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The ideational impacts of Indonesia's renewable energy project failures

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ABSTRACT

Transitioning to a sustainable future involves a comprehensive shift into a new technical configuration and set of institutional arrangements. Despite global efforts to achieve sustainable development goals (SDGs), many energy projects have failed due to technical and institutional problems and misunderstandings. Failure leads to uncertainty at the end of long-term transformative change, but discussion of failure in socio-technical transitions has been limited as the current body of knowledge focuses primarily on highlighting 'winning' innovations and their historical path. Exploring project failure can potentially reveal the misalignments in socio-technological configurations that lead to stagnation in progression of transition trajectories. Failures have discursive implications as they can result in a period of instability and so trigger actors to revisit their commitment towards transition visions and effectiveness of trajectories. This article contributes to debates around project failures by tracing their impact on overarching ideas of transition. The case of Sumba Iconic Island (SII), as one of the strategic efforts of Indonesia's energy transition, is selected for an in-depth exploration. Our analysis found that the ideational power of SII, which is embedded in the overarching discourse of Indonesia's energy transition, is relatively stable despite numerous technical and managerial failures. However, people's trust in renewable energy ambition has been diminished as centralised diesel-generated electricity offers better reliability.

Introduction

By focusing on project failures there will inevitably be contestation of ideas and concepts of what constitutes achievement in the global transition towards renewable and sustainable energy. The pro-sustainability storyline is primarily supported by the socio-ecological narratives (Curran, 2021), but misalignment caused by technological failures can challenge these narratives by opening up contrasting discourses in which technical performance, technology applicability and economic viability are highlighted (Rosenbloom, Berton, & Meadowcroft, 2016). The widely accepted potential of new cost-effective renewable energy technologies has resulted in a lack of discussion about the ideational impact of technological failures. The research presented in this paper explores the impacts of renewable energy project failures on the ideational energy transition framework. Using Indonesia as a case study, this research specifically seeks to answer the question: "To what extent do project failures disrupt the ideational trajectory of sustainable energy policies in Indonesia?"

As a country committed to decarbonisation through signing the Paris Agreement, the socio-technical transition in Indonesia, particularly related to Sustainable Development Goal 7 (SDG7), faces contesting discourses between energy security, energy poverty and climate change mitigation (Gunningham, 2013). In an often aggressively argued discursive layer, opposition to the sustainable energy transition highlights storylines against an integrated and holistic shift to renewable sources. In the rural electrification policies, for example, there was a consensus among coalitions that ensuring energy access is the primary aim of Indonesia's policies; hence, prioritising a grid powered by coal-generation, while renewable mini-grids are considered a temporary solution due to high cost and fluctuating power production (Wibisono, Lovett, & Anindito, 2023). This contestation is filled with the failure of numerous renewable energy projects, resulting in the lack of development impact and even abandonment despite large amounts of expenditure in grants and investment (DAGI Consulting, 2018; Mathis & Listiyorini, 2022; Sovacool, 2018).

Technological failures associated with the energy transition are happening worldwide, particularly in the context of the Global South. In the case of Iran, instead of mutually complementing each other as an integrated hybrid energy source, the deployment of wind and solar energy competes, leading to stagnation in the sustainable energy transition

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(Rahmani, Ranjbar, & Mafi, 2022). This situation is worsened by unsupportive government policies, international pressure and unattractive pricing mechanisms, leading to the failure of renewable energy to dominate the market (Rahmani et al., 2022). In Taiwan, unrealistic targets and inadequate policy assessments that are undemocratically executed led to the failure of the country to achieve its 2025 energy transition vision (Ming-Zhi Gao, Yeh, & Chen, 2022). In the case study examined in this paper on Sumba Island, Indonesia, although there was massive political and financial support for establishing a fully renewable powered Island, the initiative still resulted in failures of sustainable implementation, although it should be noted that there were some successes in the Sumba projects (DAGI Consulting, 2018). While the impact of failures on the overarching energy transition ambition will be elaborated further in this article, the case of Sumba reveals the issue of unjust distribution of benefits (Fathoni, Setyowati, & Prest, 2021), knowledge transfer (Wibisono, Lovett, & Suryani, 2023), biased narratives on energy poverty (Wibisono, Lovett, & Anindito, 2023), as well as inconsistent and overlapping policies (Fathoni & Setyowati, 2022; Setyowati, 2020) surrounding Indonesia's energy transition.

The significant frequency and role of failure has attracted researchers to understand the extent to which such failures impact the transition process (See Feola and Nunes (2014); Rahmani et al. (2022); Turnheim and Sovacool (2020); Weber and Rohracher (2012)). Researchers argue that scrutinising failure can reveal misalignment in socio-technological configurations, leading to stagnation in progression of transition trajectories. In the context of the global south, such misalignments appear primarily in the form of misarticulation of demand, uncoordinated action, and inadequate price mechanisms (Rahmani et al., 2022; Raven & Walrave, 2020; Sovacool, 2018).

The explanatory power of ideas and discourse, along with their constructing elements, has been recognised as a pivotal part of understanding institutional dynamics and complexity of the policymaking process (Schmidt, 2008). The endogenous nature of change in discursive institutionalism studies enables researchers to capture the contestation behind institutional shifts (Schmidt, 2010). Ideas, discourse, and narrative also play a substantial role in explaining socio-technical transitions. Hermwille (2016) emphasises that transition involves frames and storylines in constructing a socio-political interpretation of problems, expected solutions, and trajectories. In the case of solar PV, for example, efforts to promote solar-generated energy faced contesting frames promoted by the incumbent fossil fuel energy regime, emphasising its high cost, that it was economically ineffective, and other technical issues, particularly in system integration (Rosenbloom et al., 2016). Ideas contestation in transition is thus seen as an inevitable process in which competing coalitions deploy different narratives publicly with the aim of shaping public discourse and actors' policy preferences (Weible & Sabatier, 2018). In some cases, this contestation influences decision-makers in a way that the hegemony discourses dominate the problem definition and policy priorities. In the context of Indonesia's energy policy for example, the focus on alleviating energy poverty has resulted in Indonesia maintaining its coal dependency despite its commitment to decarbonisation (Gunningham, 2013; Setyowati, 2020; Wibisono, Lovett, & Anindito, 2023).

