. As already stated before in the previous sections, the steel parts corrode faster in tropical conditions, especially near the coast. The combination of high humidity and high temperature is known to accelerate metal corrosion in general (Corvo et al., 2008). Cemare, which lies at the coast, has a high airborne salinity, which creates chloride-induced corrosion.

For the steel in the pillars, the cycle that was already described applies: with high tide, chloride from the water flows into the concrete, while with low tide, the drying pushes it toward the steel reinforcement. Once enough chloride accumulates, it breaks down the steel's protective oxide layer locally rather than uniformly, causing pitting corrosion. This matters because pitting cuts a bar's strain capacity far more than uniform corrosion of the same mass loss, and can shift its failure from ductile to brittle (Ali et al., 2024). The resulting rust also occupies two to six times the steel's original volume, which is the actual mechanism behind the cracking of concrete mentioned earlier. Cracked cover then lets chloride in even faster, explaining why the pillars' decline accelerates.

Countermeasures against corrosion

There are some measures and materials that can expand the lifespan of the steel parts of a bridge. Using stainless steel is probably the most effective measure, but also the most costly one, twice as much as for example weathering steel (Federal Highway Administration [FHWA], 2011). However, it can be applied to the most critical parts of the bridge. For the bridge piers, weathering steel would be a good option as reinforcement, as it provides a self-protective oxide layer against wet-dry cycles. Unfortunately, the salinity of the water in the area counters this effect. A different, relatively cheap measure would be to just increase the layer of protective concrete around the pillars. This increases the time necessary for chloride to reach the steel weaponing. For the steel beams, Hot-Dip Galvanizing (HDG) and Cold Galvanizing Coating (CGC) methods can work to increase their service life. Zinc-based coatings are one of the most effective and practical methods for protecting steel against corrosion in marine environments (Silaban et al., 2026). Epoxy-coating could also mitigate corrosion, but should be carefully chosen for this exact case in a tropical climate (SSPC, n.d.). Research by Alfaini (2022) in two Indonesian coastal area’s shows that ST 37 steel and epoxy primer is applicable in this environment as well. However, in the tidal zone it will have very little protective effect for the steel.

The corrosion can also be seen at the joints, such as bolts. Partly this is due to the timber in which the bolts are embedded, since it contains water and oxygen. The corrosion of the bolts accelerates the decay of the wood (Zelinka & Rammer, 2005). Timber is still used often for medium sized bridges on Lombok, since it has great local availability and favourable strength-to-weight ratio. If you take into account the limited bearing capacity of coastal soils,

this advantage becomes even more important. However, timber structures located in tropical coastal environments such as Cemare are subject to accelerated biological degradation. For the bridge deck degradation is primarily driven by fungal decay. Prabowo et al. (2022) modelled this process in their research paper. The predicted decay depth is a function of the wood-species parameter, analysing the four Indonesian tropical wood species: Belian, Bangkirai, Keruing, and Meranti. These wood species belong to durability class 1, 2, 3, and 4, respectively. Thickness, width, surface treatment, fastening and geometry were also taken into account. The wood species were tested in the most hazardous environment. The resulting decay was 1.05; 1.30; 2.39; and 4.62 mm/year for Belian, Bangkirai, Keruing, and Meranti respectively. This research does not state the decay for the previously mentioned coconut wood, which is sometimes used in timber structures on Lombok. For the use of this kind of wood, regular inspections are even more crucial.

Sea and tides

Any bridge constructed near the coast should take into account the effects of the sea. Sea level rise, flooding, and tidal changes are all factors that are of great importance to the design. In this section, they are evaluated and possible measures are presented.

Sea level rise

According to the intermediate-confidence SSP3-7.0 climate change scenario (NASA, 2021), the sea level rise is shown in Table E.1.

Table E.1 Expected sea level rise in meters per decennia (NASA, 2021)

Year	Sea level rise (m)
2040	0.14
2050	0.21
2060	0.28
2070	0.37
2080	0.46

Therefore, it is recommended to increase the bridge height to account for the expected sea level rise. This can avoid boats getting into trouble in the following decades because the bridge is too low for the high water level.

