

# Evidence-based coordination of national climate resilience

## Briefing report



Climate and  
Sustainability  
Policy Research  
Group

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# Executive summary

This report presents the results and implications of a systematic review of academic, government and nongovernment organisation literature on climate security and climate resilience in the Indo-Pacific published between 2014 and 2019. The key messages from the review and implications are outlined below.

Climate change is a threat multiplier that raises security concerns about:

- > territorial integrity arising from climate refugees, increased migration and conflict over cross-border resources
- > the activities of non-state actors, including terrorist networks and pirates, that are likely to take advantage of disasters to build their claims
- > challenges to government legitimacy from domestic inequality, lack of disaster preparedness and poor health, food and water security.

The critical implications for Defence in terms of national security include the need to work on building and strengthening internal, domestic and international partnerships. This encompasses:

- > a need for better coordination with domestic Australian government policy partners
- > the development of international relationships for regional cooperation in the Indo-Pacific
- > the recognition of and commitment to Defence's critical regional role
- > the importance of closer internal integration of Defence activities on climate and security.

Climate security challenges are intensified by issues of poor governance at all levels. To build more robust governance:

- > regional cooperation is needed to increase the efficiency and efficacy of climate and security responses
- > cooperative relationships need to be built and maintained with bilateral partners, nongovernment organisations, the private sector, local governments and trusted local actors, collaborative international networks and key domestic partnerships.

Key governance challenges to building climate resilience include:

- > regional socioeconomic instability, diminishing government legitimacy and low governance capacity
- > the low capacity, but increasing responsibility, of subnational governments in climate resilience
- > the need for meaningful engagement of communities and local knowledge, nongovernment organisations and the private sector.

Climate security can be greatly enhanced through the integration of disaster risk management and climate change adaptation. However, there are conceptual, operational and technical challenges to integrating these fields. Policy champions are needed across governance networks to advance this goal.

A central constituent of well-integrated climate resilient security governance will be appropriately designed systems and resources for sharing evidence within and between government institutions and their partners. However, the absence of key information, limited quality and poor data availability continue to be central challenges.

- > Well-designed knowledge management systems can be used to underpin collaboration and mainstreaming of adaptation measures.
- > Policymakers need to understand the strengths and weaknesses of research and be active in challenging researchers to answer the most pertinent policy questions.
- > The poor usability of climate science at local scales introduces impediments for decision-making and policy development within traditional 'rationalist' frameworks.
- > The general public, particularly in developing countries, is not well educated in relation to climate change issues.

Our review suggests a critical need to maintain and enhance existing governance structures, processes and institutions, and the physical infrastructure they administer, in order to improve the adaptive capacity of the Indo-Pacific region as a whole. Developing adaptive capacity will require:

- > developing institutional arrangements and participatory collaborative systems to enhance regional governance

- > enhancing the resilience of critical infrastructure and considering future infrastructure development
- > identification of poorly functioning supply chains and developing strategies to resolve vulnerabilities and inefficiencies
- > integration of resilience-building activities with the ongoing development agendas of individual states.

Key activities to focus on for building climate resilience include:

- > the building of regional collaborative partnerships via bilateral and multilateral activities and forums
- > empowering local institutions and collaborating with nongovernment organisations
- > building Australian leadership in climate resilience regionally
- > the integration of resilience into development policy
- > engagement with the community, including women, Indigenous groups and resettlement communities
- > improving access to information, building information platforms and portals and providing scenarios, tools and guidelines
- > mainstreaming climate resilience into working policies and priorities facilitated by knowledge brokers.

Going forward, Australian Defence and partner agency initiatives to improve climate resilience should:

- > seek to integrate disaster management and climate resilience capacity building
- > integrate Australian aid and investment with disaster and climate adaptation
- > target those communities that are most climate vulnerable
- > focus on developing government legitimacy and state capacity
- > be evidence-informed and context-specific.

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# Abbreviations

ABF	Australian Border Force
ACT	Australian Capital Territory
ALGA	Australian Local Government Association
ASEAN	Association of Southeast Asian Nations
CCA	Climate change adaptation
CFS	Country Fire Service
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DFAT	Department of Foreign Affairs and Trade (Australia)
DPC	Department of Prime Minister and Cabinet (Australia)
DRM	Disaster risk management
EMA	Emergency Management Australia
NCCARF	National Climate Change Adaptation Research Facility
NGO	Nongovernment organisation
NSW	New South Wales
NIRA	National Indigenous Reform Agreement
PNG	Papua New Guinea
SAARC	South Asian Association for Regional Cooperation
SIDS	Small Island Developing States
SIWSAP	Solomon Islands Water Sector Adaptation Project



# Introduction

Climate change presents a key threat to Australia's national security over the coming decades. Increasing hazards from extreme climate, such as drought, flood, extreme heat and more intense storms, act as risk multipliers for already-vulnerable communities and governments in the Indo-Pacific region. These pressures expose governments' poor adaptive capacity, can lead to declining government legitimacy and can inflame tensions across communities and between states. These cascading pressures make climate security a key concern for the Australian Government Department of Defence and its partners domestically and internationally.

This report builds on the conclusions of Defence's 2016 White Paper<sup>1</sup> and the 2018 Senate Committee report on climate change and security<sup>2</sup> to describe and discuss key issues that are likely to arise for maintaining climate security in the Indo-Pacific region. The report draws on a systematic review of literature on climate security and climate resilience in the Indo-Pacific. The review includes 396 research items published between 2014 and 2019 by academic researchers, nongovernmental agencies and governments across the region (full details of the review protocol are contained in Appendix 1). On this basis, the report develops conclusions and recommendations for how Defence can prepare for the challenges ahead.

A central theme arising from the review presented here is that collaboration and cooperation are the cornerstones of the adaptive capacity necessary for maintaining and enhancing climate resilience. Cooperation should begin within Defence's institutional structures and with partners across Australian government to enhance Defence's capacity to effectively build climate resilience in the region. With this in mind, this interim report can serve as a first step in a collaborative process to develop mutual understandings of the climate security challenge, domestically and regionally. Developing a shared conceptual framework through a codesign approach can provide a foundation from which to enhance all future efforts to address climate security in the Indo-Pacific region.

The first section of this report begins with an overview of the pressing climate security concerns faced by governments and communities across the region. Section 2 highlights key conceptual and governance challenges that have been identified as impediments to enhancing climate resilience. Section 3 discusses the challenges for, and potential solutions to, evidence-informed decision-making and communication for building climate resilience. Section 4 outlines a

range of key strategic actions to develop capacity for climate security in the Indo-Pacific region arising from the review. Finally, Section 5 discusses the implications of these findings for Defence.



## Section 1. Climate security concerns

# Climate security concerns

Climate change is a threat multiplier: it exacerbates existing threats and burdens and introduces new vulnerabilities. Security concerns identified in the review fall under two interrelated thematic areas:

1. territorial integrity
2. governance legitimacy.

