

Review

Localizing Sustainable Development Goal 13 on Climate Action to Build Local Resilience to Floods in the Hunter Valley: A Literature Review

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Abstract: The realization of the 2030 Agenda for Sustainable Development requires local governments globally to integrate Sustainable Development Goals (SDGs) into their policy and practice. In the case of the Hunter Valley Region of Australia, a key sustainable development issue is climate change-induced flooding. The localization and mainstreaming of SDG 13 on climate action can support tangible municipal climate actions in the Region. However, while it is acknowledged that SDG localization is needed to address sustainable development challenges, there is a gap in research and practice to guide local government attempts at SDG localization. This research analyzes literature on SDG localization to understand strategies, challenges and gaps that can inform localization approaches for the Hunter Valley. An analysis of the literature revealed that the implementation of SDG 13 at the local government level is a sparsely researched area, and in practice, efforts to implement SDG 13 have not been publicly communicated. Research-based recommendations for SDG 13 localization are presented to highlight the potential of integrating SDGs into pre-existing local policy so that the SDGs and their targets can support climate action and decrease disaster risk of future floods in Hunter Valley communities.

Keywords: SDG 13; sustainable development goal; localization; SDG mainstreaming; climate action; disaster risk reduction; disaster resilience; flood risk; Hunter Valley



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1. Introduction

The 2030 Agenda for Sustainable Development was initiated by the United Nations in 2015, providing 17 sustainable development goals (SDGs) to address the world's most pressing social, environmental and economic development issues [1]. For the global realization of the 2030 Agenda to occur, SDG integration into policy and practice by all nation states, across all levels of government is required [2,3]. "Localization" or the "process of defining; implementing; and monitoring strategies at the local level for achievable global, national and subnational sustainable goals and targets" [4] is essential for each country to reach their commitments to the 2030 Agenda [3]. Municipal governments are arguably best placed for such implementation because "local government is the sphere of government closest to individuals and their communities" [5] and can, therefore, effectively integrate SDGs that best reflect the needs of their communities [6]. In global scholarship, local governments are referred to as municipal governments or municipalities. However, in Australia, the local tier of government is referred to as 'councils' or 'local councils', and the region they govern is commonly referred to as Local Government Areas (LGAs). Therefore, when references are made in this research to municipal governments and local councils, it is a reference to local administrative tiers of government.

In Australia, a key sustainable development issue is climate change-induced natural hazards. The nation is highly exposed to a variety of hazard types, such as bushfires,

cyclones and droughts; however, rainfall-induced floods are Australia’s most widespread climate-related disaster due to their annual occurrence and damage rate [7,8]. The flood-prone region of the Hunter Valley in New South Wales, Australia is the focus of this study [9]. Assessments completed by councils in the Hunter Valley indicate high to extreme risk of flash flood, riverine flood and storms (see Appendix B). The Hunter Region (and greater State of New South Wales) experienced large and devastating floods in 2021 and 2022, following consecutive La Niña years. Although La Niña traditionally occurs in a cycle of 3–7 years [10,11], changing weather systems caused by global warming are contributing to concurrent and large-scale downpours during La Niña years [12]. This in turn increases flood risk during periods of heavy rainfall, where these deluges inundate catchments and contribute to subsequent flooding [12].

It is predicted that changing weather systems caused by climate change will increase the severity of high-rainfall flood events in Australia [13–17]. The latest IPCC report highlights that, without global climate action, warming will likely exceed 1.5 °C and 2 °C scenarios this century [17]. With floods being the most damaging climate-induced disasters, there is an imperative for local-level climate action that incorporates strategies for reducing the disaster risk of future floods in Hunter Valley communities.

In acknowledging the need to strengthen climate action, local resilience and adaptive capacity in the Hunter Region, this research argues that the localization of SDG 13 on climate action by Hunter Valley local governments is a step towards addressing these challenges. In particular, Target 13.1 and Indicator 13.1.3 (see Table 1) can be localized to address the critical challenge of floods in the Hunter Valley. (Table A1 details these targets and indicators; a full breakdown of SDG 13 is available in Appendix A.) However, while it is acknowledged that SDG implementation at the local government level is effective in addressing sustainable development challenges, there is a gap in research and practice to guide localization at the local government level [6,18,19]. This gap has resulted in researchers calling for more investigation to support local governments in understanding the best approaches to SDG implementation in their communities [2,6,18].

Table 1. SDG 13 targets and indicators explored in this study [1].

SDG 13: Take Urgent Action to Combat Climate Change and Its Impacts	
Target 13.1: Strengthen resilience and adaptive capacity to climate-related disasters	Indicator 13.1.3: Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.