Flooding

In recent years, many floods have taken place on the island of Lombok, differing in size and location. These flood events also occur in the West Lombok regency, of which Cemare is part. As far as recent documentation and local residents indicate, Cemare itself has not experienced significant flooding in recent years, although the area was previously threatened by coastal abrasion and tidal flooding before mangrove replanting by Eco Green converted the coastline into a natural buffer (Lombokvibes, 2025). This protective function is supported by academic research on the Cemara mangrove ecosystem itself, which identifies mangrove cover as a direct contributor to reduced coastal erosion and flood risk (Imran & Efendi, 2016). The preservation of the Cemare mangrove forest is therefore essential to prevent, or at least significantly reduce the impact of, floods damaging the bridge in the future. Additional structural measures could further reduce exposure, such as raising the bridge deck. The exact chances of floods and how high they are is not elaborated on in this report.

Tidal changes

Tidal changes in the coastal area of Cemare are characterized by significant fluctuations in water levels. The coastline of West Lombok is directly connected to the Lombok Strait, a major pathway for the Indonesian Throughflow (ITF) known for its complex oceanographic conditions, internal waves, and exceptionally strong currents (Gordon et al., 2010; Katavouta et al., 2022). For the bridge in Cemare, these tidal movements directly dictate local water levels and hydrodynamic forces. Based on records from the past five years in Mataram (Tides4Fishing, n.d.), the coastline exhibits a mixed to diurnal tide pattern with prominent extremes during spring tides. Specifically, extreme high tides reach maximum peaks of 1.77 to 2.10 meters above the chart datum, while extreme low tides drop to a minimum of roughly 0.08 to 0.20 meters. This results in a significant tidal range of approximately 2 meters along the coast.

Beyond the physical shifts in water height, these tidal movements dictate the chemical conditions of the local environment. Research in the estuaries of West Lombok shows that tides play a driving role in the chemical composition of the water. During high tide, seawater flows inland, leading to a rapid increase in salinity and electrical conductivity (Alaydrus et al., 2025). This creates a dynamic intertidal zone that is continuously subjected to fluctuating chloride concentrations and oxygen exposure, driving intense wet-dry cycles in the area.

Furthermore, these tidal water movements govern the local hydrodynamics and ecological balance. The continuous ebb and flow are responsible for the transport of vital nutrients and sediments that sustain the surrounding mangrove forests (Sukuryadi et al., 2021). An unobstructed natural tidal flow ensures the health of the Cemare mangrove ecosystem, which in turn acts as a crucial natural buffer for the coastline and the bridge infrastructure.

Seismic Activity

Lombok is located in an area called the Ring of Fire. Within this area, earthquakes and volcanic eruptions are highly common. One of the most recent earthquakes that struck Lombok occurred in 2018 with a magnitude of 6.9. This event damaged thousands of homes and caused many casualties. Bridges are critical infrastructure that need to be safe like housing; however, they also play a vital role in damage control after a disaster has struck. Therefore, we focus on strategies to mitigate the damaging effects of seismic activity based

on recorded earthquakes. This is also stated in the SNI building codes of Indonesia (Putra & Adi Riyono, 2020).

According to Amirsardari et al. (2019) in order to assess seismic risk of transportation infrastructure all various forms of earthquake hazards need to be assessed. There are 5 different types of damage causations: Ground shaking, ground failures, faulting, and induced physical damage. 38 damaged bridges on Lombok and Palu have been visually inspected after the 2018 earthquake. From this inspection by Putra and Adi Riyono in 2020, it is concluded that the approach road is the most critical part for seismic activity, since it is prone to embankment settlement. For the Cemare area, this can once again be countered by the presence of mangroves. Stone or brick retainment walls are especially vulnerable, since there is little cohesion. Therefore it is recommended to put reinforced concrete backwalls on each of the bridge abutments (Mata et al., 2025). To increase resilience against earthquakes further, additional measures could be taken for the substructure of the bridge. This can be done by increasing the natural period of the structure with energy dissipation parts, like seismic isolation bearings. Recycled Rubber Fiber Reinforced Bearings (RR-FRBs) can be used as an inexpensive alternative for bridges in Indonesia. However, research is still necessary to understand if it is safe to use under major bidirectional excitation, as it is mainly tested on housing structures (Calabrese et al., 2019).

Mitigation: design for deconstruction

The previously mentioned measures can be effective and easy to implement. However, these approaches often offer a permanent structural interface and are less meant to enable disassembly for repair. What often occurs is that the pier base of a conventional monolithic bridge incurs irreparable damage after a seismic event. Because these bases are completely integrated, a complete replacement or full renovation is required. As a result, repair costs are relatively high and take longer times relative to the damaging effects.

