

Minimum Viable Governance for Community-Owned Connectivity

Early findings from two South African community engagements

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Abstract. This paper examines how governance shapes the sustainability of community-owned connectivity and locally relevant services in low-resourced South African settings. Community networks are no longer novel in themselves. Current work increasingly frames them as community-centred connectivity initiatives whose value depends not only on access, but also on local services, community benefit, financing, stewardship, and policy conditions. However, the minimum governance arrangements needed to sustain such networks and services remain insufficiently specified in practice.

Drawing on community-based engagements across two contrasting South African sites, Sweetwaters in rural KwaZulu-Natal and Ocean View in the peri-urban Western Cape, we report early findings from workshops and follow-up engagements with caregivers, farmers, local leaders, growers, and community collaborators. Across the sites, participants foregrounded service-level governance, including verification of announcements, safeguarding and consent, moderation, fair access, appeals, training, and backup stewardship, as prerequisites for trust and adoption. At the same time, the form that legitimate authority should take differed between traditional authority structures in Sweetwaters and civic or community-development structures in Ocean View.

Based on these early findings and prior work on commons, network governance, and community-centred connectivity, we propose Minimum Viable Governance (MVG) as an initial analytic and practical scaffold. MVG identifies a small set of roles, rules, escalation paths, service affordances, and capability-building practices that can help communities and researchers make governance visible early enough to support adoption, accountability, and service evolution.

Keywords. community networks, governance, connectivity, sustainability, participatory design, South Africa, infrastructuring

1 Introduction

Many technology deployments in rural and low-resource settings have historically been framed through a technical premise, namely that if infrastructure, platforms, or services are made available, meaningful uptake and longer-term value will follow. In

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community-network research, however, current work increasingly treats community networks as community-centred connectivity initiatives whose value lies not only in extending access, but also in enabling locally relevant services, local control, and meaningful digital inclusion. The Association for Progressive Communications (APC) defines community networks as infrastructures set up by, owned or run by local communities for their benefit, often including local digital services alongside voice or internet connectivity (Association for Progressive Communications, 2026a,b). Recent APC work further argues that meaningful community-centred connectivity depends on how communities shape, use, and benefit from connectivity, local services, and technologies in ways that strengthen local economies and culture (Association for Progressive Communications, 2024; Association for Progressive Communications and Rhizomatica, 2024).

In this paper, we use *community networks* to refer to connectivity infrastructures that are set up, owned, operated, or governed by local communities for community benefit, often combining internet access with locally hosted digital services. We use *community-owned connectivity* and *community-centred connectivity* to emphasise that the concern is not only technical access, but also local ownership, meaningful use, service relevance, stewardship, and accountability. We use *Minimum Viable Infrastructure* (MVI) to refer to the smallest technical and organisational arrangement through which connectivity can begin to operate. We propose *Minimum Viable Governance* (MVG) as a complementary concept that refers to the smallest set of locally legitimate roles, rules, responsibilities, escalation pathways, and capability-building practices needed for connectivity and related services to be trusted, maintained, and adapted over time.

This shift reframes the question from how little infrastructure is needed to start operating a network to how little governance is needed for that network and its services to remain workable in practice. In Sweetwaters, for example, participants anticipated disputes around content sharing, escalation to traditional leaders, and safeguarding even while connectivity infrastructure remained partial. In Ocean View, caregivers and collaborators foregrounded moderation, verification, and consent as preconditions for using local services, underscoring why a continuity-focused MVG lens needs to accompany MVI in governance-sensitive deployments.

While the field, literature, and research around community networks and community-centred connectivity have matured considerably, the governance arrangements through which these initiatives and their services remain usable, trusted, and sustainable remain comparatively under-specified in both research and practice (Association for Progressive Communications and Rhizomatica, 2024; Rey-Moreno, 2024). This is especially clear in South Africa, where recent APC strategy work notes that community-centred connectivity initiatives already operate across the country, but continue to face constraints around affordability, finance, licences, spectrum, capacity, and meaningful participation in policy and regulatory processes (Association for Progressive Communications et al., 2025). The issue, then, is not whether community-owned connectivity can exist. The more pressing question is how it becomes meaningful, governable, and sustainable when the services running on networks are often what make connectivity matter in everyday life.

South African community-network work makes this especially visible. Zenzeleni remains important not simply as an early proof of concept, but because its current model still shows the practical value and constraints of cooperative ownership and

non-profit support structures in community-owned connectivity (Institute for Social Entrepreneurship in Asia (ISEA) et al., 2025; Rey-Moreno et al., 2015; Zenzeleni Networks, 2026). iNethi has demonstrated how locally hosted services can make networks valuable beyond access alone, while also exposing how fragile that value can become when ownership, maintenance, and revenue arrangements are not clearly embedded locally (Farao et al., 2020; Johnson et al., 2023; Lorini et al., 2019). The Soweto Wireless User Group (SOWUG) offers a contrasting urban trajectory in which community-driven services have persisted through volunteer participation, but with visible limits around formal governance, inclusivity, and scalability (One World Connected, 2017; Soweto Wireless User Group, 2026). Taken together, these cases suggest that sustainability depends on more than technical rollout. It also depends on the business, governance, and stewardship arrangements through which locally relevant services are maintained over time.

This paper, therefore, shifts the point of inquiry from *Minimum Viable Infrastructure* to *Minimum Viable Governance* (MVG). Here, governance does not refer to governance in the abstract, nor to enterprise ICT governance in the narrow corporate sense. Rather, it refers to the local arrangements of roles, rules, responsibilities, accountability, support, and escalation through which community-owned connectivity and related services are managed and sustained. We present MVG as an initial analytic framing grounded in exploratory empirical work, rather than as a final or fully generalisable governance model.

Rather than treating Sweetwaters and Ocean View as interchangeable low-resource sites, we use them as contrasting settings through which to examine a shared problem. Sweetwaters is a rural community in KwaZulu-Natal where connectivity is shaped by geographical distance, limited resources, and recognised traditional authority structures. Ocean View is a low-resourced peri-urban community in the Western Cape where community-owned connectivity intersects with the flagship iNethi deployment. That deployment combined low-cost Wi-Fi, local servers, and locally hosted services such as file sharing, chat, community media, educational resources, and local content creation (iNethi Technologies, 2026a,b; Johnson et al., 2023; Lorini et al., 2019; University of Cape Town News, 2018). Our engagement therefore built on a setting where connectivity had already been linked to local services, community ownership, affordability, and civic community-development work.

Across both settings, the central question is not only how connectivity is provided, but how local roles, rules, responsibilities, and support systems are organised so that connectivity and related services can be maintained, trusted, and adapted over time. This becomes especially important when external partners withdraw, as the durability of the intervention depends on whether authority, stewardship, moderation, accountability, training, and continuity have been negotiated and embedded locally. Our early findings suggest that long-term viability is shaped less by technical provision alone than by the governance arrangements that remain once external actors exit.

This framing also positions community-owned connectivity as a question of rural and peri-urban innovation governance: not simply how digital infrastructure is introduced, but how local institutions, maintenance practices, authority structures, and service arrangements make such infrastructure durable after external project support recedes.

The core problem we address is that there is little clarity on the minimum governance arrangements needed for community networks to remain usable, trusted, and sustainable once external actors withdraw.

In response, this paper makes three contributions, namely:

- It offers an empirically grounded account of how local stakeholders in two South African sites articulate governance, stewardship, and capability needs around community-owned connectivity and locally hosted services.
- It introduces Minimum Viable Governance (MVG) as an analytic lens and practical scaffold, expressed through a five-element toolkit and a minimal one-page governance artefact developed from participant concerns and formatively reviewed with participants.
- It provides comparative insight into how different local legitimacy structures, including traditional authority in Sweetwaters and civic or community-organising roles in Ocean View, shape viable governance arrangements for community-owned connectivity and services.

2 Background and related work

2.1 From solutionism to sustainability in practice

Earlier Information and Communication Technologies for Development (ICTD) and Human-Computer Interaction for Development (HCI4D) work remains useful for explaining why social and cultural fit cannot be treated as secondary to technical provision. Foundational studies cautioned that technologies designed for industrialised settings often carry assumptions about infrastructure, use, and context that do not hold elsewhere, and that adoption is shaped by social network structures and local cultural dynamics (Brewer et al., 2005; Dearden and Rizvi, 2011; Ramachandran et al., 2010). Related critiques argue that design cannot be separated from questions of politics and power and that attempts to smooth over conflict through technical intervention often obscure the social conditions that shape whether systems are accepted, contested, or ignored (DiSalvo, 2012). Taken together, this literature cautions against assuming that technical provision alone is enough to produce durable social change.

Subsequent work in Sustainable HCI has extended this critique by showing that many deployments struggle not because their technical intent is incoherent, but because questions of maintenance, repair, appropriation, and long-term responsibility remain underspecified. Reviews of the field suggest that Sustainable HCI has increasingly grappled with durability, systemic complexity, and the limits of novelty-driven intervention models (Bremer et al., 2022; Clear et al., 2013). In this sense, the problem is not only whether a system works at launch. It is whether it can survive the withdrawal of external support structures, adapt to everyday realities, and remain meaningful over time.