To address these gaps in scholarship and practice for the context of the Hunter Valley, an understanding of good practice approaches to localization and examples of successful SDG 13 localization are needed. This paper presents the findings of a literature review that sought to identify good practice examples of SDG 13 implementation in academic and gray literature to understand strategies, challenges and gaps in the local-level implementation of SDG 13. The literature review was the first step in answering the overarching research question that guides this research project: How can local governments in the Hunter region adopt and implement flood risk reduction strategies in line with the SDG 13 framework that can improve local resilience and adaptive capacity? The paper is organized into six sections. Firstly, the background context of the Hunter Valley, climate change and flood risk is detailed to provide context on why SDG 13 on climate action is a key issue for the region. Secondly, the literature review approach is discussed, followed by a summary of scholarship on SDG implementation at the local government level. The paper then continues with discussion and conclusions, which include recommendations that Hunter Valley councils can use to localize SDG 13 in their communities.

2. Background: The Hunter Valley, Climate Change Floods and SDGs

The Hunter Valley is a sub-region of the State of New South Wales (NSW), Australia. The region is made up of the local government areas (LGAs) of Cessnock, Dungog, Lake Macquarie, Maitland, Mid-Coast, Muswellbrook, Newcastle, Port Stephens, Singleton and Upper Hunter. The Valley is bounded geologically by the Sydney Basin and the Hunter-Mooki fault, and water catchments are defined by the Liverpool, Hunter and Great Dividing Ranges. Its length is approximately 230 km north-south and 210 km east-west [20]. The greater Hunter is situated in NSW's largest coastal catchment area [9], including the Hunter River catchment in the eastern region, Manning and Karuah in the northern region, and Lake Macquarie and Hawkesbury-Nepean rivers, which make up the larger catchments within these LGAs [9]. Figure 1 [20] highlights the region and intricate catchments made up of river and creek systems throughout the Hunter Valley. Excluding the Newcastle urban area, the Hunter Valley is home to nearly 300,000 people [21] and is experiencing rapid population growth [22], thus resulting in increasing exposure and risk to climate change impacts. The key industries of agriculture and mining [23] are vulnerable to climate change impacts, such as increased temperatures, erratic rainfall, drought and floods.



Figure 1. Map of the Hunter Valley and Catchment Watercourse [21].

2.1. Climate Change and Flood Risk in the Hunter Valley

Since March 2020, a triple La Niña event has led to successive floods and flash flooding events across the Hunter Valley and throughout the vast areas of the entire country [24]. The combination of different climate drivers, including La Niña, Southern Annular Mode (SAM), Southern Oscillation Index (SOI), Indian Ocean Dipole (IOD) and temperature anomalies in the oceans and seas surrounding Australia, all contribute to these weather patterns and can contribute to the setup of East Coast Lows (ECLs), which are commonly implicated in flood risk in the Hunter Valley [25,26]. Coupled with this, incidents of rainfall extremes are increasing, with Australian data showing an increase in extreme hourly and daily rainfall observations, whilst there is a decrease in overall maxima of in-flows, consistent with global trends [27]. The concepts of integrated water vapor transports (IVTs) and atmospheric rivers (ARs) have also been introduced into climate and weather vernacular, and the incidence of IVTs is being closely investigated for their contribution to weather and disaster impacts. Reid et al. [28] looked at the influence of IVTs in the 2021 Sydney flood events (which were also felt in the Hunter Valley) and, based on greenhouse gas and climate modeling, have projected an up to 80% increase in long duration events by the end of the century.

2.2. SDG Localization Efforts in the Hunter Valley

Locally, Hunter Valley councils have started the process of integrating the SDGs into policy and practice. Table 2 below outlines these councils, as well as councils who have yet to implement SDGs. However, there are gaps in these approaches. For example, Singleton Shire Council has implemented strategies for some SDGs [29] but does not include actions related to SDG 13. Furthermore, MidCoast Council efforts to act on SDG 13 are focused on emissions reduction targets and lowering energy consumption and do not include actions related to Target 13.1 on disaster risk reduction [30]. Cessnock, Lake Macquarie and Newcastle Council's efforts to implement SDG 13 focus on understanding local disaster risk and supporting householder preparedness and disaster risk knowledge [31–33] and are therefore working to integrate SDG 13, Target 13.1 "Strengthen resilience and adaptive capacity to climate-related disasters". However, these documents do not outline specific benchmarks for climate action related to disaster risk. Lastly, the Upper Hunter, Port Stephens, Dungog, Maitland and Muswellbrook Councils have not directly integrated SDGs into their planning (or have not made this information publicly available on their websites). However, this is not to say that these councils have not made efforts on climate action and disaster risk reduction. For example, the Muswellbrook Community Strategic Plan [34] outlines strategies for transitioning to net zero emissions, which reflect the principles of SDG 13 even if they have not been directly linked. Similarly, Singleton Shire Council does not integrate actions for SDG 13 on Climate action, however, the Environmental Management Policy [35] outlines principles of "Ecologically Sustainable Development (ESD)" (p.4). While these councils are working to integrate climate action and resilience building in their communities, arguably work is needed to link these actions to SDG 13, its targets and its indicators because local-level agenda setting that localizes SDG 13 can result in tangible municipal climate actions [36,37].