Both of these themes have implications for Australian domestic security and the efficacy of current approaches to climate governance.

## Territorial integrity

Good governance and maintaining state capacity to secure sovereign borders are integral to territorial integrity. The key challenges to border integrity presented by climate change in the Indo-Pacific include:

- > **Climate refugees and increased migration.** While most expected increases in migration will be internal, there will be movements of refugees across the region from the impacts of climate change.<sup>3-5</sup> The management of refugee migration presents a range of challenges, but the maintenance of territorial integrity is key.<sup>6, 7</sup>
- > **Conflict over cross-border resources.** The potential for conflict can arise over water resources, natural resources that connect to food security and a range of other resources in locations of acute economic downturn and inequality.<sup>8, 9</sup>

Building climate resilience can help to prevent or minimise these challenges. Enhancing state capacity can secure resilience by reducing the movement of climate refugees and the potential for conflict over resources. Building state capacity and resourcing vulnerable states to improve governance systems will ease future challenges by ensuring current regimes can respond in the aftermath of climate-related events that might otherwise result in state failure. For Defence, supporting border security and pursuing increased cooperation in the region will contribute to more robust territorial integrity.

Climate security concerns in relation to territorial integrity have also been focused on actors that would challenge sovereignty, territoriality and legitimacy

for existing states in the Indo-Pacific. These actors are seen as especially likely to escalate claims in the Indo-Pacific in times of disaster response or in the aftermath of disasters when governance capacity is weakened and resources stretched more thinly:

- > **Terrorist networks.** Internal and transboundary challenges arise from terrorist networks in times of disaster and crisis. These networks take the opportunity to build support during the disruption arising from natural disasters, in locations with disaffected populations and at times of mass migration.<sup>6, 10</sup>
- > **Piracy.** An expansion of piracy and its integration into broader criminal networks is anticipated in the Indo-Pacific due to increasing poverty in coastal communities, especially in South Asia. Poor resourcing and a lack of commitment to anti-piracy measures in the region will exacerbate this.<sup>11</sup>

## Legitimacy

There are concerns that the legitimacy of existing governments will be undermined by future disasters and climate change impacts.<sup>3, 12, 13</sup> Challenges to the legitimacy of existing states and governments in the Indo-Pacific on a broad scale (rather than isolated, acute instances over time) would present significant difficulties for Australia and Defence in relation to maintaining security and capacity in the Indo-Pacific.

The key challenges for maintaining governmental legitimacy arise from:

- > **Domestic inequality.** Significant changes in domestic inequality may be expected due to communities' unequal exposure and economic vulnerability to climate extremes. These changes will undermine domestic economic security<sup>3, 14-20</sup>, especially where there is limited state capacity to support poor and marginalised communities.
- > **Disaster preparedness.** Inadequate or ineffective preparedness and incomplete disaster recovery will challenge internal legitimacy, especially as climate-related disasters become more regular and more disruptive.<sup>6, 10, 20-26</sup>
- > **Health security.** Access to health services – health infrastructure and quality and breadth of services – is inconsistent in the Indo-Pacific region.<sup>14, 24, 27-29</sup> Health services are poor in the South Pacific in particular. Although excellent services exist in parts of Asia, these are often price-

restrictive. Maintenance and improvement of health security are critical for enduring legitimacy in the face of climate change impacts.<sup>16, 27, 30</sup>

- > **Food security.** The challenges to food security are variable across the region, with different drivers existing in the Pacific and South/South-East Asia, and for different affected groups.<sup>6, 21, 30-40</sup> Food security presents a more acute threat for legitimacy in Asia, with impacts more likely to be felt among urban wage earners and those who have left rural communities.<sup>10, 31</sup>
  
- > **Water security.** Secure access to clean drinking water in both urban and rural areas will be challenged. Additionally, increasing demand on water sources for agricultural needs is anticipated. Growth in population and migration to urban centres is also expected to stress existing water sources and infrastructure.<sup>41-49</sup>

Improvements in capacity in these sectors will be critical to maintain and improve the legitimacy of Indo-Pacific governments. Defence and national partner agencies can minimise these legitimacy threats by supporting disaster preparedness, providing support for disaster response, improving health infrastructure and security, and encouraging locally appropriate food security measures in the region. Each of these measures may reduce, though not resolve, domestic inequality issues. Taking action on these issues will contribute significantly to the maintenance of Australia's national security under climate change.

The security concerns raised by climate change lead to significant challenges for governance. The review identified key issues including the brokering of relationships at local, national and international scales and integrating the new demands of climate change adaptation with existing disaster risk management systems. These are discussed in the following section.



## Section 2. Governance challenges: Relationships and integration

# Governance challenges: Relationships and integration

Climate security challenges are intensified by issues of poor governance at all levels. These challenges may involve national, subnational and local governments, as well as autonomous public agencies, defence institutions, domestic police forces, international organisations, community groups, interest groups, traditional or Indigenous leadership structures, and other formal or informal organisations that govern or represent groups of people. Building and harnessing networks among these groups will be an essential part of any strategy to address climate security risks, but there are a number of challenges associated with this. Domestically and internationally, a key challenge involves relationships among government departments, particularly in light of the conceptual and operational obstacles to integrating climate change adaptation with portfolios responsible for disaster risk management.

## The need for cooperation

Regional cooperation is needed to reduce information and transaction costs and to increase efficiency and efficacy of responses to climate and security issues. This is particularly important given the likely shortfall in funds from international and domestic sources for climate mitigation and adaptation in the region. However, while there is a strong history of cooperation and joint action on climate change in the Pacific (for example through the Pacific Small Island Developing States and Secretariat of the Pacific Community), this is not the case in South and South-East Asia.<sup>50</sup> This is particularly concerning given the current fragility of some central and southern Asian states, the history of tension in regional organisations (for example the South Asian Association for Regional Cooperation [SAARC]) due to conflict between India and Pakistan, and the lack of coherent, decisive and cooperative action on climate in this part of the region.<sup>51</sup> Concerted resources and capacity would need to be devoted to building trust and cooperative activity to secure better outcomes.<sup>3, 52</sup>

## Key Relationships for integrated climate governance

Building and maintaining cooperative relationships is a key component for integrated, resilient governance. This should occur through:



- > **Bilateral relationships with key partner nations.** This includes both developed and developing nations, particularly in times of disaster response.<sup>53-55</sup>
- > **Private sector and nongovernment organisation (NGO) stakeholder partnerships with government.**<sup>56</sup> One of the most important private-sector relationships for government may be with the insurance industry, which can facilitate resilience through risk assessment and appropriate insurance instruments for communities and infrastructure.<sup>26, 57</sup>
- > **Collaboration with local government and trusted local actors.** This provides understanding of local contexts and underlying drivers of vulnerability, and can help inform targeted interventions over the long term.<sup>58-60</sup>
- > **Collaborative international networks.** Several networks for climate change and disaster risk reduction exist already. These involve multi-stakeholder partnerships including policy- and decision-makers, practitioners, nongovernment organisations and researchers.<sup>61-63</sup>

Domestically, the following developing partnerships are of note:

- > **Collaboration between responsible bodies for DRM, CCA and National Security.** It has long been recognised that responsible parties (and their representative bodies) for DRM (EMA, ALGA, CFS) and national security (ABF) can benefit from dialogue with institutions seeking to develop and enhance the CCA agenda in Australia (e.g. NCCARF, CSIRO, The Australia Institute).<sup>60, 64</sup>
- > **National Indigenous Reform Agreement (NIRA).** Initially endorsed by COAG in 2008, NIRA is a partnership between all levels of government to work with Indigenous communities to 'close the gap' in Indigenous disadvantage in target areas.<sup>65</sup> This would be an appropriate forum to ensure Indigenous needs are addressed in government DRM provisions.