These concerns are particularly acute in African and other low-resource contexts, where design assumptions rooted in Western epistemologies may fit poorly with communal, relational, and indigenous ways of organising knowledge and authority (Winschiers-Theophilus and Bidwell, 2013). This has helped motivate participatory and co-design approaches in ICTD (Till et al., 2022). However, even where

technologies are shaped with communities, continuity is often left underspecified. Systems can be launched with participation, while the governance needed for them to work and survive remains unclear.

These sustainability concerns are directly relevant to community networks, but they do not explain them fully. Community networks are not generic Information and Communication Technology (ICT) deployments. They are connectivity initiatives in which infrastructure, local services, ownership, operating models, and community participation are expected to remain over time. The next subsection, therefore, situates the paper in South African community-network work before turning to governance as the central analytic concern.

2.2 Community networks in South Africa

South African community networks are now best read not only as access interventions, but as experiments in how connectivity, local services, business models, and governance are organised together. Zenzeleni, a community owned wireless internet service provider, remains important not simply as an early proof of concept, but because its current model still makes visible a cooperative and non-profit support structure in which community cooperatives act as local operators while a central non-profit seeds new cooperatives, supports services, mentors operations, and undertakes advocacy (Institute for Social Entrepreneurship in Asia (ISEA) et al., 2025; Rey-Moreno et al., 2015; Zenzeleni Networks, 2026). In contrast, iNethi has been especially important for showing how locally hosted services such as content sharing, community media, and messaging can make a network meaningful beyond access alone, while also illustrating how fragile such services can become when ownership, maintenance, and revenue arrangements are not clearly embedded locally (Farao et al., 2020; Johnson et al., 2023; Lorini et al., 2019). SOWUG provides an additional urban counterpoint as a long-standing non-profit wireless user group that has supported community-driven services through volunteer participation, but with visible constraints around formal governance, inclusivity, and scalability (One World Connected, 2017; Soweto Wireless User Group, 2026).

The findings of these projects are especially relevant for the present study, which builds on previous engagements in two sites that expose a comparable sustainability problem under different conditions. Earlier work in Sweetwaters identified parental support, connectedness, and locally relevant content as community priorities, and subsequent workshops produced the idea of a parenting centre supported by a community wireless network and local early childhood development (ECD) resources (Coleman et al., 2023; Till et al., 2022). Ocean View, meanwhile, sits within the broader *iNethi* ecosystem and long-standing community development work in the area, where connectivity and platform use have been tied to practical concerns such as local communication, content sharing, affordability, community acceptance, and local service governance (Farao et al., 2020; iNethi Technologies, 2026b; Lorini et al., 2019). The two sites are, therefore, comparable not because they are the same, but because they allow us to examine how a similar sustainability problem is negotiated through different authority structures, participation practices, and service priorities.

Taken together, these cases underline that sustainability depends not only on technical rollout but also on the business, governance, and stewardship

arrangements through which locally relevant services are maintained over time. Recent work on financing locally owned internet infrastructure argues that community connectivity providers, including community networks, cooperatives, municipal networks, and social enterprises, have distinct ownership and operating models, and that their sustainability depends heavily on whether they can leverage community assets, align financial expectations, and access appropriate capital and support (Belli, 2018; Internet Society et al., 2021). Recent South African work on community-centred network management also shows that local operators require interfaces, training, and support structures that match community needs and capabilities, reinforcing the importance of capability-building as part of governance (Iitumba, 2024).

In this light, the problem is not that community networks are new. It is that, despite a more mature field, there is still limited clarity on how to characterise and compare the governance arrangements through which infrastructure, services, stewardship, and sustainability are held together in practice. That gap is particularly important where networks are expected to support locally meaningful services, but where the business, regulatory, and governance conditions for those services remain fragile.

2.3 Governance and the value of slowing down

Having located the paper within community-network work, we now clarify what we mean by governance. In current community-network literature, governance is not treated as a single institutional template. APC frames community networks and community-centred connectivity initiatives as participatory and community-oriented arrangements whose legal, ownership, and governance forms may differ across contexts, but which are distinguished by their social mission, local relevance, and community benefit (Association for Progressive Communications, 2026b; Association for Progressive Communications and Rhizomatica, 2024). Some initiatives may operate with limited participation and specific community-orientated services, while others aim for deeper community ownership and participation in governance and management (Association for Progressive Communications and Rhizomatica, 2024). Luca Belli and related community-network scholarship similarly describe community networks as democratic and community-governed initiatives, shaped by governance models established by community members and by enabling policy frameworks (Belli, 2017, 2018).

In this paper, governance includes not only who owns or maintains infrastructure, but also how decisions are made, how roles are allocated, how moderation and verification are handled, how conflicts are escalated, how services are sustained, and how communities engage with policy, funding, and support actors. Governance, in this sense, is less a fixed structure than a relational practice of coordinating infrastructure, services, stewardship, and accountability over time.

This broader understanding of governance also explains why slowing down early design and deployment can matter. If governance is partly about clarifying roles, responsibilities, legitimacy, and accountability before breakdown occurs, then taking time to surface those arrangements is not administrative delay, but part of making a deployment socially workable. Participatory design research increasingly treats participation as something that unfolds over time, during, between, and beyond

discrete workshop events, while infrastructuring perspectives frame design as the gradual development of sociotechnical relations and responsibilities rather than a one-off intervention (Karasti, 2014; Saad-Sulonen et al., 2018).

2.4 From governance importance to governance characterisation

Although previous work highlights governance as central to community networks, there is less clarity on how to analytically characterise and compare governance arrangements as they emerge in practice (Belli, 2017; Rey-Moreno, 2017). The existing literature consistently emphasises the importance of community ownership, local stewardship, and participatory processes, but is less explicit about how governance should be described or implemented once multiple actors, services, and responsibilities are involved. In our case, this matters because continuity is not only a question of whether a network was co-designed or launched with community participation, but also how authority, stewardship, moderation, training, escalation, and service continuity are practically organised over time.

We, therefore, draw on commons governance and network governance as complementary sensitising lenses rather than as fixed frameworks to be tested. Commons governance provides a foundation for understanding how shared resources are collectively managed through locally defined rules, responsibilities, and stewardship practices (Ostrom, 1990). Network governance, in contrast, highlights coordination between multiple actors with distributed authority, including communities, organisations, and service partners (Provan and Kenis, 2008). Together, these lenses allow us to analyse governance as both situated and relational, supporting comparison across sites without requiring us to treat Sweetwaters and Ocean View as entirely separate conceptual and socio-technical problems.

3 Methods

3.1 Research sites and population

Sweetwaters: KwaZulu-Natal Province: Sweetwaters is a low-income rural area located approximately 97 km from Durban in the uMgungundlovu district. The average monthly income in this region is approximately R2,400 (USD 1 = R18.51)¹. To recruit participants in KwaZulu-Natal, we collaborated with the Human Sciences Research Council (HSRC)², a governmental research institution with strong connections to local farmers. A community liaison assisted in recruiting six farmers, including two community growers who provide food to those in need, as well as ten mothers and elderly quilters who participated in the previous study.

Ocean View, Western Cape Province: Ocean View is a low-income peri-urban community located approximately 40 km south of Cape Town along the Cape Peninsula. Originally established during forced removals under the Group Areas Act³, the area remains shaped by spatial marginalisation and limited access to economic opportunities. Many residents rely on informal employment, seasonal labour, or social grants, with household income levels broadly consistent with

¹ <https://www.statssa.gov.za/publications/P0318/P03182019.pdf>

² <https://hsrc.ac.za/>

³ <https://www.sahistory.org.za/article/group-areas-act-no-41-1950>

lower-income communities in the Western Cape⁴. To recruit participants in the Western Cape, we collaborated with local community organisations and urban agriculture initiatives that had established trust within the community and supported food-security work. A community liaison assisted in identifying and recruiting participants, including two local growers and 12 mothers and caregivers.

Participants were recruited through purposeful sampling because they represented different forms of practical participation in, or prior exposure to, community-based services and technologies that could benefit from community-owned connectivity. Mothers and caregivers were central to parenting, learning, safeguarding, and content-sharing use cases developed through the Co-Designing Community-based ICTs Interventions for Maternal and Child Health in South Africa (CoMaCH) project. Farmers and growers were included because SmartHydro and food-growing activities provided a second service context in which maintenance, training, peer learning, and local knowledge stewardship were prominent. Traditional leaders, civic actors, and community collaborators were included because participants repeatedly treated authority, dispute resolution, verification, and escalation as governance questions that could not be answered by service users alone.

3.2 Research design

This study adopts a qualitative, multi-site participatory design approach, using co-design not simply as a method of inclusion but as a critical strategy for engaging with the social, cultural, and political conditions shaping technology use. In both sites, co-design activities were used to foreground local knowledge, cultural practices, and existing leadership structures, recognising that governance cannot be meaningfully designed without accounting for situated power relations and historically embedded forms of organisation. Rather than treating communities as sites for the deployment of preconfigured solutions, the study deliberately resisted universalised models of technology design, instead creating space for participants to articulate, negotiate, and contest how systems should function within their own contexts.

This approach acknowledges that questions of access, ownership, and responsibility are inherently political, and that design processes must engage with, rather than abstract away from, these dynamics. Working through co-design, the study surfaces how authority, trust, and decision-making are distributed within communities, and how these distributions shape both the possibilities and limitations of community-based digital services.