The method called Design for Deconstruction (DfD) creates options to repair damaged parts and avoid a situation where the whole system needs to be replaced (Figure E.1). Within infrastructure design, the fundamental principles of this method focus on the use of mechanical rather than monolithic connections. This provides a clear separation of structural systems, making it possible to locate damage to parts that are often replaceable. For infrastructure placed in areas with high seismic activity, this strategy provides a framework to implement sacrificial components to avoid complete deconstruction and replacement repairs.

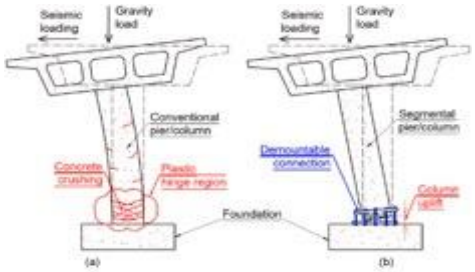

Figure E.1 Schematic drawing of a DfD bridge pier

As a result, this is meant to extend service life by creating more opportunities for repair and creating environmental benefits through component reuse (Fernandes & Ferrão, 2025). This

stands in contrast to the historical data from the Jembatan database that shows the need for easily adaptable, repairable designs to fulfill the needs of heavy transport use and withstand extreme events like seismic activity.

The article by Kopiika et al. (2026) explores the possibility of applying the DfD method to a bridge pier. It describes a low-damage, hinge-base self-centering alternative to a conventional integral bridge pier design. The external rebars act as sacrificial fuses that help locate damage by making it possible to check for plastic yielding. If damage occurs from, for example, a seismic event, the stretched rebars can be replaced rather than deconstructing the whole pier. According to the methodology of DfD related to reuse at the end of the bridge lifespan, the pier can be unbolted and reused in another project as a refurbished part.

Scour

Scour has been a cause of many bridge failures in the recent history of Indonesia. In the period from 2011 till 2021, 3193 bridge failures in the country were attributed to scouring, according to BNPB data cited by Pratama et al. (n.d.). Their paper mainly describes scour at river bridges, and tidal inlets such as the one at Cemare are not covered. Nevertheless, it is highly emphasized to at least check the condition of the foundation of the Cemare bridge piers to see if this risk is also present here, especially since the bridge has been in service for about 22 years and Pratama et al. warn specifically about older bridges with shallow foundations. A full assessment is not done in this report, but a short overview of possible steps is given to review the need for bed protection.

Pratama et al. describe the Indonesian guideline for inspecting river conditions at bridges (2021), which states that the state of the river can indicate risks of scour, but also that inspections around the foundation are necessary to ensure structural safety. They also note that visual inspection of scour is difficult and that special inspection tools are needed. The protection of the mangrove trees may contribute to bank stability, as was previously mentioned in reducing the risk of flooding.

To estimate the maximum equilibrium scour depth around a cylindrical pier, the method from Introduction to Bed, Bank and Shore Protection (Schiereck & Verhagen, 2019) is used. The maximum scour depth h_s, measured below the original bed level, is expressed as:

$$h_s / D = C \cdot K_s \cdot K_\alpha \cdot K_u \cdot \tanh(h_0 / D)$$

Where:
D = pier diameter
h_0 = water depth (high water level is governing, since tanh increases with depth)

The factors K_s, K_α and K_u account for pier shape, flow direction (angle of attack) and flow intensity, respectively. Since we are dealing with a cylindrical pier with aligned flow, K_s and K_α are taken as 1. The grain size and flow velocity are contained in factor K_u, through the ratio u/u_c. By taking K_u = 1 (live-bed scour) these are not taken into account, and h_s becomes an upper limit of the equilibrium scour depth. C is a proportionality constant. A conservative value of C = 2.0 is used, as given by Schiereck & Verhagen. Since this report only gives a first estimate of whether bed protection is necessary, a conservative result is wanted.

The result is compared with the foundation depth below the bed. If h_s, including a safety margin, remains well within this depth, no further calculation is needed. When the scour is known at the current bridge, this formula might help to determine the scour of the new bridge with piers of a different size.