Of particular mention for enhancing Australia's climate security are regional relationships with:

- > **New Zealand.** NZ's approach to integrated national security governance is well developed and worth consideration as a model. New Zealand has created a 'national security architecture' that is highly integrated and

leverages partnerships between a range of stakeholders including government, the private sector and the community.<sup>66</sup>

- > **China.** China has expressed an interest in strengthening international cooperation in three aspects of DRM: knowledge exchange, international coordination and technological research collaboration.<sup>18</sup> China's increased willingness to collaborate with international agencies on knowledge exchange and capacity building may enhance relations between China and Australia in the future. Climate change may exacerbate tensions in the Indo-Pacific region, so building collaborative networks with the Chinese government may be a useful pre-emptive strategy to improve regional climate and disaster response capacity.

## Governance challenges

### International governance challenges

Socioeconomic instability, diminishing government legitimacy and low state governance capacity can contribute to adverse security outcomes.<sup>11</sup> In addressing climate security, Defence should consider how governments across the region can come together cooperatively to mitigate these challenges. In the first instance, collaboration between neighbouring governments should be encouraged and developed. Over time, Defence is likely to encounter more international demands for humanitarian assistance, disaster relief and search and rescue operations.<sup>5</sup> Advance planning and preparation would allow Defence to take a leadership role in the region on this. At the extreme end, Australia may need to help stabilise weak states or prevent governments from collapsing.<sup>6, 50,</sup>

67-69

### National and subnational governance challenges

National coordination by central government has been recognised as a key component for the effective preparation for, and response to, climate security issues.<sup>5</sup> However, subnational governance structures, including state, provincial and local government, traditional Indigenous leadership and community groups, are also important for effective governance and enacting of climate security. Subnational governments often have substantial – and increasing – responsibility for policy areas important for addressing climate change and security, but they frequently do not have the requisite authority or resources to contribute to or manage these policy issues effectively.<sup>34, 64, 70-75</sup>

Subnational governments may lack the information and training to understand the long-term impacts of climate change and they are usually focused on immediate service-delivery issues.<sup>61</sup> For instance, they are often tasked with urban planning but lack the authority, funding and long-term strategic capacity to mitigate climate risks at the local level.<sup>59, 64, 76, 77</sup> Governance challenges in this regard can include:

- > overcoming path dependencies in infrastructure provision and land development and when regulating private-sector development<sup>18, 26, 78</sup>
- > managing rapid urbanisation, informal/illegal settlements, urban poverty, public health issues and vulnerability to climate-related disasters, especially in the developing world<sup>72</sup>
- > deflecting or insulating the public sector against liability during disaster events, which can be costly, thereby depleting public resources and capacity.<sup>79</sup>

These challenges can lead to tensions between central and subnational governments.<sup>64, 78, 80, 81</sup> In addition, in a decentralised system there is a risk of inconsistent legislation, governance approaches and policy responses that make it difficult to address climate-related security concerns strategically and effectively.<sup>10, 60, 79, 82-84</sup>

### **Community participation**

In many jurisdictions, informal community organisations, including religious organisations and traditional or Indigenous governance structures, can help to address issues related to climate change and security. Engaging with these groups can maintain and establish legitimacy through co-production of policies and programs that meet end-user needs and use local knowledge.<sup>15, 24, 43, 85, 86</sup> Cultural sensitivity is critical here as traditional or religious organisations may be uncooperative<sup>32, 70</sup> and may present challenges for policy implementation.<sup>70</sup>

### **The role of NGOs and the private sector**

International organisations, domestic nongovernment organisations, research institutions and the private sector can all be important partners for climate security. For example, the International Committee of the Red Cross has expressly noted the connection between climate change and the potential for civil unrest, and there may be a role for Red Cross to play in helping to prevent conflict.<sup>5</sup> In general, the Red Cross, its international affiliates and similar

organisations are instrumental to disaster response, including response to disasters related to climate change.<sup>81, 87</sup>

In the developing world, international aid organisations, including the providers of direct bilateral aid, are highly influential actors. For example, the Global Environment Facility's program to fund the development of renewable energy generation in Pacific Island states has led to sustainable development practices and increased self-reliance.<sup>88</sup> However, international aid itself can present problems of sustainability as recipient countries become dependent on aid that is not always consistent or reliable<sup>12</sup> and do not have the resources to continue programming after aid has been cut short or withdrawn.<sup>78, 85</sup> Relationships between aid donors and recipient governments can create problematic power imbalances.<sup>48, 70</sup> There is also a considerable integration deficit between climate-related policy and planning and ongoing development initiatives. Access to external development finance provides important opportunities for building integrated climate resilience. However, donors and climate financing institutions set compliance requirements that often cannot easily be met by small Indo-Pacific countries with limited public sector capacity.<sup>54, 89</sup>

## Integrating disaster risk management and climate change adaptation

Climate security can be greatly enhanced through a targeted, collaborative effort to develop the climate resilience of communities and governments in the Indo-Pacific region. Resilience building, however, includes a range of activities and policy areas that have traditionally been the responsibility of disparate governance portfolios that are poorly integrated.<sup>60</sup>

Perhaps the most significant integration concern for Australian government is the gap between the well-established governance portfolio of disaster risk management (DRM) and the burgeoning field of climate change adaptation (CCA).<sup>90</sup> There are three principal areas of overlap between these policy areas:

- > both are concerned with understanding and managing climate-related hazards, their associated risks and uncertainties
- > both seek to reduce or otherwise manage exposure, vulnerability and inequity that arise from extreme climate events
- > both seek to enhance the adaptive capacity and resilience of communities and their governments.<sup>91</sup>

However, a range of issues contribute to an ongoing lack of integration between these policy areas. This poor integration has been identified as a key limiting factor in developing climate resilience for Australia and the Indo-Pacific region.<sup>13, 19, 80, 82, 92, 93</sup>

## Conceptual challenges

Several challenges arise from the contrasting conceptual frameworks associated with disaster response, on one hand, and the global phenomenon of climate change on the other<sup>94-97</sup>:

