

The Hunter Valley, Climate Change Floods and SDGs

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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.

SDG 13

sustainable development goal

localization

disaster risk reduction

Flood

Hunter Valley

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]}. Assessments completed by councils in the Hunter Valley indicate high to extreme risk of flash flood, riverine flood and storms. 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 ^{[9][10]}, changing weather systems caused by global warming are contributing to concurrent and large-scale

downpours during La Niña years ^[11]. This in turn increases flood risk during periods of heavy rainfall, where these deluges inundate catchments and contribute to subsequent flooding ^[11].

It is predicted that changing weather systems caused by climate change will increase the severity of high-rainfall flood events in Australia ^{[12][13][14][15][16]}. The latest IPCC report highlights that, without global climate action, warming will likely exceed 1.5 °C and 2 °C scenarios this century ^[16]. With floods being the most damaging and costly 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.

| 2. 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 ^[17]. The greater Hunter is situated in NSW's largest coastal catchment area ^[18], 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 ^[18]. **Figure 1** ^[17] 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 ^[19] and is experiencing rapid population growth ^[20], thus resulting in increased exposure and risk to climate change impacts. The key industries of agriculture and mining ^[21] 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 [\[19\]](#).

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 [\[22\]](#). 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 the setup of East Coast Lows (ECLs), which are commonly implicated in flood risk in the Hunter Valley [23][24]. 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 [25]. 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. [26] 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. However, there are gaps in these approaches. For example, Singleton Shire Council has implemented strategies for some SDGs [27] 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 [28]. 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 [29][30][31] 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 [32] 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 [33] 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 [34][35].

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" [36]. 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 ^[37]. 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.

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