3.3 Study context and previously deployed software as a point of inquiry

The study builds on previous work by members of the broader research team, but it asks a different question. Earlier CoMaCH work in Sweetwaters focused on community-based co-design for maternal, child, and early childhood development priorities, including parental support, connectedness, and locally relevant digital content (Till et al., 2022). That work led to the development of a content-sharing application and a broader parenting centre concept that combined

⁴ <https://www.statssa.gov.za/publications/P0318/>

community-owned connectivity with local ECD resources (Coleman et al., 2023). The present study uses that prior service and community engagement history as a point of departure to examine what local roles, rules, responsibilities, support structures, and escalation pathways are needed for such services and the connectivity around them to remain usable and trusted over time.

Sweetwaters also included engagements with farmers involved in SmartHydro, an AI- and IoT-enabled hydroponic grow-tent initiative concerned with food-growing practices, maintenance, and sustainability (Wilson et al., 2024). These growers provided a second service context in which community-owned connectivity was discussed through content sharing, specifically around local agricultural knowledge, mentoring, training material, and the maintenance of practical food-growing systems.

In both sites, participants were taken through service artefacts that could run on or alongside community-owned connectivity. In Sweetwaters, this built on previous CoMaCH work around parental support, connectedness, locally relevant digital content, and community-based co-design for maternal, child, and ECD priorities (Coleman et al., 2023; Till et al., 2022). The application allowed participants to discuss onboarding, safe use, content creation, sharing boundaries, and continuity. In Ocean View, the application was introduced as a newer artefact, but was similarly used to prompt discussion about moderation, content ownership, announcements, verification, parental consent, and ongoing support. In this sense, the application functioned less as a finished product than as a service probe through which participants could articulate governance expectations around the services running on community wireless networks.

3.4 Data collection

This study relied on a series of focus groups with relevant community stakeholders, supported by scenario cards, role cards, demonstrations, fieldnotes, audio recordings, and optional WhatsApp follow-up. All engagements were conducted under institutional ethical approval (ethics clearance reference R.1602248), with informed consent, anonymisation of participant names, and restricted storage of recordings, transcripts, fieldnotes, and workshop artefacts.

3.4.1 The design and use of scenario cards

Scenario cards were used as a facilitation and elicitation tool to support discussions of governance, use, and responsibility regarding community-based digital services. Scenario-based approaches are well-established in HCI as a way to represent situated episodes of human activity, allowing participants to reason about technology in context rather than in abstraction (Carroll, 2000; Rosenbaum and Carroll, 2000). By grounding the discussion in concrete, plausible situations, scenarios enable participants to reflect on everyday practices, anticipate breakdowns, and consider the social and organisational implications of technology use.

In this study, scenario cards were designed to present specific situations involving platform use (e.g. moderation, consent, content sharing, and access), which participants could collectively interpret and respond to. Previous work shows that scenario-based participatory design methods can surface a broad range of social values, including trust, accountability, autonomy, and fairness, particularly in

contexts where technologies intersect with existing power relations (DiSalvo, 2012). This makes scenario cards especially useful for exploring governance questions that are difficult to capture through direct questioning alone.

Card-based formats further support participation by structuring discussion, reducing cognitive load, and providing prompts that guide reflection without constraining it. Such approaches have been shown to help participants externalise ideas, generate alternatives, and engage with complex design considerations in accessible ways (Lucero and Arrasvuori, 2012; Wassenaar and van den Hoven, 2017). In this study, the cards functioned both as discussion prompts and as a means of collaboratively exploring multiple possible configurations of use, including points of ambiguity, tension, and contestation.

As the fieldwork progressed, we found that scenarios alone were less effective for eliciting how participants understood named positions of responsibility and delegated authority. We, therefore, adapted the elicitation approach in Ocean View to include both scenario cards and role cards, which made it easier to discuss not only governance situations, but also who should act, who should provide support, and how responsibility should be distributed in practice.

3.4.2 Sweetwaters focus groups

Data collection in Sweetwaters comprised three main focus-group engagements. The first involved mothers and caregivers and was conducted over two days. The initial session lasted approximately 1 hour and 37 minutes and focused on current data use, device sharing, alternate access practices, app onboarding, children's learning, and questions of ownership, management, and training. During the mothers' sessions, each participant received a scenario card. Participants read their cards aloud, placed themselves in the scenario, and discussed how they would respond, how they would want other community-network stakeholders to respond, and what rules or roles were needed to handle the situation fairly. The cards were used to provoke group discussion around concrete governance situations rather than abstract opinions about connectivity. Representative examples are shown in Figure 1.

Two follow-up sessions on the second day lasted approximately 1 hour each. These subsequent sessions focused more directly on content creation, content-sharing boundaries, training strategy, continuity, and practical maintenance and repair questions.

The second Sweetwaters engagement was conducted with traditional leadership and lasted approximately 2 hours. This discussion focused on how the network should be governed and grown, how community members should be involved, what ownership should mean in practice, and how troubleshooting, breakdowns, and dispute resolution should be handled. No audio recording was available for this engagement so it was documented through detailed fieldnotes.

The third Sweetwaters engagement involved farmers and lasted approximately 1 hour and 13 minutes. This session focused on the AI and IoT enabled hydroponic grow tents, the supporting application, the practices of learning and knowledge sharing among farmers, and questions of how such knowledge might circulate through community-oriented digital services. As with the mothers' sessions, this engagement was documented through audio recording and fieldnotes and later translated manually from isiZulu into English where required.

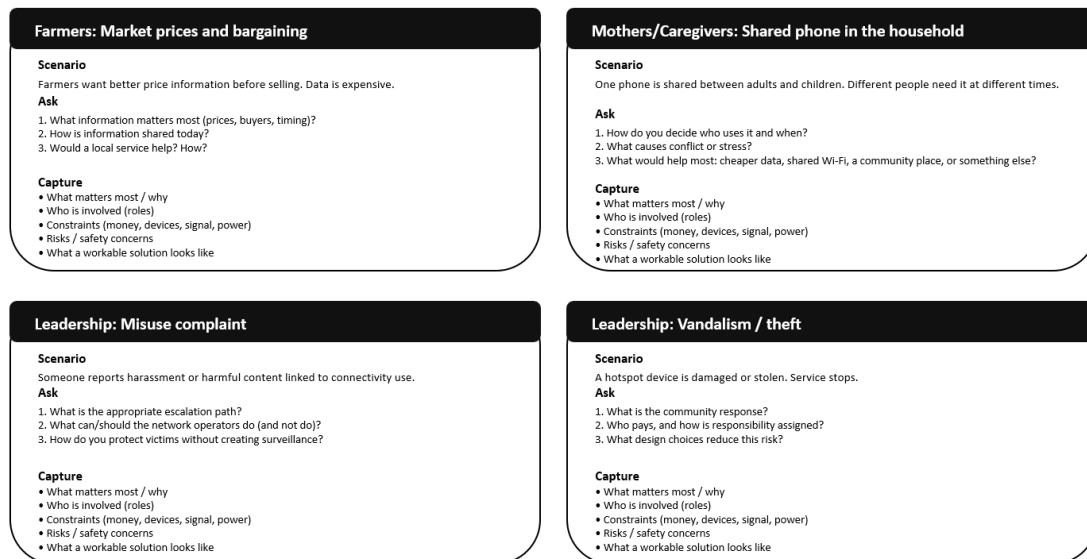


Figure 1. Representative elicitation cards used in the Sweetwaters workshop where scenario cards were used initially to prompt discussion around concrete governance situations.

3.4.3 Ocean View focus groups

Data collection in Ocean View took place over three days and combined governance elicitation, platform demonstration, and iterative design discussion. Day 1 included a governance-focused group session with caregivers and community participants, a shorter demonstration and training session on ShareMe, and a later discussion with local collaborators on SmartHydro-related food-growing and community sustainability issues. Day 2 comprised a longer governance workshop, which lasted approximately 2 hours and explicitly used scenario and role cards to explore decision-making, moderation, consent, announcement verification, complaint handling, and expectations of stewardship. The ShareMe application was used during these sessions as a concrete service example through which participants could respond to questions about moderation, verification, consent, and stewardship. Day 3 consisted of a shorter recap and clarification session, after which low-fidelity prototyping continued with the participants.

Ocean View audio was recorded on researchers' mobile devices and later transcribed using automated transcription. Because these transcripts contained errors and uncertain speaker attribution, they were treated as noisy artefacts and interpreted alongside field notes, WhatsApp follow-up, and workshop artefacts rather than as fully reliable standalone records. Across both sites, the cards were used to prompt discussion around concrete situations rather than abstract principles, which helped participants articulate what they considered necessary for community-owned connectivity and related services to function in practice.