- > **Contrasting problem formulations.** DRM has traditionally focused on all types of disaster event, whereas CCA is primarily concerned with anthropogenic climate change.<sup>19, 91</sup> Recognised best-practice for DRM now instructs an institutionally-integrated 'all hazards, all agencies' approach to disaster preparedness and response, whereas CCA policy is still primarily focused on anthropogenic climate change, and is thereby often expected to be centred within environmental portfolios of government.<sup>96</sup>
- > **Ambiguities of terminology.** DRM and CCA communities have developed terminology independently, in ways that can cause confusion when attempting integration between them. For instance, the term *mitigation* indicates very different sorts of activities for the DRM community as compared with the CCA community.<sup>60, 78, 98</sup>
- > **Contrasting temporal perspectives.** CCA is focused on preparing for long-term future transformative climate change, whereas DRM is frequently focused on responding to immediate circumstances or future planning that assumes a stationary climate.<sup>59, 75, 82, 95, 99-102</sup> In Australia and developed countries more generally, the principal focus is still on short-term DRM response and reconstruction in the aftermath of extreme events. Best-practice prescriptions advise a longer term, preparatory outlook to policy and planning<sup>26, 58, 80</sup> to build climate resilience and capacity.
- > **Contrasting governance approaches.** DRM is often coordinated and operationalised at local scales, often involving close community consultation. In contrast, CCA efforts to date have been largely instigated at a regional or national scale in a top-down way that has had poor integration at subnational scales.<sup>17, 19, 70, 81, 93, 100, 103</sup>

Although better integration may be possible through the resolution of these conceptual differences, a complete convergence of these policy areas may be

neither realistic nor desirable.<sup>104, 105</sup> These conceptual differences may provide food for thought in relation to Defence's integration with their inter- and intragovernmental partners now and for the future since they imply that effective integration will demand careful engagement and policy codesign with all involved parties.

## Operational challenges

In addition to conceptual challenges there are operational challenges arising from substantive differences among governance portfolios. This creates a need for articulated systems and approaches for Defence and its partners to implement better integration. Challenges include:

- > **A lack of governance capacity.** In developing countries this can constrain policy implementation generally and integration between policy portfolios more specifically.<sup>106</sup> Extreme climate events will likely amplify these challenges further.<sup>107</sup> Capacity gaps can prevent implementation of policy<sup>50</sup> by decision-makers and other stakeholder groups, and may impede the establishment of robust communication systems<sup>108</sup> and the uptake of evidence.<sup>109</sup> Many subnational-level officials have limited education, restricting their utilisation of available evidence.<sup>61</sup> Education thereby becomes a key component of vulnerability reduction.<sup>61</sup>
- > **A lack of coordination and communication.** This occurs vertically between levels of governance (national, regional and local) and horizontally across government institutions at any given level.<sup>60, 61, 97</sup> Coordination and communication difficulties arise from institutional, funding and political structures that maintain governance 'silos' and discourage collaboration and integration<sup>60, 94, 97, 110, 111</sup>, and from issues of territoriality among policy communities.<sup>19, 91, 112</sup>
- > **Data and information deficiencies.** These continue to be problematic for both CCA and DRM, yet both policy communities collect information that could be useful to the other.<sup>113</sup>
- > **Lack of financial, technical and human resources.** This is a significant impediment to achieving the uptake of CCA at local government level to develop, inform and direct effective climate adaptation decisions.<sup>60, 72, 97, 103, 114, 115</sup> Infrastructure and supply chain challenges may flow from these resource deficiencies, particularly in remote areas, including in relation to maintaining effective communication, staffing and infrastructure.<sup>116, 117</sup>

## Enhancing integration and resilience outcomes

A number of overarching goals could be pursued for the purposes of integrating climate change adaptation and disaster risk management and enhancing climate resilience<sup>17</sup>:

- > improving the adaptive capacity of governing institutions and communities
- > 'mainstreaming' adaptation into existing policies and planning
- > providing necessary climate risk assessment and management tools to decision-makers
- > creating innovative solutions for adaptation
- > increasing public awareness of adaptation needs through targeted research and development, communication and education.

In pursuit of these goals, policy *champions* across all levels of governance are an important means to advance the integration and adaptive capacity of government institutions.<sup>60, 90, 118</sup> Regular communication and coordination forums by and for national or centralised coordination bodies are also necessary.<sup>119</sup>

Opportunities arising in the aftermath of extreme events should be put to better use by taking best advantage of the policy 'windows' arising with emergency disaster responses to push a climate change adaptation agenda.<sup>100</sup> Nonetheless, it is generally expected that any robust integration of DRM and CCA will demand a shift away from reactive approaches towards more proactive actions that will enhance resilience and reduce financial and social exposure to climate change.<sup>82</sup>

Effective adaptation to climate change will require a combination of top-down and bottom-up approaches to policymaking and implementation, including appropriate focus on the aforementioned integration challenges.<sup>60, 61, 97</sup>

Some have argued for a top-down national strategy for integrating disaster risk management and climate change adaptation.<sup>30</sup> Others have proposed establishing an ongoing resilience/vulnerability dialogue across key government departments and with their partners and stakeholders<sup>99</sup>, or placing disaster management and climate change adaptation within the same ministry.<sup>112</sup> There have been calls for a coordinated sharing of resources and information in a regional context.<sup>101</sup>

Many have argued for a bottom-up 'prepared community' approach<sup>12, 52, 106, 120, 121</sup> that aligns well with the 'all hazards, all agencies' perspective advocated in

the *Sendai Framework for Disaster Resilience*.<sup>122</sup> Others argue for improved ordinary citizen participation<sup>123</sup> along with better local government engagement with community organisations.<sup>84, 124</sup>

Coordinated responses to the security risks presented by climate change must be based on the effective use and communication of scientific evidence. This is the focus of the following section.





## Section 3. Communication and use of evidence to enhance climate resilience

# Communication and use of evidence to enhance climate resilience

A central constituent of well-integrated climate resilient security governance will be appropriately designed systems and resources for sharing evidence within and between government institutions and their partners.<sup>85, 101</sup> This section outlines a number of key challenges and barriers to establishing effective communication for this purpose.

## Challenges for the development and use of evidence

The absence of key information and poor data availability continue to be central challenges for effectively using evidence to enhance climate resilience and security, especially in developing countries. Serious implications can arise from the absence of data, limited access to data or the use of poor-quality data.<sup>50, 70, 75, 101, 119</sup>

### Data availability and access

The absence or limited quality of data have been noted in relation to many different applications relevant to climate resilience:

- > planning and management of essential services and infrastructure<sup>125, 126</sup>
- > human health and vulnerability<sup>80, 82, 127</sup>
- > biosecurity and biodiversity<sup>80, 82</sup>
- > managing coastal environments and early warning systems<sup>128</sup>
- > forecasting and projections from weather and climate data<sup>95, 129, 130</sup>
- > understanding vulnerability and resilience through demographic data, especially for rapidly-urbanising Asian jurisdictions.<sup>131</sup>

In addition, data *access* continues to be a major obstacle in climate change analysis.<sup>127</sup> Planning also continues to be constrained by limited access to information.<sup>132</sup> Technological limitations, for instance poor internet access,

contribute to this.<sup>133</sup> Data that is not publicly available might not be included in decision-making.<sup>134</sup>

Knowing where to access adequate and effective information can also be a challenge<sup>87, 108, 125</sup>, and systems are needed to aggregate and disseminate information to where it is most needed.<sup>57</sup> In some instances (e.g. in Indonesia<sup>135</sup>) datasets exist but have been underutilised or not maintained.