The rest of this article is organised as follows. Following this introduction, we review the relevant literature underlying this research. In particular, the topic of ideas, its attribute of power, and its relevance in transition studies are presented. Section three explains the material and method used in this article, including the context and the methodology in which research data is acquired. Further, the results and discussion section present the elaboration of findings, contributing to the established body of knowledge, which is concluded in the last section.

Literature review: discursive layer of failed transition projects

Socio-technical transition literature has a particular interest in connecting the dynamics of regime change to a micro-scale innovation process under its overarching landscape pressure (or opportunity). A long-term transformative change is associated with uncertainty in the promotion of innovation that requires a continuous evaluation of the progress towards the transition goals (Weber & Rohracher, 2012). Despite that fact that some failure is inevitable, the current body of knowledge has primarily focussed on highlighting 'winning' innovations and discussing the winning historical paths that bypassed or defeated incumbent regimes (Genus & Coles, 2008; Turnheim & Sovacool, 2020). The extensive work on successful transition has led to limited attention being given to cases of failure, such as the abandonment of a shared-mobility transportation system in South Korea (Lee, Park, & Kim, 2022), the collapse of solar off-grid electricity in Sub-Saharan African countries (Ikejemba, Mpuan, Schuur, & Van Hillegersberg, 2017), and the growing opposition to Taiwan's denuclearisation policy (Ming-Zhi Gao et al., 2022). This situation also causes selection bias in transition case studies where the transitions being reported are emphasised, and failed or difficult transitions are overlooked (Turnheim & Sovacool, 2020).

The exploration of failed innovation (a transition that never happened) is essential to reveal the practical barriers of which paths were not taken, the negative consequences of interventions, and the considerable uncertainties of regime shifts. Relatedly, paying attention to technical failure is also essential in discovering inconsistencies in policies, vulnerabilities in technology, and patterns of dependence that impede transformative changes (Turnheim & Sovacool, 2020). Failures provide nuanced insights and interpretations of policy malfunctions and technical issues (Perrons & Posocco, 2009). For example, the failure of the Indonesian solar home system project was attributed to inadequate financial design, a lack of understanding of end users' needs, poor coordination among government entities, and ineffective community empowerment programs (Sovacool, 2018). Similarly, Mathis and Listiyorini (2022) report that the combination of institutional and technical misalignment caused the abandonment of the off-grid solar electricity system in Sumba by its operator, resulting in a complete system shutdown.

As an effort to better understand failures, their explanations, interpretations, and potential impacts, Turnheim and Sovacool (2020) identified categories of perspectives on interpreting failure around transition studies. Generally, they categorised three kinds of analytical focus in explaining failures. Firstly, the discrete failure which represents system anomalies and weakness lead to disappointing performance within the process of innovation. It focuses on diagnosing a single event of failure, scrutinising its sources, processes, and impacts. Secondly the systemic failings which are associated with an institutional exploration concerning ineffective policies, reflexive learning and the (mis)alignment of the general policy patterns. Researchers in this category focus on dysfunction as an interrelated phenomenon where multi-variables components are mutually influencing. The primary concern is thus to break the linkages and discover corrective interventions. The last category named as processual accounts of failure in which explaining (in) stability of transition trajectories and its embeddedness in wider structures is the primary focus. It emphasises exogenous uncertainties and suggest a need for broadening out the analysis to understand the exogenous and endogenous contexts where the failures occur. Turnheim and Sovacool's (2020) categories of failures provide a conceptual structure of analysing and interpreting failures in transition process. While the first category primarily emphasises the technological performances, the other two categories paved the path to a more systemic analysis of transition failures focusing their interrelation with overarching transition trajectories.

Failures have discursive implications as they potentially cause system breakdowns and crises that lead to periods of instability (Turnheim & Sovacool, 2020). Such instability might influence the actor's perspective towards the shared vision of transition and the effectiveness of trajectories. In such a period, the actor's power and agency play a significant role in deciding whether the subsequent activities and

policies align with the key features of a transition (Weber & Rohracher, 2012). For example, the propagation of a decentralised energy supply generated from renewable sources as a promising environmentally friendly solution to the prevailing centralised fossil-based energy would challenge the position of the dominant utility companies (Weber & Rohracher, 2012); therefore, any failure of novel systems triggers discursive framing to the efforts in promoting a new configuration. The case of solar PV promotion in Ontario is an example of where transition efforts faced delegitimising storylines, stating that PV is a waste of resources, has no benefits for the locals, and hurts productive businesses as the electricity cost will increase (Rosenbloom et al., 2016).

In a narrower perspective as in organisational research, failure is often defined as the "deviation from goals and outcomes that are expected and desired" (Schwarz, Bouckenooghe, & Vakola, 2021 p.162). This can include improper implementation of procedures leading to health or environmental damage, as well as inadequate management resulting in financial loss (Hald, Gillespie, & Reader, 2021). Just as the socio-technical transition literature emphasises the misalignment of socio-technical configuration, failures in organisational research are associated with the organisation's misalignment with the realities in which it operates. For example, wrong strategies to address environmental challenges can lead to drops in firms' performance (Sheppard & Chowdhury, 2005). Further, while the transition debates focus on the gradual implementation of sustainable technologies or behaviours, organisational research emphasises the strategic choices of firms in adapting to environmental requirements or internal dynamics. Failures in this context can lead to consequences such as decreased sales performance, profit decline, and bankruptcy (Kücher & Feldbauer-Durstmüller, 2019).