Table 2. Hunter Valley Councils with SDG strategies (Strategies and plans related to SDGs created by Hunter Valley Councils were identified through a desktop review of publicly available policy documents on each council website. Sourcing documents on each website was achieved through a keyword search in Council document libraries for “SDGs, sustainable development goals, sustainability, climate action” and through a review of media releases on each website using the same phrases).

Council	Does the Council Have a Specific SDG Strategy or Policy? And Does It Include Strategies for SDG 13, Climate Action in General or Flood Risk Management?
Singleton Shire Council	The Singleton Sustainability Strategy 2019–2027 [29] incorporates SDG 7, 11, 12 and 15. However, the strategy does not include actions for SDG 13.
Cessnock City Council	Yes—the Community Strategic Plan [31] mentions strategies for implementing all SDGs locally, including 13. The Strategy recognizes that residents of Cessnock’s climate action and building resilience to “adapt and thrive in times of natural disasters and other emergencies” (p. 6) is an emerging issue the community faces. It refers to SDG 13. However, there are no benchmarks for climate change related to flood risk management.
Dungog Shire Council	No, the Council has not directly integrated SDGs into policy and practice.
Lake Macquarie City Council	Yes—The “Our Future in Focus, Lake Macquarie City Community Strategic Plan 2017–2027” [33] mentions strategies for implementing all SDGs locally, including 13. Their actions include “Implement programs and activities designed to increase householder preparedness for natural disasters and climate change. Undertake flood studies and floodplain risk management studies/plans, that include climate change predictions, for priority catchments in the local government area” (p. 18).
Maitland City Council	No, the Council has not directly integrated SDGs into policy and practice. The Council is releasing a sustainability plan in 2023, and, therefore, it could be in the process of integrating SDGs into practice.
City of Newcastle	Yes—the Community Strategic Plan [32] incorporates the SDGs. The Council states they are acting on SDG 13 by ensuring “2.3 Environment and climate change risks and impacts are understood and managed. 2.3b Support individuals and communities to prepare, respond and recover from emergency events.” (p. 17)
Muswellbrook Shire Council	No, the Council has not directly integrated SDGs into policy and practice.
MidCoast Council	Yes—the Council has integrated the SDGs into council strategies, plans, policies and operations through their Climate Change Strategy [38]. The strategy is aligned with SDG 13 with a focus on emissions reduction targets and lowering energy consumption. This strategy does not include actions related to Target 13.1.
Port Stephens Council	No, the Council has not directly integrated SDGs into policy and practice.
Upper Hunter Shire Council	No, the Council has not directly integrated SDGs into policy and practice.

2.3. SDG Localization in Australia

In the context of Australia, local government efforts to implement SDG 13 are needed to strengthen resilience and build community capacity to climate-related disasters. To date, the localization of SDG 13 in Australia is lacking. In the SDGs 2022 report it is highlighted in Australia’s sustainable development score that Australia’s implementation of SDG 13 faces significant challenges and that actions on climate change are “stagnating or increasing at less than 50% of the required rate” [39]. This highlights a need for further research in this field and a need for local governments globally to communicate their efforts taken to localize SDGs. Sharing implementation experiences can establish peer learning between local governments that fast-tracks SDG uptake; minimizes duplications of frameworks; and establishes tested, good practice approaches to localization that can be replicated at the municipal level [40]. Overall, work is needed across Australia and the Hunter Valley region to support the localization SDGs, especially in local councils who have yet to integrate the SDGs into policy and practice. The following section examines literature on local

government implementation of SDGs in an attempt to determine best practice approaches to localizing SDG 13, which can support localization efforts in the Hunter Valley.