Sometimes overlooked is the need for capital investments in basic data collection and communication equipment.<sup>12</sup> Of these, in particular, programs, documents and apps can become quickly outdated and require investment.<sup>130, 136</sup> Lack of resources can severely constrain availability of useful data collection and communication tools and technology.<sup>65, 131</sup>

## **Applying evidence**

To facilitate climate resilience and to integrate DRM and CCA, knowledge management systems and processes should be established.<sup>107</sup> Well-designed knowledge management systems can be used to underpin collaboration and mainstreaming of adaptation measures. Knowledge bases for local communities and local government should receive particular attention.<sup>137</sup> Current knowledge management initiatives in the Indo-Pacific region include the DFAT-funded Pacific iCLIM project.<sup>54</sup>

Integration demands the use of relevant and robust scientific evidence.<sup>85, 86, 103, 128, 135</sup> Application of evidence may be hampered by a disconnect between complex theoretical concepts and the reality of decision-making. Another impediment can be a mismatch between the geographical and jurisdictional scales at which evidence is available and the scale at which decisions require evidence.<sup>17, 98, 131</sup> There is also increasing recognition within both the CCA and DRM communities that more effort is needed to supplement scientific knowledge and expertise with local traditional knowledge.<sup>70, 91, 128, 138, 139</sup> Traditional knowledge may assist in understanding local impacts of climate change and in finding local solutions and capabilities.<sup>127, 140</sup>

Misinterpretation of data and poorly designed research may lead to perverse outcomes by failing to appropriately guide policy and action<sup>17, 19, 24, 25, 81, 82, 92, 141, 142</sup> Policymakers need to understand the strengths and weaknesses of research and be active in challenging researchers to answer the most pertinent policy questions.<sup>143</sup>

## Uncertainty and issues of data downscaling

There continues to be significant uncertainty in the science of climate change for the purposes of informing policymaking.<sup>41, 59, 76, 130, 131, 144</sup> Climate science uncertainties are particularly magnified at the local level<sup>72</sup> due to the challenges of 'downscaling' global model projections to regional and local scales. Despite these uncertainties, downscaled knowledge can be useful for informing CCA and DRM policy through the identification of broad climate change hazards.<sup>72, 137</sup> However, data sets to allow understanding of community vulnerability to resultant impacts are rarely available at local scales at which such information can be most useful.<sup>92, 98, 145</sup>

The poor usability of climate science at local scales introduces impediments for decision-making and policy development within traditional 'rationalist' frameworks. These frameworks often assume an ability to objectively define and address policy problems. Climate adaptation policymaking, however, is constrained not just in terms of uncertainties in understanding potential hazards at specific locations, but also their likelihoods of occurrence. Climate hazards identified by climate models, though useful, are often interpreted differently by different stakeholders and therefore understanding climate impacts for the purposes of policymaking often demands political judgement.<sup>144, 146, 147</sup>

## Communication barriers to enhancing climate resilience

The general public, particularly in developing countries, is not well educated in relation to climate change issues. Achieving widespread support for climate-related policies (especially in developing countries)<sup>48</sup> may therefore prove difficult. The potential for self-help in relation to hazard preparedness and prevention is also limited.<sup>148</sup>

There are many different audiences for climate change information, not all of which are receptive.<sup>110</sup> Conflicting information and the creation of doubt by political and media bodies is a barrier to action and may contribute to declines in public concern about climate change.<sup>136, 149</sup> Scepticism and reluctance to hear about climate change<sup>110</sup> can directly influence the success of policy messages to the public.

A key barrier to effective communication of climate science to the public is poor coordination of information flows within and across levels of government and with their stakeholders (institutions, NGOs, donor agencies and the community).<sup>36, 86, 127, 133</sup> This may be a consequence of institutional complexity

and multiple policy and research agendas that lack a coordinated, coherent set of messages.<sup>50</sup>

Message transmission tools are not always tested effectively to ensure their efficacy for specific user groups.<sup>124, 148</sup> Inadequacies in communication tools or technological networks may prevent organised and planned responses by the public.<sup>128, 150</sup> For instance, early warning systems require effective transmission of messages during and after disaster events. Communication technologies and networks are crucial for this; however, communication infrastructure itself is often vulnerable to disasters.<sup>151</sup>

### **Language and cultural barriers**

Effective communication requires a common language; however, multiple language barriers exist in the communication of CCA and DRM. Climate-related information is frequently unavailable in local languages.<sup>70, 108</sup> There may also be conceptual and language ambiguity in relation to the contrasting approaches of DRM and CCA.<sup>13, 19, 36, 60, 64, 92, 98</sup> Climate change science is often written in precise language, using very specific meanings for terms (e.g. 'risk', 'likely') that otherwise have common use, thus limiting the utility of research for decision-makers.<sup>152, 153</sup> and disengaging the public.<sup>110</sup>

The findings of the preceding sections describing the security concerns presented by climate change, the necessity of good governance and strategic relationships, and the use and communication of evidence provide a basis for identifying ways in which Australia can increase its capacity for climate resilience. How this capacity can be fostered is the focus of the following section.





## Section 4. Capacity building for climate resilience

# Capacity building for climate resilience

As the analysis above indicates, various issues currently impede the capacity of the Australian Government and its international partners to address climate security concerns. Our review suggests a critical need to maintain and enhance existing governance structures, processes and institutions, and the physical infrastructure they administer, in order to improve the adaptive capacity of the Indo-Pacific region as a whole. Developing adaptive capacity will require:

- > **Developing institutional arrangements and participatory collaborative systems to enhance regional governance.** This includes, but should not be limited to, developing regional partnerships, human resources and technical capacity, and the provision of education and training for governments and the public.
- > **Enhancing the resilience of critical infrastructure and considering future infrastructure development.** In the context of both anticipated and potential extreme climate change, infrastructure development does not always necessitate physical upgrade or capital expenditure, and may also be usefully addressed through enhanced administrative processes. For instance, infrastructure is often administered in a way that prioritises the maximisation of profits and the minimisation of short-term costs, rather than in a way that optimises the management of climate risk.
- > **Identification of poorly functioning supply chains and developing strategies to resolve vulnerabilities and inefficiencies.** A principal focus in this regard should be on agriculture and water resource supply chains.
- > **Integration of resilience-building activities with the ongoing development agendas of individual states.** As noted in Section 2 above, the use of development aid for the purposes of climate resilience is often constrained by protocols limiting the purposes for which that aid may be used and barriers limiting access to it for states with limited governance capacity.