From the discursive institutionalism perspective, change is endogenous and socially constructed (Schmidt, 2008), as are the shared meanings and goals of transition. The orientation of actors can be reinterpreted through the implementation phases due to reflexivity on the failure, triggering at least partial change to the embedded institutional design (Ciccia & Lombardo, 2019). Schmidt (2010) stated the process of 'displacement' of actors when they shift from one institutional arrangement to another by including new elements onto the current frameworks, resulting in the amendment of the institution. Such an amendment is linked to what Hendriks and Grin (2009) call reflexivity: creating new arrangements to respond to failures towards better institutional coordination, demand articulation, and directionality of transition trajectories. Taiwan's ambition of becoming nuclear-free is the example of how failures 'displaced' actors to oppose this energy transition. In this case, the failure to achieve annual targets at the beginning of transition made people question the achievability of nuclear-free ambition and concerns arose about national energy security (Ming-Zhi Gao et al., 2022). A similar situation occurred in Sub-Saharan Africa countries where the failure of numerous solar-powered electricity projects, due to inadequate planning and corruption, shifted government priorities away from off-grid renewables to fossil fuel powered grids (Ikejemba et al., 2017).

Carstensen and Schmidt (2016) developed conceptual frameworks to scrutinise the extent to which ideas remain by classifying ideational power into three attributes. The first attribute is power promoted through ideas, which is associated with the persuasion capacity of actors through reasoning and arguing particular ideas. Secondly, the power over ideas focuses on the power given to actors to dominate the meaning of a discourse by resisting the adoption of alternative ideas in the policy arena. Lastly, the power in ideas in which they become socially entrenched and construct policy discourse at the expense of other ideas. Such a concept has been applied in a wide range of political research, such as the adoption of climate policy in the UK (Gillard, 2016), the power relations within the EU's Economic and Monetary Union (Maris & Sklias, 2020), and the historical comparison between the US and the UK in their economic policy (Widmaier, 2017). However, despite the extensive use of Carstensen and Schmidt's (2016) ideational power concept, the application of understanding the ideational impact of failures in socio-technical transition is limited. Hence, this research is undertaken to contribute to this topic.

Material and methods

Research context

This research focuses on one of Indonesia's national strategic programmes in rural electrification called Sumba Iconic Island (SII). It is an ambitious project with the goal of electrifying the island of Sumba, in Eastern Indonesia, using 100 % renewable sources. In 2010, the SII was officially launched at the Indonesia-Netherlands Joint Energy Workshop with Hivos as the initiator. Being initially funded primarily by Hivos and ADB the project later attracted support from a wide range of organisations, from national to local government, NGOs, state-owned companies, the private sector, and donors. Government expressed support by signing an agreement with Hivos in 2013 for achieving 100 % renewable energy in Sumba by 2020, which was later legalised in MEMR Decree No. 3051 K/30/MEM/2015 concerning the determination of Sumba as an iconic island as well as coordination of various actors.

The selection of Sumba Island (Fig. 1) was due to the availability and reliability of renewable sources that were predicted to be sufficient to fulfil the island's energy demand (Winrock International, 2010). At the time of selection Sumba had a low electrification rate (24.5 % in 2010), high dependency on diesel power plants, and high energy-related transport costs (diesel fuel was sent from other regions), and 20 % of inhabitants were poor (SII Development Team, 2012). As a result of implementation of SII up to 2018, 9.3 MW of renewable energy power plants were installed with an energy production of 42.2 GWh. Solar power plants dominate the units installed, reaching 18,782 units and producing more than 7 million kWh. However, micro-hydropower plants had the largest energy capacities. They generate around 34.5 million kWh from 22 power plant units. Perhaps more importantly, electricity access increased to 50.9 % from 24.5 %, and the contribution of renewable energy has reached 20.9 %. Detailed information on established renewable systems in rural Sumba is presented in Table 1.

Table 1 shows that solar-powered electricity has diverse applications while others are primarily for household electricity and cooking. The capacity/unit ratio of the solar powerplant also indicates its limited capacity and primary use for specific purposes such as lighting or powering water pumps. The installation of solar powerplants in Sumba also indicates the focus on providing Tier 1 levels of electricity access, which is associated with lighting and charging services (World Bank, 2022). On the other hand, the substantial capacity of micro-hydropower (MHP) indicates water-generated electricity as the current primary source for Sumba electrification. MHP provides greater connectivity with a higher applicability. Some of the 'success stories' of renewable electrification in Sumba are MHPs such as in Kamanggih (Guerreiro & Botetzagias, 2018) and Waimbidi (Wibisono, Lovett, & Suryani, 2023) Villages.

Data acquisition

Data acquisition was primarily qualitative information from interviewing relevant actors and reviewing related articles, policies, and reports. Semi-structured interviews, which are also known as a guided conversation (Dunn, 2000), were chosen due to their ability to conduct in-depth investigations. Despite using pre-formulated guidelines, the exploratory nature of the semi-structured interview technique makes it favourable over the questionnaire or structured interview method. By conducting semi-structured interviews, we did not direct the possible answers and provided space for informant's opinions, and experiences, thereby allowing a more comprehensive understanding on the topics (Timmermans & Tavory, 2022). In total there were nineteen people interviewed from multiple domains to capture diverse perspectives in