3. Literature Review Method

The search for academic scholarship was conducted using Google Scholar so that both academic and gray literature related to local-level implementation could be sourced. The date of publications was limited from 2015 to the present, as 2015 was the year that the United Nations' SDGs were implemented. The literature search aimed to identify research on (a) approaches taken by local governments to implement SDG 13 and targets into policy and practice and (b) global research on SDG implementation at the local government level. The search was conducted at these two stages because scholarship on SDG 13 implementation at the local government level provided sparse results. Therefore, a focus on SDGs, in general, was taken to identify whether the implementation of other SDGs could provide insight for best-practice SDG implementation and localization. The following search strings were used when searching for SDG literature: ("SDG*" OR sustainable development goals OR "2030 Agenda") AND (implementation* OR mainstreaming OR localization*) AND (local government OR municipal government OR district government OR municipalities OR local-level governance) AND (climate change OR disasters* OR "disaster risk reduction" OR adaptive capacity OR resilience)). The symbol (*) represents variations of the searched term.

This search resulted in 82 matches on Google Scholar (when accounting for duplicates). After this initial search, the results were then refined to encompass academic, peer-reviewed content and reports from government bodies and international organizations. Next, the titles, keywords and abstracts of the search results were assessed for their relevance to this study suitability. For example, sources were excluded if (i) the source was not focused on the local government level, (ii) the article predated the inception of the SDGs in 2015, (iii) if the source did not significantly focus on SDG implementation at the local government level (iv) or if it focused on local government governance challenges outside of SDG implementation. After this scan, the final sample consisted of 52 papers that matched the research project proposal.

4. Results

There is a growing body of research focused on the process and justification for national or state government SGD implementation [41]. However, local government implementation research is lacking. Research that does examine municipal government localization of SDGs primarily focuses on desktop reviews on the importance of local implementation [4,42–44]; roles of local governments in governing SDGs [6,45]; and the challenges of local governments incorporating the theoretical importance of SDGs into practice at the local level [18,46,47]. Specifically, these challenges identified in the literature can be summarized broadly as (i) the lack of best practice knowledge or data on local government SDG implementation globally; (ii) the lack of indicators for assessing implementation that can be applied at the local government level; (iii) limited governance power and capacity at the local government level; (iv) and inadequate funding allocation for climate action from the central/federal and state, province or district levels to local governments.

Empirical research on local implementation primarily provides case study research examining municipal integration of the SDGs, focusing mainly on the challenges of such implementation [2,48]. However, there is a lack of analysis of what local governments are doing to effectively implement SDGs, including Goal 13 [6,19]. This is likely because there remain limited opportunities for local councils globally to provide feedback on their efforts [2], meaning that data on local-level implementation are not being communicated to wider audiences. A growing area of scholarship is empirical research on cities implementing SDGs, particularly in relation to SDG 11 on "Sustainable cities and communities" [49–52]. For example, researchers have developed rankings for SDG implementation [53]; frameworks for implementing SDGs [40,54,55]; and novel systems for linking city sustainability

indicators to SDGs [56]. The following sections provide an overview of these themes in SDG localization research.

4.1. Challenges of Implementing SDGs at the Local Level: The Unequal Capacity of Local Governments

Case studies that examined the implementation of SDGs at the local level highlighted that the uneven capacity for local governments to implement tangible actions to address SDGs is a key factor that negatively impacts SDG localization [6,57]. As Diprose et al. [46] argued, while most of the goals are intended for localization, sub-national governments are faced with implementation challenges because of the top-down fashion in which resources for SDG implementation are provided by central government. According to Diprose et al. [46], this reflects a mismatch between local governments' responsibilities and their "powers, resources and capacity" to implement SDGs.

Furthermore, it is argued that effective local-level implementation requires local governments to have the institutional capacity to do so. Research by Salvador and Sancho [58] into local government SDG 13 implementation assessed local governments' efforts to implement SDGs into climate policy and found that four institutional capacities are needed, including "strategic or leadership capacity, analytical and data management capacity, management capacity and collaborative or network management capacity" (p. 2). They suggest that the above institutional preconditions assist local governments in developing climate change policies that reflect sustainable development [58]. Other challenges identified in the literature include resource deficits experienced by local governments in that municipalities are typically the most underfunded tier of government [6,59].

Local government resourcing of SDGs is an issue across local governments in both the Global North and Global South. For example, Duah et al. [2] argue that the main challenge of mainstreaming SDGs in Ghana was resources, as a lack of federal or state funding impacts the implementation of SDGs, which will likely make the achievement of the 2030 Agenda by 2030 an impossibility. Furthermore, Dziva and Kabonga [47] argue that resourcing SDG implementation and monitoring is a significant challenge for Zimbabwe. However, the SDGs Global Dashboard [60] highlights that local governments in the Global South are falling behind in implementing SDGs and that variations in resources between larger, urban municipalities and smaller, regional municipalities can occur within the same country. As such, a growing body of research is targeted toward addressing these challenges in the Global South [47,61,62].