When h_s is determined to be unsafe, a more detailed calculation is necessary, in which K_u is determined from:

K_u = velocity factor, see Figure 4-3b: $K_u = 0$ for $u/u_c < 0.5$, $K_u = 1$ for $u/u_c > 1$ and $K_u = (2u/u_c - 1)$ for $0.5 < u/u_c < 1$

Here u is the maximum depth-averaged tidal velocity at the piers and u_c is the critical depth-averaged velocity at which the bed grains start to move. To obtain u_c, the critical shear velocity u_c is needed first. This is done iteratively, by first estimating u_c, for example 0.01 m/s. Then Re* can be calculated with:

$$Re^* = u^*_c \cdot d / v$$

With a kinematic viscosity (v) of approximately $0.9 \cdot 10^{-6}$ m²/s for water of about 28 °C (Engineering ToolBox, 2025), and d being the median grain diameter (D_{50}) of the bed material at Cemare. From the Shields graph (Figure E.2), the critical Shields parameter (Ψ_c) can be obtained, and with:

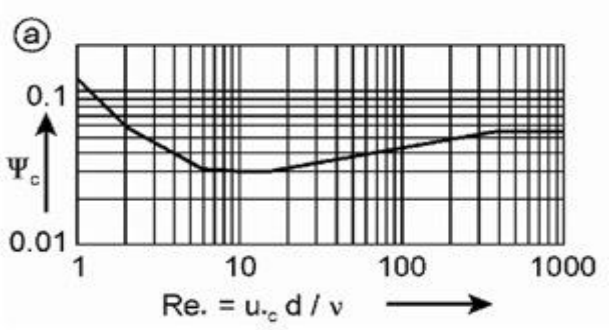

Figure E.2 Shields parameter against Reynolds number graph (Schiereck & Verhagen, 2019)

$$u^*_c = \sqrt{(\Psi_c \cdot \Delta \cdot g \cdot d)}$$

the new u^*_c is obtained, until the result no longer changes. In this formula, g is the gravitational acceleration (9.81 m/s²) and Δ is the relative density $(\rho_s - \rho_w)/\rho_w$, which is approximately 1.65 for sand. The critical depth-averaged velocity then follows from:

$$u_c = u^*_c \cdot C / \sqrt{g}$$

Where C is the Chézy coefficient (m½/s), calculated with:

$$C = 18 \cdot \log(12\ h / k_r)$$

In this equation, k_r represents the bed roughness. For a sand bed it is related to the sieved D_{n50}, taken as $k_r \approx 2 \cdot D_{n50}$. The water depth h is also necessary to obtain this number.

Both the Shields criterion and these formulas hold for non-cohesive material. If the bed at Cemare consists of silt or clay, as can be the case in a mangrove area (Woodroffe et al., 2016), the calculated scour depth is a conservative upper limit, since cohesive soils generally erode more slowly. Table E.2 gives an indication of the critical velocity for clay soils with different velocities. A soil examination test should be conducted to examine what kind of soil is present.

Table E.2 Critical velocity for clay soils at different porosities (Schiereck & Verhagen, 2019)

Table 3-2 Critical velocity clay

	Porosity		
	20 %	40 %	60 %
Critical velocity (m/s)	1.5 - 1.8	1.0 - 1.2	0.1 - 0.4

The result is an indication of the equilibrium scour depth at the piers only. It does not state how fast the equilibrium depth is reached. If the calculated scour depth is large compared to the foundation depth, further research is recommended. Because the current bridge has existed for 22 years, the scour hole may already be close to equilibrium if the velocities exceed the critical value. An inspection of the foundations below water level, for example by divers or by echo sounding of the bed around the piers, is therefore advised. If scour is found, the design of bed protection via the method of should be carried out for the design of the new bridge.

Appendix F: Excel design concepts

https://tud365.sharepoint.com/:x:/s/stud-MDP2026-2027/IQD8pi5-kVJKRaUnoS16itCCAWnILbHFEZleeUt_wSeccrQ?e=Q71Cj9

Appendix G: Criteria

Table G.1 lists the design requirements and the evaluation criteria derived from them.

