POLICY BRIEF | JULY 2024

Future proofing a basic social service: climate resilient rural water supply

Policy brief attachment 3

Recommendations for PAMSSANIMAS program

This document provides recommendations based on the research project "*Future proofing a basic social service: climate-resilient community-based rural water supply*" (2023-2024), led by University of Technology Sydney, Centre for Policy, Regulation and Governance, Universitas Indonesia and Universitas Gadjah Mada. This research comprised: (i) a country profile of climate risks for rural water supply; (ii) piloting of a Rural Water Supply Climate Resilience Monitoring and Assessment Tool (RWS-CRMT) in 34 locations in 7 provinces (complemented by qualitative risk and resilience assessments in 14 locations) as well as 56 further locations online; and (iii) an institutional analysis involving policy and regulatory review and an in-depth case study.

The intended audience for this document is Bappenas, Ministry of Public Works and Housing and any implementing partners for the PAMSSANIMAS program. PAMSSANIMAS documents reviewed include: (i) PAMSSANIMAS concept note; (ii) Policy brief Provision of Drinking Water, Domestic Wastewater and Rural Household Waste Management Services 2025-2030 prepared by PAMSIMAS Next Generation Team, Directorate of Housing and Settlements, Bappenas.

1 Policy directions guiding PAMSSANIMAS

The research team is in support of the main implementation policy directions described in the Pamssanimas documentation, which include:

- Water as a social and economic good
- Appropriate technology
- Environmentally friendly and climate resilient
- Improving hygiene behaviour
- Inclusive community approach
- Accountability in the development process
- Development collaboration across actors

However, we suggest the need to reconsider two aspects of the overall approach which are especially important in the context of climate change:

- **Explicit co-management rather than a community-driven approach**: We agree that building community ownership and involvement is key, however we suggest a 'co-management' approach with local and village government, with clearly articulated roles and responsibilities of each actor.

- This recommendation is based on observation that even without climate change impacts, communities and community-based organisations struggle to operate, maintain, repair and expand existing services. Climate events require further external support to be provided to community level from village and regency governments, and hence the need to be more explicit about a co-management approach with clear on-going government responsibilities. The concept note already makes clear many of these responsibilities, but does not confirm a 'co-management' approach. In Koneksi research and in our previous research, we described what a 'co-management' approach entails in previous peer-reviewed research on rural water supply.[1]
- **Increase the emphasis on sustaining and achieving resilience of EXISTING water systems, alongside policy focus on development of new systems**: The policy brief on PAMSSANIMAS focuses only on the process around setting up new systems, which is much needed, however it leaves a gap in the policy guidance on how existing systems will be sustained and be made climate resilient. For instance, the performance indicators for post-construction (e.g. includes % regencies with policies and strategies to achieve access to water and sanitation in strategy documents and in RISPAM, and % villages allocating funds to the development of water systems, etc.) however there are no indicators concerning regency or village government commitment to SUSTAINING existing systems - instead, the indicators are focused on increasing new access.

2 PAMSSANIMAS alignment climate resilient features

At a high level, there is acknowledgement of climate resilience in the existing policy directions, as documented below in Table 1. Two notable omissions are that the policy directions do not cover approaches to ensure responsive funding, and do not consider back-up water resources for PAMSSANIMAS systems. In addition, most of the aspects of climate resilience are not carried through to the specific steps outlined for pre-construction and post-construction of PAMSSANIMAS systems. In this document, we therefore provide additional concrete actions and steps that could realise these climate resilience features in practice.

Climate resilience features	Relevant Pamssanimas policy directions that support this feature, and further efforts that may be required
1 Able to assess climate risk	**Policy 3:** Have insight for environment and climate resilience Communities are expected to have the capacity to anticipate and prepare for climate risks and to respond to and recover from the impacts of climate change, however, the steps to enable this are not mentioned. This document provides suggestions on such steps.
2 Aligned with climate and disaster initiatives	**Policy 3:** Water managers must be able to "manage the impact of disasters" but no clear communication channel established with other initiatives (such as ProKlim, BNPB efforts etc.) in the PAMSSANIMAS documents.
3 Have access to climate-related expertise	**Policy 3:** Planning for the development of drinking water, domestic wastewater, and solid waste services incorporates consideration of climate risks and adherence to the agreed framework for strengthening climate resilience, and assessment of environmental and social risks to affected communities. However access to climate-related expertise is not described in the PAMSSANIMAS documentation.