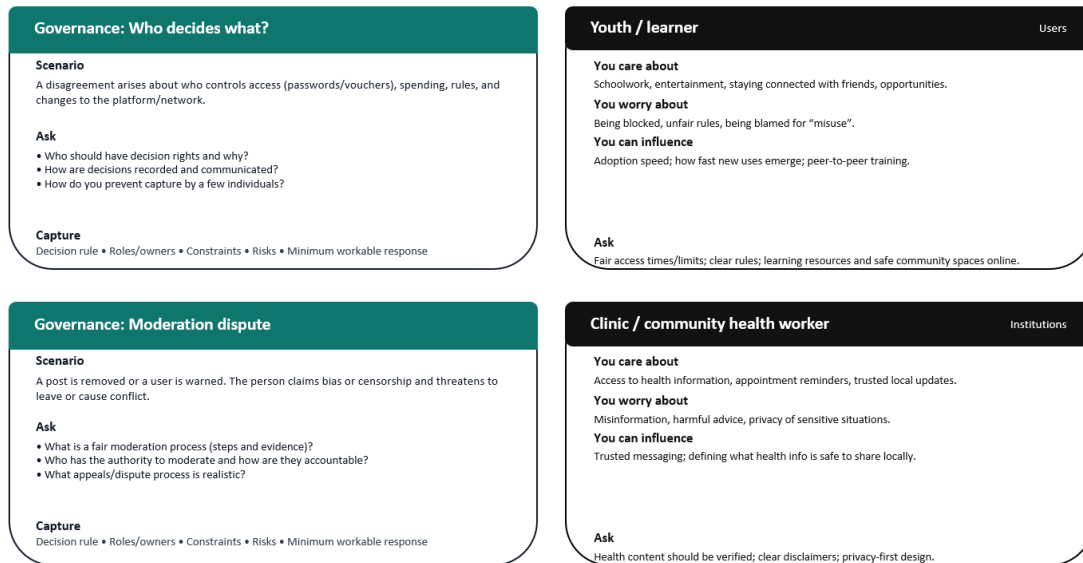


Figure 2. Representative elicitation cards used in the Ocean View workshops. Ocean View used both scenario and role cards to elicit discussion about governance situations and named responsibilities.

3.4.4 Follow-up communication and artefacts

In both sites, data collection extended beyond live sessions. Optional WhatsApp groups were used as follow-up channels in which participants could continue discussions, reflect on prototypes, share ideas, and ask additional questions. Recordings, transcripts, fieldnotes, and associated artefacts were stored in a restricted-access institutional cloud environment accessible only to the research team.

3.5 Artefact feedback and preliminary evaluation

After the initial MVG elements were derived from the cross-site analysis, we developed a one-page MVG artefact as a formative evaluation object. This evaluation was not designed as a summative validation of MVG as a finished framework. Rather, it was used to test whether the proposed roles, rules, escalation pathways, service affordances, and capability-building elements were recognisable, usable, and locally meaningful to participants and community collaborators.

Feedback on the artefact was gathered through workshop discussion, fieldnotes, and follow-up communication. In Sweetwaters, participants were asked whether the one-pager represented their governance expectations, whether the proposed authority structures and roles were appropriate, and how the artefact might be used with community structures such as the *Ndunas*, *Nkosi*, committees, and other local stewards.

We treated this feedback as preliminary and formative. The purpose was to assess traceability between the empirical findings and the proposed MVG elements, and to identify what would need to be clarified before external researchers, funders, or implementation partners reduce their involvement. The evaluation, therefore, focused on whether the artefact helped make local authority, stewardship,

accountability, training, and continuity visible enough to be discussed, challenged, and revised.

Table 1. Summary of participants, engagements, and focus across study sites

Site	Participants	N	Engagement	Focus
Sweetwaters	Farmers	6	Focus group (1)	Use of AI and IoT enabled hydroponic grow tent, farming practices, and sharing of agricultural knowledge through community systems
	Mothers & caregivers	10	Focus groups (3)	Data access, device sharing, onboarding, children's learning, content creation and sharing, training, maintenance
	Traditional leaders	11	Focus group (1)	Network governance, ownership, community roles, troubleshooting, and dispute resolution
Ocean View	Growers	2	Group discussion	Food growing practices, sustainability concerns, and AI and IoT enabled hydroponic grow tent
	Mothers & caregivers	12	Focus groups + workshop	Governance (moderation, consent, verification), platform use, onboarding, and stewardship expectations
	Collaborators	2	Discussion sessions	Platform demonstration, design feedback, and community sustainability considerations
Both	All (optional)	All	Follow-up (WhatsApp)	Continued discussion, prototype reflection, idea sharing, and secure storage of recordings, transcripts, and fieldnotes

3.6 Data analysis

The complete dataset comprised fieldnotes, audio recordings, manually translated Sweetwaters isiZulu conversations, noisy automated transcripts from Ocean View, optional WhatsApp follow-up interactions, and service artefacts such as shared videos from the ShareMe app, shown in Figure 3. Because the dataset included different kinds of material, in different languages, and with differing levels of reliability, no single source was treated as authoritative in isolation.

We analysed the dataset using Braun and Clarke's reflexive six-phase thematic analysis as an analytic guide (Braun and Clarke, 2006). The analysis proceeded iteratively through familiarisation with the data, generation of initial codes, clustering of codes into candidate themes, review and refinement of those themes across the dataset, definition and naming of themes, and the writing of an interpretive account. Consistent with a reflexive approach, themes were treated not as passively emerging from the data, but as interpretive constructions developed

through repeated engagement with the material, memo writing, and discussion within the research process. This analytical strategy was useful because the study did not seek to generate a formal grounded theory. Rather, it aimed to identify recurring patterns of meaning around governance, stewardship, moderation, consent, accountability, and sustainability across two contrasting sites.

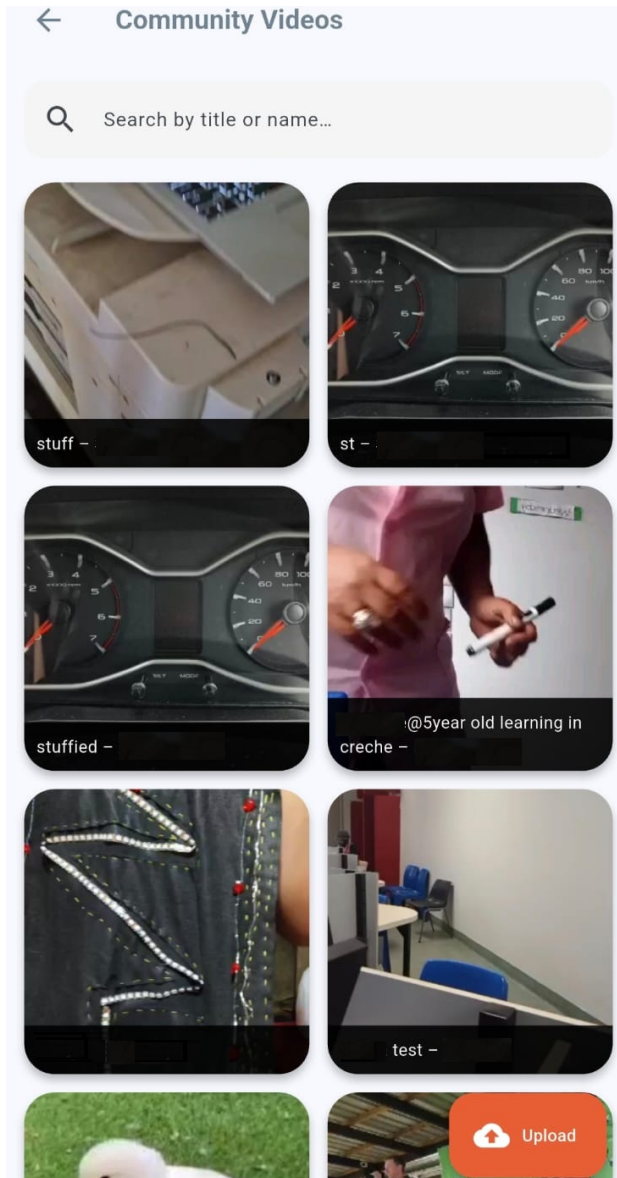


Figure 3. A screenshot of the Community Videos section of the ShareMe app. Names of uploaders have been redacted for anonymity.

These methodological choices have some limitations. The Ocean View transcripts are automatically generated and, therefore, noisy, and the Sweetwaters traditional leadership engagement is documented only through fieldnotes and not through audio recordings, as per the request of the traditional leadership. Therefore, we treat these materials as partial and triangulate them with translated workshop conversations, other audio recordings, WhatsApp follow-up, and artefacts rather than as complete records. Claims about specific stakeholder groups, for example, traditional leaders in Sweetwaters or particular community organisers in Ocean

View, are interpreted cautiously and at the level of recurring patterns rather than detailed interactional analysis.

3.7 Positionality and reflexivity

The first author entered the field as an outsider, with institutional proximity to the study through a supervisory relationship and a professional background in IT governance. Although he aimed to adopt a neutral and conversational stance, participants may nevertheless have perceived him as institutionally connected, technically knowledgeable, and at times linked to resources, particularly where he was involved in workshop logistics such as meals and participant honoraria. Early engagements in Sweetwaters shifted his framing of the problem from a minimum viable infrastructure toward governance, stewardship, and community ownership. This in turn shaped the later fieldwork, including adaptations to the role and scenario cards for Ocean View. In the paper, this reflexive positioning is treated briefly because the fuller account is more appropriate for the dissertation. Finally, the remaining members of the research team have a long history of conducting community-based research with a particular focus on rural areas.

4 Findings

These findings are based on early, exploratory engagements rather than long-term deployment studies. Across both sites, governance was not treated as a secondary concern to infrastructure but as the condition under which connectivity could become usable, trusted, and sustainable over time. Participants from both communities consistently framed governance as a practical matter, questioning who decides, who is responsible, and what happens when things go wrong. From this exploration into locally informed governance structures, four cross-cutting themes emerged.

4.1 Negotiating authority and ownership as locally grounded and not transferable

Governance was repeatedly framed as a question of who should hold authority, how that authority should be constrained, and how ownership should be understood in practice in both sites. In addition, participants in both communities emphasised that governance must align with locally legitimate authority structures, but what counted as legitimate differed sharply.