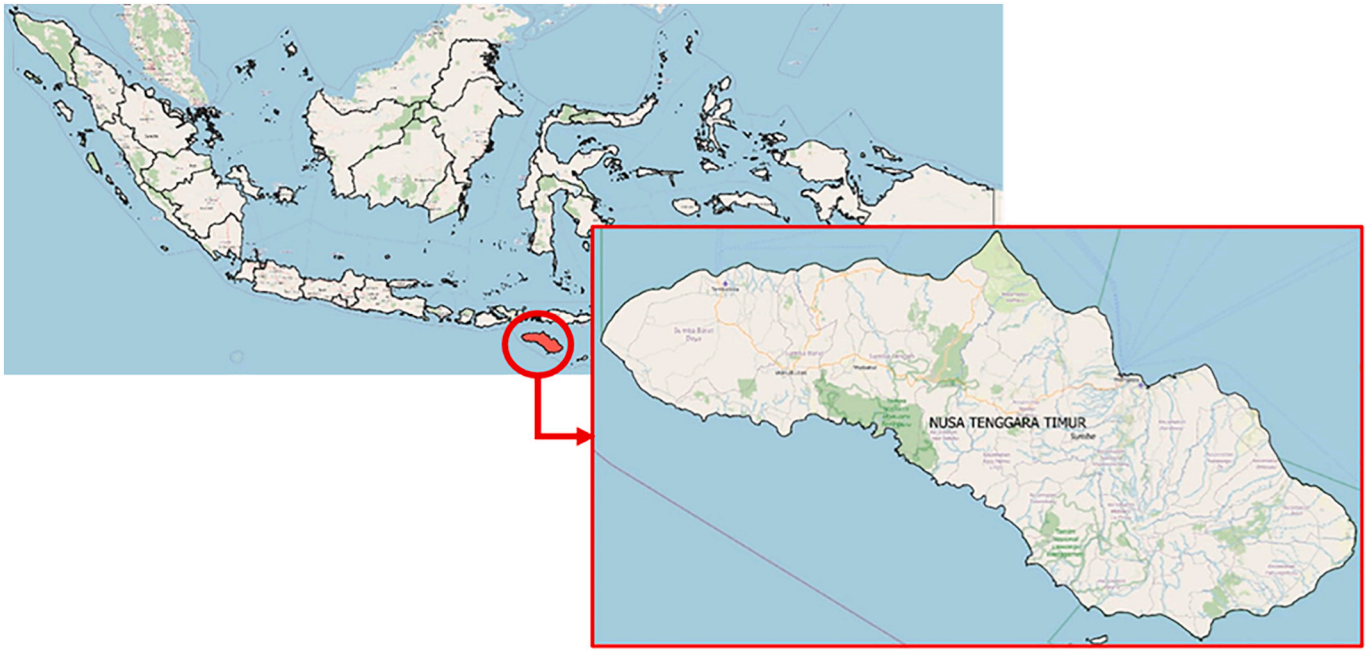

Fig. 1. The location of Sumba Island.

Table 1
Summary of renewable facilities in Sumba Island.

No	RE facilities	Total unit	Installed capacity (kW)	Operated capable power (kW)	Energy production (kWh)	Investment value (Billion Rupiah)
1	MHP (Micro-hydro power plant)	22	3713.40	1213.00	34,466,702	101.19
2	Solar Power plant	18,782	4554.59	2881.21	7,321,258	520.49
	a. Centralised	68	3557.10	2308.20	5,579,630	297.85
	b. PV School	36	137.14	125.73	280,480	31.66
	c. PV Agro processing	47	11.30	11.03	803	2.71
	d. Energy Kiosk	30	12.00	11.40	10,512	2.88
	e. Spread Solar Power plant	17,840	639.66	286.19	1,025,231	136.08
	f. Smart PJU	704	41.50	28.89	140,054	15.44
	g. Hybrid	4	14.50	14.50	21,900	4.18
	h. Solar Water pump	53	141.39	95.27	262,648	29.70
3	Biomass Power plant	2	1030.00	0	166,510	32.77
4	Wind Power plant	100	50.00	25.50	257,412	2.70
5	Biogas	2173	10,131	–	–	26.35
6	Energy Efficient Stove	5687	–	–	–	3.84

Source: (DAGI Consulting, 2018 p.8).

explaining and perceiving failures (see Table 2). They were pre-selected based on a desk study conducted prior to the fieldwork. Additionally, a snowball method was also done to identify informants overlooked by the desk study. The involvement of a wide range of actors also helps to avoid domination of certain perspectives as well as for triangulating the information, in addition to the utilisation other datasets. This effort is pivotal as multiple sources mutually complemented to generate a cohesive and interconnected narrative (O'Cathain, Murphy, & Nicholl, 2010).

The data acquisition processes were conducted in two phases of fieldwork, with some organisational interviews taking place prior to the fieldwork through video conference. The first fieldwork was conducted in June 2022, primarily addressing the power-building process of the SII ideas and the role of actors within the SII coalition. This phase involved national, provincial, and local government bodies, NGOs, and donors, ensuring a diverse range of perspectives. The second period of fieldwork, conducted in January 2024, was primarily focused on observing the sustainability of the established projects and involved village-level stakeholders such as powerplant operators, beneficiaries, and heads of village authority. The research obtained ethical approval from the research ethics committee of the University of Leeds, ensuring that the interview process adheres to ethical protocols such as consent, anonymity, and data protection.

The interviews were recorded and transcribed verbatim to assist the qualitative analytical analysis. Interviews were then coded to extract relevant information and sort them thematically. The thematic analysis was undertaken deductively guided by the Carstensen and Schmidt's (2016) ideational impact as general categories. Each category was further sorted into groups inductively to accommodate as many findings as observed and keep the examination in a natural setting (Chowdhury, 2015). In addition to the interviews, the coding was also done for the relevant reports (e.g. Castlerock consulting. (2015); DAGI Consulting (2018); JRI Research (2012)), news articles (e.g. Mathis and Listiyorini (2022)), policies (e.g. MEMR (2015); PLN (2021)) and research publications related to the Sumba Iconic Island (SII) projects. The information from such documents complements the analysis by providing statistical data, project design and implementation, and the overarching policy framework of SII.

Table 2
The interviewed actors.