4.2. Challenges of Implementing SDGs at the Local Level: Indicators and Monitoring Implementation Progress

A significant challenge for SDG localization identified in the literature was that targets and indicators for SDGs are less explicit at the municipal level than at the national and state tiers of government [19,58]. For example, there is a lack of transparency on the roles and responsibilities of local-level governing of SDGs. In addition, the SDGs provide limited guidance on how local actors can implement the universal goals in ways relevant to their communities [6]. Therefore, municipal governments are faced with the challenge of designing, implementing and monitoring systems, policies and programs incorporating economic growth, social equity and environmental sustainability with little guidance on how to do so effectively and efficiently [58]. Dziva and Kabonga [47] argue that the 2030 Agenda relies on grassroots-level localization for the goals to be realized. However, the failure to translate SDGs into firm actions that can be taken at the local level demonstrates a lack of support for local actors, resulting in global SDG localization challenges [49].

The lack of indicators specific to the local context means that local governments must be creative in reaching targets, as there are limited methods known for effective municipal level localization [3]. Furthermore, research that does highlight case study examples of local government SDG implementation often fails to interrogate their success in practice or how implementation is being monitored [4,18]. As Dziva and Kabonga [47] argue, this research gap makes it challenging to determine what local governments have

implemented SDGs and how they are faring in practice. The International Institute for Sustainable Development [63] recognizes the lack of data sharing on local-level SDG implementation and progress. It has developed a method for tracking SDG localization that is freely available to local governments. Their method involves the development of a Tracking-Progress website tool that contributes to the Tracking-Progress network, where local governments can share lessons learned from SDG localization [63].

Researchers also suggest that a bottom-up approach that involves local governments establishing their own approaches to monitoring and establishing their own indicators is a way to bypass these challenges and ensure effective localization occurs [64]. Timmers and Sidney [65] provide examples of this “bottom-up” approach to monitoring. They suggest that, while the localization of SDGs has its challenges, local governments can monitor SDG progress through community indicator systems [65]. They draw on the example of Community Foundations of Canada’s (CFC) Vital Signs® program, which allows local governments to implement locally relevant indicators to track progress associated with each community’s SDG implementation [65]. Furthermore, they highlight that the Aloha+ Challenge in Hawaii (Hawaii Green Growth, 2018), the city of Los Angeles (2021) and the Voluntary Local Review for Shimokawa, Japan (Institute for Global Environmental Strategies, 2018) have each aligned existing community-driven data programs to measure their implementation of SDGs [65].

4.3. Best Practice: “Mainstreaming” SDGs into Existing Policy and Practice

Due to the lack of guidance on localization, local governments face the task of translating SDGs and their targets for the local context for SDGs to be successfully implemented [48]. While the current body of literature provides limited accounts of best practice approaches for SDG localization, a common theme in literature was that localization can be achieved by mapping SDGs against pre-existing local policy so that the SDGs and their targets can be effectively matched and integrated into existing policy and practice [66]. This approach is known as “mainstreaming” and seeks to take the needs and concerns of the community at hand and to integrate them into policy-related decision-making that can be used to achieve the local government’s commitment to SDGs [59].

The effectiveness of local government SDG mainstreaming was demonstrated across research based on the Global North and Global South contexts. For example, Pereira Lindoso et al. [67] explain that, in Brazil, localizing SDGs has been challenging because there are limited studies demonstrating best practice approaches to downscaling indicators at the municipal level. However, their analysis of the local-level implementation of SDG 3 found that effective localization requires decentralized initiatives that adapt SDGs to reflect specific municipal contexts [67]. This is echoed by Diprose et al. [46], whose research on SDG localization in England suggests that the goals can be effectively implemented by contextualizing SDGs for the context of their communities. In short, by making SDGs real (thinking about what can practically be done), relevant (thinking about what is locally important), relatable (considering how to engage community and actors) and relational (considering what coalitions are needed to implement SDGs successfully) [46].

While mainstreaming cannot wholly overcome the multilevel implementation challenges presented by the 2030 Agenda, it can assist municipal governments in working with these challenges. As Rohdewohld [68] argued, adapting SDG indicators to reflect the needs determined by local communities and stakeholders ensures that the SDGs become embedded into local-level governance structures. For example, Tremblay and Gowsy [19] analyzed Quebec City’s SDG implementation. They found that contextualizing the SDGs to reflect the needs of the specific municipality provided a “local-scale approach” to SDGs relevant to the community, which increased the tangibility of targets. Furthermore, researchers argue that, because local governments globally are likely already undertaking sustainable development initiatives, adapting existing policy and practice to meet the aims of the SDGs is an efficient way for SDGs to be localized [66]. Mainstreaming also ensures

that sustainable development efforts at the local level are not duplicated and that SDGs do not become marginalized [18].