In Sweetwaters, participants linked ultimate authority to established rural governance structures and described the traditional leaders, including the *Nkosi* (local chief) and *Ndunas* (local headmen who act on behalf of the chief in different villages), as legitimate escalation points for unresolved disputes. In line with this, the *Nkosi* and *Ndunas* explained that they have well-understood and entrenched governance structures that could support the continuity and sustainability of the network and the shared services running on it. The *Nkosi* explained:

“We have governance structures in place that could be used to support the functionality of the network. We have a headsman in each village who

oversees various portfolio committees. Community members know to contact the leaders of the portfolio committee for conflict resolution, assistance and a variety of other reasons already.” - Nkosi, KZN

At the same time, both the traditional leadership and community members stressed that the shared service should not be monopolised and controlled by traditional leadership roles, nor should it be researcher-owned; it should be community-owned. One participant captured this emphasis on local rule-making when questioned about what rules of protection around content sharing would make them comfortable, especially when minors could potentially access the content, by stating,

“Yeah, so we follow the rules. We have to follow the rules. We create our own.” - Mother 1, KZN

The community further echoed the sentiments of the traditional leadership that the already entrenched structures would be most suitable for conflict resolution, error reporting, maintenance, and stewardship. In a subsequent visitation to Sweetwaters one of the mothers expressed:

“Yes, I agree with the legitimacy, it was absolutely correct to include the Ndunas and the Nkosi, he is very involved and they will be around for a very long time . I can see how handling the network will fit in. You know the Nduna for Zayeka is very approachable, the entire community , any member knows they can take thing to him. We all know about the portfolio committees and we are comfortable with going to them for help. The Nkosi is not some one who will want to control things, he is supportive” - Mother 1, KZN

Finally, both the community and the traditional leadership discussed a marked distrust in the civic governance structures at play in Sweetwaters, explaining that the ward councillors are often corrupt. During a discussion on how the community would like to handle fake news and scam messages, an elderly community member mentioned:

“I will tell you this much, when you see that scam message, you don’t phone the ward councillor, they are the ones putting the scam there.” - Mother 2, KZN

In Ocean View, by contrast, participants did not refer to traditional authority structures at all. Instead, they spoke about trusted civic and community organising roles such as ward councillors and local NGOs, and stressed that governance should be held by people with the community’s interests at heart rather than by actors seeking personal power or personal benefit. When prompting with the traditional leadership structure in Sweetwaters, the ward councillor representative stated:

“There is a vast difference between the communities... I’m the ward councillor representative for youth within the arts and the creative director for Youth development for a NGO called “Art Vibration” and we have partnerships with Sarina Till in terms of SmartHydro. We have been doing community development with the focus initially with youth within the arts and we’ve been doing it for the past 36 years... - Community leader and ward councillor representative, Western Cape

The Ocean View participants also distinguished between different types of content and the authority required for features of the content-sharing app envisioned for the community wireless network. Announcements, for example, were treated as a special category that should be verified before release and, in some cases, should not allow comments at all. However, in both sites, ownership was not discussed as possession of equipment alone but as the legitimate capacity to make, enforce, and revise rules.

4.2 Governance is enacted through stewardship, not roles alone

Participants in both communities treated governance as inseparable from stewardship and capacity building. They repeatedly discussed who should train people, who should manage day-to-day issues, and what should happen if the main support person was unavailable. In Sweetwaters, this took the form of a discussion about local administrators, backup support, and the need to spread responsibility beyond a single person. As one participant put it,

“...there should be an admin and then that admin should have a partner if she’s not available like I said for instance [redacted] and then if she’s not around I know that I’m in charge. I’m like a second partner to help with computers, sisters and children other people can ask.” - Mother 3, KZN

The Nkosi and the traditional leadership team further emphasised that they would like to see the Ndunas and members of the community trained to support the network, as well as ten local unemployed youth. It was important to the leadership team that it is clear that the network needs to be owned, administrated, and run by the community, using the traditional leadership as a support structure rather than a monopolising entity.

In Ocean View, participants similarly emphasised onboarding, support, and the importance of empowering older community members rather than assuming digital confidence. One of the Ocean View participants noted,

“...nobody’s thinking about actually empowering the older people as well because they didn’t get that opportunity and all of a sudden they plunged into this world with all this digital technology...” - Mother 1, Western Cape

In Ocean View, participants similarly framed stewardship as something that required support and respectful handover rather than simply assigning responsibility to community members. One participant described encouragement, recognition, and training as conditions for taking on such work:

“Encouragement. You know, like being acknowledged for our hard work as well. I believe that if the people are nice to us and treat us well and train us, then we will be at our best.” - Mother 2, Ocean View

This suggests that capability-building was not understood only as technical training. It was also tied to recognition, respectful treatment, and the confidence needed for community members to participate in ongoing stewardship.

In Sweetwaters discussions with the farmers extended this theme by framing sustainability through mentoring, demonstration, and peer learning. One farmer stated that

“Because we are talking as farmers, we learn from experience.” - Farmer 1, KZN

in relation to planting and growing cabbage, understanding what varieties work and do not work in the grow tents, and how the planting knowledge should be shared amongst the community. Some suggested that knowledge could be shared through videos, meetings, WhatsApp, and drawings for those with lower literacy. Participants were also willing to contribute community generated training content for others. These accounts position training, mentoring, and backup roles not as peripheral matters, but as governance work in their own right.

4.3 Infrastructural constraints as governance concerns

The participants did not treat infrastructure conditions as merely a technical concern in both communities. Rather, data cost, uneven device access, local safety, and physical hosting arrangements were discussed as governance conditions that shaped what kinds of rules would be workable. In Sweetwaters, discussions about shared Wi-Fi quickly turned to the questions of fair access. The participants proposed time limits, turns, and small group use as ways to prevent a few users from monopolising the service. One participant explained this logic directly by saying,

“For example, if [Mother 4, KZN] has her own street group, and she has the timing where she uses that group to use the Wi-Fi, and then it’s [Mother 5, KZN] and, etc... Just, we have turns so it won’t lose connection, and not more people would be using.” - Mother 3, KZN

The participants also linked the value of Wi-Fi to weak mobile signal in the area and to the practical need to share information more easily between households. One participant stated:

“Wi-Fi is much better in this community because we have a problem with network.” - Mother 4, KZN

In Ocean View participants raised similar constraints in different forms. They highlighted shared devices, uneven digital skills, and the risk that a service could quickly become exclusionary if the onboarding or moderation processes were too complicated. Participants further pointed out the need for trusted support and clear rules if the platform was to be usable across different generations. Across sites, infrastructural constraints, therefore, appeared not as a separate layer beneath governance but as part of what governance had to manage, including safe placement of networking equipment, access and allocation of connectivity, local hosting, and fair use.

4.4 Sustaining connectivity through meaningful use and repair

A final theme between sites was that governance was legitimised by locally meaningful use and visible plans for continuity and repair. Across both sites, participants treated the value of connectivity as inseparable from its continued usefulness in everyday practices, suggesting that governance must support not only access, but ongoing maintenance, relevance and repair of locally meaningful

services. This is evident when one considers that participants did not ask only for connectivity; instead, they tied the value of shared services to concrete uses, including children's educational videos, community announcements, health and clinic information, shared local media, and, in the farming context, practical guidance for growing food and managing hydroponic systems. One of the Ocean View mothers described a practical example of how clinic hours and bookings could be facilitated through a community app to avoid unnecessary waiting in long queues,

"...other people who have an appointment must now wait because you came here at 7:00 in the morning to obtain an appointment... So maybe the clinic's information should be noted on it. Actually, you cannot come if you do not have an appointment. You need to have an appointment unless it is emergency." - Mother 2, Western Cape

Among farmers, this emphasis on meaningful use was grounded in practical local knowledge. One participant explained before discussing how crop performance changed across growing conditions:

"But in summer the spinach doesn't need a lot of water. That's why the spinach doesn't like that tent." - Farmer 2, KZN

Participants also argued that those doing the work should help decide what knowledge should be recorded and shared, because they were the ones who could see what was going wrong, what was working, and what needed to be updated. As one farmer explained,

"We are always in the tunnel, always in the garden ... We are going to decide."
- Farmer 1, KZN

This suggests that local knowledge stewardship was itself treated as a legitimate governance issue rather than only as a question of technical content production.

In Ocean View, participants proposed verification and complaint processes partly because they wanted the platform to remain useful and trustworthy rather than becoming a source of gossip or conflict. In Sweetwaters, participants described content sharing and network access as valuable insofar as they supported everyday educational and community needs. The same logic appeared in farming discussions, where the platform was imagined as a way to support mentoring, crop knowledge, and practical decision-making. These accounts suggest that continuity is not only about maintaining infrastructure. It also depends on whether the service continues to matter locally. Governance, in this sense, is what links repair, adaptation, and meaningful use over time.

5 From findings towards a minimum viable governance toolkit

Based on the findings above, we propose an initial *Minimum Viable Governance* (MVG) toolkit. The toolkit is not intended to replace locally legitimate decision-making. Instead, it acts as a scaffold that helps communities make governance explicit early enough to support adoption, accountability, and service

evolution. This framing draws on community-network literature that treats community networks as locally owned or locally run infrastructures for community benefit, often including local digital services alongside connectivity (Association for Progressive Communications, 2026b; Belli, 2018). It also draws on commons governance and network governance as complementary lenses for thinking about shared resources, locally defined rules, and coordination across multiple actors (Ostrom, 1990; Provan and Kenis, 2008).