No	Informant's affiliations	Their relevancies
1	Hivos – National Office	The initiator and executor of SII, and the SII national secretariat
2	Hivos – Sumba Office	
3	IBEKA – National Office	Involved in establishing and managing MHP in Kamanggih (a successful case)
4	IBEKA – Sumba Office	
5	Ministry of National Development Planning (Bappenas)	Ministry responsible for national development
6	Ministry of Energy and Mineral Resources (MEMR)	The initiator, one of the members of SII secretariat, ministry responsible for the deployment of renewable energy
7	Municipal Development Planning Agency (Bappeda) of East Sumba – Economic development division	Local government agency where SII projects took place
8	Village authority in Waimbidi	Village-level government where the MHP is located
9	Village authority in Tawui	Village-level government where the centralised solar powerplant was located and is abandoned
10	Village authority in Lukuwingir	Village-level government where the MHP electricity was about to be replaced with grid-fossil electricity
11	Asian Development Bank	One of the donors in the early period of SII
12	MHP operator	The operator of one of the established MHP
13	Customary leader	The community leader in the cultural and customary affairs
14	Business owners in Waimbidi Village	Renewable electricity beneficiaries
15	Business owners in Lukuwingir Village	Renewable electricity beneficiaries
16	Village cooperative in Kamanggih Village	Cooperative that manages renewable powerplants in Kamanggih, some still running but others stopped working
17	Energy and Mineral Resource Provincial Agency	Provincial government body who has the authority for energy affairs
18	PT. PLN (state-owned electricity company)	The electricity company owned by Indonesia's government
19	Academician from local university	Academician who has longstanding and community development experiences in East Sumba

Results and discussion

Unfolding the ideational power of Sumba Iconic Island

The ideational power reflects the ability of certain ideas to make an effect and define the spectrum of others' possibilities (Carstensen & Schmidt, 2016; Hay & Rosamond, 2002). In our case, the idea of having a 100 % renewable-electrified island in Sumba underlies the establishment of SII, which was powerful at the time. Such power exists through an effective network-building process through contextual reframing clean energy discourse. The SII was politically accepted due to its main narrative in simultaneously addressing Indonesia's energy poverty and its struggle to accelerate renewable energy share (Hivos, n.d.). In one of its supporting reports, it is explicitly stated that:

> "[The SII is] a bold and ambitious plan to showcase how people on a poor, isolated island can take on their development by reducing their dependency on fossil fuel and relying instead on a supply of 100 per cent renewable energy"
>
> (Hivos, 2016 p.2)

The emphasis on community role and decentralised renewable sources was also relevant for Indonesia due to PLN's (a state-owned electricity company) financial burden and the substantial cost of grid extension (Wibisono, Lovett, & Anindito, 2023). Hivos, the initiator, played a significant role in gathering political support from government and non-government organisations. Our informant from Hivos stated that in the initial phase they were motivated to develop ideational power through conveyance and negotiation to relevant stakeholders, as stated in the following statement:

> "This is like we test the assumption, whether Indonesia's stakeholders want to collaborate without any definitive funding. [so] after we had a consensus with local stakeholder regarding the development of renewable electricity, we went to EBTKE (a directorate of new, renewable energy and energy conservation of the MEMR). They [the EBTKE] were happy to know that the local governments supported us and were keen to materialise the idea collaboratively"
>
> – interview with Hivos

Moreover, apart from substantial efforts in 'knocking on the door' for all possible collaborations (see Hivos (2015)), Hivos gained power through their ideas through substantial efforts in publishing a research report and developing a pilot project (see Castlerock consulting. (2015); JRI Research (2012); Vel and Nugrohowardhani (2012); Winrock International, 2010) making the SII idea attractive despite no definitive plan, funds, and concept at the initial time. Ratri (2016) argues that such research materials catalysed the network-building process and sought investment. For example, the research conducted by Castlerock consulting. (2015) explores the potential location of each renewable source, including demand analysis and people's willingness to pay. Such research led to a Least Cost Electrification Plan for Sumba, further translated into an annual investment plan. Hivos (2015) states that the study is essential in building credibility and stakeholder trust in the project as a solid feasibility assessment supports it. Our informants admitted the substantial roles of having pilot project and its related reports in establishing supportive SII coalition in the following statement:

> "[In the SII Secretariat] our roles is to direct foreign investment to Sumba by stating that SII is formalised through the ministerial decree and has been through pilot projects"
>
> – Interview with Bappenas

> "Hivos made scientific reports about the potentiality of Sumba to become fully renewable-electrified island. After receiving the reports, the ADB decided to participate such an effort through technical assistance scheme"
>
> – Interview with Asian Development Bank

The power through ideas exercised by Hivos is an example of the importance of framing sustainable ambition to be contextually relevant, as well as the importance of academic argument and tangible examples as supportive materials in communicating ideas. We echo the argument of Scrase and Ockwell (2010) that discursively constructing environmental goals of energy projects into government priority areas significantly promotes political interests. Such issue framing plays an essential role in sustaining a continuous energy transition process as it contributes to reducing polarised tension between the supportive and opposing coalitions (Lee & Hess, 2019). The case of aggregation in California community choices is an example of how the narratives of consumer protection, good government, and economic-environmental sustainability are mobilised for achieve GHG and clean-energy goals (Hess, 2019). In our case, the ability of the initiator, Hivos, to recognise Indonesia's political ambition, i.e. achieving 100 % electrification rates (Setyowati, 2020), contextualising the global agenda of clean energy and frame it as a solution to such an ambition (Wibisono, Lovett, & Anindito, 2023), and academically reporting the abundant energy sources potential of Sumba Island (Hivos, 2012) is the pivotal aspect in starting the journey to shift a centralised-diesel-based electricity provision in Sumba into a renewable-based energy.

Around a decade after the launching of SII, our interviews found that the SII idea had gained 'power in' as the supporting coalition was able to prioritise SII and limit the opposing solution in electrifying Sumba, as expressed by our informant.

> "Within this collaboration what we did was directing actors…, particularly directing foreign grant. We had Sumba Iconic Island, so we better support it because it was legalised by Ministerial Decree, and we have had several pilot projects there"
>
> – Interview with Bappenas

The 'power in' of the SII idea was supported by enacting a ministerial decree of MEMR number 3051 K/30/MEM/2015 (MEMR, 2015) in 2015, in the same year when Indonesia committed to the global decarbonisation effort through Paris Agreement. The MEMR decree provided a legal basis for the SII supporters to materialise shared goals in achieving a 100 % renewable-powered island. Practically, for example, the SII coalition had the authority to establish coordination meetings, work with a diverse range of organisations, communicate their ambition, attract investors, establish local organisations, and disseminate their approach to the communities (Hirsch et al., 2015; Lambooy & Foort, 2013; Ratri, 2016; Utomo, 2015). As a result, the amount of investment on Sumba renewable energy rose significantly after 2015, as shown in Fig. 2.