[1] https://www.water-alternatives.org/index.php/alldoc/articles/vol12/v12issue1/490-a12-1-16/file

4. Have access to responsive funding	No mention of responsive funding support in the PAMSSANIMAS documents
5 Have climate literate personnel	**Policy 3**: Climate resilience concept is introduced to target communities in the "triggering" phase, however there is no mention of provision of technical training on disaster preparedness and response for KPSPAMs, which are essential to support them to provide services in the face of climate events.
6 System located away from climate hazards	**Policy 3:** Mitigation and adaptation actions by facility managers are carried out to place infrastructure in locations that are safe from climate hazards. However, a more detailed climate risk and vulnerability assessment of the site is not mentioned, and is critical for understanding which parts of a water system (eg intake, transmission, pump, distribution, reservoir etc.) are likely to be at risk for each relevant climate hazard.
7 System structure is strong and secure	PAMSSANIMAS documents include mention of: i) use of design and adaptation measures to minimise the impact of climate change. ii) using low-energy technology. However, in practical terms, the specific design recommendations and methods to ensure adaptation measures are not mentioned
8 Have backup water resources	No mention of this in the documents
9 Conserve and manage water resources	**Policy 1:** Water as a Social and Economic Good There is mention of priority programs to support the conservation of water sources through special allocations for these programs in the APBN/APBD Provinsi/APBD Kabupaten/Kota/APBDes.
10 Has an emergency services plan	**Policy 3:** Infrastructure managers must be able to a) provide early warning, b) take emergency steps, c) manage the impact of disasters, and d) contribute to climate change mitigation efforts through a low-carbon development approach. These elements are all important, however training processes for KPSPAMs to enable them in practice are not outlined.
11 Inclusive community characteristics and processes *(added in Koneksi project-additional to original Bappenas framework)*	**Policy 5:** Inclusive Community Approach Increased commitment, understanding and capacity of program actors across all levels related to the implementation of gender, disability and socially inclusive processes is needed. This includes involvement of marginalized and vulnerable groups (poor communities, women, disability groups), understanding their differential experiences of water disruptions and climate impacts and their involvement in response.
12 Has access to wider institutional support *(added in Koneksi project-additional to original Bappenas framework)*	**Regency Dinas PU and DLH roles:** There is mention of operational, maintenance, service expansion support and support on technical issues. The village role is to ensure the provision of APB Desa subsidies or capital participation for the costs of restoring facilities and infrastructure. These roles are primarily oriented to support for new water systems, with insufficient detail on how institutional support will be provided in response to climate events or to ensure long-term sustainability.

3 Construction phase recommendations

The following section describes recommendations for the pre-construction phase, to better integrate climate risks and concerns into this phase, including for: (i) village selection criteria; (ii) selection of appropriate KPSPAMs institutions; (iii) site planning and (iv) community workplan.

3.1 Additions to village selection criteria

Existing criteria in the PAMSSANIMAS concept note for village selection include requirements for behavioural changes on the five pillars, capacity to manage development and expansion through community-management groups, financial contributions including first year of operation and maintenance, land for construction of facilities and willingness to operate and maintain, and commitment by village/subdistrict to provide 20% funds for scheme development that takes place over 3 years.