We use the term *toolkit* cautiously. At this stage, MVG is not a fully validated framework or a finished governance model. It is a practical and analytic artefact that translates recurring participant concerns into a small set of governance questions, roles, rules, escalation pathways, service affordances, and capability-building practices. In this sense, the MVG one-pager can be understood as a boundary object, a revisable artefact that supports coordination between community members, local stewards, researchers, and service partners without requiring all actors to hold exactly the same understanding of governance (Star and Griesemer, 1989). This is consistent with participatory design and infrastructuring work that treats participation and sociotechnical arrangements as unfolding over time rather than being settled in a single workshop or deployment moment (Karasti, 2014; Saad-Sulonen et al., 2018).

5.1 What “minimum” means in MVG

We use “minimum” in a pragmatic sense, namely the smallest set of governance elements that participants repeatedly treated as *non-negotiable* for trust and day-to-day operation. Importantly, the toolkit distinguishes between:

- **Network-level governance**, responsibilities and decision rights for shared connectivity infrastructure including maintenance, access, costs, expansion, and repair; and
- **Service-level governance**, rules and roles for locally valued services such as content sharing, announcements, and learning resources, including safeguarding and moderation.

The discussions of the participants suggest that service-level governance often becomes salient *earlier* than infrastructure governance because everyday risks such as conflict, misinformation, and safeguarding concerns are immediate barriers to adoption.

This distinction matters because it helps explain why governance concerns surfaced even where infrastructure was still limited, partial, or was still being planned. Participants often were able to imagine service harms, access disputes, or moderation problems before they could describe the full operational future of the network itself. In that sense, MVG is not only about keeping infrastructure running. It is also about making sure that the services that give the network daily meaning are governed well enough to be used with confidence.

5.2 Deriving the MVG elements from the findings

The five MVG elements were derived by tracing recurring governance concerns across the empirical findings, rather than by applying a pre-existing checklist to the

data. The themes traced included locally legitimate authority, ownership and stewardship, backup roles, rules-in-use, fair access, safeguarding and consent, moderation, verification, escalation and appeals, training, handover, feedback, and continuity after external partner involvement reduces. Each MVG element responds to a problem participants raised repeatedly across the engagements, including who has legitimate authority, who should hold day-to-day responsibility, what rules are needed, how problems should be escalated, how service features should support governance, and how training and handover should be sustained.

In the remainder of this section, we, therefore, refer back explicitly to the themes in Section 4 to make this traceability visible in the main text as well as in Table 2.

MVG element	Grounding in findings	Illustrative empirical support
Local authority	Participants treated legitimacy as locally situated. In Sweetwaters, authority was linked to the <i>Nkosi</i> , <i>Nduna</i> , and committees. In Ocean View, authority was linked more to trusted civic and community-development roles.	Sweetwaters feedback affirmed that including the <i>Ndunas</i> and <i>Nkosi</i> was appropriate because these were recognised and approachable community structures.
Defined roles	Participants repeatedly discussed admins, backup admins, moderators, trainers, technical helpers, stewards, and farmer mentors.	Sweetwaters participants said roles mattered and described group admins, moderators, and people who could help the community join and use the network.
Rules-in-use	Participants asked for rules around fair access, acceptable content, safeguarding, consent, privacy, and consequences for misuse.	Participants proposed turns for shared Wi-Fi and rules for content that should not be allowed in shared spaces.
Escalation pathway	Participants described the need for pathways from informal support to local stewards and then to recognised authority or trusted community structures.	Sweetwaters participants wanted to use the artefact with the <i>Ndunas</i> , <i>Nkosi</i> , committees, and community so that people would know where to go for help.
Capability and feedback	Participants treated training, encouragement, handover, mentoring, and backup support as part of governance.	Ocean View participants linked handover to recognition, respectful treatment, and training, while Sweetwaters feedback described the artefact as something to use, share, and revise over time.

Table 2. Traceability between MVG elements, empirical findings, and preliminary feedback on the one-page artefact.

5.3 MVG elements

We identified five elements that can be instantiated differently across contexts. The elements should be read as a minimum starting point for surfacing governance, not as

a comprehensive governance framework.

1) IDENTIFY LOCAL AUTHORITY. The first step is to identify who is locally trusted to resolve disputes, make or endorse decisions, and legitimate the governance arrangement. This element comes directly from the finding that authority looked different across the two sites. In Sweetwaters, participants linked final escalation and legitimacy to traditional leadership structures, including the *Nkosi*, *Nduna*, and committees. In Ocean View, legitimacy was articulated more through civic and community-development roles. MVG, therefore, begins by asking which authority structures already matter locally, rather than assuming that authority can be assigned by the research team or by technical partners. As discussed in subsection 4.1, legitimacy was grounded in markedly different authority structures across sites, ranging from traditional leadership in Sweetwaters to civic and community-organising roles in Ocean View.

2) DEFINE ROLES WITH DELEGATED ACCOUNTABILITY. Communities identified the need for a small set of named roles, held either by individuals or by a committee, that are responsible for different aspects of operation. Typical roles include network maintainers, service administrators, trusted verifiers for announcements, moderators, and community-facing support stewards who help onboard new users and troubleshoot issues. This element is grounded in participants' insistence that responsibility should not rest with one person alone. In Sweetwaters, participants proposed admins with partners or backup support. In Ocean View, participants discussed the need for people who could support onboarding, moderation, verification, and complaints. These concerns echo subsection 4.2, where participants repeatedly tied governance to concrete stewardship roles, backup support, and mentoring arrangements.

3) SET RULES-IN-USE. Participants requested clarity on what is allowed and what happens if something goes wrong. A one-page charter can capture a minimum set of rules-in-use, including acceptable use, safeguarding and consent, especially around children, what kinds of posts require verification, and basic privacy expectations. This element is grounded in findings around fair Wi-Fi access, content boundaries, moderation, and consequences for misuse. Rules-in-use should, therefore, be co-created with community participants and should specify how they will be shared, reviewed, and updated as services change. This directly responds to the rules-in-use and service-level governance concerns described in subsections 4.3 and 4.4, including proposals for turn-taking on shared Wi-Fi, content boundaries to protect children, and processes for complaint and verification.

4) PLAN ESCALATION AND APPEALS. Across sites, participants described multi-step escalation, moving from informal resolution to steward review and then to community leadership or trusted civic involvement where needed. MVG, therefore, includes an explicit escalation pathway and an appeals mechanism. The final appeals body should be locally legitimate and may differ across governance ecologies, for example traditional authority structures in rural settings or ward-based civic and community-development structures in peri-urban settings. This element is grounded in the finding that unresolved problems cannot be left to informal judgement alone if the service is to be trusted. This directly responds to the authority and escalation

concerns described in subsections 4.1 and 4.4, including participants' references to the Nkosi and Ndunas as legitimate escalation points in Sweetwaters, and to trusted civic or community-organising actors, complaint handling, verification, and appeals in Ocean View.

5) BUILD CAPABILITY AND FEEDBACK. Participants treated training and ongoing support as part of governance. MVG, therefore, includes a capability plan, initial training, periodic refreshers, handover documentation, and a way to induct new stewards. Feedback loops, such as periodic check-ins, WhatsApp support, or community meetings, help surface issues early and prevent governance from becoming stale as the service evolves. This element is grounded in participants' own framing of handover as requiring training, encouragement, respectful treatment, and recognition, not only technical instruction. As subsections 4.2 and 4.4 show, participants framed training, respectful handover, and recognition as integral to governance, and suggested feedback channels such as WhatsApp groups and community meetings as ways to surface issues early.

CONSIDERATION FOR RURAL AND PERI-URBAN SETTINGS. Together, these five elements are deliberately modest. They do not prescribe an ideal governance structure for all communities, nor do they assume that the arrangement can simply be copied into another. Rather, they offer a way of asking whether a deployment has enough governance in place to move beyond installation and towards practical, locally supported use. In rural settings such as Sweetwaters, this may require alignment with recognised traditional and community authority structures. In peri-urban settings such as Ocean View, it may require stronger emphasis on moderation, verification, and trusted civic or community-organising roles. MVG is, therefore, not intended as a universal template, but as a modest starting point for making governance questions visible in new deployments.

In the context of innovation in rural regions, these elements can help projects move beyond small pilots and technical demonstrations toward arrangements that are locally owned, maintainable, and adaptable as community priorities change. Rather than prescribing a single organisational model, they provide a way to ask whether a rural or peri-urban deployment has enough governance in place to remain plausible once external project support recedes.

5.4 How the toolkit could be used

The toolkit is intended to be used as a structured conversation guide during early deployment and refinement, rather than as a fixed template to be completed by researchers alone. A practical use of the toolkit would begin with a locally meaningful service, such as parenting content, announcements, local media, farming knowledge, or shared Wi-Fi access. Participants would then work through each MVG element by asking who should hold responsibility, what rules are needed, how those rules should be enacted in the service, and what should happen when rules are unclear or contested.

In Sweetwaters, for example, the role map would need to distinguish between day-to-day service stewards, technical support roles, and locally legitimate escalation points such as the *Nkosi* or *Nduna*. The rules-in-use charter could include fair access to shared Wi-Fi, expectations for locally shared educational content, and

responsibilities for reporting breakdowns. The escalation pathway would need to clarify when an issue can be handled by a local steward, when it should be referred to a technical support person, and when it should move to recognised community authority. The capability loop would include training for mothers, caregivers, and farmer mentors, with attention to how knowledge can be handed over when key people are unavailable.