Moreover, from the local perspective, besides investment which enable the installation of 9.3 MW renewable powerplants with 42.2 GWh of produced energy (DAGI Consulting, 2018), the SII was also able to deploy sustainability narratives to communities, for example, Atahau, Sakti, Huruta, and Kim (2021) found the shift of Sumba Microfinance institution into a more environmentally considerate, while Utomo (2015) highlights the increasing participation of local organisation in promoting sustainability. Wibisono, Lovett, Wen, and Suryani (2023) also found considerable market and non-market electricity benefits to its beneficiaries indicated by positive benefit-cost ratio values. Accordingly, among the economic benefits, savings from shifting kerosene-fuelled equipment into electric appliances is the most substantial and inclusive advantages of having electricity.

Projects failure and the barriers in materialising the iconic island

The ideational power gained by SII indicates the ability to align institutional arrangements in Indonesia's rural electricity sector, supported by the massive development of off-grid renewable systems through considerable multi-sourced funding. However, while the established ideational power of SII had a significant role in implementing the idea, the sustainability of the established systems and actors' performance in operating and maintaining electricity benefits determine whether the ideational power will last. The case of Prai Witu and its surrounding villages is an example of a place where the SII renewable power plant was completely abandoned. Mathis and Listiyorini (2022) reported that such villages were electrified using a communal solar system funded by the Millennium Challenge Account in 2017. The system was operated by a company named PT. Mikro Kisi Sumba (see Prilandita (2021)) who left the villages in 2021, resulting in unworkability of the established system. Additionally, the monitoring report in 2018 also reported that only 44 % of the established system operated due to various causes such as natural events (storms and floods), technical issues (inadequate installation, lack of maintenance, and limited funding), and stolen components (DAGI Consulting, 2018).

Technical failures in accelerating renewable utilisation have repeatedly occurred in Indonesia's electricity context. The case of micro-hydro Banyubiru in Central Java has a similar situation where the unclear responsibility over operational and maintenance led to a technical breakdown, which further jeopardised the plan to integrate renewable sources into the PLN grid (Kurniawan, Pradheksa, & Saleh, 2024). The case of solar home systems (SHS) is another example. The project which sought to install 200,000 SHSs failed due to a lack of government involvement and an inefficient financial model (Sovacool, 2018), while Barnes (2019) highlights the case in Klaten, where rural electricity failed to be impactful due to a lack of applicability to the agricultural sector. In general, such failures impact the credibility of the policy preferences or tools towards shared sustainable futures. These phenomena trigger actors' displacement (see Schmidt, 2010), which further potentially leads to the diminishing power of ideas due to a lack of supporters.

In the second period of fieldwork, we captured the re-electrification efforts of the villages that are primarily generated using diesel and managed by the PLN. Our village informants reveal that, in the process of reconnecting, they were required to sign a letter against future development (if any) of solar energy in the villages, as shown in the following statement:

> "When we were in the middle of re-connecting process, they (the PLN) asked everyone to sign a letter concerning our commitment to against any future development of off-grid solar PVs"
>
> – Interview with village stakeholder

The abovementioned problem complements other issues in materialising SII's ambition. Ratri (2016) highlights the substantial logistical costs of developing wind powerplant in Sumba and the uncertainty of feed-in tariff regulation, a policy framework that incentivises renewable energy by providing an above-market price for renewable energy produced. Such an uncertain regulation results in investors either pulling themselves out or freezing their investment plans. The constantly changing and PLN-favoured regulation regarding power-purchase agreements made investors pull out of their intentions (Setyowati, 2020; Torra, 2019). Lastly, the unsustainability of project funding due to

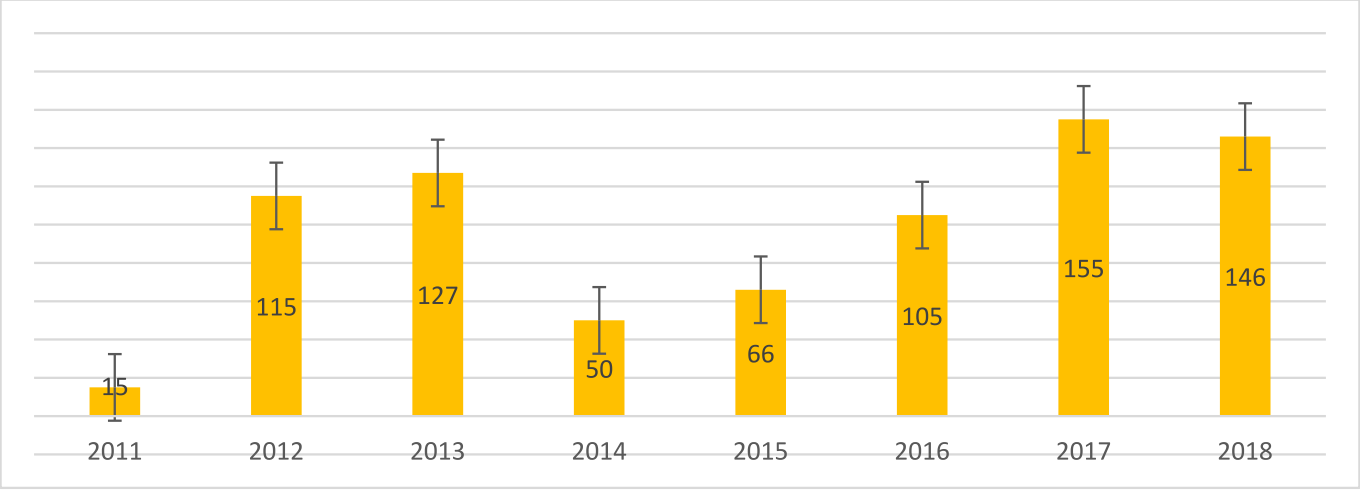

Fig. 2. Investment value of the SII-related projects in billion IDR.

being donor-oriented and the lack of willingness to pay the beneficiaries were among the problems causing the failure of the established off-grid renewable electricity systems (Chelminski, 2015; Prilandita, 2021). This funding issue was also contained in complaints by the local government who struggled to maintain the systems due to the 'build-only' nature of donor funding.