In Australia and New Zealand, disaster management systems are comparatively well developed, but there is much work still to do in other jurisdictions. Australian experiences and expertise in disaster governance and hazard



communication may constitute a key asset to contribute when developing international partnerships to enhance climate security in the region.

The adaptive capacity needs identified below will be subject to funding and resource constraints, but the greatest benefit for the Indo-Pacific region as a whole may be garnered from prioritising the most vulnerable communities and jurisdictions first. This focus will enhance regional cooperation and reduce the possibility of climate-induced conflict by avoiding state failure. However, efforts to enhance adaptive capacity must be sensitive to the variability of needs across the region. Adaptive capacity needs are dependent, inter alia, on levels of development, existing local political dynamics and local contextual factors. Regional cooperation is strong, for instance between the Pacific Island states, but much more fragile in Southeast Asia. Subsistence agriculture may be a key area worth targeting for enhancement in small island states. In countries like Indonesia, however, failing subsistence agriculture can contribute to maladaptive urban development as it contributes to rapid migration of rural communities into already over-crowded cities. These sorts of issues mean that initiatives that are successful in one location may not be successful in another.

## Key activities

### Partnerships

Regional collaboration can be bilateral or multilateral and can:

- > Build transparency and confidence, develop dialogue, support information sharing, build capacity and encourage reciprocity and learning.<sup>51, 154</sup> These efforts are important both between Australia and New Zealand, which have long experience in disaster risk management practices, and between Australia and developing countries that have fewer formal governance frameworks in place.<sup>70</sup>
- > Reduce costs through sharing of resources and avoidance of duplication.<sup>42</sup>
- > Support regional strategies for transnational policy problems. These may relate to, for instance, migration and resettlement of displaced communities or management of water security.<sup>41, 134</sup>

Partnerships may include intergovernmental organisations such as the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation. These organisations have an interest in human security

concerns, and most have specific climate change or disaster management initiatives, such as ASEAN's Working Group on Climate Change or the SAARC Disaster Management Centre.

Empowering local-level institutions is recognised as a key measure for ensuring integrated governance. On this basis, there have been calls for greater engagement between national and international organisations for the purposes of conducting local-level training and community education<sup>63 106</sup>, as well as the development of a training needs assessment to develop human capacity in the public sector.<sup>55</sup>

Governments can also collaborate with nongovernmental organisations, research institutions and private-sector corporations to harness existing expertise. The Australian federal government already sponsors institutions such as CSIRO and NCCARF that provide assistance in this way.<sup>70, 83, 87, 110, 153, 155-161</sup>

## Leadership

Australian leadership in this context can take many forms. Australia already has a regional leadership role in the Pacific, and regional intergovernmental relationships can be affected by Australia's stance on climate change and other policy positions.<sup>119, 162</sup> Leadership from wealthy countries may include protection of vulnerable island states through support for alternative governance arrangements, as in the relationship between Niue and New Zealand<sup>68</sup>, or leadership in international climate response initiatives, such as the development of a 'super smart grid' connecting electricity markets in Europe and north Africa.<sup>163</sup>

Leadership can also include financial support, directly through international aid<sup>164</sup> or indirectly, for instance, by allowing access to labour markets to enable individual remittances to countries with low domestic economic capacity, such as small island nations.<sup>109, 117, 164, 165</sup>

Risk reduction policies, and, more specifically, measures that address underlying macro-level causes of vulnerability<sup>36</sup>, should be integrated into development policy, rather than stand-alone adaptation strategies that seek to respond only to the ramifications of climate change. Problems created by climate change will likely exacerbate existing development problems, and vice versa. There have also been calls for embedding individual development projects into national plans and goals, including the Sustainable Development Goals.<sup>46, 119</sup>

There is general agreement that governments should seek to facilitate better micro-finance and micro-insurance instruments to support low-income communities in times of disaster. This underscores the need for effective partnerships between government and the financial and insurance industries.<sup>84, 166</sup>

## Community engagement

Engaging with stakeholders, citizens and community groups can ensure:

- > **better representation of women** at all levels of climate governance<sup>21, 83, 167</sup>
- > **effective collaboration of Indigenous groups**<sup>21</sup>
- > **cooperation of host communities when people need to be resettled.**<sup>34</sup>

## Improving access to information

Alongside robust institutions, infrastructure and logistics is a concurrent need for data and evidence to inform government, to direct policy and to educate the public. There is an ongoing need for the identification of climate hazards and risks, and for appropriate policies and actions to address them. With appropriate data and evidence, climate security strategies can be appropriately targeted to provide the most benefit.

## Information platforms and portals

The capability of the media in all its forms (including TV, radio, social media networks) to transmit information rapidly to the public is key to developing public capacity in DRM and CCA, notwithstanding the potential limitations of media operations in the face of disaster.<sup>12, 87, 127, 135, 168</sup> Science communication is digested more readily by the public through these sources than through printed text.<sup>169</sup>

Online platforms for sharing climate change information can provide clear and up-to-date information to a range of users (e.g. government, academia and the public).<sup>28, 135</sup> For instance, digital libraries can be used to house collections of resources on a range of climate change matters (risks, impacts and solutions for adverse events, weather). For examples of Australian portals see Appendix 2.

Tactics to expedite information sharing include data registries, national data 'stocktakes', local data hubs and systematic capture and dissemination of

project/program outcomes.<sup>53, 89, 133</sup> Where possible, existing community engagement mechanisms are most effective to disseminate information.<sup>89</sup>

## Scenarios, tools and guidelines

Realistic computer-generated scenarios and simulations help develop adaptive capacity and enhance understanding of adaptation needs.<sup>28, 72, 91, 170</sup> Scenarios make future possibilities more realistic and understandable for decision-makers and can force new ways of thinking about existing policy problems.<sup>171</sup>

Open source databases and forums, practical applications and toolkits can be used to enhance governance capacity. Examples include the provision of training materials and guidelines such as community-based disaster risk management guides, projections and hazards maps.<sup>28, 120, 125, 130, 153, 172, 173</sup>

Easily understood, place-based climate change education and training is regarded by many as key to developing local technical capacity and expertise<sup>40, 70, 169, 174, 175</sup>, especially targeting children and young people.<sup>57, 127, 176</sup>

## Information as an integration tool

The mainstreaming of climate change concepts into working policies and priorities across a range of sectors requires effective communication in collaborative processes within and between governments, researchers and nongovernment actors.<sup>84, 87, 90, 100, 120, 146, 177</sup> Knowledge brokers, much like policy *champions* noted above, may provide a means of facilitating cross-sector alliances.<sup>87, 148</sup>

Policy uptake is improved when expert and local knowledge (including community sentiment and attitudes) and traditional practices are integrated into local planning schemes.<sup>57, 70, 138, 148, 175, 178, 179</sup> Local-level adaptive capacity is strengthened when data and information is relevant and accessible.<sup>54, 106</sup> Information, education and training materials must be transmitted in local languages.<sup>180</sup> Risk identification and emergency services will be improved when local adaptive capacity is improved.<sup>87, 159</sup> This means enhancing communications infrastructure, technology and applications (especially early warning systems) in remote and regional locations, where necessary making them robust to extreme conditions.<sup>124, 172, 181</sup>

Australia's adaptive capacity, and that of the region, depends on its ability to maintain and enhance its governance practices and institutions, its management of partnerships, its use of evidence and its preservation of critical infrastructure.