Based on our research, the following additions are suggested to the site selection process:

- **Climate risk potential and security of water source:** Consider additional factors in the selection process, including ensuring prioritisation of schemes in locations that may face specific challenges but recognising that these will require additional financial and technical resources as compared with other locations:
  - climatic aspects including potential for climate events to adversely affect a proposed water system (e.g. flooding, landslides, drought or water shortages) and where possible avoid locations that are highly susceptible to climate events or plan mitigating measures. Include engagement with BMKG and BPBD on these matters.
  - potential issues and challenges with secure water sources (e.g. climate impacts on supply, water quality as well as competing water uses such as irrigation, and impact of surrounding land-use on water sources and wider systems).
  - geographical location (remoteness, which impacts ability to maintain and repair systems, particularly in the face of climate events)
- **Financial capacity to accumulate reserve funds for repairs**: Evaluate the community's ability to contribute regular fees (based on both willingness to pay as well as socio-economic levels) to support operation and maintenance costs and allow for accumulation of a reserve fund that can be used in the case of climate impacts and support long-term financial sustainability to operate the water system in the chosen villages (aligned to Policy 1 on water as a social and economic good).
- **Village commitment to support climate resilience:** Require a mandatory written statement completed by the village head and administration to commit to address climate resilience by encouraging sustainable water conservation and management practices, to support equitable community engagement with both women and men, and to adopt adaptive strategies to climate impacts.
- **Ecosystem resilience:** Prioritize environmental conservation, by where possible avoiding water system sites (both water sources and wider system) that could harm delicate ecosystems and disrupt natural water flows, or minimising impacts to the extent possible, as climate resilience also depends on ecosystem resilience.
- **Differential climate impacts and needs of the population:** Consider the specific needs of marginalized groups (e.g., women, disabled individuals, ethnic minorities), as different groups may be differently impacted by climate events and any disruptions to services, with differing abilities to cope and access back-up water services.

- **Alignment with existing water management and governance:** Consider the organisation of local governance and institutions currently responsible for water management in the village to ensure effective project alignment and support.

3.2 Selection of appropriate KPSPAMS institutions

The PAMSSANIMAS guidelines suggest that during the pre-construction phase, the village management institution can be either: institutions integrated into the village (LKD or BUMDes) or may be independent institutions (including cooperatives, associations and foundations).

Based on the Koneksi research we propose that the choice of institution should include provision of information to community members and leaders on the **implications of different choices of institutional form, including with respect to climate resilience.** This is because depending on the level of risk (related to expected levels of damage from climate events) and the potential need for future investment in the system (e.g. to add additional water sources etc.), each of these institutional forms will present advantages and disadvantages in terms of access to external support.

3.3 PAMSSANIMAS site planning

During the site planning phase, beyond those steps covered in the PAMSSANIMAS documentation, there are additional steps that could support climate resilience as follows:

- **Conduct a risk assessment:** Conduct a risk assessment to identify the climate risks of the proposed PAMSIMAS location based on existing datasets (i.e., BNPB's disaster risk data, water source protection measures), develop the infrastructure design accordingly (e.g. including water source protection measures or other adaptations), and develop emergency plans accordingly.
- **Secure alternative water sources:** Where risks may exist for a primary selected water source, include assessments for alternative water resources that may be used in the case the primary water supply fails so that the current PAMSIMAS system may be connected to an alternative supply.
- **Address land ownership issues:** Ensure a clear understanding of the land ownership for the PAMSIMAS site, ideally using. government or indigenous and community land, and avoid constructing the PAMSIMAS system on land owned by private companies. A land certificate or other document with legal basis should also be attained.
- **Assess compatibility of adjacent land-use activities and management:** Perform a site assessment to classify land use management categories around the proposed site and identify activities that may affect water quality, quantity, and social dynamics (eg potential for conflicts with external stakeholders involved in other land-use activities), including with respect to climate risks (e.g. landslide risks due to erosion from heavy rainfall, contamination risks due to mining, heavy rain and flooding). Ensure compliance with local laws and regulations related to water rights, land use and environmental protection. In some cases mediation may be required from parties such as sub-district or regency, and this is best done before the PAMSIMAS project starts. In some cases a memorandum of understanding (MOU) may be valuable to prevent changes in land-use in the catchment area.
- **Identify sanitary risks, including with respect to climate events:** Identify existing sanitary risks from contamination sources such as sanitation infrastructure, agricultural activities, and livestock rearing, particularly those that may be exacerbated by climate events such as flooding. Develop measures to protect the water source and distribution network against contamination from the identified source(s).
- **Ensure back-up power supply:** Install backup power sources (such as solar panels or generators) to maintain water supply during power outages caused by storms or other climate-related events