> "After the project finished, we complained to the central government [as they] handed over the asset and asked us to be responsible for the operational. We are not rich and the operational cost, which reach IDR 2.4 billion burden us financially"
>
> – interview with Bappeda

The situation of SII shows that the trilemma between prioritising energy security, alleviating energy poverty and mitigating climate change, in electrifying rural areas persists (see Gunningham (2013)). While Sumba Island was nominated to be a renewable-electrified island, the failure of the renewable electricity system promotes the application of unsustainable electricity. However, it is understandable that the communities desperately demanded to be reconnected as they have bought appliances and experienced electricity benefits as expressed in the following statement:

> "They [the communities] have bought fridges, televisions, and other appliances, what should they do with them? They also had experienced lights, could study and socialised at night, now it is all dark"
>
> – interview with village authorities in Tawui Village

Despite the effort to solve the situation through grid connection, we argue that the requirement to oppose the development of a non-PLN renewable energy system reflects the marginalisation of clean energy discourse in Indonesia's rural electrification while alleviating energy poverty and ensuring PLN's financial security are the primary goals (Wibisono, Lovett, & Anindito, 2023). Therefore, the failure of sustainable energy innovation leads to the rise of unsustainable solutions. A similar case happened in South Korea's shared-mobility innovations, e.g. Uber and Kakao Mobility. Lee et al. (2022) reveal that the failure of the shared-mobility concept left a negative impression among the users and investors. It further increases the current regime's stability through regulatory enforcement, diminishing the opportunity for shared-mobility innovation to flourish. Technological failures that has ideational impact was also observed in South-Saharan Africa where the massive investment on solar off-grid electricity lost its public and government support due to poor technological performance and corruption (Ikejemba et al., 2017).

The failure of socio-technical intervention can potentially disrupt the transition trajectory as it reveals inconsistencies, vulnerabilities, and systemic pressure in implementing innovation (Turnheim & Sovacool, 2020). Our case shows that making Sumba a fully renewable island faces technical and institutional challenges. Technically, establishing large-scale renewable systems was hindered by geographical hurdles and a lack of infrastructure (Ratri, 2016). Additionally, the broken systems, lack of feedstock for biomass, and the overlapping areas with diesel-based electricity impeded the transition to renewable electricity in Sumba (DAGI Consulting, 2018). Institutionally, substantial power given to PLN has limited the space for the private and community sectors to be involved in the electricity business sector, particularly in rural areas where financial profitability has always been an issue (Setyowati, 2020). Relatedly, Fathoni and Setyowati (2022) emphasise that PLN-centred policies are associated with the national state's territorial and power extension in maintaining its service delivery dominance. It further leads to uneven price distribution for communities where PLN's electricity, which is primarily diesel-generated, offers a considerably cheaper price per kWh than the renewable option (Fathoni & Setyowati, 2022).

Does failure of sustainable projects promote unsustainability?

The diminishing power in ideas means such an idea no longer has the credibility to limit opposing alternatives. Our case shows that the 'power in' SII ideas indeed existed. However, the repeated failures challenge it to be the priority of Sumba's rural electrification solution. Consequently, as discussed above, the opposing solution emerged and, to some extent, decreased the trust in the transition trajectory. In a national level, the Bappenas admitted that one of the primary mistakes was the inability to maintain the interest of PLN, as expressed in the statement below.

> "In my opinion, if we do not learn from our mistake, even in ten years the SII ambition will not be materialised … We did not consider the appetite of PLN [when planning the SII]. Despite our [100% renewable] ambition, PLN still working on the demand, If they see demand, they will fulfil it with their powerplant, which are mostly non-renewable"
>
> – interview with Bappenas

The failure in maintaining PLN's support significantly affected the transition trajectory as it has the highest power in implementing energy transition in Indonesia due to Indonesia's electricity law (see Fathoni & Setyowati, 2022). The organisational position of PLN which is under the Ministry of State-Owned Enterprises requires them to be a profit-oriented company. To some extent this is problematic as rural electrification is unprofitable due to lack of demand and a scattered population. The establishment of numerous donor-funded community-based mini-grids exacerbated this situation as it further reduces the potential demand for grid electricity.

Furthermore, our interview with local stakeholders reveals the growing scepticism of both communities and local governments towards renewable off-grid electricity due to the repeated failures as expressed in the following statements.

> "We found that our communities think that they need electricity, but the established system could not satisfy them [due to the broken systems]"
>
> – interview with the Bappeda of East Sumba Regency

> "We communicated with the local government about the PLN's plan to electrify our village and we think we will take the opportunity [to be electrified]. What could we do? We need the electricity"
>
> – interview with the Tawui village authority

The above statements show that both local government and village authority initially supported renewable electricity as it delivered services that had been lacking for decades. However, the technical failures diminished their support as it was no longer able to provide the services promised. Meanwhile simultaneously, PLN's grid expansion offers a potential solution to the community's electricity issue; and hence gained community support regardless of the sources.