However, while mainstreaming is considered an effective way to localize SDGs, there is little unification in current scholarship and practice on how this process should be achieved [59]. Frameworks for implementing SDGs mainly stem from research and guidelines for international or national levels [69]. However, there is an emerging area of research attempting to explain ways to mainstream SDGs at the city level. The Sustainable Development Solutions Network (SDSN) developed guidelines for city-level SDG implementation [70]. The SDSN is made up of university research institutions and centers that translate and monitor SDG action globally. The networks are organized into 40 national networks and 13 regional networks. Regional networks include Andes, Amazon, Australia, New Zealand and Pacific, Black Sea, Caribbean, Great Lakes, Mediterranean, Northern-Europe, Sahel, South Asia, Southeast Asia and Western Balkans. The guidelines provide steps for mainstreaming, which include (i) “a participatory process”, (ii) “setting the local agenda”, (iii) “planning for implementation” and (iv) “monitoring and evaluation” [70]. Researchers Krellenberg and Bergsträßer [71] adapted the SDSN guidelines for municipal localization and mainstreaming. They suggest the need to follow a six-step process: 1. Mapping the system; 2. Setting visions, goals and indicators; 3. Setting the strategic guidelines; 4. Actions; 5. Developing tools; 6. Establishing necessary readjustments; 7. Completing the strategy [71]. Valencia et al. [72] also build from the SDSN approach by suggesting that best practice should involve the inclusion of “delimitation of urban boundaries, integrated governance, relevant actors, synergies and trade-offs, and indicators” (p. 7) to make the SDSN framework applicable to municipal mainstreaming of SDGs.

The local-level approach to SDG implementation by Masuda et al. [59] provides an analytical framework derived from a comprehensive review of literature that established 26 key requirements for SDG mainstreaming that can be used as a checklist for local governments undertaking SDG implementation initiatives. Their research found that, for SDGs to be localized effectively in Japan, municipalities needed to incorporate five overarching criteria (with sub-criteria for each), including “1. Governance and co-ordination mechanisms; 2. Mobilization of stakeholders around the SDGs/partnerships; 3. Policy mechanisms for SDG mainstreaming; 4. Monitoring and reviewing arrangements; 5. Approaches centering on the SDGs” [59]. It is suggested that this approach could be used as a key component for mainstreaming SDGs at the municipal level due to its in-depth checklist based on research literature [59]. However, this approach has only been tested against two case studies and therefore requires more examples of its successful use as a framework for determining SDG mainstreaming needs for specific municipalities. As such, while this is a comprehensive tool, more evidence of it being used as a successful tool during the SDG mainstreaming process is needed.

5. Discussion

In light of the findings from this analysis of scholarship and practice of SDG there is a gap in research on best practice approaches to localizing SDG 13 Target 13.1, “Strengthen resilience and adaptive capacity to climate-related disasters”, which is impacting the implementation of SDG at the local government level. This is evident when searching for examples of how municipal governments implemented SDG 13 Target 13.1. For example, the search for real-world examples of SDG 13 mainstreaming, which resembled efforts for flood risk management, resulted in limited findings. However, it is important to note that this does not mean that flood risk reduction is not occurring, as it is likely that local councils are not connecting these practices to SDGs. The South Lanarkshire Council, Scotland; City of Bradford Metropolitan District Council, England; and Whitehorse City Council, Australia as local governments who are undertaking efforts to Mainstream SDG 13 and to communicate their efforts. This highlights that, if SDG 13, Target 13.1 and Indicator 13.1.3 localization is occurring, this information is not publicly available or easily accessible.

Furthermore, research that touches on SDG 13 does not directly link SDG targets with efforts for disaster risk reduction outlined in the Sendai Framework for Disaster Risk Reduction (SFDRR) [73]. Research that explores mainstreaming climate change governance focused on the limited structures to integrate climate change action at the local level [2]. However, this research does not always touch on SDGs specifically and tends to focus more directly on the Sendai Framework or the Paris Climate Agreement [74]. The lack of integration between SFDRR, the Paris Agreement and SDGs is arguably a missed opportunity, given the clear overlapping themes between them [73].

This highlights that further academic scholarship is needed on the integration between disaster risk reduction (DRR) and climate change adaptation (CCA) in SDG 13 implementation at the local level. Furthermore, SDG 13 arguably covers these two ideas; therefore, actions taken to implement the goal need to integrate these ideas [75]. Internationally, there is a call for DRR and CCA in public sector policy and practice to manage climate extremes [76]. However, this has failed to occur holistically due to a variety of well-documented challenges, including the responsibility of implementing CCA and DRR falling on different sectors and agencies [77]; differing methods of implementation and timescales [78]; and varying political awareness, resourcing and interest [79]. These issues are documented in Australia, particularly at the local government level [80,81]. Given these challenges of DRR and CCA implementation, it is unsurprising that the lack of integration is reflected in the localization of SDG 13.