Defence has a critical role to play in this, and the implications of our findings for Defence are the focus of the following section.





## Section 5. Implications for Defence

# Implications for Defence

As outlined throughout this report, there is an increasing need for better coordination among the institutions and policy portfolios of Australian government and better engagement with our regional partners. Poor integration for the purposes of disaster management, capacity building and enhancing climate security holds significant implications for Defence and the ongoing viability of its contributions to climate resilience in the Indo-Pacific region. Defence's role in disaster risk management, to date, has been largely reactive, providing short-term support in response to extreme climate-related events. The ability of Defence to continue in this reactive mode, however, will be challenged significantly by the increasing impacts of climate change. Moreover, undue focus on disaster response that neglects strategic planning for climate resilience may draw resources away from developing and implementing broader climate security strategies for which Defence will have oversight or responsibility.

In the context of the various challenges outlined, this report emphasises that strategic investments undertaken now to enhance Defence's adaptive capacity can reap significant benefits over the coming decades. Strategic planning and investment should seek to establish and maintain a central role for Defence in climate adaptation, disaster management and resilience building, both domestically and internationally, through the development and maintenance of key governance partnerships. Conversely, a failure to work collaboratively to enhance resilience will likely have significant impacts for Defence in relation to its operational budgets, external operations and, ultimately, for Australia's national security.

Strategic investments at this time should prioritise programs and projects that:

- > **Develop relationships with international partners for the purposes of regional cooperation.** This will likely also demand collaboration with DFAT, DPC and the development aid community, as well as with ASEAN, South Pacific and South Asian climate forums.
- > **Focus on building strong relationships with key partners in Australian government.** A priority in this regard should be to develop common understanding with Department of Foreign Affairs and Trade (DFAT), Department of Environment and Energy (DoEE) and Emergency Management Australia (EMA) around climate security concerns and governance practices. Note that from 1 February, DoEE will be split between a new Department



of Agriculture, Water and the Environment and a new Department of Industry, Science, Energy and Resources.

> **Work collaboratively across various groups in Defence to prevent duplication of work and ensure focused outcomes for climate security.**

For instance, efforts could be made to ensure coherence between research initiatives of Defence Science and Technology and the Strategic Policy Group. The latter is likely best placed to lead these efforts.

In collaboration with DFAT and DPC, Defence should seek to develop understanding of existing development, aid and investment mechanisms and build relationships with institutions (NGOs and governments) that administer them. In doing so, Defence should strive to integrate disaster management and climate adaptation into existing investment schemes as well as the design of future schemes. Defence should strive to help their international partners to reduce wastage and to develop human resources and technical capacity at appropriate governance levels to improve the governance capacity critical for improving climate resilience. In doing so, Defence will be better placed to embed and advance its climate security agenda through development initiatives.

In collaboration with DFAT and DPC, Defence can also contribute to cost-effective outcomes at the scale of subnational government that target climate vulnerability hotspots in the region. These initiatives should be focused on developing government legitimacy and state capacity through the bolstering of community climate resilience. Investment may be focused on developing resilient food and water resource supply, health security, urban resilience and government and community education and training. In the short term, strategic investment should focus on developing good governance practices and enhancing community resilience of the region's most vulnerable communities, rather than on the provision of capital for physical infrastructure. Any geographically focused initiatives from Defence should be evidence-informed and context-appropriate.



# Conclusion

This report outlines the key messages from a systematic review of literature on climate security, climate resilience and governance. The review emphasises the interconnected nature of Australia's domestic actions and governance of climate resilience and the external relationships and actions critical to ensuring Australia's national security under climate change. The report highlights key issues to be addressed in subnational, national and regional governance to build climate resilience in the Indo-Pacific. A range of key challenges, actions and initiatives for building capacity for climate resilience are identified. Implications for the Australian Government Department of Defence's goal of maintaining Australia's national security in this context, and the scope of its domestic and international activities, are outlined for consideration.

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# Appendix 1: Methodology

We followed a rigorous systematic quantitative review protocol<sup>182</sup> to identify the scope and findings of existing research. This approach has been found to be 'robust and reliable' across a number of studies in the natural and social sciences<sup>97</sup>, including studies addressing climate change.<sup>97, 183-188</sup>

The research was structured by three key questions:

- > What are the challenges and opportunities arising from climate change for maintaining national and regional security of Australia and its Indo-Pacific partners?
- > What best-practice guidelines are available to inform governments' work to enhance and integrate climate change resilience and disaster risk management?
- > What best-practice guidelines could be used to inform governments' communication and use of evidence on climate change risks and impacts?

Our search found few explicit best-practice guidelines. We extrapolated best practices from the research results reported in the literature.

## Academic literature search protocol

We conducted individual searches of the academic literature to identify key research addressing each of these questions.

Table 1: Academic literature search

	Web of Science	Google Scholar
<b>Theme 1: Climate change and security</b>		
Australia and New Zealand		
Search terms	[Title field] (climate OR "climate change") AND security AND (resilience OR risk OR "risk management" OR disaster OR Australia OR "New Zealand")	Search terms used in Google Scholar: allintitle:[climate OR "climate change"] AND security AND [resilience OR risk OR "risk management" OR disaster OR Australia OR "New Zealand"]. Patents were excluded
Initial results	230	54
Papers included after inclusion/exclusion criteria applied	<b>9</b>	