Table G.1 Design requirements and evaluation criteria

Requirements	Criteria
The bridge shall safely carry the design loads of all permitted traffic	Heavy trucks can pass in at least 1 way
	Heavy truck = either tourist bus or construction truck
The bridge shall provide a desired functional lifespan without major reconstruction.	The bridge lasts for 30 years
The bridge shall allow traffic from both directions to cross, either simultaneously or alternately.	The width of the bridge has at least space for two cars and two pedestrians at the same time.
The bridge shall have measures to ensure a safe crossing	The safety and comfort of the bridge is rated as an 8 or higher by user response from a conducted survey with N = 50 minimum.
The bridge shall have a maintenance arrangementwith a responsible party	Maintenance duration is limited at 2 weeks for bridge deck related repairs. Efforts to repair the substructure section will be limited to one month.
The construction and maintenance costs of the bridge shall be coverable by identified funding sources.	Funding is available within 2 days if applied for inspection, maintenance and repairs.
The bridge shall be inspectable and repairable with locally available skills and materials	Bridge deck and railings issues are resolved by locals within 2 weeks.
The bridge design shall include a distinctive visual feature that makes it recognisable as a landmark for Cemare	Bridge design is rated by locals with a grade of at least an 8 via a conducted survey.
	Bridge design is rated by visitors with a grade of at least an 8 via a conducted survey.
The design shall minimise disturbance to the surrounding mangrove ecosystem and local fauna.	Environmental impacts from bridge operations are minimized by regulating light and noise emissions. Luminaires shall feature 100% downward cut-off (0%ULR) with light spill not exceeding 0.5 lux at the habitat boundary, while operational noise levels shall not exceed 45dB at 20 meters distance of the bridge.
The bridge shall provide sufficient vertical and horizontal clearance for objects to pass underneath safely	The bridge height is higher than the low tide, sea level rise (until 2070, 0.37 m) the height of fishing boat (2 m) and a margin of 1 m combined.
The bridge shall provide a reliable connection between Cemare and the mainland able to withstand environmental hazards and for residents to cross in case of an evacuation	The bridge is able to withstand floods not higher than 2 m above sea level and can withstand earthquakes according to SNI 2833:2016 benchmark, on the base of local seismic hazard and soil conditions. Bridge cannot collapse for heavy earthquakes and should remain in service for smaller ones.
The construction of the bridge shall minimise environmental impact.	The materials used in the bridge have a maximum estimated emission of 100 ton CO2e.

Appendix H: Bridge types

Figure H.1 gives an overview of common bridge types, their hallmarks and best uses.

Bridge Type		Hallmarks	Best Uses
Suspension		•Draping Cables supporting additional set of vertical cables •Piers with draping cables attached high above the roadway	•Over Rivers •Earthquake Zones •Can construct at least 2 towers
Cable-Stayed		•Straight Cables •Connected to towers •Counter acting (balancing) forces by cables on both side of towers	•Long Distances •May use only one tower •Preserving Environment •Cost less than Suspension
Arch		•Semi circular design (elliptical shaped) •Arch is either above or beneath the roadway •One of the oldest bridge types	•Durability •Easily Accessible Materials -Yes! Even natural materials •Deep gorges: preserving Environment as well
Truss		•Steel Girders, but not necessarily, wood also a common material •Triangular Shapes •Fracture critical (no load path redundancy)	•Strong Winds •Prefabricated pedestrian bridges •Temporary bridges •Very Stiff •Accommodate Dynamic Loads
Cantilever		•Pre-Stressed Steel or Concrete •No Direct Under Supports	•Extremely Safe and Secure (wouldn't say this more than any other) •Overhanging structures without additional support •Floating aesthetic
Beam		•Simple Design •Simply supported	•Cheap •Quick Construction •Standardized members and design
Rigid Frame		•One Single Construction •Some shaped like "K"	•Overpasses •More vertical clearance
Movable		•Modular •Incorporates mechanical systems to create movement	•Accommodate Various Uses •Allows Passage

Figure H.1 Overview of bridge types, their hallmarks and best uses

Appendix I: Statement of Indonesia Biru Foundation

Indonesia Biru Foundation and the Cemare Bridge Project

Indonesia Biru Foundation (IBF) is a non-profit organization established in October 2020 by Raditya Andrean Saputra (Andre). Based in Lombok, Indonesia, IBF focuses on marine and coastal conservation, ecosystem restoration, environmental education, and community empowerment.

IBF believes that effective and lasting conservation requires more than protecting ecosystems. It also involves empowering local communities, raising environmental awareness, and addressing the challenges that affect their livelihoods and well-being. Through initiatives such as the Cemare Mangrove Project, IBF works to connect environmental conservation with education, community participation, and sustainable local development.

Why IBF Initiated the Cemare Bridge Project

Through its ongoing activities in Cemare Hamlet, South Lembar, West Lombok, IBF identified the poor condition of the bridge providing access to the community as a significant local concern. The bridge plays an important role in residents' daily mobility and access to essential services. Its condition raises concerns about safety, accessibility, and the long-term needs of the community.

Although IBF's presence in Cemare is primarily driven by its commitment to mangrove conservation, we recognize that environmental sustainability cannot be separated from the well-being of the people living alongside these ecosystems. The condition of local infrastructure is therefore an important issue to consider alongside our conservation efforts.