- **Ensure accessibility of the site**: Ensure the site location is accessible for construction equipment and to facilitate repairs, including during climate events
- **Plan and implement water source protection:** Implement measures to protect water sources from contamination and environmental degradation.
- **Establish spare parts stockpiles:** Set up systems to stockpile parts, particularly critical components of the water system, such that these are readily available at the time of need, including village and regency levels.

3.4 Community work plan

- **Integrate climate risk and response planning into work-planning:** Develop mitigation strategies for each climate risk identified and appoint responsible parties/individuals for those strategies. Regularly review and update the work plan based on community feedback and changing needs, as climate risks are expected to evolve over time. Educate community members on disaster risk reduction and support them to develop emergency response plans.
- **Implement a preventive maintenance regime:** Develop a maintenance calendar specifying routine tasks (e.g., cleaning water tanks, checking pipes, repairing leaks).
- **Provide training and support to climate resilient water safety planning:** Climate resilient water safety planning: Integrate climate resilient Water Safety Planning (WSP) such that climate risks and mitigation plans are addressed in the community work plan.
- **Ensure proactive financial management including establishing reserve funds:** Facilitate a reliable and easy implementation of financial statements and platform for managing fees.
- **Allocate clear responsibilities, including for disaster response:** Outline roles and responsibilities of stakeholders involved in the project including community members, project leaders, water operators and technical experts. Ensure clear roles for times of disaster, including a village response team to support on water system issues with KPSPAMs.
- **Inclusive, climate-responsive approach:** Train facilitators and KPSPAMS on gender and disability-inclusive approaches, ensuring effective engagement with disabled people and members of marginalised groups. This is particularly important with respect to climate resilience, as climate impacts usually affect vulnerable populations the most, and they will need the most support to cope and adapt.
- **Inclusive community planning and preparedness processes:** Support KPSAMs to establish the following processes that support inclusion, transparency and preparedness:
  - Ensure active involvement of women in KPSPAMs management, including in technical and leadership roles (not only administration and communication roles) and establish mechanisms for complaints to be voiced by women
  - Include people with a disability in KPSPAMs management by providing suitable jobs, such as data administrative or financial accounting, answering complaints or giving information to users.
  - Engage with stakeholders, such as BNPB, health ministries, and other stakeholders who can help with social and technical aspects of scheme management, particularly during and after climate events.
  - Form an advisory board for the KPSPAMS to ensure transparency for the users and the village, and to ensure support.

- Conduct a thorough needs assessment within potential target villages. Engage with community members to understand their water-related challenges, health issues, and existing water sources, including with respect to climate risks.
- KPSPAMs should include unforeseen expenses ("dana cadangan") in the initial budget.
- Develop monthly/yearly financial plans which includes revenue projection, operation and maintenance costs, minor and major repair costs, and emergency fund. KPSPAMs incentives should be made clear in the beginning to incentivise good management practice.
- Integrate climate hazard and seasonal variability into financials and assets management.

4 Post-construction phase recommendations

The post-construction phase is critical for achieving climate resilience, as it is the period in which climate events may impact water systems, causing disruptions and damage. As such, continued support is required over that period.