Asia-Pacific		
Search terms	[Title field] (Climate OR "Climate Change") AND Security AND (Resilience OR Risk OR "risk management" OR disaster OR "South Asia" OR "Southeast Asia" OR Australasia OR Indonesia OR Malaysia OR Philippines OR "Papua New Guinea" OR PNG OR "Pacific Islands")	allintitle:[Climate OR "Climate Change"] AND Security AND [Resilience OR Risk OR "risk management" OR disaster OR "South Asia" OR "Southeast Asia" OR Australasia OR Indonesia OR Malaysia OR Philippines OR "Papua New Guinea" OR PNG OR "Pacific Islands"] Patents were excluded. Since 2014.
Initial results	59	144
Papers included after inclusion/exclusion criteria applied	<b>35</b>	
<b>Theme 2: climate change resilience and disaster risk management</b>		
Search terms	[Title field] (Climate OR "Climate Change") AND Disaster AND (Risk OR Governance OR "Whole of government" OR Communication OR Network OR Coordination OR Adaptation OR Resilience)	allintitle:[Climate OR "Climate Change"] AND Disaster AND [Risk OR Governance OR "Whole of government" OR Communication OR Network OR Coordination OR Adaptation OR Resilience] Patents were excluded. Since 2014.
Initial results	181	395
Papers included after inclusion/exclusion criteria applied	<b>120</b>	
<b>Theme 3: Effective use and communication of climate change evidence</b>		
Search terms	[Title field] (Climate OR "Climate Change") AND [Government OR Governance] AND (Communication OR Evidence OR Evidence-based OR "evidence use" OR "evidence based" OR "evidence-based policy")	allintitle: [Climate OR "Climate Change"] AND [Government OR Governance] AND [Communication OR Evidence OR Evidence-based OR "evidence use" OR "evidence based" OR "evidence-based policy"] Patents were excluded. Since 2014.
Initial results	16	40
Papers included after inclusion/exclusion criteria applied	<b>9</b>	
Total number of academic papers included in the review	<b>173</b>	

Because of practical difficulties with assessing the strength of evidence across disciplines and in grey literature, we applied consistent inclusion criteria based on relevance <sup>189</sup>.

Table 2: Inclusion and exclusion criteria applied

Inclusion	Exclusion
Published between January 2014 and November 2019	Published outside this period
Published in a peer-reviewed scholarly journal	Publications not in peer-reviewed scholarly journals
English language	Languages other than English
Indexed by Google Scholar or Web of Science	Not indexed by Google Scholar or Web of Science
Include key terms in search protocol	Key terms not present
Not already included in study	Duplicates of studies already included
Studies with relevance to the questions under consideration	Studies that are not relevant to the questions under consideration

The sources identified, whether qualitative or quantitative, were predominantly in narrative form, so there were few figures that could be readily compared. To extract relevant findings, careful reading of each source was required.

## Grey literature search protocol

Our search of grey literature targeted publications by governments, United Nations bodies and nongovernment organisations working in the Pacific region. We searched the government domain of each included country using the following search string in Google:

- > "Climate change" OR adaptation OR security OR resilience site:[government domain for each country] filetype:pdf Custom range: since 2014

The following search string was used for each country for both NGOs and UN agencies:

- > allintitle: Tuvalu "Climate change" OR adaptation OR security OR resilience site:[NGO domain] filetype:pdf Custom range: since 2014

See below for the list of agencies and organisations included.

NGOs included in the grey literature search:

- > Red Cross
- > Medecins Sans Frontier
- > Greenpeace
- > Transparency International
- > WWF

- > JANE'S 360
- > Oxfam
- > The Worldview Project
- > Pacific Islands Climate Adaptation
- > Secretariat of the Pacific Community

UN agencies included in the literature search:

- > United Nations
- > Food and Agriculture Organization of the United Nations
- > World Health Organization
- > World Meteorological Organization
- > United Nations Development Programme
- > United Nations Office for the Coordination of Humanitarian Affairs
- > United Nations Office for Disaster Risk Reduction
- > United Nations Department of Safety and Security
- > Economic and Social Commission for Asia and the Pacific
- > United Nations Department of Political and Peacebuilding Affairs
- > United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
- > Executive Office of the Secretary-General.



Table 3: Grey literature search

Country	Government sources		NGO sources		UN sources	
	Initial results	Included	Initial results	Included	Initial results	Included
Australia	184	52	1	0	2	0
Cook Islands	3	3	1	0	1	1
Fiji	8	4	0	0	1	1
French Polynesia	0	0	0	0	0	0
Kiribati	0	0	1	0	0	0
Marshall Islands	2	0	3	2	0	0
Micronesia	0	0	2	2	0	0
Nauru	0	0	3	3	2	2
New Caledonia	1	1	0	0	0	0
New Zealand	185	76	0	0	10	7
Niue	0	0	1	1	1	1
Northern Mariana Islands	4	3	1	1	0	0
Palau	0	0	5	3	0	0
PNG	7	7	2	2	4	4
Samoa	3	2	1	1	6	4
Solomon Islands	1	1	2	2	5	5
Timor-Leste	0	0	2	2	6	5
Tokelau	1	0	0	0	0	0
Tonga	5	4	2	1	3	3
Tuvalu	22	1	2	1	1	1
Vanuatu	5	4	4	4	6	6
Wallis and Futuna	0	0	0	0	0	0
<b>Total included for each</b>		<b>158</b>		<b>25</b>		<b>40</b>
<b>Number of grey literature publications included in study</b>	<b>223</b>					

This report presents analysis of 223 government/NGO publications and 173 peer-reviewed journal articles: a total of 396 recent research publications.

## Geographical coverage

Table 4: Geographical coverage

	Academic literature	Grey literature	Total
International	21		21
Africa	8		8
Australia	18	51	69
New Zealand		34	34
UK and Europe	8		8
North America	5	1	6
South America	3		3
South Asia	27		27
East Asia	5		5
Southeast Asia	29		29
Pacific Islands	12	83	95
No location information available	37	54	91
Total	136	169	396

## Analysis

Once selected for review, sources were entered into an EndNote database and imported into NVivo data analysis software for coding. A series of nodes and subnodes were used consistently by members of the research team to extract the key relevant findings from each of the sources. This process was refined through trial coding to ensure consistency. The coding protocol ensured that content relevant to all themes was identified in every source, regardless of how sources were identified through the search protocol. Once all of the papers had been read carefully and relevant text had been coded, a further round of analysis was conducted on the coded material to synthesise the findings.

# Appendix 2: Information platforms and portals

Examples of Australian online platforms or portals for sharing climate change information include:

- > **Climate Change in Australia** [www.climatechangeinaustralia.gov.au](http://www.climatechangeinaustralia.gov.au)<sup>130</sup>
- > **Australian Climate Futures**  
[www.climatechangeinaustralia.gov.au/en/climate-projections/climate-futures-tool/introduction-climate-futures/](http://www.climatechangeinaustralia.gov.au/en/climate-projections/climate-futures-tool/introduction-climate-futures/)
- > **National Climate Change Adaptation Research Facility**  
[www.nccarf.edu.au/](http://www.nccarf.edu.au/)<sup>157</sup>
- > **Carbon Disclosure Project Cities** [www.cdp.net/en/cities](http://www.cdp.net/en/cities)<sup>190</sup>
- > **The Long Paddock** [www.longpaddock.qld.gov.au/](http://www.longpaddock.qld.gov.au/)<sup>191</sup>
- > **ACT Smart** [www.actsmart.act.gov.au/](http://www.actsmart.act.gov.au/)<sup>87</sup>
- > **AdaptNSW** [climatechange.environment.nsw.gov.au/](http://climatechange.environment.nsw.gov.au/)<sup>125</sup>