Recognizing that addressing this challenge requires technical expertise and collaboration beyond our own capacity, IBF approached TU Delft to explore the existing situation, understand the needs of the local community, and investigate potential approaches to bridge improvement. Through this collaboration, we hope to bring together technical perspectives, local knowledge, and stakeholder input to explore solutions that are appropriate to the needs and context of Cemare.

For IBF, this initiative represents an opportunity to strengthen the connection between environmental conservation and community development. Our aim is to contribute to a safer, more accessible, and sustainable future for Cemare, where the well-being of the local community and the protection of its surrounding ecosystems can progress together.

Appendix J: Poster series

Figures J.1 to J.19 show the poster series Project Jembatan: Mewujudkan jembatan di Cemare in Bahasa Indonesia, in the order in which the posters were presented in Cemare (Section 5.2).



Figure J.1 Poster 1: Cover



Figure J.2 Poster 2: Current problems



Figure J.3 Poster 3: Our process: from your ideas to a bridge

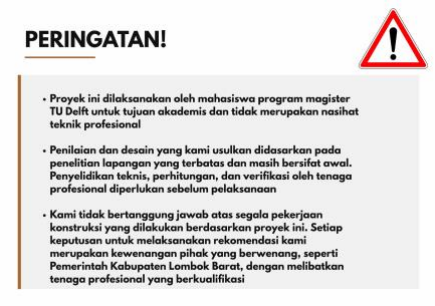

Figure J.4 Poster 4: Disclaimer



Figure J.5 Poster 5: Impression of the final design



Figure J.6 Poster 6: The final design with a car crossing

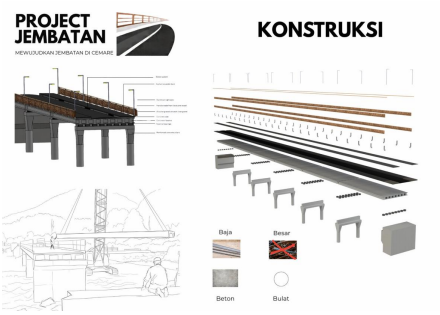

Figure J.7 Poster 7: Construction

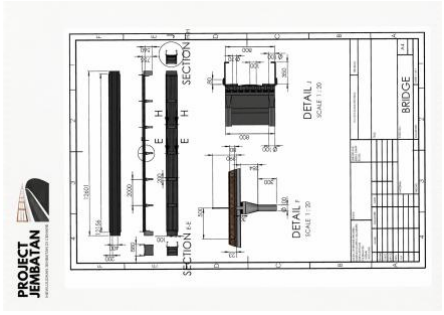

Figure J.8 Poster 8: Technical drawing

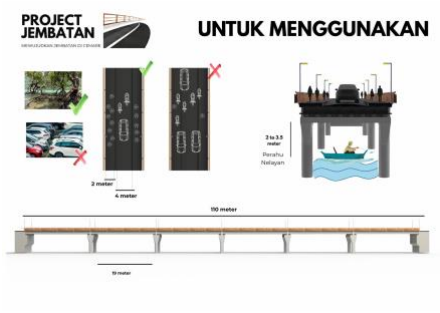

Figure J.9 Poster 9: Use of the bridge

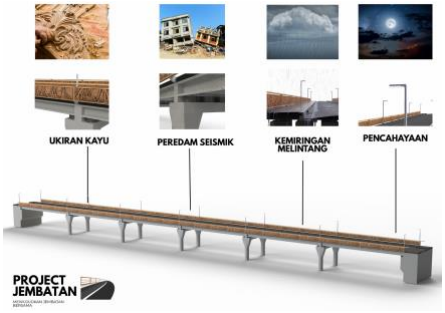

Figure J.10 Poster 10: Design features: wood carving, seismic dampers, cross slope and lighting



Figure J.11 Poster 11: Community preserved: local maintenance and regional expertise



Figure J.12 Poster 12: Parking and transit system



Figure J.13 Poster 13: Toll system



Figure J.14 Poster 14: Advantages of the new design



Figure J.15 Poster 15: The future: roles of the regency, local construction team and residents