SDG 13 mainstreaming literature acknowledges the lack of research on successful examples of local governments implementing the goal and its targets [82]. It is suggested that there is a lack of evidence of SDG 13 implementation at the local government level, which impacts municipalities from accessing insights on how to integrate SDG 13 into their climate governance [58,83]. As argued by Skoog [84], SDG 13 targets and indicators primarily focus on reducing global carbon emissions and actions that can be taken to mitigate the effects of global warming. SDG 13 research suggests that in instances where mitigation is preferred over adaptation at the local level, it may slow the country's ability to align SDG 13 with their national and local development agendas [57]. Bandyopadhyay [85] argues that the lack of knowledge on climate change adaptation in city planning hinders SDG 13, as council stakeholders mostly deal with mitigation. Therefore, mainstreaming SDG 13 requires climate change adaptation to be implemented into all levels of development planning for the local government [2]. As a first step, municipal governments must understand their climate change vulnerability and level of hazard risk and have plans to mitigate risk [86].

While the research on SDG 13 mainstreaming at the local level is growing, best practice actions for climate adaptation to strengthen resilience against natural hazards at the local level through SDG localization are not being effectively communicated to local actors or in scholarship. Researchers argue that it is difficult to determine if Target 13.1 has been effectively achieved due to the limited measurable indicators for SDG 13 that can be adapted at the municipal level [87]. For example, only one indicator is used to measure progress following implementation, which is 13.1.1 on disaster-related deaths and injuries [84]. In drawing from the research identified so far in this review, a good practice approach for addressing this issue is to examine ways to integrate SDG 13 and Target 13.1 into existing policy and programs for disaster risk management and sustainable development at the municipal level [57,73]: mainstreaming SDG 13.

6. Conclusions

In drawing from the analysis of SDG localization scholarship, local governments in the Hunter region can arguably adopt and implement flood risk reduction strategies in line with the SDG 13 framework by ensuring:

1. Localization of SDG 13, its targets and indicators should follow a process to ensure that localization and mainstreaming of SDG 13 can result in tangible municipal climate actions [36,37]. While there is no unified approach to local SDG 13 agenda setting,

many of the examples identified in scholarship and practice either follow or build on the approach taken by the Sustainable Development Solutions Network (SDSN) (i) “a participatory process”; (ii) “setting the local agenda”; (iii) “planning for implementation”; and (iv) “monitoring and evaluation” [70]. Incorporating examples presented in this paper, good practice mainstreaming and localization are demonstrated in Figure 2 below.