4.1 Implementation

- **Regency and village government on-going monitoring of climate resilience and institutional support:** At the regency level, implement the Rural Water Supply Climate Resilience Monitoring Tool (RWS CRMT) on an annual basis to understand the climate risks and impacts faced by KPSPAMs throughout the regency. Integrate response and support plans for KPSPAMs into RISPAM and other regency level planning and budgeting processes.
- **On-going interaction with specified local government personnel:** KPSPAMS should keep in contact with the local facilitators and/or relevant specified local government staff (since facilitators are contract-based). Facilitators can be contacts for support or recommendations for issues encountered. Facilitators also require sufficient training to be able to provide support in the face of climate events.
- **Early warning systems communication to KPSPAMs**: Together with BPBD establish early warning systems for extreme weather events (e.g., cyclones, floods, droughts). Ensure that KPSPAMS and community members receive timely alerts and have an emergency plan in place, using appropriate communication mechanisms that are easily received (e.g. whatsapp).
- **Ensure KPSPAMs access to technical design documentation**: All KPSPAMs should be given access to detailed engineering designs and other construction-related documents, and a system for archiving these documents is required at multiple levels (KPSPAMs, village and district government) to ensure availability over the long-term.
- **Provide training on disaster preparedness and response for KPSPAMs:** Conduct training sessions by BNPB on disaster preparedness, including first aid, safe water storage, and emergency response. Trainings should include action plans in response to climate-hazards such as long droughts or floods.
- **Training on technical repairs and response:** KPSPAMs should receive training from local facilitators on technical responses to damage to the system. For example, recommendations about what type of pump is most durable, what type of pipe they should use etc. Ideally, such training should be recognised and certified by BNSP (National Professional Certification Agency).

- **Regency, village and KPSPAMs weather monitoring and Regency-level analysis of long-range forecasts and predictions:** Monitor climate data (e.g., rainfall patterns, temperature changes) to understand local climate trends within KPSPAMs and village level. Regencies should also analyse wider datasets on longer term climate trends and predictions, and provide relevant information to villages and KPSPAMs to enable planning. Based on the data, adapt water management strategies (e.g., adjusting water allocation, modifying infrastructure) to cope with changing conditions.
- **Ongoing KPSPAMs preventive maintenance:** Conduct a periodic maintenance check list report.
- **Continued spare parts stockpile management:** Procure and stockpile equipment as well as spare parts based on climate risk identification. The stockpile is particularly helpful if a disaster was to occur in the early stages of PAMSIMAS implementation. To support this, maintain documentation of technical specifications list (i.e., types of pumps, pipes, or any other technical equipment) to buy a similar replacement part when the technical problems occur
- **Support water quality monitoring, including during climate events:** Many of the PAMSIMAS systems included in the Koneksi study had not tested their water quality, There should be opportunity to include water quality monitoring costs in initial budgets for PUPR, or support provided from environmental agency.
- **Periodic drills to support preparedness:** Conduct periodic drills to utilize emergency water sources, ensuring that the alternative water source and emergency distribution infrastructure are in proper condition.

5 Technical guidance for climate risks to different water system types

The research revealed common climate hazards and their impacts on different system types. The recommendations below provide steps to take during design and construction phase that are likely to improve climate resilience.

5.1 Spring source systems

General technical recommendations

- Identify of the spring catchment area and recharge area based on background data of springs such as land use, settlements, distributions of springs and geology
- Maintain the land use of the spring recharge area (where that is feasible and possible) and restrict the human or animal activities in the recharge area
- Prevent contaminated water from entering the spring by constructing a cut off drain.
- Install a handpump or tap in the spring box area to prevent the contamination caused by local residents during collection of the water directly from the spring
- Identify nearby spring sources as an alternative water source as an emergency plan and connected to the existing water network

For landslide-prone systems

- Install distribution pipes at least 50cm below the surface to prevent damage, and construct a secure pipeline crossing over rivers and gaps to prevent dislodgement from landslides or strong winds
- Stabilise landslide-prone areas by planting trees

- Improving drainage systems, building channels and clearing pipe networks can reduce landslides from happening
- Wherever possible, build infrastructure in areas not affected by steep angles or elevations, prone to landslide impacts

For forest fire-prone systems

- Create buffer areas (land free of dried vegetation and other flammable materials) around the system in areas prone to fires

For drought-prone systems

- Capture and store rainwater in wet seasons to increase capacity
- Increase water storage capacity to accommodate longer periods without supply
- Identify potential additional spring or other water source to supplement the water supply, and if possible connect the additional source to the main system
- Conduct more intensive water quantity monitoring in the dry season
- Construct infiltration galleries around the catchment area

5.2 Groundwater source systems

General technical recommendations

- Collect the background data such as land use, settlements, groundwater map, groundwater quality, and geology. Identify the groundwater recharge area
- Well maintenance should include inspection for damage, leaks or holes in covers and protective tubes, regular testing of water quality
- Implement appropriate low-cost treatment (filtration, chlorination) to maintain water quality.