Figure J.16 Poster 16: A shared mission

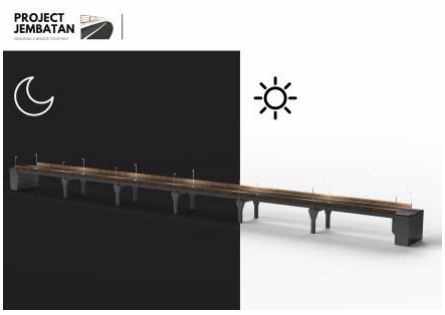

Figure J.17 Poster 17: The bridge by day and by night



Figure J.18 Poster 18: Top view of the bridge

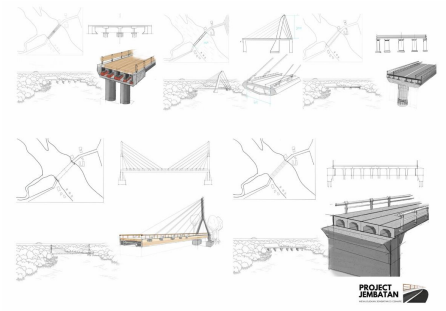

Figure J.19 Poster 19: Sketches of the bridge concepts

Appendix K: Presentation transcript

Table K.1 Presentation details: public presentation in Cemare

Date & Location:	**Cemare, Lembar Selatan, West Lombok, Indonesia (24-10-2026)**
Participants:	Speaker 1: Representative of the West Lombok regional government (Indonesian) Speaker 2: TU Delft researcher (English / Dutch) Speaker 3: Interpreter, IBF (English / Indonesian) Speaker 4: TU Delft researcher (English)
Languages Spoken:	English, Indonesian [ID], Dutch [NL]
Translation Mode:	Indonesian and Dutch passages translated into English
Language Tags:	[NL] = Originally Dutch | [ID] = Originally Indonesian

Response of the regional government

Speaker 1: [ID] ...try calculating it with the consultant team, so that—what is it—later it can be included in our proposal for the government. Because for the process of every development project, we cannot just immediately say, "Let's build it"—we can't do that. In the government, there are stages before something is built. First, a proposal must be submitted into the Regional Budget (APBD) the year before, and then once it is in, there is the planning phase. After the planning, there is a process where if the project value is over 400 million [Rupiah], it must go through a tender. So it is tendered out first, and only after there is a winner can it be executed. So the process probably takes about a year. Provided that this activity is actually included in the Regency Government's Regional Budget (APBD).

Speaker 1: [ID] Well, we actually hope that we can handle this in full, right? However, given the fiscal financial condition of the Regional Government (Pemda), not everything can be handled at once. We want to handle everything, but the money, the funds are lacking, right? So deciding which urgent matters must be resolved first—even though everyone feels that "This is urgent, this is needed immediately"—we are not the final decision-makers. Because there has to be negotiation—or rather, discussion—with the Regional Government and the Regional Legislative Council (DPRD), right? So if any of the ladies and gentlemen attending here have a channel to the Council members, well, go ahead and lobby our friends on the Council so that this can be prioritized. That way, it can be included in the West Lombok Regional Government's budget (APBD).

Speaker 1: [ID] Now, regarding the designs that have been presented here, hopefully—we aren't actually setting a strict time limit. Our hope and desire is for it to happen quickly. As was mentioned, that it could be implemented next year in January. However, we have an administration system that we also have to follow. Yes, perhaps that's it. I won't speak about the technical construction design, because there are already experts for that later. But in principle, the Regional Government also has a vested interest in improving the things that directly touch the community. Of course, we also have to sort through it based on the available budget. Perhaps that is all; later, if there are any questions, maybe they can be discussed further with the consultant.

Speaker 1: [ID] Oh yes, by chance we also have colleagues here from the Audit Board of Indonesia (BPK), West Nusa Tenggara (NTB) Representative Office. Yesterday we were chatting because we had an entry meeting. Here is Mas Nur from BPK NTB, and over there is Mas Yoga. These colleagues want to see what the tourism conditions are like at Cemare Beach. And also, how the surrounding community participates. Furthermore, what the communication is like with the private sector, third parties, foundations, and even with the government. The hope is that going forward, policies related to tourism can bring a better impact, especially for the economy of the local community. So it shouldn't just be that tourism exists, but the local community doesn't get to enjoy the results. As much as possible, people from the local community should actively play a role in developing tourism in their own area. Perhaps that's all for now, Mas. But thank you very much for all your hard work. It's amazing. Thank you.

Conversation after the presentation

Speaker 2: [ID] Thank you.

Speaker 3: So, he was from the government. He was really appreciating your works, really great. And then as of like next year, they were gonna do the reparations, but they can't really boom and make a new one because of the funding and things, but they were gonna send it to the central government to see if it could be funded. And they were also bringing a consultant and they have their own designs, and they want to see like your designs and combine it to make a better one. So yeah, there's that, and they really appreciate your work.