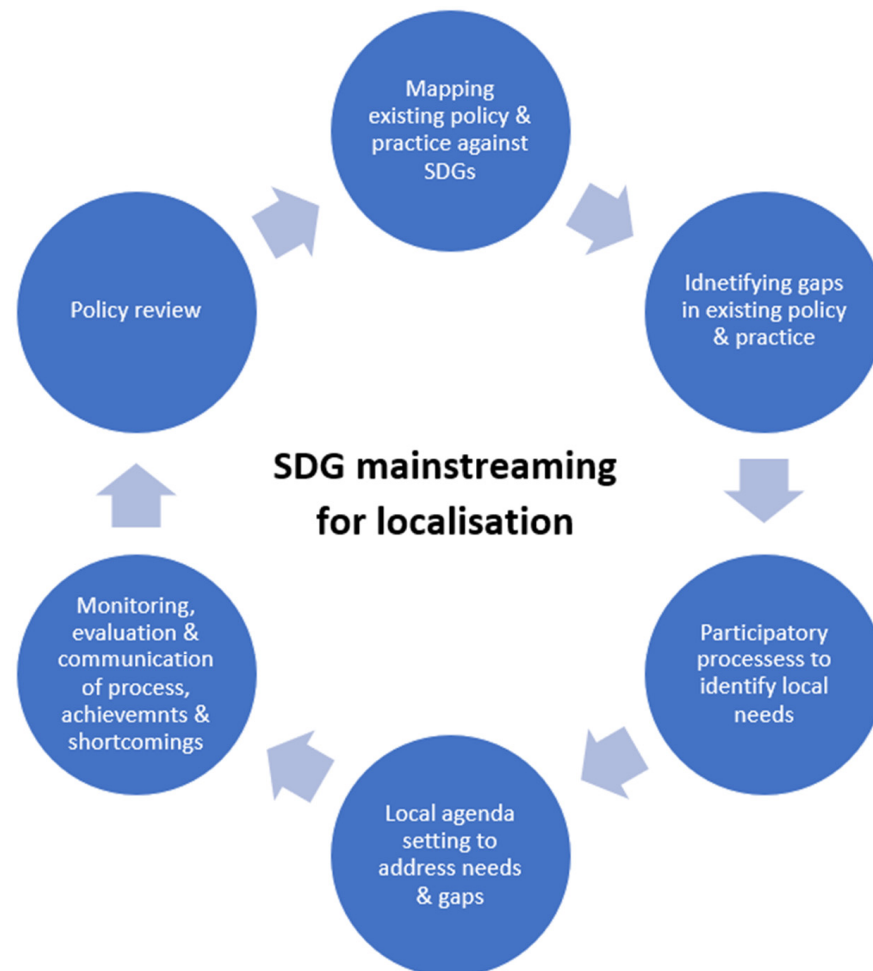


Figure 2. Good practice approach to SDG mainstreaming.

2. Any efforts to implement SDGs require community input and participation, so localization is community driven and supported. Research in this field suggests that such community-driven approaches to SDG implementation increase the likelihood of success [88].
3. The implementation of SDG 13 should be publicly communicated (as was done by the Whitehorse Council’s report) and reported to UN databases so that learnings and processes can be shared internationally [40]. This can help address the knowledge deficit in best practice SDG implementation at the local level [6].
4. Integrating DRR and CCA into localization approaches supports effective localization. The lack of synergy between DRR and CCA in policy approaches to climate change tends to hinder efforts to reduce vulnerability and increase resilience [77]. Integrating DRR and CCA is widely recognized as a solution for reducing the risk and impacts of disasters [73,77]. SDG 13 localization efforts that implement flood risk management approaches would benefit from integrating learnings from the Sendai Framework to address this lack of integration in research and practice [73].

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Appendix A

Table A1. SDG 13 targets and indicators [1].

SDG 13: Take Urgent Action to Combat Climate Change and Its Impacts		
Targets:		Indicators:
13.1	Strengthen resilience and adaptive capacity to climate-related disasters	- Indicator 13.1.1: Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population. - Indicator 13.1.2: The number of countries that adopt and implement national disaster risk reduction strategies aligns with the Sendai Framework for Disaster Risk Reduction 2015–2030. - Indicator 13.1.3: Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.
13.2	Integrate climate change measures into policies and planning	- Indicator 13.2.1: Number of countries with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change. - Indicator 13.2.2: Total greenhouse gas emissions per year.
13.3	Build knowledge and capacity to meet climate change	Indicator 13.3.1: Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.
13.4	Implement the UN framework convention on climate change	Indicator 13.a.1: Amounts provided and mobilized in United States dollars per year in relation to the continued existing collective mobilization goal of the USD 100 billion commitment through to 2025.
13.5	Promote mechanisms to raise capacity for planning and management	Indicator 13.b.1: Number of least developed countries and small island developing states with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change.

Appendix B. Flood Risk in Hunter Valley LGAs Based on Data from Local Emergency Management Plans

Definitions for these hazards are defined in the “Hunter-Central Coast Regional Emergency Management Plan March 2021” as the following: “Flood (Flash)—Heavy rainfall causes excessive localized flooding with minimal warning time” (p. 37). “Flood (Riverine)—River flows exceed the capacity of normal river systems resulting in flood waters escaping and inundating river plains” (p. 40). “Storm—Severe storm with accompanying lightning, hail, wind and/or rain that causes severe damage and/or localized flooding” (p. 37).

Table A2. Hazard and Risk data from Hunter Valley Local Emergency Management Plans.

Council/Document	Hazard Type	Risk Priority
Port Stephens Council Local Emergency Management Plan [89]	Flood (Flash)	Extreme
	Flood (Riverine)	Extreme
	Storm	Extreme
MidCoast Council Emergency Management Plan [90]	Flood (Flash)	Extreme
	Flood (Riverine)	Extreme
	Storm	Extreme
Newcastle City Council Emergency Management Plan [91]	Flood (Riverine)	Medium
	Storm	Extreme
	Flood (Flash)	Extreme
Maitland City Council Emergency Management Plan [92]	Flood (Riverine)	Extreme
	Storm	Extreme
	Flood (Flash)	Extreme
Lake Macquarie City Council Emergency Management Plan [93]	Lake flood	High
	Creek flood	High
	Storm	High
Dungog Shire Council Local Emergency Management Plan [94]	Flood (Riverine)	High
	Storm	Extreme
	Flood (Flash)	Extreme
Singleton Shire Council Local Emergency Management Plan [95]	Flood (Riverine)	Extreme
	Storm	Extreme
	Flood (Flash)	Extreme

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