For drought-prone systems

- Increase water storage capacity to accommodate longer periods without supply
- Capture and store rainwater as an additional source in wet seasons to increase capacity
- Identify potential additional well to supplement the water supply, and if possible build and connect the well to the main system.
- Conduct a more intensive water quantity monitoring in the dry season
- Construct infiltration galleries around the catchment area

For flood-prone systems

- To overcome floods, build one or more structures to retain or divert floodwater, such as vegetated berms, drainage swales, levees, dams or retention ponds. Install watertight cover to avoid contaminated water infiltration
- Use clarifiers and improved water treatment methods to improve water quality following floods

- Incorporate infiltration holes that can relieve pipe pressure under heavy rain conditions.
- Construct water supply infrastructure (wells, pumps, etc.) above flood levels to prevent inundation during floods
- Install mesh before influent pipe to protect the pump and conduct regular cleaning of the mesh

For forest fire-prone systems

- Create buffer areas (land free of dried vegetation and other flammable materials) around the system in areas prone to fires

For lightning-prone systems

- Install lightning prevention systems or lightning eliminators.
- Turn of electrical equipment during storms or heavy rains.
- Have reserve funds to buy damaged equipment

5.3 Surface water systems

General technical recommendation

- Collect the background data such as land use, settlements, river map, surface water quality, and geology. Identify the water body watershed
- Implement appropriate low-cost treatment (filtration, chlorination) to maintain water quality.

For drought-prone systems

- Assess flexibility to switch between different water sources during times of drought.
- Capture and store rainwater in wet seasons to increase capacity
- Increase water storage capacity to accommodate longer periods without supply
- Identify potential additional water source to supplement the water supply, and if possible build and connect the source to the main system
- Conduct a more intensive water quantity monitoring in the dry season.

For flood-prone systems

- To overcome floods, build one or more structures to retain or divert floodwater, such as vegetated berms, drainage swales, levees, dams or retention ponds. Install watertight cover to avoid contaminated water infiltration.
- Use clarifiers and improved water treatment methods to improve water quality following floods.
- Incorporate infiltration holes that can relieve pipe pressure under heavy rain conditions.
- Construct water supply infrastructure (wells, pumps, etc.) above flood levels to prevent inundation during floods.
- Install mesh before influent pipe to protect the pump and conduct regular cleaning of the mesh

Future proofing a basic social service: climate resilient rural water supply

Policy brief attachment 3

For forest fire-prone systems

- Create buffer areas (land free of dried vegetation and other flammable materials) around the system in areas prone to forest fires.

For lightning-prone systems

- Install lightning prevention systems or lightning eliminators.
- Turn of electrical equipment during storms or heavy rains

LEARN MORE

https://www.uts.edu.au/isf/explore-research/international-development/water-sanitation-and-hygiene-wash/climate-change-and-wash

RESEARCH TEAM

UTS: Juliet Willetts, Avni Kumar, Leanne Casey

CRPG: AlAfghani, Mohamad Mova, Paramita, Dyah Muhajir, Bahagia Mohamad Aftaf

UGM: D. Daniel, D. Daniel, Adhin Harum Wulaningtyas, Elsa Febriana Devi, S. Satriani

UI: Cindy Priadi, Rioneli Ghaudenson, Sucipta Lakono, Danisha, Amalina Az Zahra, Kamilia Insani, Elzavira Felaza

This document is an output from research funded by Department of Foreign Affairs and Trade (DFAT) through the Australia-Indonesia Knowledge Partnership Platform KONEKSI. The views and opinions expressed in this document are those of the authors and do not necessarily reflect the views of DFAT or the Australian Government.