In Ocean View, the same toolkit would be instantiated differently. The role map would likely centre on trusted civic or community-development actors, platform administrators, and backup moderators rather than traditional authority. The rules-in-use charter would need to address announcement verification, comment control, safeguarding, complaints, and the handling of inappropriate or misleading content. Service affordances could include role-based posting for announcements, reporting functions, notification routines, and visible feedback when posts are removed or escalated. The capability loop would need to include onboarding for older participants and support for users who share devices or have uneven digital confidence.

5.5 A minimal artefact, the MVG one-pager

The practical output of this process is a minimal governance artefact that can be printed, discussed, revised, and returned to during deployment. The one-pager should include (i) a role map, (ii) a short rules-in-use charter, (iii) an escalation pathway, (iv) the service affordances that enact these rules, and (v) a training and feedback plan. It should be co-created with community participants rather than written after the fact by the research team. Its purpose is not to permanently settle governance, but to make early decisions visible enough so that they can be tested, challenged, and revised through use.

The one-pager is, therefore, not a constitution or a finished governance arrangement. It could act as a boundary object for discussion between community members, local stewards, researchers, and service partners. In practice, it should be revisited when new services are added, when stewards change, when conflicts arise, or when the network moves from a workshop or pilot setting into longer-term use.

As described in Section 3.5, the one-pager also functioned as a formative evaluation object. Its value was not only that it summarised the MVG elements, but that it made visible where responsibility, authority, accountability, training, and continuity still needed to be negotiated. This is especially important when researchers, funders, or implementation partners reduce their involvement or exit. In that transition, the one-pager can help expose whether enough local governance has been established for connectivity and related services to remain trusted, maintained, and adaptable beyond the workshop or pilot setting.

PRELIMINARY FEEDBACK ON THE MVG ONE-PAGER. Preliminary participant feedback on the one-page artefact supported the traceability between the empirical findings and the proposed MVG elements. Sweetwaters participants stated that the document “really represents us”, affirmed the inclusion of the Ndunas and Nkosi, and described the artefact as something they wanted to use with community structures before revising it over time. Therefore, we treat the one-pager not as a validated framework, but as an early formative artefact that participants recognised as connected to their own governance concerns.

Having shown how the MVG elements were derived and how the one-pager began to function as a locally recognisable artefact, we now turn to what these findings imply for community-network governance and rural innovation more broadly.

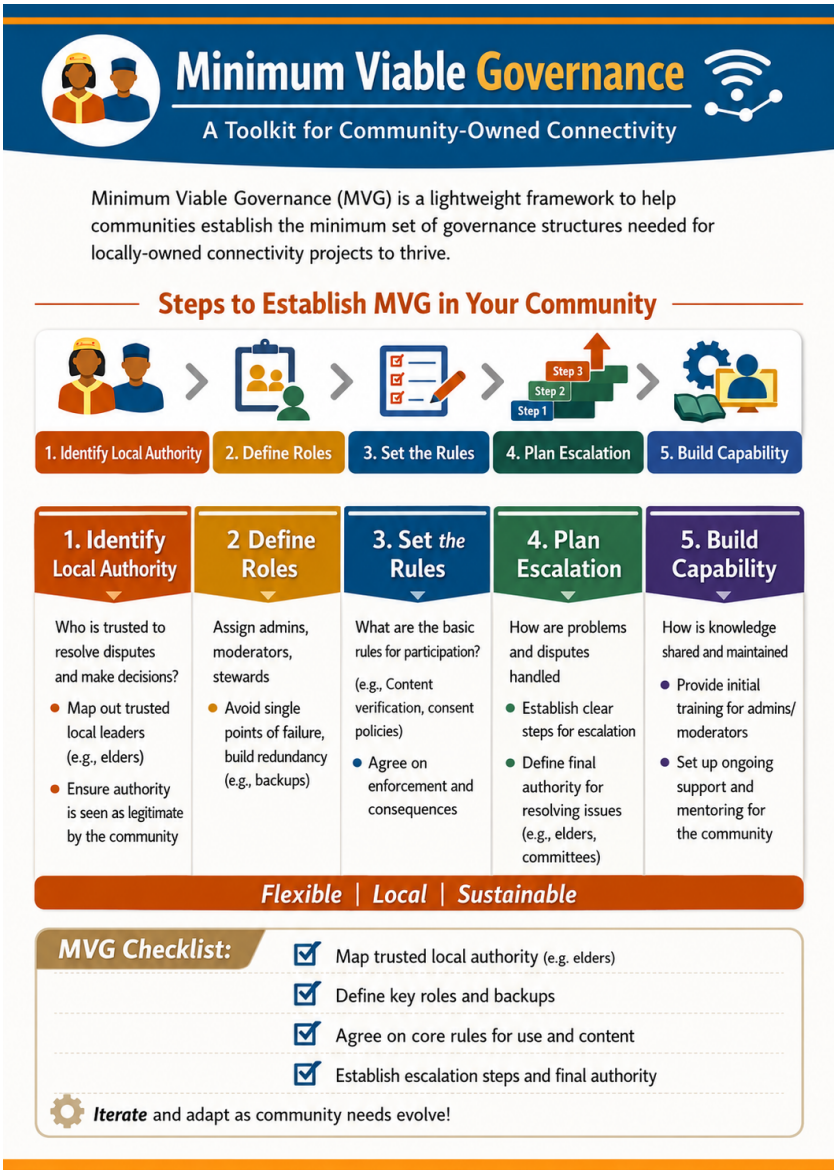


Figure 4. The Minimum Viable Governance Toolkit one-pager

6 Discussion

The previous section translated the empirical findings into an initial MVG toolkit. This section steps back from the artefact to discuss what the comparative engagements suggest for community-network governance more broadly. Our findings reinforce a recurring lesson in community-network research, namely that sustainability is not only a technical problem but a sociotechnical one in which governance, legitimacy, and capability are central (Farao et al., 2020; Rey-Moreno et al., 2015). We discuss this through three implications. First, community voice should be treated as polyvocal rather than singular. Second, governance must be

adapted to local legitimacy structures. Third, service-level governance is central to whether community-owned connectivity remains meaningful over time.

For rural innovation research, the implication is that innovation cannot be evaluated only by whether a technical intervention is novel, deployable, or initially useful. In these sites, the innovative work was partly in making local authority, stewardship, rules, escalation, and handover discussable before the service became dependent on informal assumptions. MVG, therefore, reframes community-owned connectivity as an institutional and infrastructural innovation problem, not only a connectivity problem.

This also means that MVG cannot be assessed only by whether roles and rules have been named. It must also be assessed by who can understand, contest, and use those arrangements in practice. Across the engagements, participants raised concerns about older users, shared devices, uneven digital confidence, literacy, respectful onboarding, and the need for training that does not assume prior technical familiarity. A minimum governance arrangement is therefore inadequate if it simply formalises authority without creating pathways for less confident or more marginalised participants to participate in, question, and benefit from the service.

6.1 Community voice is polyvocal, and governance must hold that complexity

Our findings reinforce that “the community” does not constitute a single, unified voice, but a set of overlapping and sometimes competing perspectives. This aligns with recent HCI4D work on community voice, which cautions against treating “the community” as if it speaks with one stable and homogeneous voice (Saha et al., 2023). In our engagements, caregivers foregrounded child safety, trust, moderation, and access. Farmers foregrounded practical knowledge-sharing, mentoring, and sustainability. Leadership structures focused more explicitly on legitimacy, dispute handling, continuity, and accountability. MVG, therefore, cannot be derived from an abstract notion of “the community”, but must be negotiated across different priorities, forms of authority, and locally recognised responsibilities.

The contrast between Sweetwaters and Ocean View clearly illustrates this. In Sweetwaters, community voice was mediated through structures involving the *Nkosi* and *Nduna*, which shaped how legitimacy, dispute resolution, and stewardship were imagined. In Ocean View, by contrast, governance expectations were articulated more through civic and community-organising roles, content moderation, announcement verification, and consent management. This comparison suggests that MVG cannot be derived from an abstract notion of “the community,” but must instead be negotiated through the forms of authority, trust, and local knowledge that are recognised within each site.

This polyvocality matters because governance arrangements only become workable when they are recognised as legitimate by the people expected to live with them. The comparative value of Sweetwaters and Ocean View is, therefore, not that they produce one common governance model, but that they show how similar governance concerns must be resolved through different local authority structures.

6.2 Governance must be adapted to local legitimacy structures

The contrast between Sweetwaters and Ocean View demonstrates that governance arrangements cannot be standardised without losing legitimacy. In Sweetwaters, authority was embedded in traditional leadership structures. In Ocean View, authority was distributed across civic and community-organising roles. Both commons governance and network governance scholarship emphasise that workable rules depend on legitimate authority and locally recognised enforcement mechanisms (Ostrom, 1990; Provan and Kenis, 2008). Our comparative engagements underscore that legitimacy is not an abstract design parameter. It is embedded in the governance ecology of a place. In Sweetwaters, participants' references to rural authority structures suggest that governance arrangements may gain legitimacy by aligning with, or at least acknowledging, existing traditional and community structures. In Ocean View, where participants described the absence of traditional leadership, legitimacy was instead associated with civic ward-based organisation and trust accumulated through long-standing community service.