Despite the consensus of actors in prioritising renewable sources, the necessity to accelerate Sumba's electrification rate became prominent when the transition agendas failed to work properly. In this case, the SII coalition's power over ideas was not influential in limiting the expansion of PLN's diesel-generating system, and it simultaneously indicated a decrease in power over ideas. This finding is a local example of how alleviating energy poverty and energy security discourses primarily underpin Indonesia's rural electrification policies. Researchers in Indonesia's renewable energy policy field have also argued similarly. For example, (Wibisono, Lovett, & Anindito, 2023) highlight this phenomenon by examining national-scale discursive contestation within the rural electrification policy arena. Meanwhile, Setyowati (2020) highlights the mismatch between Indonesia's commitment to carbon emission reduction and Indonesia's institutional arrangements, which favour energy security by imposing a price cap for renewable options.

However, the indication of decreasing trust in the SII idea is not necessarily interpreted as the loss of SII's ideational power. To address

this, we explored the extent to which renewable energy discourse is involved in the future development of Sumba Island. We found that the commitment to promote renewable sources in electrifying Sumba still exists. For example, the document 'Sumba Development Acceleration Plan' published by the Ministry of Development and Planning (Bappenas) states explicitly that renewable electricity will be the priority to achieve equal access to electricity in Sumba, specifically by developing new cost-effective systems and connecting them into grid network (Bappenas., 2023). Moreover, despite seeming to be against the idea of SII expanding their diesel grid system, the current PLN's electricity business plan states otherwise. In such a document, PLN states that they plan to build more solar and water-based energy systems, while the diesel-generated electricity plan no longer exists (PLN, 2021). It is interesting that in the same document year 2012–2021 (during the SII period), PLN primarily relied on diesel generators to fulfil the peak demand growth in Sumba island (Hirsch et al., 2015; Ratri, 2016).

Furthermore, referring to the concept of 'power in' ideas, which highlights the "authority of certain ideas enjoy in structuring thought" (Carstensen & Schmidt, 2016 p.329), the prioritisation of renewable electricity in Sumba's planning documents indicates the remaining 'power in' of SII ideas as a solution to Sumba's rural electrification issue. We argue that the trade-off between renewable-energy share and electrification rates targets exists just in case renewable systems cannot fulfil their function; otherwise, in rural Sumba, the use of renewable sources is still favourable. Nevertheless, we argue that in our case, the project's failure, despite repeating, represents the non-linearity of the development process in promoting innovation with inevitable ups and downs (Geels & Raven, 2006).

Introducing new technologies, innovations, or orientations can trigger a comprehensive shift if the overarching institutional arrangement pressures the incumbent regime and creates new opportunities (Geels, 2002). For example, the steamship technology success in entering the long-distance freight shipping regime was due to a change in the physical landscape of the Suez Canal and the alteration of British tonnage and navigation laws (Geels, 2002). In the context of this research, despite gaining 'power in' ideas, the promotion of renewable rural electricity in Sumba is significantly influenced by the position of Indonesia's electricity institutional arrangements towards renewable, fuel-based, and coal-based systems. The presence of unsustainable solutions responding to the failure of renewable systems indicates the limited pressure on unsustainable energy at the landscape level, as Turnheim & Sovacool (2020 p.280) explained as a "mismatch between innovation system and its institutional framework". Therefore, we argue that the window of opportunity to promote clean energy has maintained the ideational power of SII; however, the necessity to support national energy access and security leads to limited pressure on fossil-based electricity systems.

Lastly, our case shows that Indonesia's commitment to its nationally determined contribution (NDC) to climate change is still alive. Despite being "highly and critically insufficient" for years (Climate Action Tracker, 2023), including SII ambition in the Bappenas' and PLN's future development and electricity provision plan indicates this commitment. However, we echo Marquardt's (2018) that relying on the community-based mini-grid funded by donor money will have a limited impact on Indonesia's overarching energy transition. The Sumba case shows that while the donor-funded renewable mini-grid helped deliver electricity to remote rural communities, it also raised the potential for grassroots scepticism due to financial and institutional limitations that led to failures. We therefore argue that in the current institutional arrangement of Indonesia's electricity provision, the implementation of Indonesia's renewable electricity is primarily in the hands of PLN due to its massive authority. Relatedly, while NGO and donor projects are essential at the local level, scaling up the initiatives, even on the scale of a medium-sized island like Sumba, requires the 'appetite' of PLN throughout the transition trajectories.

Conclusion and policy recommendations

This article describes the rise and fall of ideational power in Indonesia's renewable rural electrification projects. Following the thread where the power was built, challenged, and maintained, this article contributes to the debates of sustainable transition in the global south country through the lens of discursive institutionalism. Our findings show that a transition to sustainability can be built by establishing the ideational power of the ambition in which contextual framing and program institutionalisation are pivotal. Despite encountering setbacks, we observed that the ideational power of the Sumba Iconic Island (SII) remains relatively steadfast, albeit with potential implications for public trust in the initiative. Furthermore, the absence of counterpressure on alternative solutions, such as diesel and coal-based systems, coupled with the prioritisation of electrification rates in Indonesia, creates space for the proliferation of unsustainable electricity systems.

The case of Sumba underscores two key issues with Indonesia's institutional approach to remote rural electrification policies, particularly in the utilisation of off-grid renewable systems. Firstly, we have observed that the current electricity policy, with its favouritism towards PLN, has restricted the involvement of non-PLN electricity providers, including donors, as primary electricity providers in the long term. This is due to recurring local institutional issues leading to technical failures. Therefore, we recommend that funding mechanisms for operations and maintenance be clearly defined and established inclusively prior to power plant development. A formal decree or regulation addressing this is essential to mitigate scepticism towards off-grid sustainable electricity in areas beyond PLN's reach. Additionally, the Sumba Case demonstrates the need for a more nuanced understanding of local ideational dynamics in national-level sustainability initiatives. As a result, we propose local-level regulations to translate national commitments to sustainability and climate change into practical guidelines for implementation.

CRediT authorship contribution statement

Hafidz Wibisono: Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jon Lovett:** Writing – review & editing, Supervision, Data curation, Conceptualization. **Maulidia Savira Chairani:** Writing – original draft, Methodology, Formal analysis. **Siti Suryani:** Writing – review & editing, Resources, Formal analysis, Data curation.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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