Speaker 2: Thank you, thank you. They did do something with it?

Speaker 3: Yeah, they were gonna repair it, but partially.

Speaker 2: Oh, but they already did one, I think they added already one beam, right?

Speaker 3: Yeah, so maybe they're gonna do more.

Speaker 2: Gonna do more, okay. When? Wait, when do they start with that?

Speaker 3: Next year, January. Yeah, and it maybe take one, two, three years for the administration progress to, yeah, you know. You know how it is.

Speaker 2: [NL] Yes, they haven't... but I will still tell them. And after that, we will ask for a meeting.

Speaker 4: Okay, yeah, we're ready.

Appendix L: Brainstorm session on communicating the concept proposals

Table L.1 Session details: brainstorm session with IBF

Date & Location:	**Local café, Lombok, Indonesia (October 2026)**
Participants:	TU Delft research team Four representatives of Indonesia Biru Foundation (IBF)
Format:	Brainstorm based on the design statement and questions shared in advance
Recording:	Written notes; answers are summarised, not transcribed verbatim

Design statement

We aim to enable the Indonesia Biru Foundation with a design that helps develop a future-proof connection between Cemare village and the mainland. The design includes conceptual proposals to create, use and maintain a bridge in a sustainable way. We translate these proposals into an understandable way of communicating for the Indonesia Biru Foundation.

Questions and answers

Q1. What is the best way for us to share our concept proposals so they are understandable and easy to use for IBF?

- **Final output:** a presentation for the government as the key stakeholder, the full report so that they can read it as well, and graphical output for the local community.
- **Content:** the structural assessment and problem statement, what the people want (participatory design), what makes the concept feasible, viable and desirable, and which factors need to be taken into account for the long term. IBF will also forward this to the stakeholders.
- **Presentation for the local community:** on 24 October, with visuals and a Bahasa Indonesia translation. Still to be decided: whether IBF, the TU Delft team or both together will present.
- **Timing:** on 24 October the concept version will be presented; adjustments follow later. IBF is flexible in this and will wait for the adjustments that will be presented at the end of November.

Q2. Are there specific formats or designs that have worked well for IBF in the past?

- Infographics and video footage. For the full report, the team's own format is fine.
- The bridge is a different topic from what IBF normally works on, so IBF first needs to fully understand the project before presenting it to its audience. Suitable ways of communicating are a website and an infographic.
- Suggested elements: (1) a pitch deck for the local government (see the example for the Marine Hub), (2) a comparison between the current and the future situation and (3) a projection of the revenue that can be generated through the tourist tax.

- For politicians, a positive public view matters: it is not only about the residents, but also about their own position and generating income. 10% of the tourism tax goes to the government.
- The output does not need to follow the IBF house style, because the bridge is a problem of the whole community. It should be presented as a collaboration between TU Delft and IBF, not as an IBF product only.

Q3. With which stakeholders will these proposals be shared?

- The local government and the residents (Eco Green is part of this group).

Q4. Among them, whose understanding is the most critical?

- **Local government:** to persuade them to invest.
- **Residents:** they are the daily users and need to know the condition of the bridge and what will be done. The main goal is to inform them and to convince them to help with renovating the bridge, keeping it in good shape and reporting any problems.
- **Eco Green:** they will bring the residents along. The residents need to know the load capacity of the bridge, so that they can stop tourists, trucks or other users that would damage it. Eco Green did the same for waste management, so they know how to involve the local population.

Q5. Which stakeholders are the most difficult to communicate with, and why?

- The village government and the West Lombok regency are the most difficult to reach. They only reached out after the situation went viral, and now want to keep this contact.
- Communication will become easier, because phone numbers and connections have now been established. Because of the team's visit, the priority is clearer to them and they understand the wider problem.

Other questions discussed

Q6. What is the relation between IBF and foreign visitors? If foreign visitors book a mangrove tour, does the revenue flow directly to Eco Green, while IBF assists Eco Green with attracting ecotourism and with mangrove conservation?

- The collaboration with Eco Green focuses on the mangrove and ecotourism, and on education about setting up and managing projects. It has been running for three years and covers waste management and ecotours.
- IBF provides educational modules about the mangrove. The aim is more ecotourism to develop the community, combined with education.
- The assumption is correct: when a foreign tourist books a mangrove tour, the money flows directly to Eco Green, and IBF assists with attracting ecotourism.