This implies that MVG toolkits should not prescribe a single governance form such as committee-based administration. Instead, the toolkit should explicitly support mapping local legitimacy and determining where final decision rights and appeals should sit. This mapping is itself a participatory activity and should be treated as part of infrastructuring work rather than as an administrative afterthought (Pipek and Wulf, 2009).

Although MVG is informed by commons governance, it should not be read as a direct application of Ostrom's design principles. Ostrom helps explain why locally recognised rules, monitoring, graduated response, conflict-resolution mechanisms, and collective choice matter for shared resources. Community-owned connectivity also involves coordination across heterogeneous actors, including residents, stewards, researchers, local organisations, funders, and technical partners. This is where network governance is useful as it draws attention to distributed authority, interdependence, and coordination beyond a single bounded commons. MVG sits between these traditions by asking what must be made explicit early enough for a shared connectivity-service arrangement to be locally workable.

Nevertheless, our material shows that MVG only partially aligns with Ostrom's design principles. Some principles are clearly visible. Locally defined rules-in-use around fair access to shared Wi-Fi, acceptable content, safeguarding, and verification resonate with the principle that rules should fit local conditions. The references to the Nkosi and Ndunas in Sweetwaters, and to long-standing civic actors in Ocean View, provide partial equivalents to locally legitimate conflict-resolution mechanisms. Participants' emphasis on community ownership and on creating or revising their own rules also resonates with collective-choice arrangements. Other principles were only weakly present or absent in the material. Monitoring arrangements were still implicit, graduated sanctions were not yet formalised, long-term resource allocation remained uncertain, and nested governance across community structures, researchers, funders, and technical partners had not yet been fully worked out. MVG, therefore, does not replicate Ostrom's full set of design principles. Instead, it surfaces a minimum subset that participants treated as non-negotiable for trust and day-to-day operation, while making visible which governance arrangements would still need to be developed over time.

6.3 Service-level governance is not secondary to infrastructure governance

A striking pattern across both sites was that participants treated service-level governance, including moderation, verification, safeguarding, consent, and appeals, as a precondition for adoption. This challenges the common sequencing in community-network deployments, where governance is often treated as a secondary layer following technical implementation. Instead, our findings suggest that service-level governance directly shapes trust, perceived safety, and willingness to use local services. This resonates with iNethi work that frames local services as central to how community networks become meaningful and used in everyday life (Farao et al., 2020; Johnson et al., 2023). In commons terms, these service spaces function as shared resources with high social stakes. Without clear rules-in-use and enforcement, participants anticipated conflict, misinformation, and harm, particularly to children.

The value of bringing multiple community voices into the design process is therefore not only epistemic, in the sense of producing richer contextual understanding, but also practical. Prior HCI4D work shows that community voice can support contextual understanding, local knowledge, empathy, trust, and buy-in, while also reminding us that communities are polyvocal rather than singular (Saha et al., 2023). In our case, this helped reveal which rules, roles, and escalation paths were likely to be accepted, trusted, and sustained locally. This was visible in discussions around content ownership, announcement verification, parental consent, moderation, backup administrators, and mentoring or training roles. These are not merely feature requests. They are community-articulated governance requirements.

This framing also aligns with recent community-centred connectivity work, which treats local services, participation, safety, capacity building, and community ownership as central to whether connectivity becomes meaningful and sustainable (Association for Progressive Communications, 2024; Association for Progressive Communications and Rhizomatica, 2024). Framed this way, MVG can be understood as a bounded response to community voices, namely a small but sufficient set of governance mechanisms that translate local concerns, knowledge, and expectations into roles, rules, escalation paths, and processes capable of supporting early adoption and longer-term sustainability.

What MVG contributes here is something more specific than the broad claim that governance matters. Previous work already shows that ownership, participation, and local stewardship are important in community networks (Belli, 2018; Farao et al., 2020; Rey-Moreno et al., 2015). What remains less clear is how to describe the minimum governance arrangements that need to be visible early in a deployment if continuity is to remain plausible. Our findings suggest that this threshold includes at least legitimate authority, stewardship and backup capacity, rules for access and moderation, and mechanisms for maintaining locally meaningful services and knowledge.

MVG is, therefore, best understood not as a universal model to be transplanted across contexts, but as a practical analytic aid for asking whether a deployment has enough governance in place to move beyond launch. Commons governance helps explain why locally recognised rules, stewardship, and accountability matter for shared resources, while network governance helps explain why coordination across

community members, researchers, local organisations, and service partners cannot be assumed away (Ostrom, 1990; Provan and Kenis, 2008). MVG sits between these concerns by asking what must be made explicit early enough for community-owned connectivity and related services to become usable, trusted, and adaptable in practice.

6.4 Governance as capability-building and relational work

Participants framed governance as inseparable from training, mentoring, and day-to-day support. Stewardship roles, backup arrangements, and feedback mechanisms were treated as essential for continuity. This aligns with participatory design perspectives that position infrastructuring as an ongoing process rather than a discrete intervention. MVG should, therefore, be understood not as a fixed model, but as a lightweight scaffold that supports continuous adaptation as community needs and capacities evolve. Participants' emphasis on training, steward roles, and feedback loops aligns with participatory design work that highlights the importance of situated participation practices and ongoing relationship-building in African contexts (Akama et al., 2019; Kapuire et al., 2015; Winschiers-Theophilus et al., 2010). It also resonates with early-stage co-design accounts that show how social networks shape technology acceptance and use (Ramachandran et al., 2007). Rather than treating capacity as a one-time training outcome, participants treated capability as something that must be cultivated and renewed, especially as services evolve and as community members' availability changes.

This supports viewing MVG not only as a set of rules, but also as a capability pipeline: governance includes onboarding, handover, and mechanisms for revisiting decisions. Recent work on collective resilience in community networks similarly suggests that social organisation and learning practices are central to sustainability (Bagalkot et al., 2024).

6.5 Limitations and next steps

This study does not claim statistical representativeness; instead, we focus on recurring governance concerns articulated across engagements, treating them as analytic patterns rather than as a basis for generalisation to all community networks. Its contribution lies in using two contrasting engagements to identify recurring governance concerns and to develop an initial analytic and practical scaffold for discussing minimum governance arrangements in community-owned connectivity projects.

The Ocean View engagement reported here is relatively short, and the transcripts are automatically generated and, therefore, imperfect. The Sweetwaters traditional leadership engagement was documented through fieldnotes rather than audio recordings. Although triangulating transcripts with fieldnotes, translated material, and WhatsApp follow-up mitigates some risks, longer-term engagement is still required to observe how governance mechanisms hold up under real use, conflict, and resource constraints. Future work should, therefore, co-design and trial concrete governance-supporting affordances in the service, evaluate the MVG one-pager as a living document that communities can revise, and investigate how MVG interacts with broader development initiatives, such as education and food-growing projects,

that shape community priorities.

Future work should also examine how MVG arrangements hold up under pressure, including leadership turnover, loss of external funding, infrastructure failure, and conflict between stakeholder groups. In particular, our engagements raise unresolved questions about content governance, such as how to balance locally defined rules for moderation and verification against access to global content and freedom of information. A further open question is whether communities come to treat community-owned connectivity as core infrastructure that warrants sustained investment of time and effort, or as a secondary service that remains subordinate to the wider internet.

6.6 MVG as an implementation lens

For practitioners and programmes working on innovation in rural and peri-urban regions, MVG offers an implementation lens for foregrounding governance from the outset. Rather than treating governance as an informal afterthought once infrastructure has been deployed, project teams can use the MVG one-pager with communities to identify local roles, rules-in-use, escalation and appeal pathways, service affordances, and capability-building needs alongside technical and financial plans.

In rural and peri-urban contexts such as Sweetwaters and Ocean View, this can help align new connectivity or service deployments with existing legitimacy structures, make responsibilities visible before conflicts arise, and create lightweight mechanisms for adaptation as services evolve. This makes MVG useful not only during implementation, but also during handover, when external researchers, funders, or delivery partners reduce their involvement and local actors need a shared basis for maintaining, moderating, and adapting the service.

6.7 Ethical reflections

Governance design is inseparable from ethical considerations because it allocates power, visibility, and voice. Participatory design work cautions against assuming that participation is uniformly empowering in different contexts and highlights the need to adhere to norms of cultural participation and power relations (Till et al., 2022; Winschiers-Theophilus et al., 2010). In our engagements, compensation, safeguarding, and privacy were treated as non-negotiable. As this work progresses, ethical practice will require continued attention to who is excluded by governance arrangements, how harms are handled, and how participants can withdraw from services and data collection without penalty.

7 Conclusion

This paper argued that sustainable community-owned connectivity depends on governance as much as it depends on infrastructure. Drawing on community engagements in Sweetwaters and Ocean View, we reported early findings that (i) legitimate authority and escalation pathways differ across governance ecologies, (ii) service-level governance is foregrounded as a prerequisite for trust and adoption,

and (iii) governance is intertwined with capability-building, co-design, and broader community agendas.

We proposed a minimum viable governance toolkit intended to scaffold early adoption and iterative service evolution without prescribing a single organisational model. The next steps include long-term engagement and deployment to evaluate how the elements of MVG operate in real use, conflict, and change, and to refine the toolkit with communities as a living artefact of governance.

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